Home Modifications Booklet II 2007

Areas for Modification

External and Internal Access

Spina Bifida and Hydrocephalus Queensland and Montrose Access

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October 2004

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October 2007

Disclaimer

This booklet is designed to provide general information about topics covered to assist interested parties. It is compiled from information written by the staff of SBH Queensland and Montrose Access, as well as from various publications by authors not related to the associations. Accordingly, whilst SBH Queensland and Montrose Access believe the information is the most accurate and up to date available, the organisations accept no responsibility for the information from other sources.

Standards and government legislation are continually changing, as is the type of equipment available due to improvement sin technology. Prices and contacts are current as at September 2007. Because costs change, prices are included as a guide only. Please use the contact numbers provided to obtain the most recent and up to date information.

Products featured in this booklet are intended as a guide only. SBH Queensland and Montrose Access do not endorse any of the products in this booklet and recommend that you seek professional advice before purchasing assistive equipment.

Acknowledgements

Originally devised by Mary Rydstrom

Linda Moylan and Belinda Harris, occupational therapy students from the University of Queensland completed this booklet in July 2004.

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Part 3: Areas for Modification

There is an international trend towards Universal Housing concepts, which involves designing, building and modifying homes to promote freedom of access and independent living for all people, regardless of their abilities. Please refer to www.design.ncsu.edu/cud and www.smarthousing@housing.qld.gov.au websites for more information. These websites present universal design concepts and may be used as a general guide when building a new home or renovating an existing home.

Australian standards

You may wish to refer to the Australian Building Standards when building or modifying your home. The Standards serve to provide minimum design requirements to enable access for people with a broad range of disabilities. The standards **do not** offer a simple formula that can be used for any person in all homes, as modifications need to be customised to an individual's specific current and future needs. However, the standards may be used as a reference tool. When building or modifying your home, an **occupational therapist** can provide you with specialised information and assistance to ensure the home is designed to be fully accessible and functional for all members of the family.

The Australian Standards may assist you in establishing basic design criteria.

Design for access and mobility:

- AS1428.1 (2001)
- AS1428.2 (1992)
- AS1428.3 (1992)

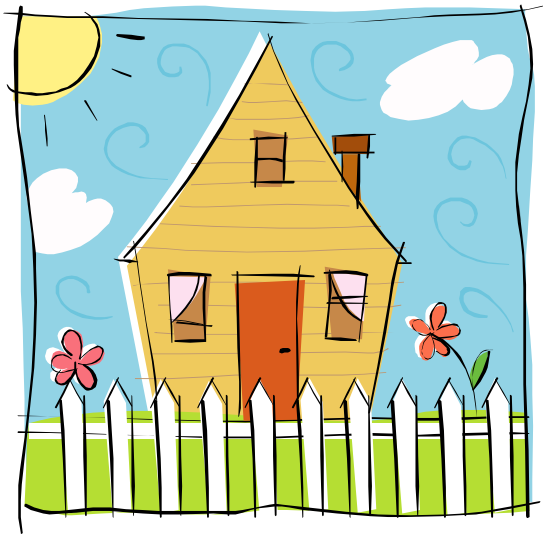
(these standards mainly apply to public buildings but may be used as a reference for domestic design)

Adaptable Housing:

- AS 4299 (incorporates AS1428.1 and AS1428.2)

The Australian Standards website is located at: www.standards.com.au

External and Internal Access



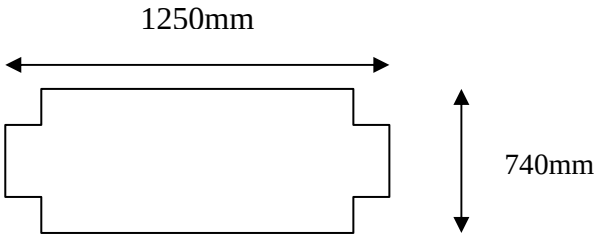
Wheelchair dimensions


(www.orlandoscooterrentals.us)

The Australian Standards are based on average manual wheelchair dimensions. It is important to remember dimensions vary for different types of manual and electric wheelchairs, and both the individual's and the carer's body dimensions must be taken into account.

It is important to consider these dimensions when undertaking any building or home modification to ensure free access to all essential areas of the home. Electric wheelchairs are considerably larger than manual wheelchairs and require more space to manoeuvre.

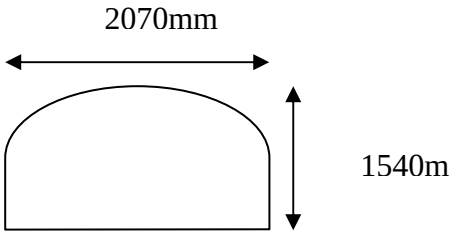
Manual wheelchair dimensions
1250mm x 740mm is representative of 80% of wheelchairs typically used (Hunter, 1992).



Space for wheelchair turn (AS1428.2, 1992)

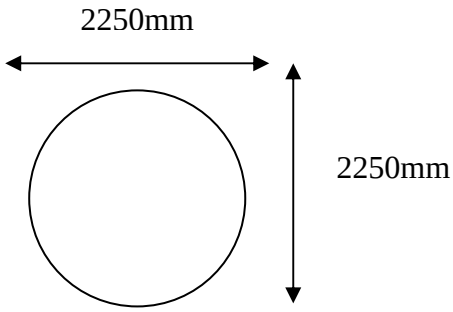
Minimum space required for 180-degree wheelchair turn:

2070mm x 1540mm



Minimum space required for 360-degree wheelchair turn:

2250mm x 2250mm



External Access

Purpose
The following section will outline what needs to be considered for external access to a building. This will ensure easy access for all members of the family from the road to the entrance.

Access to local community
For an individual whose disability impairs their mobility, it is important to consider the homes proximity to local community resources such as shops, health services and transport facilities.

The Site
Whilst a sloping site may not preclude a dwelling being suitable for a person with a disability, the opportunity for access beyond the dwelling will be enhanced if the terrain is level or with minimal slope (Hunter, 1992).

Letter Box
It is beneficial to place the letter box in an accessible position so that it may be accessed both on foot and from a vehicle. Level paving leading to the letter box is ideal and a height of approximately 900mm from the ground may be suitable for the majority of people (Building Commission, 2002).

