BRANZ

build

Supplement

The RIGHT STUFF

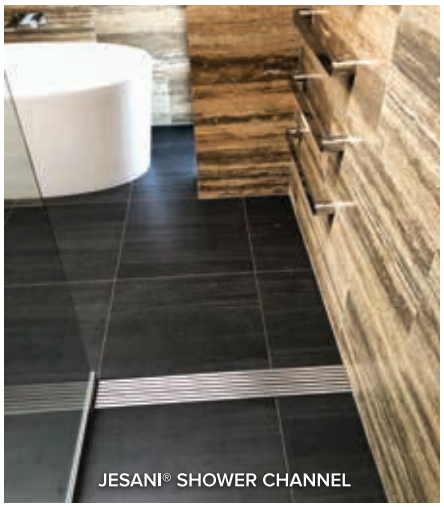
Universal design for houses


"MY KITCHEN WILL BE ALL WHITE, I LOVE THIS TREND"
That's what I said when I chose the home decor.
TODAY
I can't see the switches to turn the lights on.
CHOOSE UNIVERSAL DESIGN
Lifemark
CERT TM
A division of
CCS Disability Action
lifemark.co.nz

JESANI®
WETROOM DESIGN SOLUTIONS

JESANI® products are the only BRANZ appraised linear wetroom drainage channels in NZ

The specialised design of JESANI® Shower, Door and Appliance Channels provide architects, designers and other building professionals the confidence of specifying a highly effective and reliable product.



PREVENTATIVE UNIVERSAL DESIGN PRINCIPLES IN WETROOMS

- Level access providing safety for all ages, abilities and mobility aids
  - Wheelchairs • Walking Frames • Crutches
  - Knee Walkers/Tri Walkers • Adjustable Shower Stools/Chairs
- Peace of mind living
- Bathroom flooding prevention
- No four way falls or nib wall hazards

LEVEL ENTRY

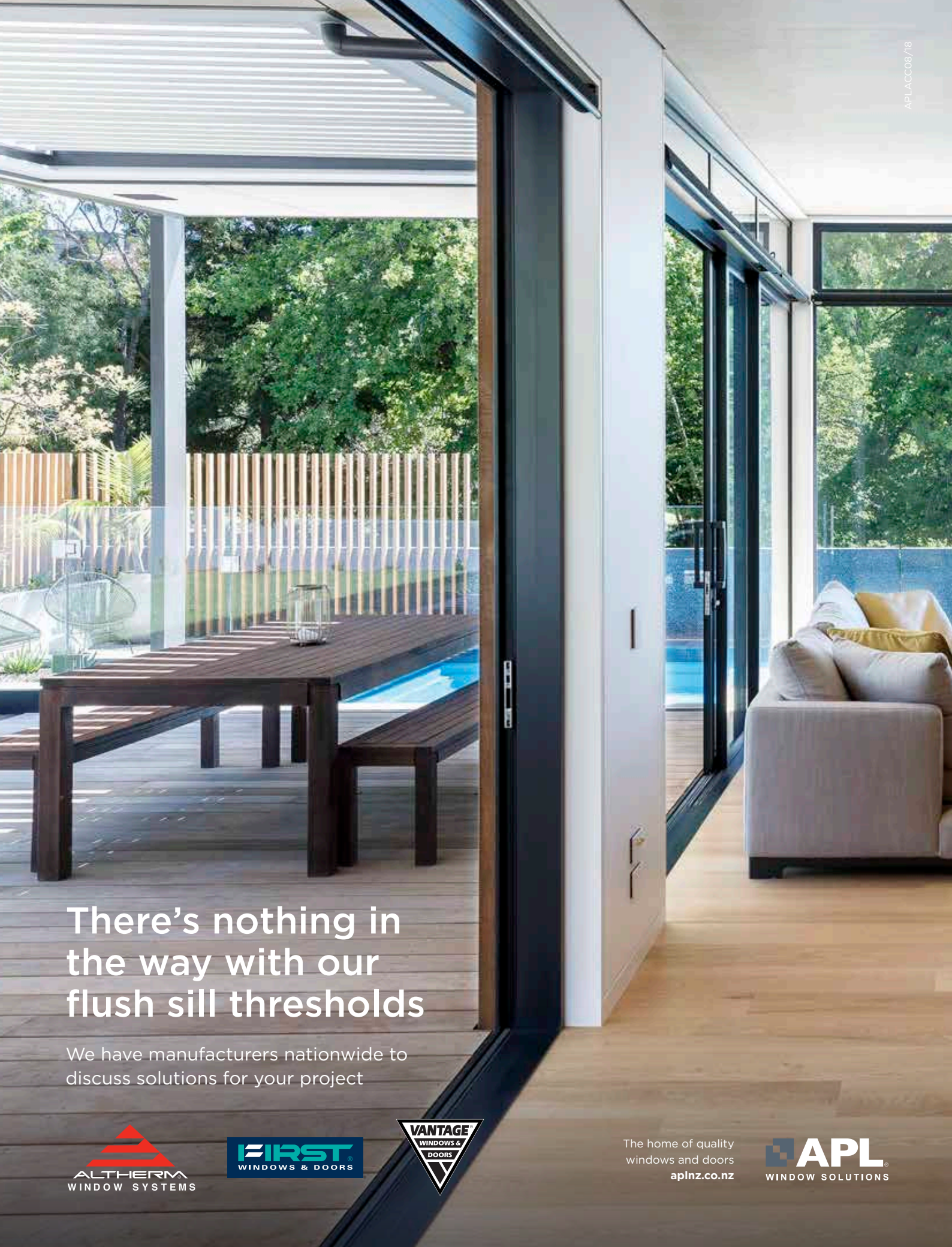
- Eliminating trip hazards, thus preventing injuries
- Straightforward Installation due to product design
- Insurance policy- with emergency overflow Door Channel design

BRANZ Appraised
Appraisal No.934 (2016)

APPROVED Lifemark PRODUCT

All JESANI® Channels can be manufactured to individual requirements. Call us to discuss how we can help you.

0800 JESANI (537264) solutions@jesani.co.nz
www.jesani.co.nz



APL-ACC08/18

There's nothing in the way with our flush sill thresholds

We have manufacturers nationwide to discuss solutions for your project

ALTHERM WINDOW SYSTEMS

FIRST WINDOWS & DOORS

VANTAGE WINDOWS & DOORS

The home of quality windows and doors
aplnz.co.nz

APL WINDOW SOLUTIONS

build
BRANZ
Supplement

Universal design for houses

Sections

ISSN: 0110 4381

1 Introduction

Making houses accessible to all ages and abilities is logical, but this often doesn't feature on the designer's or client's radar. This compilation of articles from *Build* magazine provides comprehensive advice on how to make houses universally accessible.

UNIVERSAL DESIGN, accessible design, lifetime design and futureproofing all describe similar design concepts that involve:

- making buildings safer and easier to use for everyone all of the time – this is all people of all abilities at any stage of life, including young children and people with limited mobility, temporary injuries or permanent disabilities
- designing new homes so they accommodate the changing needs of people as they age.

Universal design features allow people to continue to live independently in their own home as they age, regardless of their physical ability, health or age.

In essence, universal design is inclusive design.

NZ lags in universal design

Most New Zealand homes do not incorporate universal design principles or provide good accessibility for people with physical disabilities. As a result, significant and often costly modification can be required where the needs of occupants change. The current shortage of these properties will only get worse as the population ages.

Narrow door openings, long narrow hallways, small rooms and spaces, indirect or convoluted travel paths within the building and stairs can make moving around the home difficult for young children, older people and people with limited mobility.

In our many hillside suburbs, steps provide the only access to the house, making simply getting to and from the home difficult for anyone with impaired movement.

A 2016 study (see BRANZ External Research Report ER19) found a deep lack of awareness of universal design in the building industry to the extent that there was an 'apparent inability to access universal design from the building industry even when it is desired and explicitly sought by householders'.

The study also found the rewards for householders who do achieve universal design dwellings included 'considerable satisfaction across a number of functional and comfort dimensions' .

Best time is during new builds or renovations

BRANZ research has shown that the extra costs of adopting universal design principles at the design stage for new builds and major renovations is minimal. Retrofitting, however, can be difficult and is more expensive.

