

Australian/New Zealand Standard™

Wheelchairs

Part 1: Requirements and test methods for manual wheelchairs



AS/NZS 3695.1:2011

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee ME-067, Mobility Appliances for People with Disabilities. It was approved on behalf of the Council of Standards Australia on 12 December 2011 and on behalf of the Council of Standards New Zealand on 20 October 2011. This Standard was published on 23 December 2011.

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Part 1: Requirements and test methods for manual wheelchairs

Originated as part of AS 3695—1992.
Jointly revised in part as AS/NZS 3695.1:2011.

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME-067, Mobility Appliances for People with Disabilities to supersede, in part, AS 3695—1992, *Wheelchairs—Product requirements*.

This is the first revision of the Standard, which was originally issued in 1992.

Where this Standard does not apply to particular wheelchairs, contracting parties should consider whether appropriate parts of this Standard can be used as part of the contract.

Manufacturers may also wish to consider if appropriate parts of this Standard can be used to assess the performance of their products against the relevant Essential Principles of the Medical Device from the Australian *Therapeutic Goods Act 1989*.

In revising this Standard, it was determined to expand the role and function of AS 3695 in line with the ISO series of test methods for wheelchairs and, where possible, to align with EN 12183:2009, *Manual wheelchairs—Requirements and test methods*, and in so doing, the 1992 publication has been split into three Parts as follows:

Part 1: Requirements and test methods for manual wheelchairs (this Standard).

Part 2: Requirements for electrically powered wheelchairs (excluding scooters).

Part 3: Motorized mobility scooters (*to be published*).

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

CONTENTS

	<i>Page</i>
1 SCOPE	4
2 REFERENCED DOCUMENTS	4
3 DEFINITIONS	5
4 TEST APPARATUS, SET UP AND ORDER OF TESTING	6
5 GENERAL REQUIREMENTS	6
6 DESIGN AND CONSTRUCTION REQUIREMENTS	7
7 PERFORMANCE REQUIREMENTS	8
8 INFORMATION DISCLOSURE REQUIREMENTS	13
9 TEST REPORT	16
 APPENDICES	
A OPERATIONS INTENDED TO BE CARRIED OUT BY THE OPERATOR.....	17
B DIMENSIONS AND MASS OF THE TEST WHEELCHAIR.....	20
C RECOMMENDED DESIGN FEATURES.....	23
D RECOMMENDED SEATING DESIGN.....	25
E MANOEUVRING FORCES.....	26
F TECHNICAL CHANGES FROM AS 3695—1992 AND RELATIONSHIP TO EN 12183:2009.....	27

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard Wheelchairs

Part 1: Requirements and test methods for manual wheelchairs

1 SCOPE

This Standard specifies requirements and test methods for manual wheelchairs intended to carry one person.

This Standard does not apply in total to wheelchairs designed for special purposes such as those listed in (a) to (c) below. Specific elements of the Standard may be relevant to such wheelchairs.

- (a) Sports wheelchairs.
- (b) Stand-up wheelchairs.
- (c) Add on power kits for the propulsion of manual wheelchairs.

This Standard does not apply in total to custom-made wheelchairs.

However, where custom-made wheelchairs are—

- (i) constructed on the basis of a standardized design;
- (ii) using structural members of common technical specification; and
- (iii) with primarily dimensional variations between users,

the Standard may be applied to the base design.

In such circumstances the test sample needs to be constructed in accordance with the base design, to a specification that is representative of common prescriptions giving consideration to the set up requirements specified in AS/NZS 3696.22.

NOTE: Appendix F provides, for information only, a list of changes made to AS 3695—1992 in this edition and reference to relevant parts of EN 12183:2009, which informed those changes.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard.