House / Dwelling number
The following are recommendations regarding the visibility of the house number. Ideally, it will be:

- easy to find and clearly identified from the street both day and night
- contrasts against the background it is sitting on
- sufficient size and a simple style
- painted on the kerb / path as well as displayed elsewhere

Driveway and kerbs
The driveway will be most accessible if it is even and as level as possible. The best design is one which permits a driver to have good road visibility in both directions. Wheelchair access is required from the street or footpath to the home. Disabled crossover kerbs are preferable to kerbs of a 90° angle.

Pathways / Walkways

Pathways are ideal if they lead to the letterbox, rubbish bin, clothesline and carport or garage. In general, it is ideal if pathways are:

- Free of steps
- Have slip-resistant surfaces (see later section)
- Reasonably flat with adequate drainage
- Have a smooth transition between different surfaces or slopes
- Have adequate lighting

Width

It is recommended a pathway is a minimum width of 1200mm (AS1428.2, 1992) and has well defined edges or a high contrast finish with adjoining ground surfaces. The minimum width required for two wheelchairs to pass each other is 1800mm (AS1428.2, 1992).

Gradient

A gradient of 1 in 20 (AS1428.1, 2001) is recommended for pathways. This means for every 100mm of height, 2000mm of path is required. Walkways are required to provide landings at intervals not exceeding the following:

i. For walkway gradients of 1 in 33……..25m

ii. For walkway gradients of 1 in 20……..15m

iii. Landings are not required where walkway gradients are flatter than 1 in 33

(AS1428.1, 2001)

Walkway slip-resistant surfaces

It is recommended all pathways have a slip-resistant surface to increase safety. It is also important to consider the how traversable the surface is for a person in a wheelchair. Grates are ideally spaced not more than 13mm wide and not more than 150mm long (AS1428.1, 2001).

Most floor surfaces are slip-resistant when dry, provided they are not polished. All surfaces, except textiles, tend to become more slippery when they are on a slope, when they are wet or when they are covered in grit or mud (AS1428.1, 2001). The following finishes are considered satisfactory, subject to the texture being traversable by a wheelchair:

i. Concrete with abrasive or textured finish
ii. Concrete with exposed aggregate finish
iii. Bituminous concrete
iv. Natural stone or rough finish
v. Paving bricks with special abrasive finish
vi. Slip-resistant tiles

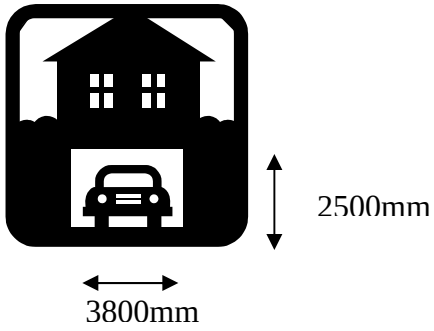
* Paving bricks with bevelled edges, chamfered arrises greater than 3mm and heavily textured and figured surfaces are not considered traversable by a wheelchair

(AS1428.1, 2001)

Garages and carports

Where possible, it would be beneficial if the garage / carport is located close to the home with direct access to the entrance via a door (if attached to the home) or a covered, level pathway. This is to protect all users from exposure to weather, and in some instances enable access to homes. For example, for homes with steep driveways, car transportation is the only means of increasing a home's accessibility. Protection from rain is particularly important for electric wheelchair users, as it is important to ensure the controls do not get wet.

A garage or carport is to be of a size large enough to allow car doors to be fully opened without hitting any walls or posts. This will allow adequate room for all people to get in and out of the car with ease. The amount of space required will vary depending on the type of car, the individual, the type of wheelchair used and whether it is transported on top of or inside of the car.



The recommended internal width of a carport or garage is 3800mm with a ceiling height of 2500mm (this will accommodate vehicles with wheelchair hoists that are located on a car roof or vehicles with a raised roof to accommodate electric wheelchair users) and an internal length of 6000mm. The additional car parking space required is a minimum of 2400mm by 6000mm with provision for enlargement to 3800mm wide. A surface slope of not exceeding 1 in 40 is recommended (Master Builders Association, 2001).

Switches, fuse box and general purpose outlets (AS1428.1, 2001)

The recommended position for the electricity **fuse box** is at a height of 900-1000mm from the floor. The preferred height for all switches and GPOs is 1000mm and a rocker action, toggle or push pad switch with a width of 35mm is preferred to accommodate for individuals with hand disabilities.

Garage Doors

Remote controlled roller doors

One option for ease of access to the garage is an automatic door operator. These are easy to use, safe to operate and save people from having to get in and out of the car to open the garage door. This is especially handy for adults who are often alone in the car. Please refer to the section appendix for suppliers of automatic garage doors.

Manually-operated doors
Manual tilt and lift doors are preferable to manual roller doors for ease of use.
Height of underside of roller door – 2000mm AFL (above floor level)
Handles to garage doors are suitable for many wheelchair and ambulant users if they are located approximately 750mm above the ground (Hunter, 1992).

* Refer to appendix for garage door suppliers

Weather protection

Roofing outside of entry doors provides an area to organise oneself when entering or leaving the home, without the impact of weather causing an individual to rush. Weather protection can be achieved by:

i. Recessing the doorway so that the dwelling roof provides shelter
ii. Providing a separate roof or extending the main roof over the external entry area

It is recommended that the roof or canopy project at least 1500mm (Hunter, 1992) beyond the outdoor face of the entrance wall. For individuals who use a wheel chair, the space at the entry area will need to be larger to accommodate the wheelchair, and the roof over the entry should therefore be larger. Additional protection from wind and rain can be gained by enclosing the external entry area with walls or screens (Hunter, 1992).

The entrance

The following simple features enhance access for all:

- Protect the entrance from rain and adverse weather conditions
- Install appropriate lighting
- Install a shelf to set items down when entering the home
- Provide adequate area outside of the door for wheelchair users
- Ensure the door handle, lock and bell are accessible on foot and from a wheelchair. A height of 900mm to 1100mm above the floor/ground is recommended, and not less than 500mm from an internal corner (AS1428.1, 2001)
- Maximum cross-fall of 1:40 (AS1428.1, 2001)
- Doorway has a clear opening of a minimum of 800mm (AS1428.1, 2001)
- Doors and doorframes are painted with additional luminance (30%) to increase visibility of boundaries (AS1428, 2001)
- Slip-resistant flooring is in place
- Low profile threshold to allow smooth movement of a wheelchair, walker or stroller

*To prevent any damage to doors and doorjambs from wheelchairs or other mobility devices, a protective surface may be applied to a height of 300mm above the floor (see appendix).