BRANZ economic research in 2011 quantified some of the costs:

- For a house of 150–200 m^2, incorporating essential universal design features costs about $1,700 for a new house compared to $14,000 if that same house was to be retrofitted.
- The extra cost of incorporating universal design features into most single-storey new houses is usually around 0.5% of the total build cost.
- For internal changes only, about 80% of new houses require either no or minor changes to layout, doors and strengthening of bathroom fittings prior to construction. These adaptations only add around $500 to the total new house cost.
- For external changes, many new houses require wider parking areas and better access to the front door. These changes typically add another $1,200 to the house cost.
- When changes are made to existing houses, the costs are typically $15,000 per house for internal work and another $7,000 for ramps and other external access features.

2 Legally required

Although New Zealand has legislation addressing access to buildings, this typically applies to buildings with public access, not housing.

IN NEW ZEALAND, two major pieces of domestic legislation apply to accessibility of the built environment:

- The Building Act 2004 (and the accompanying Building Code).
- The Human Rights Act 1993.

The Disability Convention is the international standard for disabled people's rights, which New Zealand ratified in 2008.

Nothing specific to housing

Schedule 2 of the Building Act 2004 requires the provision of access for people with disabilities, but it does not include housing. As a consequence, many houses in New Zealand have limited accessibility for people with disabilities.

In Building Code clause D1 *Access routes*, Objective D1.1 (c) states that people with disabilities are able to enter and carry out normal functions and activities within buildings. This objective only applies to buildings to which section 47A of the Building Act applies (typically buildings with public access). Performance requirement D1.3.2 requires that at least one access route shall have features to enable people with disabilities to approach the building from the street. However, this is not applicable to housing.

Getting down to the detail

Acceptable Solution D1/AS1 gives specific requirements on the design and detailing of access routes, ramps, stairs and handrails.

Design information on universal design is also given in:

- NZS 4121: 2001 *Design for access and mobility – Buildings and associated facilities*
- AS 4586-2013 *Slip resistance classification of new pedestrian surface materials*
- www.aucklanddesignmanual.co.nz/design-thinking/universal_design
- www.branz.co.nz/universal_design
- www.lifemark.co.nz.

3 Designed for all

Homes designed to meet the lifetime needs of occupants needn't take up more space. In fact, all age groups, especially children and the elderly, stand to benefit from a house that is carefully planned.

ALTHOUGH IT IS often forgotten, children and older people have many of the same housing performance and design needs. For instance, both children and older people are more vulnerable when indoor temperatures drop below 16ºC, often referred to as the World Health Organization standard.

Both are also more vulnerable to accidents in the home and around the section. The window that pushes out and obstructs outdoor paths presents real dangers to both. Children tend to be unaware of such hazards when running around outside, and older people, whose eyesight may be compromised, may find themselves walking into an open window.

Both children, older people and those with restricted mobility are vulnerable to injury from steps and stairs and to the dangers of burns from badly placed appliances. Similarly, both children and older people are vulnerable to the poor separation of parking, driveways and domestic areas.

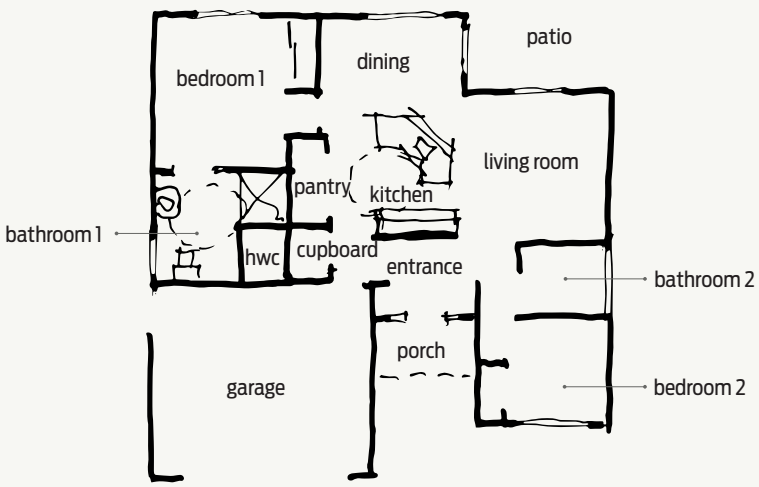


Figure 1 **2-bedroom, 2 bathroom, 1-storey property with flexible use options, designed by Kyle Davey.**

Everyone's needs can be met

Building homes in an ageing society is not only about building homes for old people. It means designing well for all. Applying universal design criteria in homes is of benefit for all and will make homes work better, be more attractive and have more use and value over the long term.

Dwellings that last – not simply in terms of materials but in terms of utility – are critical to a sustainable infrastructure.

Comparative costs

One of the anxieties around designing homes that are accessible and safe using universal design is the fear that homes will be more costly and bigger than dwellings that do not employ those standards. Overseas evidence shows that costs are generally comparative with only marginal increases.

But is this increase in size necessary? The experience of the Marlborough Sustainable Housing Trust, currently developing affordable housing for people in their shared-ownership programme, suggests not. Increases in dwelling size are more likely if existing non-accessible designs are used and attempts are made to adapt existing layouts to make them accessible.

Examples where functionality is improved without the need for additional area include:

- designs that utilise spaces for multiple functions (corridors that also have storage) or avoiding corridors completely
- locating the kitchen immediately adjacent to the main entry or the access point onto the dwelling from an attached garage
- utilising open planning - fewer walls or definition of spaces
- level-entry shower bathroom adjacent to main bedroom – have as an ensuite where space allows
- having the main bedroom on the ground level for multi-level dwellings (unless a lift is included as part of the design).

Designing up from first principles, designing to the site and to universal design means that size can reflect the budget, aspirations and tastes of the occupants. Universal design houses don't have to be 'different' or simply functional, reflecting the outcome of accessibility and safety considerations.

Key universal design features

Some building features are considered an essential part of universal design. These are summarised below and expanded on later in this supplement.

The basic principles of universal design include:

- having flat or ramped access to the main entrance with no steps between the street and the dwelling entry
- a covered sheltered entry porch
- having the main floor at entry level
- having the kitchen, bathroom and at least one sleeping area at entry level (the sleeping area could also be used as a study or living area)
- avoiding long (narrow) corridors and sharp turns into adjacent spaces.
- ensuring all rooms are large enough for residents to easily move around in once furnished
- ensuring all walkways and doorways are wide enough for strollers, wheelchairs or mobility scooters to easily pass through (while a 800 mm-wide doorway will allow minimum clearance for wheelchairs, specifying 910 mm wide doors as a minimum is prudent)
- ensuring garages and carports are large enough for wheelchair access into and out of vehicles.

For kitchen areas:

- providing a mix of kitchen bench heights and other work/storage spaces – consider at least one lower bench or one that is height adjustable
- locating appliances at a height that is reachable from a wheelchair and sufficiently above the floor to reduce bending or kneeling.

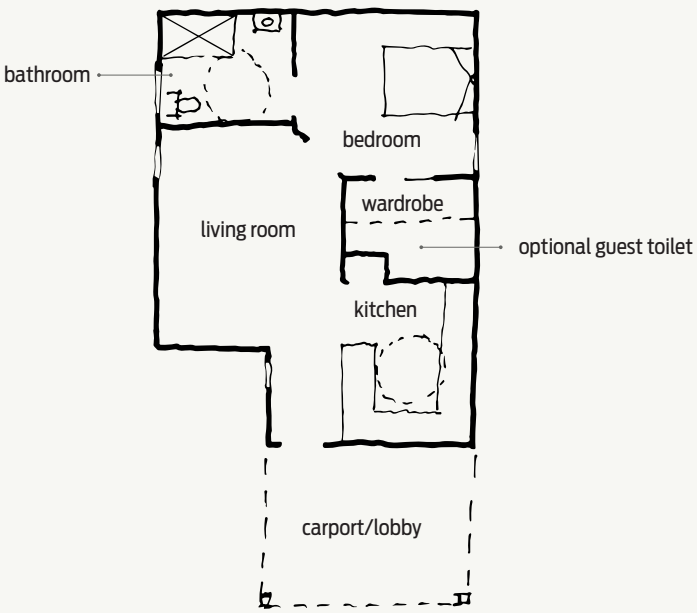


Figure 2 **1 bedroom, 1 bathroom apartment/unit.**

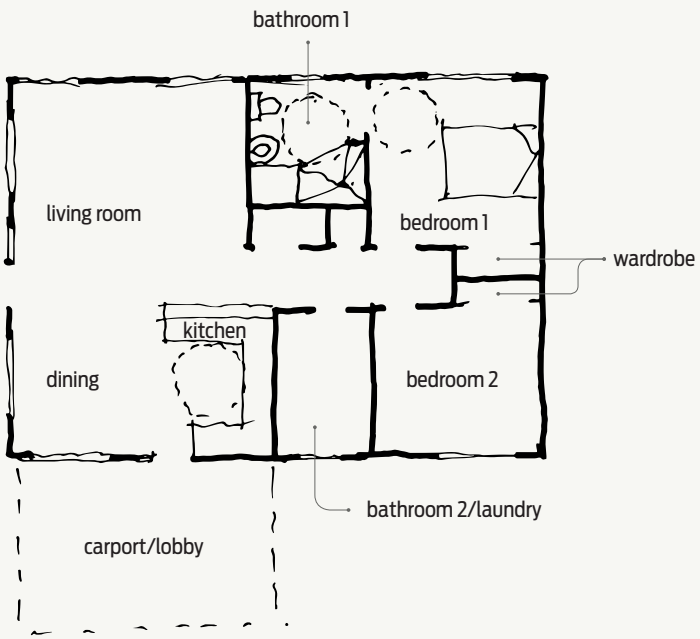


Figure 3 **2-bedroom, 2-bathroom layout.**

For bathroom areas:

