# NEW SAFETY STANDARDS FOR MOTORISED MOBILTY DEVICES IN AUSTRALIA

**Michael Paine**

**David Paine**

Vehicle Design and Research Pty Limited, Australia

Paper Number 19-0205

## ABSTRACT

A motorised mobility device (MMD) is primarily intended as assistive technology for people with limited mobility. MMDs include powered wheelchairs and mobility scooters. In recent years concerns have been raised about the number of fatal and serious incidents with these devices in Australia. These incidents are not reliably recorded in crash reporting systems but special studies indicated that several hundred Australians are hospitalised each year due to incidents involving MMDs. A review using the safe-systems approach resulted in recommended minimum safety requirements for the design of MMDs intended to be used on footpaths/sidewalks and other public infrastructure. In 2018 Standards Australia published a new Technical Specification settings out these requirements. This paper provides background on the development of these requirements.

## INTRODUCTION

In 2012 Austroads, the peak organisation of Australian and New Zealand road transport and traffic agencies, began a review of the safety of MMDs. This followed on from a review by Vicroads in 2009 and a project initiated by the Australian Competition and Consumer Commission (ACCC), as well as concerns expressed by road transport agencies about the safety of MMDs.

## RESEARCH FINDINGS

A study commissioned by the ACCC estimated that between 2006 and 2008 the average number of hospitalisations involving MMD users was at least 350 per year. It was found that injury-causing incidents with MMDs were poorly reported by road crash data systems (i.e. police-reported data) and hospital recording systems. Recording of fatalities was more reliable due to the coronial process and between 2000 and 2010 there were 62 fatalities recorded in Australia (Gibson 2011, VISU 2006), although some were medically-related.

In 2008 it was estimated that about 80,000 MMDs were in use across Australia (Griffiths 2010). There is considerable uncertainty about current numbers but it is thought to exceed 200,000 because the number in use appears to be doubling every five years, based on trends with registration of MMDs in Queensland - the only State that requires MMDs to be registered for footpath use.

It was found that the serious crash risk was much higher than conventional vehicles in terms of kilometres travelled. There are numerous reasons for this relatively high rate, including frailty of some users and low annual kilometres travelled but the findings support the need to minimise the consequences of human error or misjudgement through the clever design of MMDs.

In accordance with the safe-systems principles it was concluded that MMD construction requirements were appropriate and that these should be based closely on an existing Australian Standard AS/NZS 3695.2:2013 "Requirements and test methods for electrically powered wheelchairs (including mobility scooters): 2013". However it was recognised that some aspects of that standard were too onerous for the intended application (leading to unnecessary compliance costs) and that some extra requirements were needed to address safety and access issues not adequately covered by the standard.

Overseas standards were also found to be incomplete for the purpose of safe use of MMDs on footpaths but they contained some useful and innovative ideas that were incorporated into the proposed technical requirements.

## DEVELOPMENT OF A TECHNICAL SPECIFICATION

After consultation with Standards Australia and stakeholders it was decided that a Standards Australia Technical Specification (SATS) was an appropriate method for publishing the desired technical requirements.

A key reason for this decision was that demonstrating compliance with a Technical Specification is much less onerous than having a product certified to an Australian Standard. During the Austroads review it was recognised that a simple labelling system, where the manufacturer claimed conformity with published technical requirements, would be enforceable under Australian Consumer Law. Therefore there could be reasonable assurance that a product met safety requirements without the resources needed for third-party certification.

An existing Standards Australia committee, highly experienced in assistive technology requirements, took on the task of drafting the SATS.

The result was SATS 3695.3:2018 "Wheelchairs: Requirements for designation of powered wheelchairs and mobility scooters for public transport and/or road-related area use". Standards Australia published the SATS in mid-2018.

## CONTENTS OF THE TECHNICAL SPECIFICATION

The SATS refers to many of the requirements set out in AS/NZS 3695.2:2013. In brief, the TS requires MMDs to demonstrate dynamic and static stability on slopes, limits the dimensions and mass of devices, introduces a slow speed switch for devices that can exceed 6km/h, and requires that devices can negotiate uneven surfaces and obstacles.

### Stability on slopes

AS/NZS 3695.2:2013 recognises three classes of MMD (paraphrased):

- Class A are primarily intended for indoor use and are not necessarily capable of negotiating outdoor obstacles
- Class B are relatively compact and are intended for indoor and outdoor use
- Class C are large and are primarily intended for outdoor use

Class B requirements were found to be the most appropriate to safety requirements for MMDs used on footpaths. This required the device to be tested on a 6 degree slope as a minimum for dynamic stability (e.g. turning on a slope) and 9 degrees for static stability (e.g. remaining stationary on a slope and for parking brake performance).