*For security, you may also wish to install a peephole and security screen.

Illumination outside

The following are lighting options that may be beneficial:

- General area lighting outside of entry doorway
- Localised light directed onto door lock and handle (remember the impact of shadow when directing the light)
- Movement sensor light at entry to home
- Lighting of pathway leading to external entry area

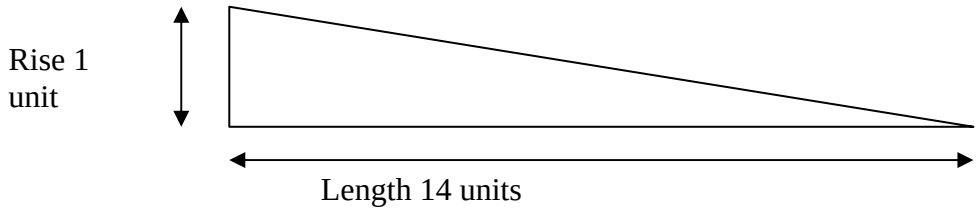
Ramps

Ramps can provide access to homes with steps or steep levels and can be built as permanent fixtures or temporary structures. The location of a ramp is important and careful consideration and discussion with all family members is recommended.

If ramps are required, the following guidelines are provided by the Australian Standards:

Width: At least 1200mm wide, measured at the narrowest point (AS1428.2, 1992)

Gradient: The maximum gradient for a ramp exceeding 1520mm in length is 1 in 14. This means that for every 1000mm in height, a ramp of 14000 mm in length is required (AS1428.1, 2001). The Master Builders Association recommends a slope no greater than 1 to 8 for ramps up to 1500mm long (Master Builders Association, 2001).



Generally, the shallower the ramp the easier and safer it will be to negotiate. If the gradient is too great for a person using a wheelchair, there is a risk of the wheels on the chair loosing their grip. Ramps with shallower gradients will be required for individuals with greater disabilities and for unassisted wheelchair users (Hunter, 1992).

Landings are required at the top and bottom of a ramp, and are important for safe ramp entry and exit. Landings are necessary where directions change and at intervals of:

- every 6000mm for a ramp gradient of 1 in 14
- every 14000mm for a ramp gradient of 1 in 19 (AS1428.2, 1992)

Landings enable a person in a wheelchair to rest and change direction safely as well as help to slow down speed gained on a decline. It is recommended ramps do not exceed 6000mm without a level area as they become steep and require too much physical effort by the user (AS1428.1, 2001).

Landing dimensions:
Minimum length: 1200mm for walkways and ramps
1330mm for kerb and step ramps (AS428.1, 2001).

Ramp surface: The surface should have a good grip in hot and dry weather as well as in wet conditions. A good way to increase the grip on concrete is to use a brushing effect

(symmetrical arc pattern is best) whilst it is still fresh. This brushing technique provides more grip than the usual trowelled finish (refer to previous slip-resistant surfaces for additional options).

Handrails: Handrails may be fitted on one or both sides of the ramp at a height of between 865mm and 1000mm (AS1428.1, 2001), however for children the following handrail heights may be more appropriate:

Age range (years)	Height to top of handrail (mm)		
	Landings	Ramps	Stairs
3 to 6.5	852	860	860
6.5 to 10.5	860	900	910
10.5 to 14.5	910	925	960
14.5 to 18	950	950	975

(AS1428.3, 1992)

Handrails need to be securely fitted and it is advisable that the handrail extends at least 300mm beyond the end of the ramp, with the ends returned (Hunter, 1992, AS1428.1, 2001). A circular handrail is recommended with a clearance of 50mm from the wall surface and 600mm above the rail (AS1428.1, 2001).

Kerbs: Kerbs at the sides of ramps and landings assist the control of wheelchairs and also act as an aid to vision impaired individuals. Ramps can be fitted with kerbs along the surface edging to prevent a wheelchair tipping over the edge. Details of these are specified in AS1428.1.

Australian Ramp Systems Pty Ltd

Different models may be fitted with components such as straight sections, landings and handrails. (www.disabilitymodifications.com.au)

Australian Ramp Systems (www.aussieramps.com.au) produce re-usable modular steel and aluminium ramps comprised of prefabricated sections that are assembled on site by licensed builders or other skilled tradespeople. The components are treated to resist weathering and the floor of the ramp is aluminium checker plate to provide slip resistance. The ramps can be dismantled, stored and relocated and they are designed for strength, stability and long or short-term use. Available from: Disability Modifications.

*Refer to appendix for producer and supplier details

Portable ramps

There are several alternatives to constructing fixed ramps to access higher levels and one option is a portable ramp.

Portable ramps can be used over short grades or as a temporary fixture, for example, when renting or awaiting funding. These are ramps that can be moved from place to place and can often be folded for storage.

Portable ramps are only suitable for smaller level changes of two or three steps due to the gradient. According to the Australian Standards the maximum gradient for a shorter kerb/step ramp (1520mm maximum length) is 1:8 (AS1428.1, 2001). Portable ramps are available with two separate tracks, so the wheels line up on either side. However, this is unsuitable for a wheelchair where front and rear wheels are not aligned or for 3-wheeled mobility devices. A one-piece ramp may be more suitable, however, they may be harder to lift and store.

Portable ramp with two separate tracks for a wheelchair. Refer to appendix for suppliers.

(LifeTec Queensland, 2007)

A number of different styles of portable ramps are available and the following is just a sample. For a more comprehensive list please visit www.lifetec.org.au

Ez-Access Roll Up Ramp

This is a portable ramp for scooters and wheelchairs to bridge the gap over one or two steps. It is available in three lengths and comes with a nylon carry bag. Sizes vary from 910 mm in length to 2440 mm in length. Price varies depending on length. Available from Sunrise Medical Pty Ltd – Queensland.

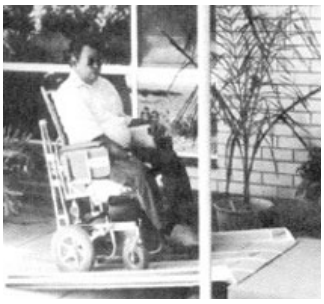
(LifeTec Queensland, 2007)

Nybro Portable Folding Ramps

(LifeTec Queensland, 2007)

These are strong and lightweight aluminium ramps designed for manual or power wheelchairs. The ramps are a channel design and are available in one size only. They fold lengthways, which allows for easier storage. The ramps are available in standard or heavy-duty models and have a load capacity of up to 240kg per ramp.
Price guide : approx $490 per pair of light duty ramps.
Available from Sunshine Orthopaedic Service, Aids to Independent Living and Nybro Holdings Pty Ltd.