AS

- 3696* Wheelchairs
- 3696.11 Part 11: Test dummies

AS/NZS

- 3696* Wheelchairs
- 3696.1 Part 1: Determination of static stability
- 3696.3 Part 3: Determination of effectiveness of brakes
- 3696.8 Part 8: Requirements and test methods for static, impact and fatigue strengths
- 3696.19 Part 19: Wheeled mobility devices for use as seats in motor vehicles (ISO 7176-19:2008, MOD)
- 3696.22 Part 22: Set-up procedures

* The AS and AS/NZS 3696 series is progressively being revised as adoptions of the ISO 7176 series. As part of this process the 3696 series is being redesignated as the AS/NZS ISO 7176 series.

AS/NZS	
4810	Medical devices—Risk management
4810.1	Part 1: Application of risk analysis
10542	Technical systems and aids for disabled or handicapped persons—Wheelchair tiedown and occupant-restraint systems
10542.1	Part 1: Requirements and test methods for all systems (ISO 10542-1:2001, MOD)
AS EN	
12182	Technical aids for disabled persons—General requirements and test methods
ISO	
68	ISO general purpose screw threads—Basic profile
68-1	Part 1: Metric screw threads
7176	Wheelchairs
7176-5	Part 5: Determination of dimensions, mass and manoeuvring space
7176-7	Part 7: Measurement of seating and wheel dimensions
7176-11	Part 11: Test dummies
7176-16	Part 16: Resistance to ignition of upholstered parts—Requirements and test methods
7176-19	Part 19: Wheeled mobility devices for use as seats in motor vehicles
7176-26	Part 26: Vocabulary
9999	Assistive products for persons with disability—Classification and terminology
10542	Technical systems and aids for disabled or handicapped persons—Wheelchair tiedown and occupant-restraint systems
10542-5	Part 5: Systems for specific wheelchairs
ANSI/RESNA	
WC19	Wheelchairs used as seats in motor vehicles
EN	
12183	Manual wheelchairs—Requirements and test methods
TGA	Therapeutic Goods (Medical Devices) Regulations 2002

3 DEFINITIONS

For the purposes of this document, the terms and definitions given in ISO 7176-26 and AS EN 12182 apply unless specifically defined below.

3.1 Attendant

A person who operates, or assists the occupant in operating, the wheelchair by using the wheelchair push handles and, where fitted, handle brakes.

3.2 Custom-made wheelchair

A wheelchair that:

- (a) is specifically made in accordance with a request by a health professional specifying the design characteristics or construction of the wheelchair; and
- (b) is intended to be used only in relation to a particular individual, (i.e. wheelchairs fabricated to a prescription for a single user—as defined in the Therapeutic Goods Regulations 2002).

3.3 Loaded wheelchair

Wheelchair with a test dummy (as specified in Clause 4.2) or occupant (of equivalent mass).

3.4 Manual wheelchair

A wheelchair that relies on an operator to provide power to propel it. [ISO 9999]

3.5 Occupant

The person occupying, but not necessarily operating, the wheelchair.

3.6 Operator

The occupant, or attendant, who propels and steers (manoeuvres) the wheelchair.

3.7 Wheelchair

A device to provide wheeled mobility with a seating support system for a person with impaired mobility. [ISO 7176-26]

4 TEST APPARATUS, SET UP AND ORDER OF TESTING

4.1 Test equipment

Test equipment includes measuring and load application devices, surfaces and platforms, etc. as specified in the relevant parts of AS 3696, AS/NZS 3696 or the ISO 7176 series of Standards.

4.2 Test dummy

The test dummy shall be as specified in AS 3696.11 for mass equal to the maximum occupant mass specified by the manufacturer.

NOTES:

- 1 If the maximum occupant mass specified by the manufacturer is greater than 100 kg, and until the revised edition of the Standard, which caters for occupant masses greater than 100 kg, is published, use an augmentation to the 100 kg test dummy from AS 3696.11—1993 (ISO 7176-11:1992) as specified below.

The following will provide the required mass and position to augment a 100 kg dummy.

M is the total mass of the required dummy.

The trunk/back section mass is to be: 61 kg (tolerance ± 3 kg).