For devices intended for use on public transport a 7.1 degree slope was found to be appropriate for dynamic stability tests, based on Australian Disability Standards For Accessible Public Transport (DSAPT) (e.g. boarding ramps).

### Speed

Each Australian state and territory sets its own road rules. These are based on the ARR, which are intended as a template for those road rules. For road rule purposes MMDs and their users are treated as pedestrians, provided that the maximum speed on level ground does not exceed 10km/h. This requirement has applied for more than 20 years.

A review of the speed issue included an analysis of sight distances needed to avoid a collision. This was based on established road design practices that took into account reaction times and braking distances. In the case of low speed situations it was also necessary to account for forward projection - the distance from the person's eyes to the front of the device (Figure 1). Because MMDs are often used amongst frail pedestrians the calculations were based on total collision avoidance.

Based on this analysis it was found that the speed of

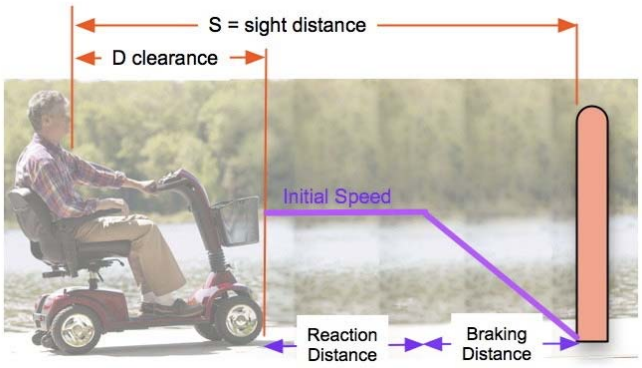


Figure 1. Stopping scenario

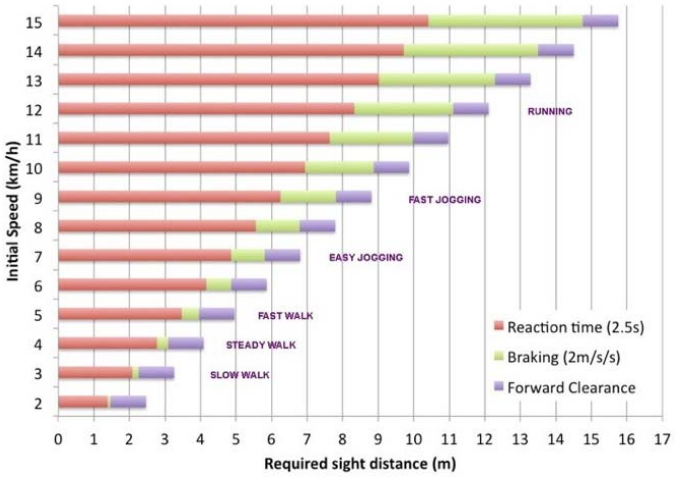


Figure 2. Relationship between speed and sight distance

travel in km/h should not exceed the available sight distance in metres (Figure 2). For example, a sight distance of 5m, typical of uncrowded footpaths, requires a travel speed of no more than 5km/h. It was found that 10km/h (i.e. 10m sight distance) was an appropriate maximum speed for MMDs using footpaths and other public infrastructure but they should travel at much slower speeds in crowded areas.

It was also recognised that, at these relatively low speeds, any motorised wheeled device gives a poor

perception of speed compared with ambulation, where gait is a reliable indicator of speed (labels on Figure 2). This has been addressed by requiring a low speed switch that limits the MMD to 5km/h. The switch is not required if the MMD has a maximum speed not more than 6km/h. Most MMDs in the United Kingdom that are capable of exceeding 4mph (~6kmh) are required to have a low speed switch (Figure 3).


Figure3. Low speed switch

**Unladen mass and dimensions**

The ARR require MMDs to have an unladen mass no more than 110kg. It is apparent that many MMDs in use in Australia exceed this limit and several Australian states have increased this to 150kg in their regulations. The review looked at this issue.

It is desirable that the laden mass (MMD, user and luggage) does not exceed 300kg based on infrastructure and equipment capacities (e.g. ramps and lifts). Based on anthropometric data and a survey of devices in use an unladen mass limit of 170kg was considered to be appropriate for mobility scooters in the SATS. In recognition of the issues associated with medical needs, powered wheelchairs have no limit on unladen mass but are recommended to not exceed 300kg laden mass.

Maximum width and length were based mainly on the design parameters of infrastructure and public passenger vehicles (Standards Australia 2010, Austroads 2009). For general infrastructure MMDs must not exceed 850mm in width and 1500mm in length.