DECPAC Portable Wheelchair Ramp



(LifeTec Queensland, 2007)

This is a lightweight fibreglass ramp that folds to enable easy storage or transportation in the boot of a car. A carry bag enables the ramp to be carried on the wheelchair if required. This ramp is sturdy enough to take a person in any powered wheelchair. Larger models are suitable for access into some vehicles. Sizes vary from 690 mm in length, which allows access over obstacles or steps up to 175mm high. 2000 mm in length allows access over obstacles or steps 630mm high. Price varies according to length and if an Edge Lip Barrier is purchased. Available from Morris Surgical, ETS Australia, Walk on Wheels and Wheelabout.

Lifts and stair-lifts

Lifts may be an option if a ramp is not feasible. Small sized and low rise lifts are an option for residential use, however they are expensive and require space. Safety extras such as telephones often need to be fitted in case of breakdown. Lifts can be purchased with varying holding capacity to accommodate for the weight of the client, the wheelchair and other equipment.

The three main types of lifts suitable for wheelchairs are:

1. Inclined platform wheelchair lifts for stair use
2. Vertical wheelchair lifts up levels or
3. Portable wheelchair lifts

Stairlifts may also be an option for families. Master Lifts (www.masterlifts.com.au) and All About Lifts (www.allaboutlifts.com.au) are two specialist companies that supply lifts and stair lifts.

Stairlift with wheelchair platform

These are platforms that elevate up and down stairways. They require space on the stairway (approximately 1200mm width). When there is a curve, the platform lift can be adapted where room allows. The platform is able to fold against the wall to allow normal use of the stairs. Available from Master lifts

Water Lifts

These lifts operate off the normal household water supply and do not require power to run. The lifts are designed to travel short distances, no longer than 3 metres or more than 2 levels. Level ground is essential for installation. You will need to contact a representative from a lift company to assess your property's suitability. Available from Aqualift Australia.

Appendix – External Access

Suppliers of automatic garage doors or gates

Action Automatics & Garage Doors Samsonvale QLD 4520 Phone: (07) 3289 9465	Action Automatics & Garage Doors Albany Creek QLD 4035 Phone: (07) 3289 9465
B & D Doors 17 Oasis Crt Clontarf QLD 4019 Phone: (07) 3883 0235 Phone: 1300 732 950 Website: www.bnd.com.au	Domestic Queensland Roller Doors Brendale QLD 4500 Phone: 1800 814 020
Gold Coast Door Centre. 14 Christine Avenue Miami QLD 4220 Phone: (07) 5535 5100 Website: www.gcdoors.com.au	Noosa Garage Doors Pty Ltd. PO Box 1135 Noosaville DC QLD 4566 Phone: (07) 5474 4144 Website: www.noosagaragedoors.com.au

Ramp Suppliers

Australian Ramp Systems Pty Ltd PO Box 3149, Albury NSW 2640 Phone: 02 6023 2244 Fax: 02 6041 3349 Email: sales@ausssieramps.com.au Website: www.aussieramps.com.au	Disability Modifications 33-37 Daniel Circuit Greenbank QLD 4124 Phone: 07 3297 5328 Fax: 07 3297 5768 Email: dismod@bigpond.com.au Website: www.disabilitymodifications.com.au
Max Specialised Welding Unit 4, 50 Herbert Street Sales Phone Number: 07 3208 7547 Fax: 07 3208 7547	Sunrise Medical Pty Ltd - Queensland 15 Leda Drive Postal Address: PO Box 2848 Toll Free Phone Number: 1800 817 888 Sales Phone Number: 07 5576 0888 Fax: 07 5576 0988 Website: www.sunrisemedical.com.au
Sunshine Orthopaedic Service 29 Short Street Sales Phone Number: 07 5441 2488 Fax: 07 5441 7644 Email:	Aids to Independent Living - Caloundra 75 Bowman Road Sales Phone Number: 07 5438 2944 Fax: 07 5438 2933

dfagan@sunshineorthopaedics.com.au Website: www.sunshineorthopaedics.com.au	
Nybro Holdings Pty Ltd 1/11 Endeavour Drive Sales Phone Number: 07 5476 7199 Fax: 07 5476 9055 Email: info@nybro.com.au Website: www.nybro.com.au	ETS Australia (Equipment Technology Services) 354 Bilsen Road Sales Phone Number: 07 3637 6360 Fax: 07 3637 6361 Email: etsmarketing@cplqld.org.au Website: www.cplqld.org.au/ets/
Morris Surgical 124 Lutwyche Road Postal Address: GPO Box 9 Sales Phone Number: 07 3357 5944 Fax: 07 3857 0031 Email: email@morrissurgical.com Website: www.morrissurgical.com	Walk on Wheels - Brendale (Head Office) 260 Leitchs Road North Postal Address: 260 Leitchs Road North Toll Free Phone Number: 1300 766 266 Sales Phone Number: 07 3205 5654 Fax: 07 3205 5467 Email: warren@walkonwheels.com.au Website: www.walkonwheels.com.au
Wheelabout 86 Mallawa Drive Toll Free Phone Number: 1300 301 903 Sales Phone Number: 0439 963 563 Fax: 07 5520 5225 Email: seestevo@bigpond.net.au Website: www.wheelabout.com	

Lift and Water Lift Suppliers

Aussie Lifts Pty Ltd Sales Phone Number: 07 3274 4211 Fax: 07 3274 5543 Website: www.aussielifts.com.au	Master Lifts 63 Yarraman Place Virginia Brisbane QLD 4014 Phone: 07 3265 6344 Freecall: 1800 700 005 Email: info@masterlifts.com.au Website: www.masterlifts.com.au
All About Lifts 430 Newman Road Geebung QLD 4034 Phone: 1300 301 355 Fax: 07 3216 2355 Email: neil@allaboutlifts.com.au Website: www.allaboutlifts.com.au	

Note: Also check ‘disability supplies’ section of local newspapers and the Trading Post for second-hand ramps

Internal Access

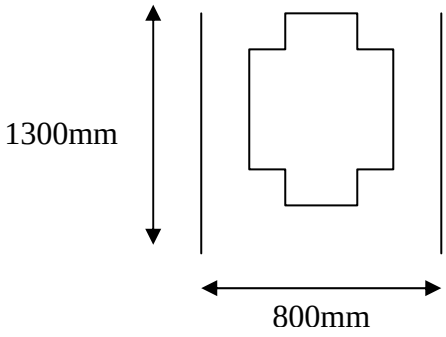
Circulation space

An open-plan living design with wide hallways and doorways is ideal to allow for a wheelchair's full turning circle. The most accessible home has generous open spaces and few passageways to maximise access between rooms and to outdoor areas.