The mass of the thigh segment (tolerance ± 3 kg) is obtained from the following:

$$M_{\text{Thighs}} = M - 69 \text{ where } M > 100 \text{ kg}$$

The mass of the lower legs (including feet) is to be: 8 ± 1 kg.

- 2 Centres of mass for dummies are currently being developed in the revision of ISO 7176-11.

4.3 Set up

Unless the set up is specified in a relevant part of the AS 3696, AS/NZS 3696 and AS/NZS ISO 7176 series of Standards, then the wheelchair shall be prepared as specified in AS/NZS 3696.22 for each test.

5 GENERAL REQUIREMENTS

5.1 Risk Analysis

In addition to technical requirements of this Standard, manufacturers shall identify hazards and estimate risks associated with the wheelchair in accordance with AS/NZS 4810.1. The results of this analysis may be used to determine where further risk management is required in line with AS EN 12182.

5.2 Specific design and hazard management requirements

The wheelchair shall conform to the requirements as specified in the following clauses and sub-clauses of AS EN 12182—2002, with any reference to EN 1441 replaced with an equivalent reference to AS/NZS 4810.1.

- (a) Clause 4.2, Intended performance and technical documentation.
- (b) Clause 4.4, Aids that can be dismantled.
- (c) Clause 4.5, Single use fasteners.
- (d) Clause 5.2, Biocompatibility and toxicity.
- (e) Clause 5.3, Contaminants and residues.
- (f) Clause 5.4, Infection and microbiological contamination.
- (g) Clause 9, Overflow, spillage, leakage and ingress of liquids.
- (h) Clause 12, Safety of moving parts.
- (i) Clause 13, Prevention of traps for parts of human body.
- (j) Clause 14, Folding and adjusting mechanisms.
- (k) Clause 18, Surfaces, corners and edges.

6 DESIGN AND CONSTRUCTION REQUIREMENTS

6.1 Pneumatic tyres

If the wheelchair is fitted with pneumatic tyres, they shall have the same type of valve connection on all tyres. The tyres or the rims shall be marked with the maximum pressure.

6.2 Fitting an anterior pelvic support

The wheelchair shall have provision for an anterior pelvic support to be fitted. The manufacturer of the wheelchair shall have available as an option an anterior pelvic support which can be used with that provision.

6.3 Wheelchairs for use as seats in motor vehicles

If the manufacturer specifies that the intended use of the wheelchair includes use as a seat in a motor vehicle by a person of mass equal to or greater than 22 kg, the wheelchair shall conform to the performance requirements of AS/NZS 3696.19.

If the manufacturer specifies that the intended use of the wheelchair includes use as a seat in a motor vehicle by a person of mass less than 22 kg, the wheelchair shall conform to the performance requirements of AS/NZS 3696.19:2009 with the exception of the horizontal excursion limits and the selection of the Anthropomorphic Test Device (ATD). The horizontal excursion limits specified in Table 1 of ISO 10542-5:2004 and the ATD selection specified in Table A.1 of ISO 10542-5:2004 shall apply.

Compliance with AS/NZS 3696.19 may be demonstrated by type testing a model variant within the same make.

NOTE: ISO 7176.19 and ANSI/RESNA WC 19, Vol. 1. Section 19 are deemed to meet the requirements of this Clause.

If a wheelchair meets the requirements of AS/NZS 3696.19, it is recommended that the manufacturer include provision for an extended backrest and/or headrest.

NOTES:

- 1 It is recognized that single sample testing does not mean that every variation of a given wheelchair model will exhibit exactly the same performance behaviour in crash situations. However, it is also recognized that it is not feasible for manufacturers to independently test every variation of a given wheelchair model.