For MMDs intended to be conveyed by public transport the maximum width is 740mm and length depends on swept path and manoeuvrability tests specified in the SATS. There are several other requirements that apply to these "blue label" MMDs (Figure 5) to ensure improved compatibility with mass-transit vehicles. These requirements took into account the accessibility and allocated space requirements of the DSAPT that apply to public passenger vehicles in Australia.

**Obstacles and hazards**

AS/NZS 3695.2:2013 includes tests for safely negotiating obstacles and others hazards. Class B MMDs are tested with 50mm high obstacles and 30mm ground unevenness.

In addition the SATS has a test for traversing a pavement gap 75mm wide, such as those found at railway level crossings. There is also a test for lateral stability if one wheel of the MMD drops down a step transition 50mm high that is parallel to the pathway (some incidents involve an MMD suddenly swinging into an adjacent traffic lane when this occurs).

**Labelling conforming MMDs**

The SATS describes the content of user information to be provided with new MMDs and the specifications of a label to be affixed to the device. The label includes the words "This product conforms with SA TS 3695.3" (Figures 4 & 5). This wording is associated with Australian Consumer Law that, in effect, requires products sold in Australia to be fit-for-purpose.


Figure 4. White Label for footpath use
(© Standards Australia)


Figure 5. Blue Label for compatibility with suitable public passenger vehicles (© Standards Australia)

Now that the SATS is published MMD manufacturers are able to test their products and claim that they conform with the requirements of the SATS. In this way they can ensure the product is suitable for use on footpaths and other public infrastructure and so is fit-for-purpose.

Similarly, purchasers of MMDs can choose a product that meets their needs by checking for the presence of and the colour of the label.

## CONCLUSIONS

Incidents involving MMDs are not reliably reported in Australia and this seems to also be the case elsewhere. Specially-commissioned injury research in Australia found a high serious injury rate (e.g. per kilometre travelled) compared with other motorised transport. While there are several reasons for this there is a strong case for a safe-systems approach where the MMD design and construction minimise the consequences of human error or misjudgement.

The number of MMDs in use in Australia is likely to be doubling very five years as the population ages and people seek to retain their mobility.

Until recently very little attention has been paid to the safe design of MMDs and the market is effectively unregulated. While clearly the assistive technology industry is experienced and provides suitable products (ATSA 2011) there is, in effect, nothing to prevent inexperienced, unqualified people from selling inferior products in Australia.

The development and publication of SATS 3695.3 is a major step in efforts to address this safety issue.

User behaviour is another matter...

Figure 6. Only in Australia!

## REFERENCES


ATSA (2011) Code of Practice for the Australian Healthcare and Assistive Technology Products and Services Industry, Assistive Technology Suppliers Association Inc, June 2011 version 1.02

Austroads (2009), Guide to Road Design – Part 6A: Pedestrian and Cyclist Paths, ISBN 978-1-921551-81-9

Bradley C and Pointer S (2009). Identifying injuries in Australia due to mobility scooters: Incidence, severity and common characteristics (presentation to ACCC)

DSAPT (2002) Disability Standards for Accessible Public Transport 2002, Attorney- General's Department, Canberra (revision pending).

Gibson K, Ozanne-Smith J, Clapperton A, Kitching F & Cassell E (2011). Targeted study of injury data involving motorised mobility scooters. A report commissioned by the Australian Competition and Consumer Commission by Monash University

Griffiths M, Bailey W and Paine M (2010), Review of Motorised Mobility Devices, report prepared for Vicroads.

Standards Australia (2010) AS/NZS 1428.1:2009 Design for access and mobility - General requirements for access - New building work and Disability (Access to Premises - Buildings) Standards 2010

Standards Australia (2013) AS/NZS 3695.2:2013 "Wheelchairs. Part 2: Requirements and test methods for electrically powered wheelchairs (including mobility scooters)"

UK Dept for Transport, (2010), Consultation on proposed changes to the laws governing powered mobility scooters & powered wheelchairs

VISU (2006) Consumer product-related injury (2): Injury related to the use of motorised mobility scooters, Hazard (Edition No. 62), Summer - Autumn 2006, Victorian Injury Surveillance Unit , Monash University Accident Research Centre


## ACKNOWLEDGEMENTS


This work was undertaken by Austroads to support the preparation of appropriate safety requirements for MMDs in the form of the SATS. Standards Australia Committee ME067 drafted the SATS. The authors participated in that task.


## DISCLAIMER

This paper represents the authors' views and does not represent the views or policy of any organisation.