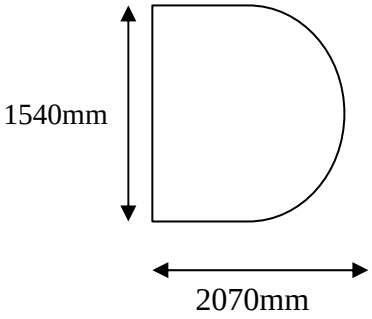
Factors to consider:

- The dimensions of the wheelchair
- Dimensions of the individual
- Dimensions of the carer (if required)
- The mode of operation (electric or manually operated)
- The storage of equipment items
- Location of furniture
- Who will be accessing the room?

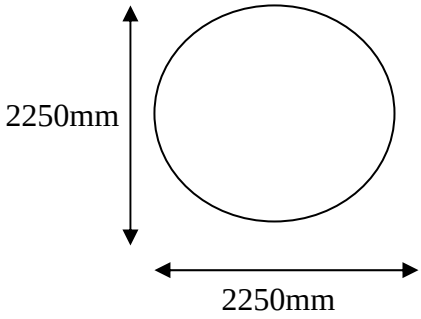
Minimum floor space for a single stationary wheelchair



Minimum space for 180-degree turn



Minimum space for 360-degree turn



(AS1428.2, 1992)

Hallways

The width of hallways and doors will depend upon the width of the wheelchair and the skill level of the user. The preferred hallway width is 1200mm (AS1428.1, 1992). For people who mobilise using wider or longer based wheelchairs, a wider width may be required. The minimum width required for two standard wheelchairs to pass in a hallway is 1800mm (AS1428.1, 1992).

Internal hallways and doors can be protected from bumps, scratches and dints using wall coverings or corner guards. Clear vinyl coverings are available for walls and corners and kick plates can protect doors from damage by wheelchair impact. Refer to the section appendix for supplier details.

Doors

Doors provide security, privacy, climate control and sound reduction. If doors are required, consideration must be given to the type and size of door, hinge and handles installed. The current minimum door width opening for access is 800mm (AS 1428.1, 2001) with a preferred width of 850mm (ie. door leaf required is 920mm) (AS1428.1, 1988).

There are a number of different types of doors that can be installed within a home. For example:

- Hinged doors
- Sliding doors
- Bi-fold and double doors
- Concertina doors
- Automatic doors

Hinged doors

Standard swing hinged doors that open inwards occupy a considerable amount of circulation space and can be difficult to operate from a wheelchair. A slow release hinge may be useful to install on doors that are too heavy or spring loaded. If hinged, the door should open outwards with a minimum width of 800mm (AS1428.1, 2001).

Sliding doors (in-wall cavity sliding and surface mounted)

Sliding doors provide less of a barrier to light, sound and smells than a hinged door. However, sliding doors minimise the circulation space occupied and may be easier to operate for wheelchair users. The minimum recommended width is 850mm (AS1428.1, 2001). It is important to remember that a fully opened sliding door provides a narrower opening than the width of the doorframe that it is placed within. Sliding door floor tracks can also create a barrier for wheelchairs. Consider overhead or recessed tracking so that the tracks are rebated and level with the floor. If this is not possible, small wedges can be fixed against each side of a track to raise the adjacent floor level.

* It is recommend that sliding doors are fitted with emergency access latches, which allow the door to be forcibly opened in case of an emergency.

Automatic swing and sliding doors
Automatic swing and sliding door systems may be installed in homes to provide hands free control for people who have difficulty opening doors. The system automatically opens a sliding or swing door, then closes and locks it after a programmable time delay. Activation of the door is achieved by pressing a wall mounted or hand held wireless remote or an optional numeric keypad for secure keyless entry. A proximity sensor may also be used, which opens the door when the sensor comes within a certain distance.

Concertina doors
Concertina doors of fabric, timber or plastic strips can be useful, however the folded door material occupies a large proportion of the door opening (25-35% extra width required), so this must be taken into account for the overall width of the door to ensure wheelchair access. They also provide less acoustic insulation and their grip handles and latches may be difficult for individuals with decreased hand and finger dexterity.

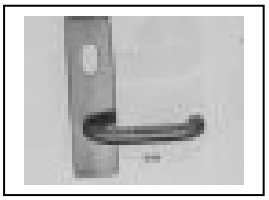
Door handles

Door handles are required to be mounted on both sides of internal doors at a recommended height of between 900-1100mm (AS1428.1, 2001). Handles are required to have sufficient grip to prevent the hand from slipping from the handle during operation.

The following are recommendations for the design of door handles:

- The door handle allows the door to be unlocked and opened with only one hand.

- **Lever handles**, with long levers and a 'turned-in' end to improve grip, are preferred as doorknobs may not provide adequate grip for people with decreased hand control / strength. Lever handles can also be opened with a small amount of effort.
    - Where lever handles are provided, the recommended clearance between the handle and the back plate or door face at the centre of the handle is not less than 35mm and not more than 45mm (AS1428.1, 2001).



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- **Sliding doors** are best when operated with raised pull handles rather than recessed handles that are difficult to grip. A d-shaped pull handle with a minimum length 200mm is optimal for sliding doors.
    - It is recommended handles on sliding doors are not less than 60mm from the doorjamb lining (AS1428.1, 2001).

- Knobs on bolts and snibs are ideal if they are designed for easy grip (AS1428.2, 1992)

- **Push-plate and pull-plate handles** for hinged doors may be installed for individuals with severe manipulatory disabilities. D-shaped handles for pull plates may be better for some people, however, the amount of space required to accommodate an individuals hand behind the handle must be taken into account.

- Handles are ideal if they contrast with their background with a luminance of not less than 30% (AS1428.2, 1992).