- installing doors opening outwards (resist any request to put locks on bathroom doors)
- providing grab bars beside toilets and within the shower
- providing a wet area or European shower (a shower that drains directly through the floor with no door or 'lip' that has to be stepped over).

For switches and handles:

- using lever style door handles (which are easier to grip and open than door knobs)
- having light switches, socket outlets and door handles at easily reached heights
- installing light switches at all entry points into spaces – for bedrooms, have the second switch located by the bed and at the other end for corridors
- providing a telephone outlet by the main bed.

Examples that are flexible for all ages

Figure 1 is a 1-storey, compact open plan with a two bedroom, two bathroom layout where:

- the garage and entry have direct access to the kitchen
- corridors have been eliminated
- the kitchen is centralised and accessible
- one bathroom is accessible and en suite.

Figure 2 is a 1-storey, 1-bedroom, 1-bathroom lay-out which could be an apartment or a stand-alone dwelling. As with Figure 1, the design is open plan, avoids the use of corridors and gives direct access into the kitchen from a lobby or carport. The sole bathroom is en suite and accessible, but the plan also has space for a separate guest toilet.

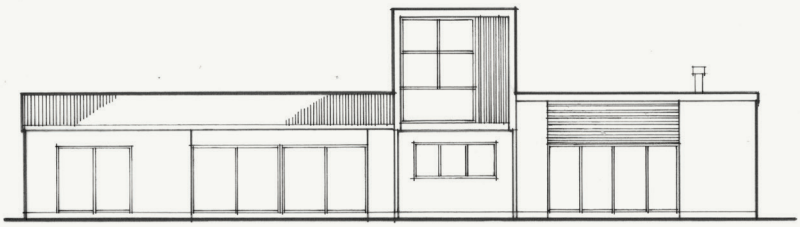
Figure 3 is a 1-storey, 2-bedroom, 2-bathroom compact layout that is based on a typical simple dwelling. As with the other designs:

- the kitchen is easily accessible from outside and has sufficient space for a wheelchair
- one bathroom is accessible and en suite
- corridors are minimised – the plan could be extended to include a third or fourth bedroom although this will increase the length of corridors.

Figure 4 is a Marlborough Sustainable Housing Trust dwelling. It was designed to meet the needs of three generations, including someone working from home. In less than 136 m², the house contains two downstairs bedrooms and a private sitting area for a person wanting to maintain a space to entertain friends without having to go into the traditional 'granny flat'. There is a bedroom adjacent for a carer or another family member. However, there is a reliance on long corridors to link spaces.

While there is no en suite, an accessible bathroom is very close. The kitchen has a turning circle, and the ground floor has level access throughout. There is also level access onto the patio and level access at the main entrance. This area is cleverly covered by the second storey, providing shelter for people arriving by car. Upstairs, there is another bedroom, bathroom and work area with provision for a platform lift, should one be required in future.

The house is north facing, designed to let in the sun in winter and keep it out in summer, with a wood burner, solar hot water heating and a water tank for the garden. The outdoor living areas are separated from the car circulation areas.



North elevation

Ground floor plan First floor plan

Figure 4 **2-storey house, designed by Kyle Davey and commissioned by Marlborough Sustainable Housing Trust, working with Ben Grady of Discovery Homes and Bev Doole.**

It all starts with the design

Designs like these have emerged because they have taken ease, accessibility, comfort and the desire to be flexible for all ages seriously at the design stage.

4 Getting into the home

A good place to start is ensuring that access in and out of buildings meets universal design criteria.

NEW ZEALAND BUILDING CODE clause D1 requires that people with disabilities can enter buildings and carry out normal activities within the building. Acceptable Solution D1/AS1 provides the means of compliance with clause D1 and cites NZS 4121:2001 which provides accessible design detail.

The legislation governing accessible routes does not apply to residential dwellings but the guidelines provided by D1/AS1 and NZS 4121:2001 should be followed.

Vehicle access, car parking and garages

People with disabilities and the elderly can often drive, so they need vehicle access and car parking up to the house. There are no special driveway requirements, but it's recommended that parking areas are 3.5 m wide for wheelchair users and 3 m wide for ambulant disabled people. If possible, a garage should have direct access into the house to provide:

- shelter
- security
- storage and battery recharging space for electric mobility scooters.

The garage should also be wide enough for a wheelchair user to get in and out of the car (see Figure 5). Access between the garage and house should be either level or ramped. An automatic door opener makes access easier.

Paths, ramps and stairs

The access path should be level without steps. Where changes in level are required, sloping paths or ramps should have a maximum gradient of 1:12 although a 1:15 to 1:20 gradient is preferred.