- 2 As such, the expectation is that wheelchair manufacturers will test a suitably representative test sample (or test samples). Where manufacturers make any subsequent claims of compliance they should ensure that the test sample is adequately representative of the model variation for which compliance is claimed. This should be determined by critical assessment of design data, with consideration of design factors and options that may alter the structural performance of the chair. Where representative assumptions are made, manufacturers should ensure adequate safety factors are incorporated into critical design elements.
- 3 In addition, where requested, manufacturers should make details of the test sample configuration, options and setup available to suppliers and/or purchasers.

6.4 Foot supports, lower leg supports and arm supports

The wheelchair shall be fitted with foot supports. Foot supports shall meet the performance requirements specified in Clause 7.6.

The wheelchair shall have provision for preventing the occupant's feet from sliding backwards. The manufacturer of the wheelchair shall have available as an option a means for preventing the occupant's feet from sliding backwards which can be used with that provision.

NOTE: Such provision could include a posterior lower leg support or similar.

Where fitted, lower leg supports and arm supports shall meet the performance requirements specified in Clauses 7.6 and 7.7 respectively.

6.5 Brake system

The wheelchair shall have provision to be fitted with a parking brake system that meets the performance requirements specified in Clause 7.1 and that the brake shall be fitted throughout the test.

NOTE: Supply of the wheelchair without the brake may be a purchasing option.

6.6 Component mass

If the wheelchair is intended to be dismantled for storage or transportation, any component that requires lifting and has a mass greater than 10 kg shall be provided with suitable handling devices (e.g. handles). The manufacturer shall provide information indicating the points where it can be lifted, and describe how it shall be handled during disassembling, lifting, carrying and assembling, to reduce risks to the person or persons lifting the equipment.

6.7 Operations intended to be carried out by the operator

All controls fitted to the wheelchair shall meet the performance requirements of Clause 7.1 (a) and (b), the operating force requirements of Clause 7.4, and the controls operated by occupant in Appendix A. Requirements for the manufacturer's instructions for operations and adjustment of the wheelchair and its components are set out in Clause 8.

7 PERFORMANCE REQUIREMENTS

7.1 Brake system

The wheelchair parking brake system shall meet the following requirements:

- (a) Shall be accessible and operable by the operator (as specified in Appendix A) in accordance with the manufacturer's intended use.
- (b) Shall have maximum operating forces for engaging and disengaging as specified in Table 1 of AS/NZS 3696.3:2008 when tested using methods of AS/NZS 3696.3.

NOTE: Wheelchairs operated by the occupant using a circular hand rim attached to the wheels are considered to have provision to stop the wheelchair so the occupant can slow it down. Requirement for operating forces for engaging and disengaging as stated in Table 1 of AS/NZS 3696.3 is not applicable for this type of braking system. Wheelchairs intended to be controlled by an assistant may require a running brake to allow the assistant to slow or stop the wheelchair.

- (c) Engaged brakes, when used with removable or movable arm supports, shall have no parts that protrude above the level of the unoccupied seat to enable occupant transfers.
- (d) Shall have provision for adjustment and/or replacement as specified by the manufacturer, if the parking brake, tyres, etc are subject to wear.
- (e) When tested in accordance with AS/NZS 3696.3 the wheelchair shall not slide or rotate its wheels on a slope less than 7°. This requirement applies to both uphill and downhill directions, before and after completion of the brakes fatigue test.
- (f) Shall not have moved from the pre-set position and no component or assembly of parts shall exhibit deformation, free play or loss of adjustment that adversely affects the function of the wheelchair when the wheelchair (including parking brake) has been tested in accordance with AS/NZS 3696.8.
- (g) Shall prevent the wheelchair from rolling on a slope of 7° after the wheelchair and associated parking brake have been tested in accordance with AS/NZS 3696.8.

7.2 Static, impact and fatigue strength

When tested in accordance with AS/NZS 3696.8 and after completion of all tests required for compliance with this Standard the wheelchair shall conform to the static, impact and fatigue requirements of AS/NZS 3696.8.

NOTE: Where the manufacturer specifies a maximum occupant mass greater than 100 kg refer to Clause 4.2 for the specified dummy.