***Refer to appendix for door handle suppliers**

Windows

Windows are one of the most important elements within the house that contribute to emotional well-being. They not only admit ventilation, natural illumination and sunlight, but also provide a source of aesthetic pleasure and provide an important link with the outside world (Hunter, 1992).

The following may be considered when installing windows:

- Visual comfort
    - Appropriate illumination levels
    - Avoidance of glare
    - Opportunity for views out
- Privacy
- Acoustic comfort
- Thermal comfort
    - thermal insulation
    - drafts
- Safety
    - glazing
    - frames
- Security
- Ease of operation
    - sashes
    - locks and latches
- Compatibility with adjacent activities
    - traffic routes and activity areas
    - furniture
- Ease of cleaning

(Hunter, 1992)

Windows and screens are ideal if they are easily opened, with catches at a height convenient for the individual. People in wheelchairs need room to approach windows and operate the opening mechanisms. Avoid placing furniture or other obstacles in front of windows.

There are different types of windows that can be used in homes to promote the use of natural light. The window opening and closing mechanisms should be easy to grip and operate with the use of one hand and be placed at an appropriate height, no higher than 1100mm from the floor.

Avoid windows that open outwards and project into paths of travel, as these may be hazardous to passing persons.

If installing new windows, consider placing them at a lower level so that all occupants who are standing, seated or reclined are accommodated for. The following are guidelines for window height:

Typically a satisfactory viewing angle can be achieved within a vertical range of approximately 600mm to 1800mm above the floor (Hunter, 1992).

Safety:

Frames

- Wherever possible, the edges of windows are best if they are rounded or bevelled to minimise impact injury
- Vertical or horizontal sliding sashes are preferable to hinged sashes because they do not project when opened

Glass

- Use thickened glass
- Special applied film can be applied to glass making it more resistant to breakage
- Mark large glazed doors to signify the presence of glass
- Protective rails may be placed in front of large windows
- Avoid placing large windows in positions where a door would be expected eg at the end of passages

Flooring

When choosing a type of flooring, it may be beneficial to consider the following:

Ease of mobility • Smoothness of surfaces • Absence of obstructions	**Visual comfort** • Reflection of light • No glare • Not disorientating • Sensory stimulation
Underfoot comfort • Thermal comfort • Underfoot warmth **Room insulation** • Acoustic comfort • Quietness between rooms • Quietness within rooms	**Safety** • Slip resistant • No tripping • Minimisation of injury from impact • Minimisation of fire hazards • Durability and ease of maintenance (Hunter, 1992)

Slip-resistive when wet floor surfaces are recommended in the kitchen, laundry, bathroom and toilet. Most floor surfaces are slip-resistant when dry, provided they are not polished. All surfaces, except textiles, tend to become more slippery when they are on a slope, when they are wet or when they are covered with dirt or products such as talcum powder. Particular attention should be given to floors in entrance lobbies, where water can be walked in on wet days (AS1428.1, 2001).

The following finishes are considered satisfactory by the Australian Standard (AS1428.1, 2001), provided the surface texture is transferable by a wheelchair:

Wet Locations	**Dry Locations**
• Concrete with abrasive or textured finish • Concrete with exposed aggregate finish • Bituminous concrete • Natural stone with rough finish • Paving bricks with special abrasive finish Slip-resistant tiles	• All materials suitable for wet locations • Short-piled carpet (consider antistatic carpet) • Smooth flooring materials, which do not have a high gloss, slippery finish or which have been suitably treated

Factors affecting the slipperiness of flooring include:

- Soft materials such as rubber or urethane are less slippery than hard surfaces such as ceramic
- Porous surfaces such as concrete absorb water, while epoxy coated surfaces retain water.
- Textured surfaces allows water to move out of the way of the contacting surfaces
- A highly textured surface finish is hard to clean and may eventually lose its texture due to the inability to remove dirt.
- Some cleaning materials leave residuals that contribute to the floor slipperiness
- All flooring materials wear with use and thus 'polish' the surface.
- Plastic beads cannot withstand heavy traffic
- Silica (sand) is more durable and wears much better
- Aluminium oxide lasts the longest
- Polyurethane elastomers have poor adhesive properties
- Epoxies have excellent adhesive strength

Wet locations:

Tiles / pavers

- Slip resistant when wet tiles (eg. Tilecraft)
- PGH Pool Safe Pavers

Slip resistive treatment to tiles:

- Slip Grip is a clear liquid treatment designed to reduce slipping on tiled, paved and concrete floors particularly when they are wet. It is suitable for ceramic, glazed or unglazed, mosaic, quarry or terrazzo tiles, pavers and unpainted or unsealed concrete (www.cpcproducts.com.au). Available from hardware stores.

Vinyl flooring

- Polyflor Slip Resistant Flooring with black silicon carbide granules (may attract dirt). Available from: Polyflor Australia Pty Ltd
- Tarkett Slip Resistant Flooring. Available from: Tarkett Sommer Pty Ltd
- Spectrum Assurance Slip Resistant Flooring. Available from: Capital Flooring Systems
- Armstrong Slip Resistant Flooring. Available from: Armstrong World Industries.

Cleaners

- Floorsafe anti-slip cleaner – cleans and sanitises ceramic, quarry tiles, marble, concrete, terrazzo and paved floors whilst making them anti-slip. Meets Australian Standards. Available from: Floorsafe International.

Dry locations:
Surfaces must be suitable for unrestricted wheelchair use. Some carpets with a raised pile restrict wheelchair movement. Low-pile carpet, linoleum or tiles provide the least amount of wheelchair resistance when pushing a manual chair. Low pile, long-wearing carpets with a tight weave pattern are ideal and are easy to clean. Non-slip surfaces such as textured vinyl, non-slip tiles or other surfaces that comply with standards may be more suitable in some cases. For example, powered wheelchairs may damage carpet with frequent travel and turning.

Lighting

Indoor lighting

- Natural light is one option, however it can be troublesome if it produces excessive glare, reflection or shadowing.
- Inside lighting is best if it is strong and consistent.
- Overhead lighting is preferred
- The provision of night lights in circulation areas and bathrooms may be beneficial
- Provision of two-way switches is desirable (AS1428.2, 1992)
- More than one light may be required in an area to ensure the area is safely illuminated.
- Higher illumination is required for a person with vision or hearing impairment. Task lighting is also recommended for areas such as work areas, in the kitchen, and over the bathroom hand-basin.
- Reflective surfaces are to be avoided as they may create confusion due to light the reflecting off them.