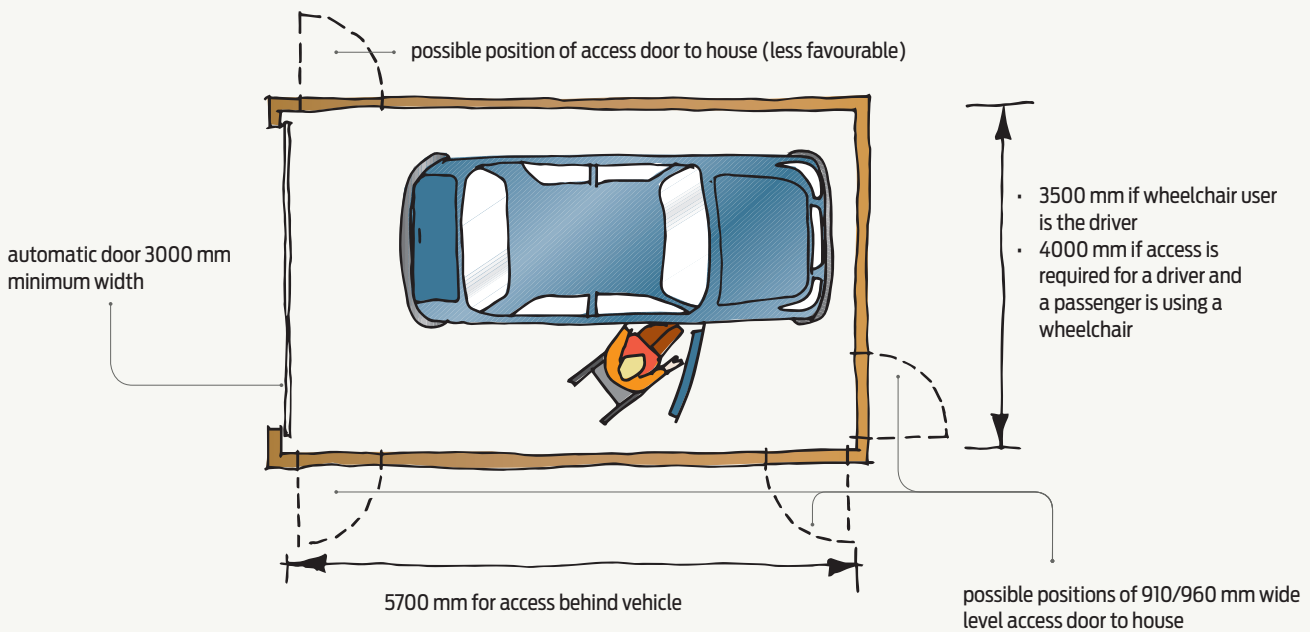


Figure 5 **Garage layout for wheelchair user.**

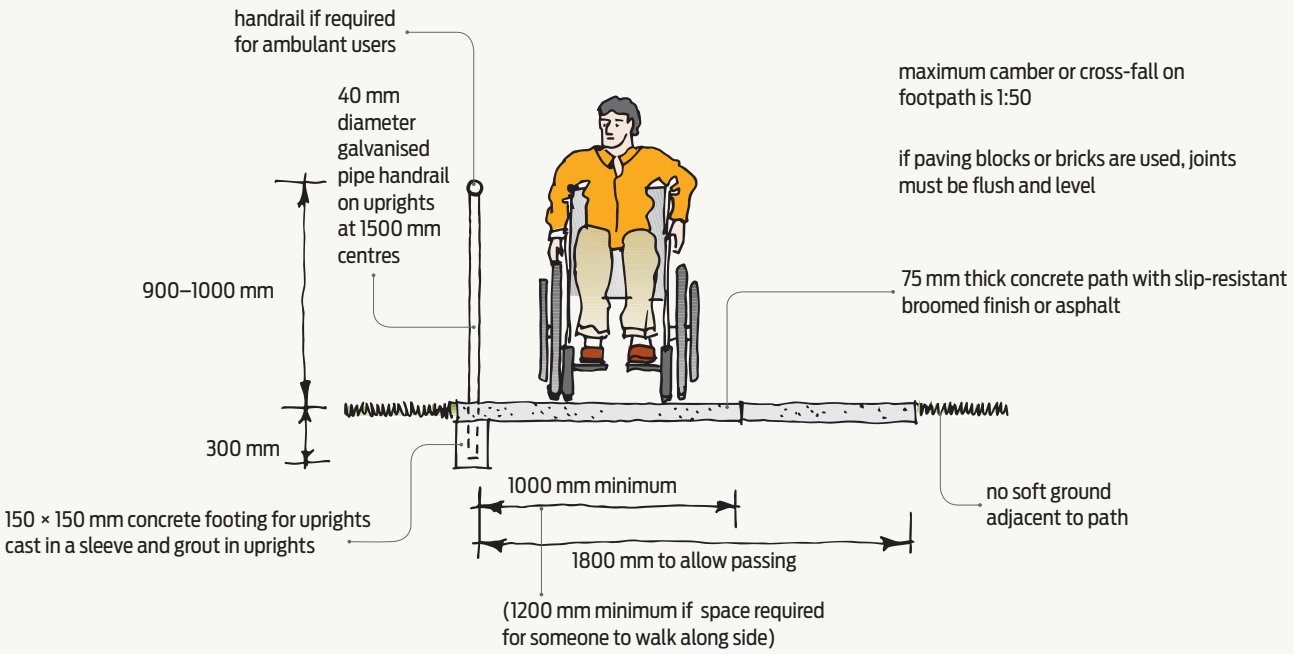


Figure 6 **Footpaths.**

Paths and ramps should be at least 1200 mm wide to allow space for someone to walk beside and assist a person with a disability (see Figure 6). They should have a non-slip surface and no obstacles. If paved, the joints between pavers should be flush and even. Ramps should also have a minimum 75 mm upstand and a handrail between 900 and 1000 mm high for ambulant users.

Where a person can fall 1 m or more from a footpath, ramp or landing, a barrier complying with Building Code Acceptable Solution F4/AS1 must also be provided.

Level entry to the house

Entry into the house from the street or garage should be level (see Figure 7). This requires careful design and construction to prevent moisture ingress at entry doors. Acceptable Solution E2/AS1 to clause E2 *External moisture* allows level access in accordance with paragraph 7.3 and Figures 17A and 17B.

Concrete slab floors must be at least 150 mm above permanent paving and 225 mm above unpaved ground, while suspended timber floors are likely to be at least 400 mm above ground level.

A concrete floor slab must have a drainage channel located across the door opening (see Figures 8 and 9) that:

- is wide enough to meet the surface water capacity requirements in E1/AS1 paragraph 3.2 for specific design

PHOTO – LIFEMARK

Figure 7 **Covered level entry and wide entry door.**

- is at least 150 mm deep
- is no more than 3.7 m long
- has a minimum 1:200 fall to a drainage outlet
- has a removable grating with gaps that cannot trap wheelchair wheels and mobility aids
- has a continuous 12 mm gap between grating and threshold.

Exterior drainage must comply with E2/AS1 including a minimum 1:40 fall away from the channel.

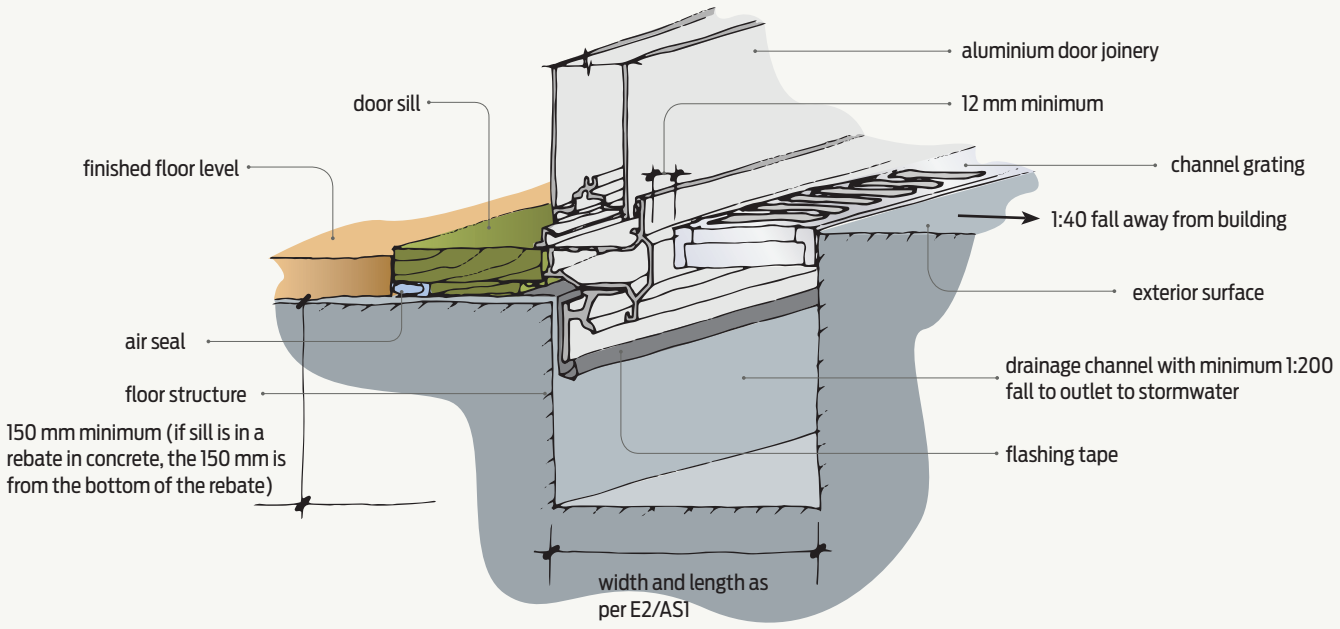


Figure 8 **Level threshold with drainage channel.**

A timber floor may have a timber deck with level access. It must have a continuous 12 mm minimum wide gap between the decking and the threshold or doorsill. All weathertightness requirements of the opening must comply with E2/AS1 (see Figure 10).

A non-cantilevered deck may be at the same level as the threshold in accordance with E2/AS1 paragraph 7.3 and Figure 17A. It must also have a continuous 12 mm minimum wide gap between the decking and the external wall. If the deck is enclosed, the underlying membrane plus removable surface of tiles, pavers or timber decking should be as shown in E2/AS1.

Covered entry

Provide shelter to the entry door by a recessed porch or a canopy. Wheelchair users are likely to have the door open for a longer time than ambulant users. Ensure the entry is well lit at night preferably with a sensor-operated light and has enough manoeuvring room for a wheelchair. A seat or parcel shelf is useful to include.

Accessible mailboxes

Locate the mailbox so a driver can pick up the contents through the car window and a wheelchair user or ambulant person has easy access.

PHOTO – LIFEMARK

Figure 9 **Channel grating across level threshold (grating parallel to opening preferable).**

Platform lifts and cable cars

Where flat access is not possible, a range of platform lifts are available that are designed to lift people and goods up to 4.0 m.

For steeper sites in hillside suburbs, domestic cable cars that consist of a platform or car pulled by cable along an inclined mono or dual rail are also available.