7.3 Static stability

The wheelchair shall be tested in accordance with AS/NZS 3696.1, using the test dummy specified in Clause 4.2 of this Standard.

The forwards, rearwards and sideways stability shall not be less than 10 degrees with the following exception:

Rearwards stability less than 10° is permissible where the wheelchair has provision for anti-tip devices. In such circumstances the rearward stability with anti-tip devices shall not be less than 10° when tested in accordance with AS/NZS 3696.1.

7.4 Operating force

All controls shall have maximum operating forces for engaging and releasing as stated in Table 1 of AS/NZS 3696.3:2008 using the test method of AS/NZS 3696.3:2008.

In addition, the maximum torque (in Nm) that may be applied to turning knobs operated by one hand (using friction) shall be less than X_{knob} times the knob diameter (in mm), where—

- (a) $X_{\text{knob}} = 0.05$, where the knob diameter is greater or equal to 25 mm; or
- (b) $X_{\text{knob}} = 0.025$, where the knob diameter is less than 25 mm.

7.5 Pushing force

7.5.1 General

When determined in accordance with Clause 7.5.2, the pushing force required to start and keep the loaded wheelchair moving at constant speed on a horizontal surface shall not exceed—

- (a) 40 N for a maximum occupant mass not greater than 100 kg;
- (b) 60 N for a maximum occupant mass greater than 100 kg but not greater than 150 kg; and
- (c) 70 N for a maximum occupant mass greater than 150 kg but not greater than 200 kg.

7.5.2 Test method for pushing force

The procedure shall be as follows:

- (a) Make provisions for applying a horizontal force in the forward direction of travel and along the longitudinal centre-line of the wheelchair as follows:
 - (i) Where push handles are fitted, to the push handles.
 - (ii) Where push handles are not fitted and the wheelchair has a flexible back support, to a point 15 ± 5 mm below the top of the back support.
 - (iii) Where the back support is rigid, to a point 15 ± 5 mm below the top of the back support.

NOTE: A bar or string may be fitted across push handles or the back support to permit a pushing force to be applied.
- (b) Place the loaded wheelchair on the horizontal test plane.
- (c) Set up a means to apply a force to start the wheelchair moving and to maintain the wheelchair moving forwards at a speed of 1.0 ± 0.1 m/s so that the direction of the force is maintained within the following limits throughout the test:
 - (i) Horizontal $\pm 5^\circ$.
 - (ii) At the height of the point to which the force is applied, and parallel to the forward direction of travel of the wheelchair $\pm 5^\circ$.
 - (iii) Within 5 mm of the longitudinal centre-line of the wheelchair.
- (d) Apply the force, and increase it at a rate not greater than 5 N/s until the wheelchair starts to move.
- (e) Accelerate the wheelchair to a speed of 1.0 ± 0.1 m/s over a distance not less than 0.5 m.
 After the acceleration is complete, measure and record the force needed to maintain the wheelchair in motion at a constant speed of 1.0 ± 0.1 m/s over a distance not less than 2.5 m.
- (f) Maintain the direction of the force within the limits specified above during the whole test procedure.
- (g) Perform the test six times in the forward direction of the wheelchair. Carry out the tests on the same area of the test track, three times in one direction and three times in the opposite direction.
- (h) Calculate the arithmetic mean value of the forces measured.

7.6 Foot supports and lower leg supports

7.6.1 General

Any swing away, movable or removable foot supports, or lower leg support, fitted on the wheelchair shall—

- (a) incorporate a means to fix securely in any operating position;
 - (b) incorporate a lower leg support assembly that allows adjustment of distance between the foot support to seat upper surface (using appropriate tools as required) in increments not exceeding 25 mm;
 - (c) be moved to facilitate transfer without the use of tools; and
- NOTE: For further information on facilitating transfer, see Paragraph C4.
- (d) when tested as specified in Clause 7.6.2, separate foot supports shall have a gap between them that either—