Outdoor lighting

Consider using security sensor lights for outdoor lighting.

The following levels of illumination are recommended:

Passageways and walkways	150 lx
Stairs	150 lx
Ramps	150 lx
Toilet	200 lx
Counter tops	250 lx
Telephone	200 lx

(AS 1428.2, 1992)

Location of lighting

Good general lighting is obtained by placing lights so the room / area is evenly lit. Most rooms will require task lighting as well as general lighting. Recessed down lights may be an effective way of providing directional task lighting with least glare (Hunter, 1992).

Power Outlets and Light Switches

It is recommended light switches and power points are placed at a reachable height appropriate to the particular person. The standard suggests placing switches at 1000mm above floor level and a maximum of 100mm above bench tops (AS1428.1, 2001). Place switches at least 500mm from corners (Hunter, 1992).

Types of switches

Rocker action, toggle or push pad switches with a recommended width of 35mm are preferred (AS1428.1, 2001).

Large rocker switches are easy to operate and can be activated with an elbow or just with light pressure.

(LifeTec Queensland, 2007)

It is often useful to mount a 2-way switch within the same room, so that it may be accessed from more than one point. In a passageway, one switch may be positioned at each end. In the bedroom, one switch may be at the door and one switch within reach of the bed.

Other types of switches

- **Slide switches** – may be a good alternative to lever and rocker switches. They are simple to operate and larger than many lever or rocker switches
- **Pull-chord switches** – may be useful next to the bed or in the garage next to the car door. However, these do require co-ordination and may be difficult for some people.
- **Foot press switches** – may be useful for people with insufficient use of hands. These include floor-mounted switches or pressure mats.
- **Movement activated switches** – these are switches that are activated when an emitted infra-red beam is interrupted, for example when movement is detected within a room. Suitable for both indoors and out of doors.

(Hunter, 1992)

Telephone

A telephone is one of the most important means of keeping in touch with family and friends and may also be a method for calling for assistance in an emergency situation. Access for people with physical disabilities to telephone technology has increased significantly with a greater availability of hands-free telephones and automatic dialling systems.

There are 2 main different types of telephone. For example,

- **Push button telephones** that may have a memory function where frequently used numbers can be dialled at the push of one button
- **Cordless telephones** are similar to push button phones but have smaller buttons. They are portable and can be carried around the house or garden area on a belt or in a pocket. This saves people from hurrying to answer the telephone and can be extremely useful in the case of an emergency.

A telephone based emergency call system can be installed within a home as a safety feature. There are a number of different systems that can be purchased, however, most have similar features. They consist of a lightweight water resistant transmitter that is worn as a pendant on a neck chain, on the wrist using a wristwatch strap, or on a keyring. It is designed to enable people who are at home alone to call for assistance when required. When the button on the pendant is pressed, a radio signal is sent to the receiver unit, which is installed beside the home telephone. The receiver unit then sends an emergency signal to a 24-hour monitoring centre. Staff at the centre will contact a relative, neighbour, doctor or the ambulance service according to your pre-determined emergency plan.

Suppliers

These systems are available throughout Queensland. Some systems are for rental only, not to purchase. Long-term rentals usually incur an establishment fee as well as ongoing monitoring fees. Short-term rentals do not usually incur an establishment fee but the monitoring fee is higher, and paid monthly.

- Vitalcall Emergency Call Systems 1300 360 808
- Tunstall 1300 760 333
- Safe At Home 1300 365 101

It is also possible to purchase a hands-free telephone, to alleviate the need to hold the receiver. Calls can be answered from a distance by pressing a button on a transmitter worn by the person.

Supplier

Telstra has a service to support people with disabilities. If you have a disability and are unable to use the standard telephone, Telstra's Disability Equipment Program may have a product to suit your needs. The program offers many ways to provide basic telephone access and help you stay in touch. Information in alternative/accessible formats, including forms, contracts and resource material about Telstra's products and services is available on request from Telstra's Disability Enquiry Hotline. For further information visit www.telsta.com or contact the Disability Enquiry Hotline on 1800 068 424.

Environmental control systems

An environmental control system can be used to replace the standard on/off control of most electrical appliances and lamps that run off mains power. They operate at the level of domestic independence and seek to give users greater control over domestic appliances. As well as appliances, lights and infra red devices, environmental control systems can be used to control security systems, telephones, sprinklers, doors, curtains, electric beds and virtually any other device in a home that is electrically operated. They usually operate through infra red, X-10 or Radio Frequency (RF) technology.

Environmental control systems can vary considerably in:

- the range of devices controlled
- the base of control
- the method of control available to the user
- the feedback offered to the user and the methods of backup provided

These differences are important and must be considered when linking the system to a person's needs and capabilities. It is important to discuss your individual needs with your occupational therapist.

Examples of Environmental Control Units (ECU)

Big Jack

The Big Jack is a six-function trainable infrared (IR) transmitter that can be operated with switches. Big Jack is simple to use and program/train. It can learn channels from other remote control units such as TV, stereo and toys. Of course it can also be used for lamps, telephones and alarms.

(www.spectronicsinoz.com)

Price guide: $505.00
Available from: Spectronics

Access Gewa Prog Environmental Control Unit

(LifeTec Queensland, 2007)

This is a programmable infrared environmental control unit with a membrane keypad that has 36 keys and an opaque keyguard. It can be used to operate a number of infrared controlled appliances and can also be combined with an X-10 system to enable remote ON/OFF control of electrical appliances and lamps. It is operated by pressing directly on individual keys or by switch scanning. Portable and can be customised.

Price Guide: $1650 - $1720
Available from: Alto Computers, Novitatech Regency Park Engineering, Technical Solutions Australia P/L, Zygo Australia.

Big Switch Remote Control Device

(LifeTec Queensland, 2007)

The Big Switch Remote is a trainable infrared remote control unit. It can be setup to control most appliances with an infrared remote control. It features a remote control on the left that has been wired to a larger keypad on the right.

Price Guide: $424
Available from: Technical Solutions Australia P/L

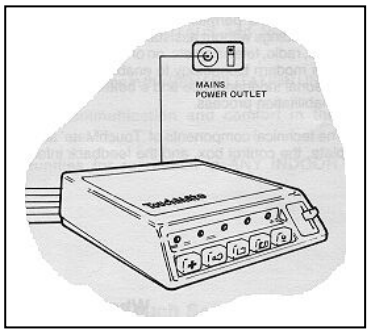
SRS100 Environmental Control Unit

(www.ilcaustralia.org)

This battery powered ECU offers remote control operation for a wide range of applications. A picture based menu on a dynamic screen provides quick access to all functions. The user scrolls through the menu and selects the picture of the appliance they want to use. These include alarms, telephone, power sockets, TV, door access and PC.