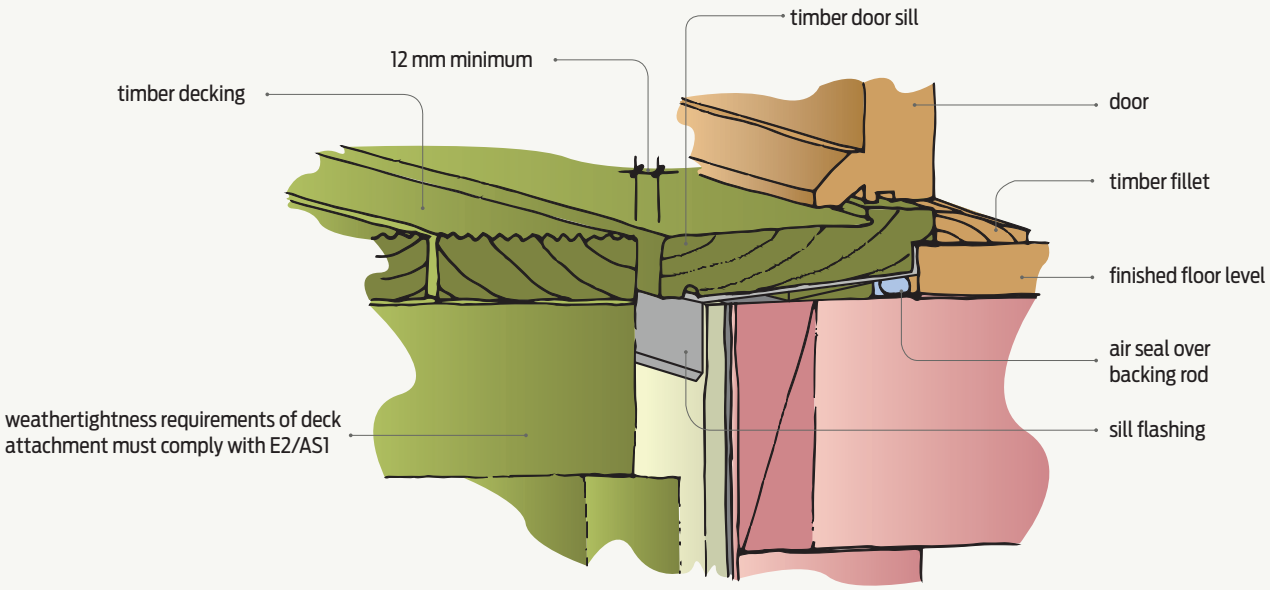


Figure 10 **Level threshold with timber decking.**

5 Wet areas

Poor accessibility to and in the kitchen, bathroom and laundry – the wet areas – is often the biggest obstacle to people continuing to live easily and independently in their own home.

A SMALL BATHROOM may mean that a wheelchair user cannot access it. Baths may be an obstacle, and showers are often installed over a bath.

Wash hand basins and vanity units that are too high and unable to be approached closely by wheelchair users are a problem. Some tap designs can be difficult for people with limited grip and agility.

When a person cannot easily use bathroom facilities, the home is effectively non-functional for that person.

Size important in a bathroom

Generally, the larger the bathroom, the easier it is to move around fittings and fixtures for someone who is older or has a disability. A turning diameter of at least 1500 mm is required for wheelchair use.

A single bathroom should be accessible from all areas of the house. If the house has more than one level, each level should have a toilet. Ideally for universal design, one bedroom and bathroom should be on the ground level with remaining bedrooms and a bathroom on the upper level.

When designing a new building, if possible, locate a bathroom directly accessible from the bedroom used by a person with limited mobility. The bathroom door, and indeed all doors in a home, should be at least 810 mm wide for wheelchair access (860 or 910 mm are better).

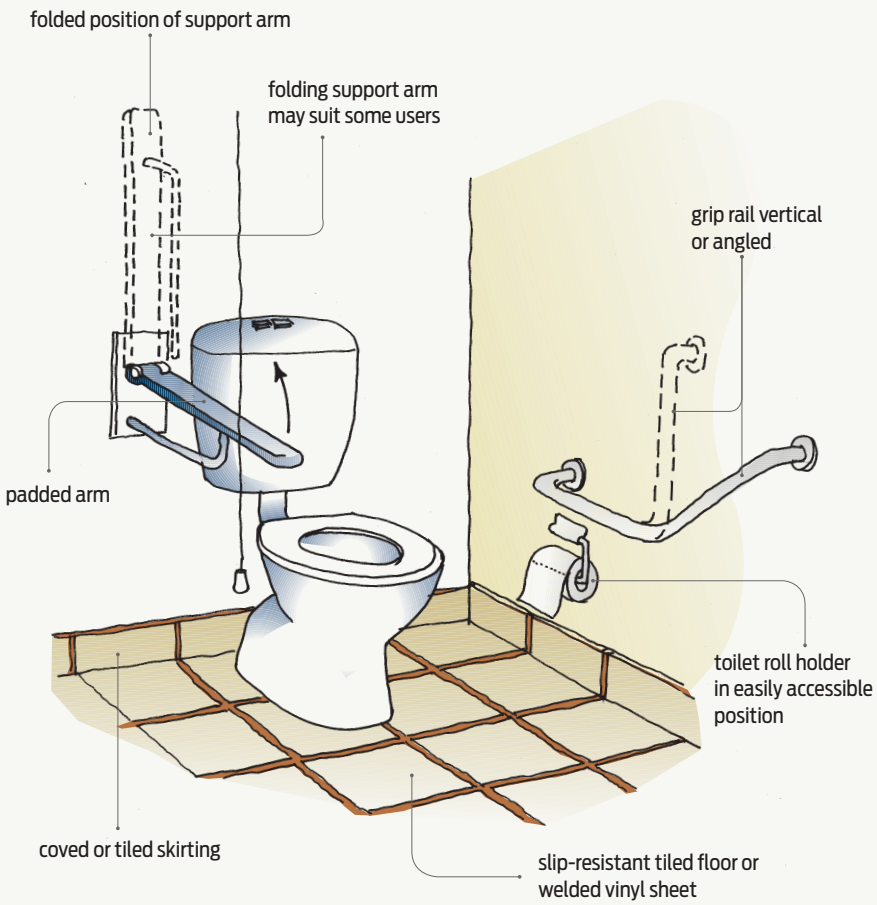


Figure 11 **Typical arrangement for accessible WC.**

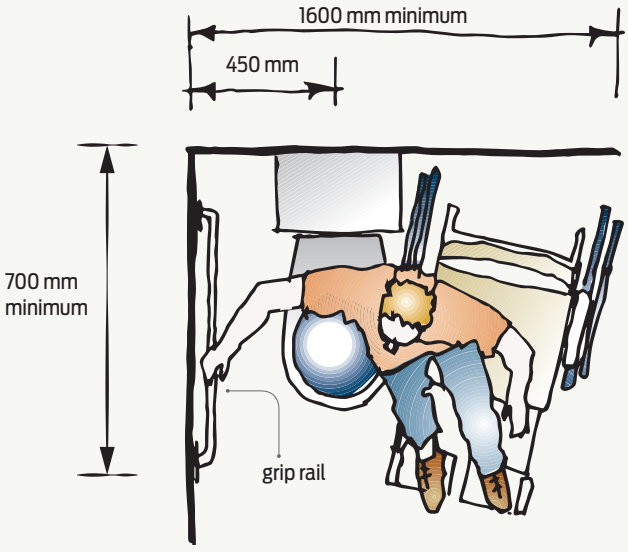


Figure 12 Side transfer onto WC.

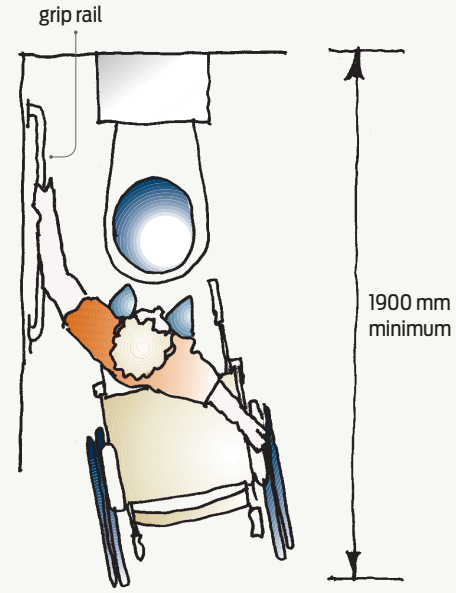


Figure 13 Front transfer onto WC.

A second bathroom on the same level need not use accessible design.

In new construction, bathroom walls, particularly around the toilet and shower, should have additional framing preinstalled or be lined with stuctural ply so that grip rails can be fitted for future use (see Figure 11).

Need space around toilets and bidets

Wheelchair and walking frame users need more space than is often available beside or in front of the toilet so they can transfer between the wheelchair and the toilet.

The most common ways to transfer are from the side (see Figure 12) and from the front (see Figure 13). Grip rails must be provided, and a moveable support arm may be useful to provide additional support if required.

The transition from wheelchair to toilet seat is easier when both seats are at the same height, typically 460–480 mm (see Figure 14). If a bidet is installed, it should be beside the toilet pan and able to be accessed in the same way as the toilet.

A standard toilet space may be too small for some disabled people, but usability may be improved if grip rails are installed.

Hanging a door to open outwards or using a sliding or automatic door can also improve access into the room for people who are ambulant.

Consider the height and selection of basins

Wash hand basins need to be at a lower level for wheelchair users. Clear space is also required below the basin or vanity to move a wheelchair underneath it (see Figure 15).

A vanity unit or wall-mounted basin that is height adjustable and designed with a removable storage cupboard below the basin or has open space below it is ideal. When adjustable, it can be easily adapted for use by a person in a wheelchair by relocating the storage cupboard and lowering the vanity top.

Another option is to install two basins in a new or retrofitted bathroom and place them at different heights. A low basin is also more easily accessible for children.

Anyone standing or seated can use a semi-recessed basin projecting beyond the front edge of the vanity as long as the height is appropriate for the seated user.

Wet area shower better

1200 × 1200 mm open level-entry showers are generally easier for people with a disability to use than a bath. Showers that incorporate a hob or upstand to contain water are an obstacle to wheelchair users or a trip hazard.

Adapting a shower

Standard shower cubicles are often too small for easy use by people with disabilities, particularly when assistance is required.

A shower space should be at least 1000 × 1000 mm (1200 mm square typically recommended) for easy use by anyone.

To adapt an existing shower, it should have grip rails, a lever mixer tap preferably located next to the shower entrance, an adjustable height, flexible showerhead hose on a sliding rail, a slip-resistant base and, ideally, a seat (see Figure 16).

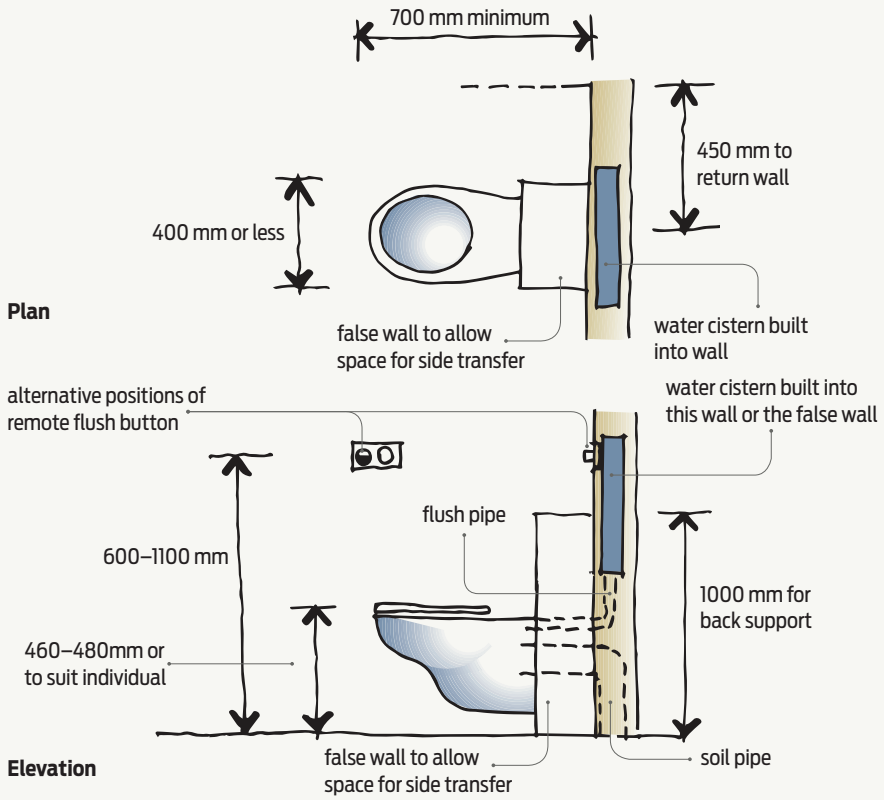


Figure 14 WC pan dimensions.

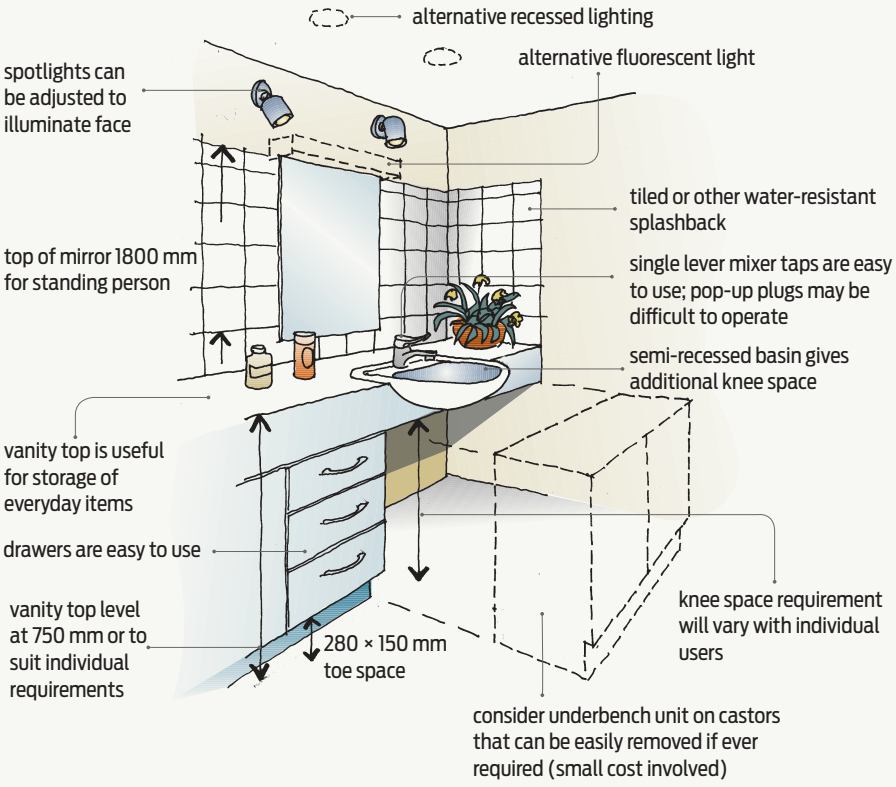


Figure 15 Typical accessible vanity layout.