Approx Price: $7,500.00
Available from: Specialised wheelchairs & rehab equipment

Touch mate environmental control unit



(www.ilcaustralia.org)

An environmental control unit on which five electrical appliances can be activated by a variety of switches eg remote switch, touch sensitive switch. It operates with most 240v A.C. appliances, eg. lamp, radio, heater, TV, alarm or nurse call.

Approx Price: $650.00
Available from: Carramar lighting Pty Ltd

Appendix – Internal Access

Suppliers of wall covering

Product: **Intrad Tri-Guards** - clear vinyl covering for walls and corners Moodie Marketing Australia Unit 9, 33-37 College St GLADESVILLE NSW 2111 **Postal Address:** PO Box 3040 MONASH PARK NSW 2111 **Phone:** 1300 666 343 **FAX:** 02 9816 3417 **Email:** *sales@moodie.com.au* **Website:** *www.moodie.com.au*	Product: **Yeaman Shields Tri-Guards** - vinyl covering for walls and corners. Acculine Surface Protection Systems PO Box 1415 TULLAMARINE VIC 3043 Phone: 03 9334 5911 Fax: 03 9335 1078 Email: asales@ivracculine.com.au Website: www.metanovus.com.au

Door Suppliers

Innotek Australia PO Box 765 Mudgeeraba Qld, 4213 Phone: (07) 5530 7471 Fax: (07) 5525 1906 Email: info@innotek.com.au Website: www.innotek.com.au	**Suppliers: Automatic opening doors** **Edington Automatic Doors** 44 Harries Road COORPAROO QLD 4151 Tel: 07 3394 6868 Fax: 07 3394 2953 Email: ead@edington.com.au Website: www.edington.com.au
Doormate Automatic Sliding Door System. Available from: Dorma Bwn Industries U1, Block V, 391 Park Rd REGENTS PARK NSW 2143 Postal Address: PO Box 212	

REGENTS PARK BC NSW 2143 Phone: 02 9738 8222 Fax: 02 9738 8022 Toll Free: 1800 675 411 Email: robert.jaworski@dorma.com.au Website: www.bwn.com.au	

Suppliers of door handles and rocker switches

Dalco Lever Door Handles Available from: Hardware Stores Brisbane suppliers: John Barnes & Co (QLD) Pty Ltd. 515/517 Stanley Street South Brisbane QLD 4101 Telephone: (07) 3844-1800 Facsimile: (07) 3844-8249 Keeler Hardware (QLD) 1/49 Douglas Street Milton QLD 4064 Phone: 07 3367 8827 Fax: 07 3367 8860 Email: queensland@keelerhardware.com.au	Supplier of rocker switches (eg Clipsal Prestige P2000 Series of Switches) Available from: Hardware Stores or Gerard Industries Pty Ltd - Brisbane 919 Nudgee Road PO Box 623 Phone Number: 07 3244 7444 Fax: 07 3267 0006 Email: contact@clipsalqld.com Website: www.clipsal.com.au Haymans Electrical Phone Number: 07 3340 4444 Fax: 07 3423 1430 Email: Stuart.Gallard@mmem.com.au Website: www.mmem.com.au Ideal Electrical Stores 256 Newnham Road Phone Number: 07 3347 0600 Email: mtgravatt@idealelectrical.com Website: www.idealelectrical.com

Flooring and floor product suppliers

Polyflor Australia Pty Ltd Offices Telephone:07 4773 6005 Telephone: 07 3865 2019 Fax:07 3865 6356	Tarkett Sommer Australia Pty Ltd Unit 126, 45 Gilby Road Mount Waverley VIC 3149 Phone: (03) 9558 8257 1800 654 883 Fax:(03) 9558 9683 Website: www.tarkett-sommer.com.au
Captial flooring systems Unit 10/65 Kremzow Rd Brendale Qld 4500 PO Box 5349 Brendale Qld 4500 Telephone: (07) 3881 3701 Fax: (07) 3881 3702 Email: sales@capfloor.com.au www.capfloor.com.au	Armstrong World Industries Pty Ltd Head Office 99 Derby St Silverwater NSW 2128 Telephone: 02 3272 0533 Fax; 02 3272 0690
Floorsafe International Phone: 08 8410 0054 www.floorsafe.com.au	

Environmental control unit suppliers

Specialised wheelchairs & rehab equipment Unit 5, 26 Wattle Rd BROOKVALE NSW 2100 Phone: 02 9905 5333 Mobile: 0408 300 233 FAX: 02 9905 2208 Website: www.swco.com.au	Spectronics Australia PO Box 88 Rochedale Queensland 4123 Unit E1 Commercial Court, 130 Kingston Road Underwood 4119 Phone Number: 07 3808 6833 Technical Support 1800 999 718 Fax Number 07 3808 6108 Email: mail@spectronicsinoz.com Website: www.spectronicsinoz.com
Alto Computers 58 O`Connell Pde PO Box 2164 Phone Number: 07 3207 2555 Fax: 07 3207 2666	Carramar lighting Pty Ltd 2 Pyne Close MT GAMBIER SA 5290 Phone: 08 8724 9299

Email: altocomp@optusnet.com.au Website: www.ramware.com.au	FAX: 08 8723 0202 Email: carramar@ozemail.com.au
Novitatech Regency Park Engineering 171 Days Rd PO Box 2438 Phone Number: 1300 855 585 Phone Number: 08 8243 8209 Fax: 08 8243 8337 Email: novitatech@novita.org.au Website: www.novitatech.org.au	Technical Solutions Australia P/L 109 Ferndale Road Phone Number: 03 9737 9000 Fax: 03 9737 9111 Email: james@tecsol.com.au Website: www.tecsol.com.au
Zygo Australia PO Box 190 73 Cobden Street Phone Number: 1800 818 353 Phone Number: 03 9696 2944 Fax: 03 9696 1755 Email: zygoaus@bigpond.net.au Website: www.zygo.com	Technical Solutions Australia P/L 109 Ferndale Road Phone Number: 03 9737 9000 Fax: 03 9737 9111 Email: james@tecsol.com.au Website: www.tecsol.com.au