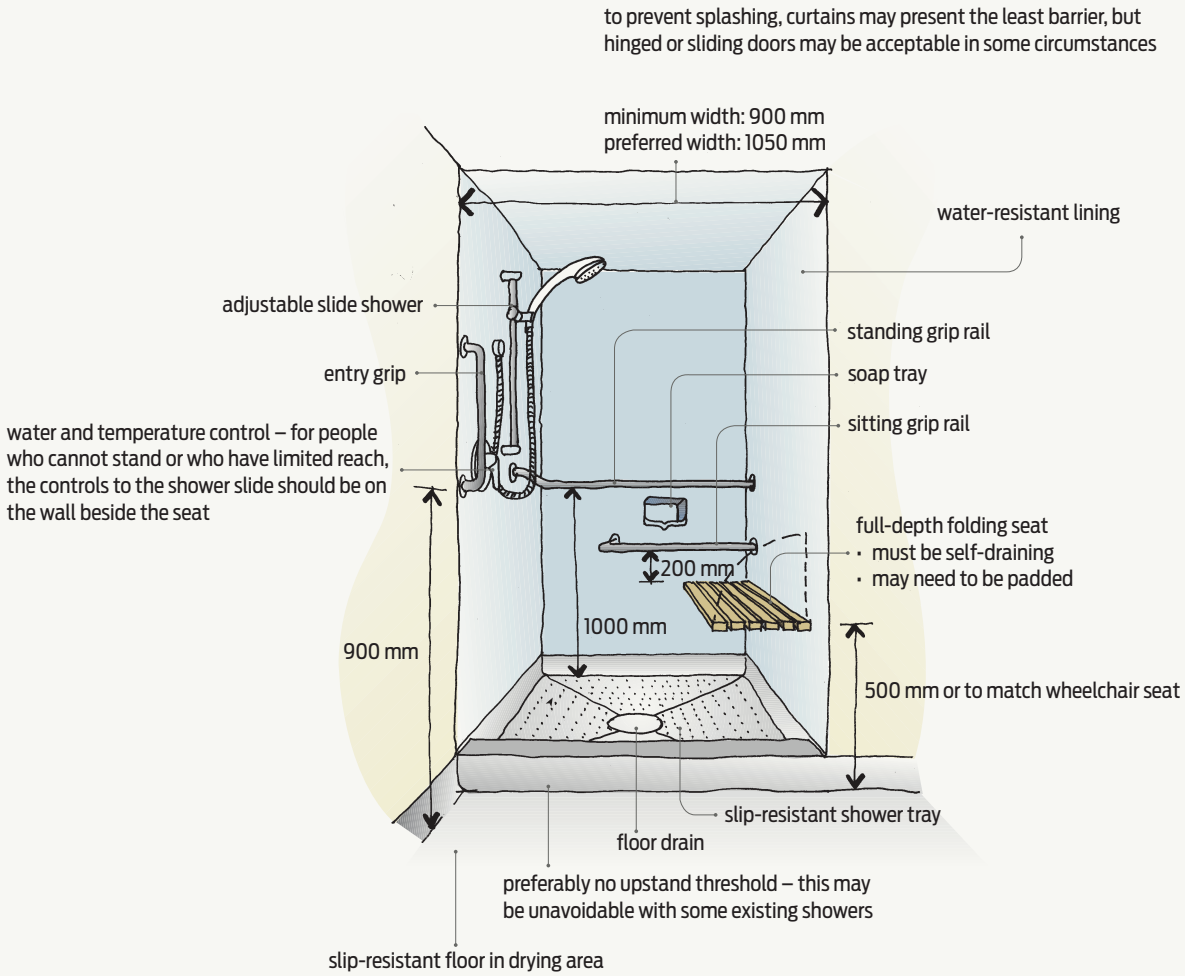


Figure 16 **Modified shower layout suitable for elderly or ambulant disabled.**

The shower seat should be installed on the wall adjacent to and within easy reach of the mixer and the stream of water. It should be self-draining and comfortable to use.

Wet area shower

A wet area shower overcomes the obstacles of size and an upstand as these are constructed continuous with the bathroom floor.

The floor in the shower area should slope to an outlet, a channel or a central drain so water can drain away.

A channel drain means the floor can be constructed with a single slope to the channel, which then drains to an outlet. The single slope is easier for a person with a disability to negotiate compared to a multiple slope floor to a single outlet.

The entire floor of a wet area bathroom must be constructed to good waterproofing practices.

A universal design shower should have a permanently installed or fold-down shower seat, grip rails, a lever mixer tap and an adjustable-height flexible hose spray on a sliding rail (see Figure 17).

Baths need non-slip matting

Baths can be hazardous for older people and people with disabilities as:

- stepping in and out is a problem
- the base can be very slippery, especially when wet
- the curved base makes it more difficult to stand.

Baths should always have non-slip matting. If a bath is kept or installed, it should be fitted with:

- a lever mixer tap reachable while a person is seated in the bath
- a shower on an adjustable-height slide
- an L-shaped (horizontal and vertical) grip rail that can be held onto while the person is showering.

A vertical grip post installed beside the bath allows a person to support themselves while making a 90° turn when they are stepping in and out of the bath.

Walk-in baths with a door are available, allowing the bather to step in and out of the bath

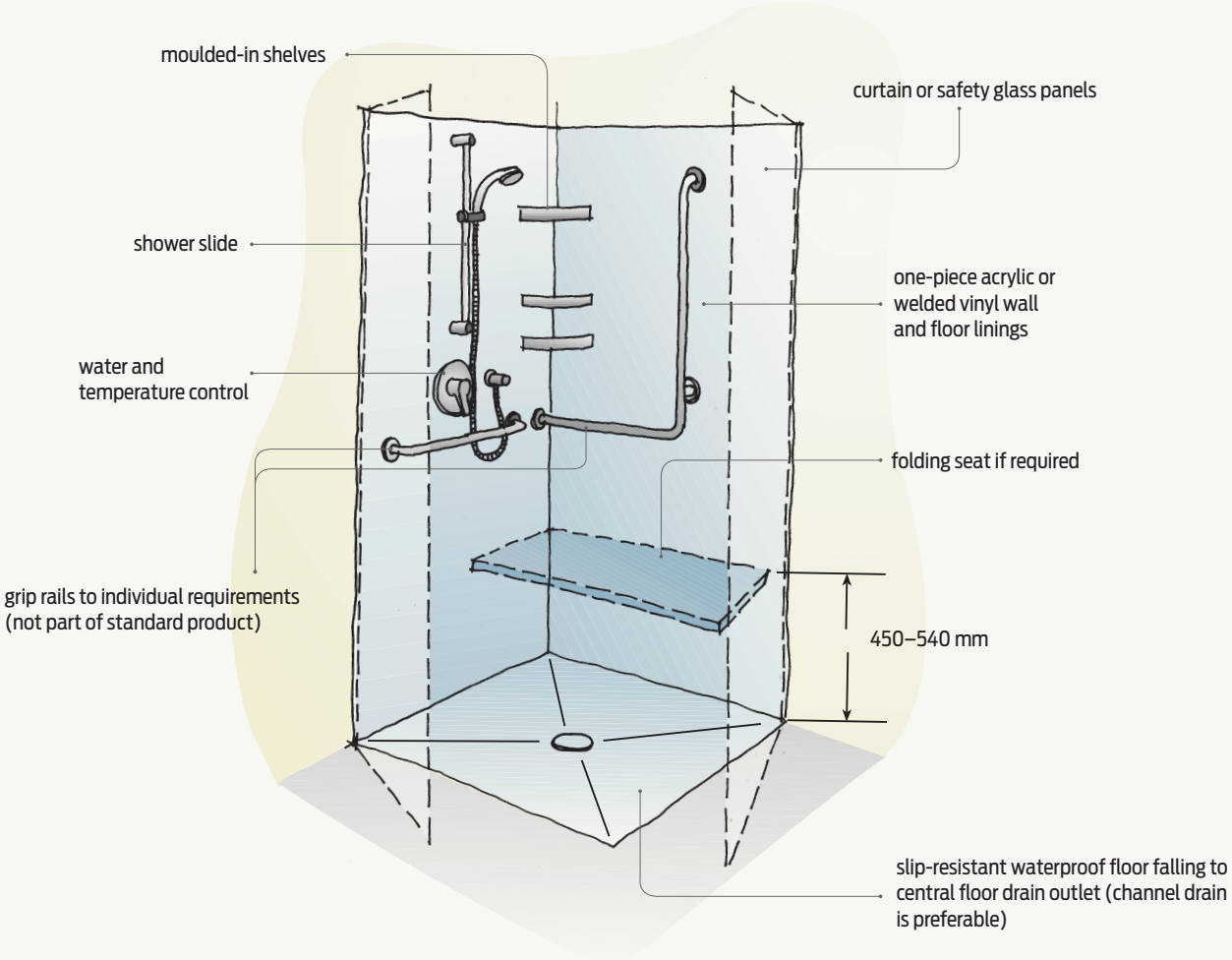


Figure 17 **Wet area shower.**

rather than needing to step over the edge. These are generally shorter than a standard bath but are also deeper with a non-slip floor and seat.

Lever handles easiest to use

Lever-action mixers and taps make the temperature control of hot water easier.

Taps should be easy to grip and use – generally lever mixer taps are the easiest. Tap handles that are round or knob-shaped can be difficult to grip and operate for people with arthritis or other disabilities affecting their hands.

Taps and mixers should be installed just inside the shower or bath enclosure for easy access to turn on and off.

Fix grip rails securely

Falls are most likely to occur in bathrooms and toilets for people with and without disabilities, so grip rails fixed to framing should be installed.

Grip rails need to be securely fixed to the wall so they can support the full weight of a person. Walls may need additional framing to securely fix grip rails.

A range of proprietary grip rails are available, and other shapes can be manufactured to suit specific requirements. These are typically stainless steel and may be chrome plated, or powder coated. They should have a textured finish to provide good grip.

People who are unsteady on their feet are likely to grab the nearest support such as a towel rail, whether it is meant as a support or not. Towel rails and other fittings should therefore also be securely fixed.

Laundry

A front-loading washing machine and dryer provide easy access for a person using a wheelchair.

If a laundry tub is installed, it should be at the same low level as the wash hand basin and have clear space for wheelchair access underneath.

Shelves, power outlets and light switches should all be at eye level or approximately 1200 mm from the floor and be within easy reach.

6 Kitchens

Kitchens, along with bathrooms and laundries, need thoughtful design to make them easily accessible for both the able bodied and disabled.

THE DESIGN OF A KITCHEN is important for good accessibility and to enable universal design principles to be incorporated.

Space is important

Kitchens should have sufficient clear floor area to allow a person using a wheelchair or with restricted mobility to work effectively. A turning diameter of at least 1500 mm is required as well as a 1200 mm minimum approach in front of all workbenches and appliances (see Figures 18 and 19).

Adjust the work surface height

Some of the worktops and sink benches need to be low enough to use from a wheelchair and have wheelchair access below them (see Figure 20).

Several proprietary, adjustable-height, support bracket systems are available for height adjustment of work surfaces including fixed brackets and mechanical and electrical adjustable-height worktop mechanisms. The height adjustment range is generally 620–900 mm.

Where sink bench units are height adjustable, sinks must be fitted with a flexible plumbing kit (see Figure 21).

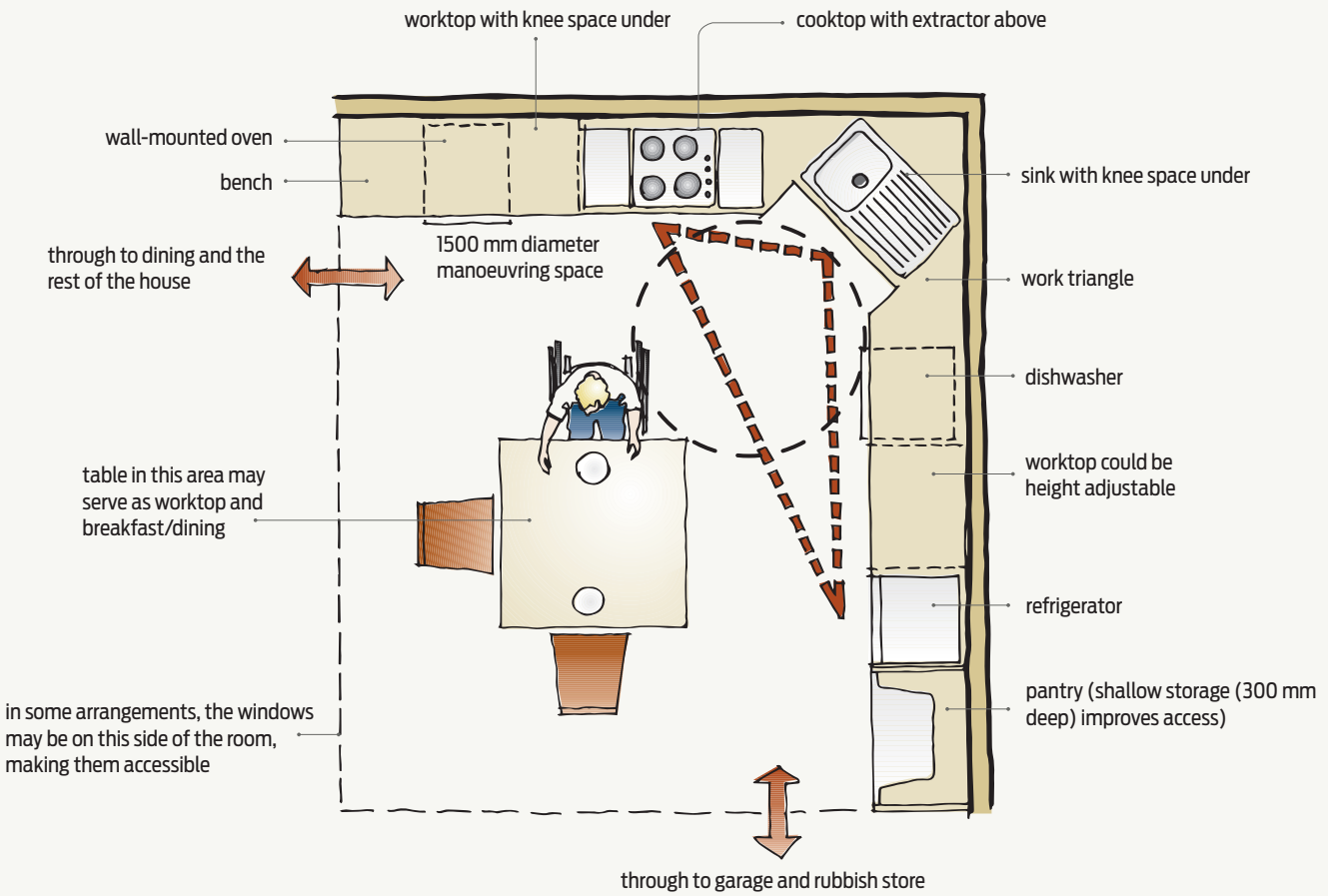


Figure 18 **Typical kitchen – L-shaped.**

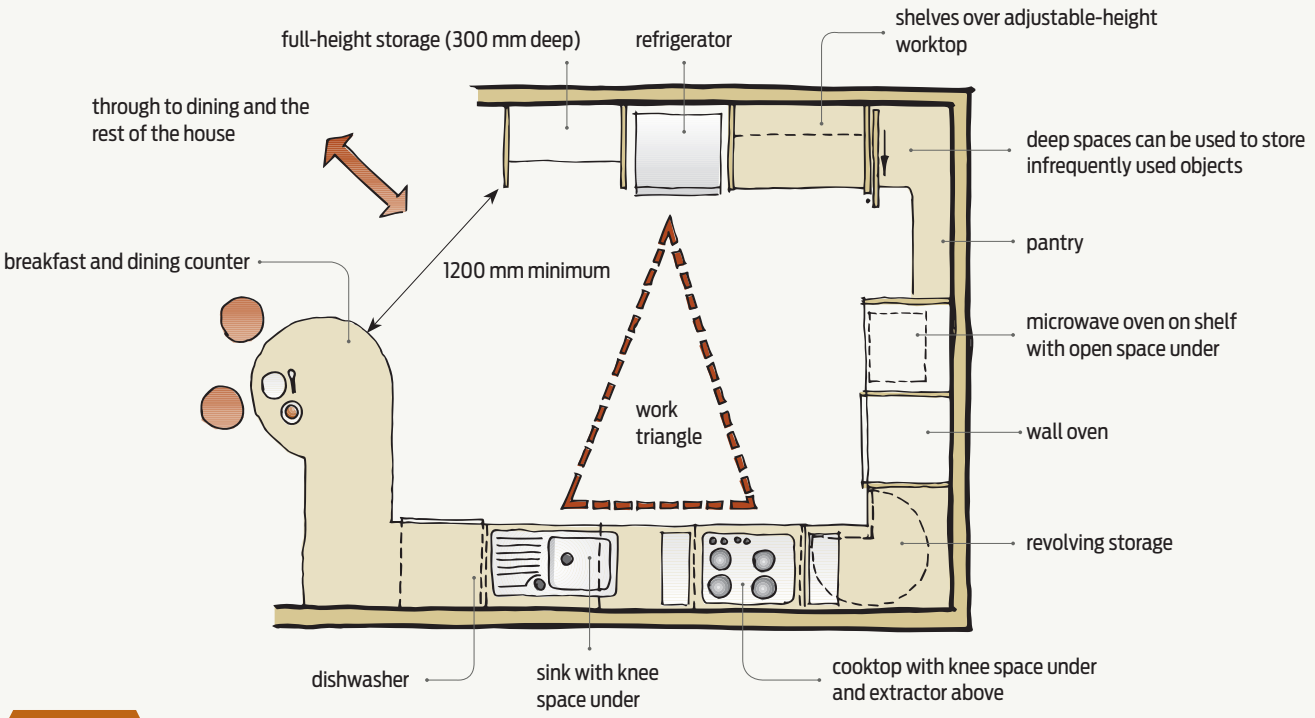


Figure 19 **Typical kitchen – U-shaped.**

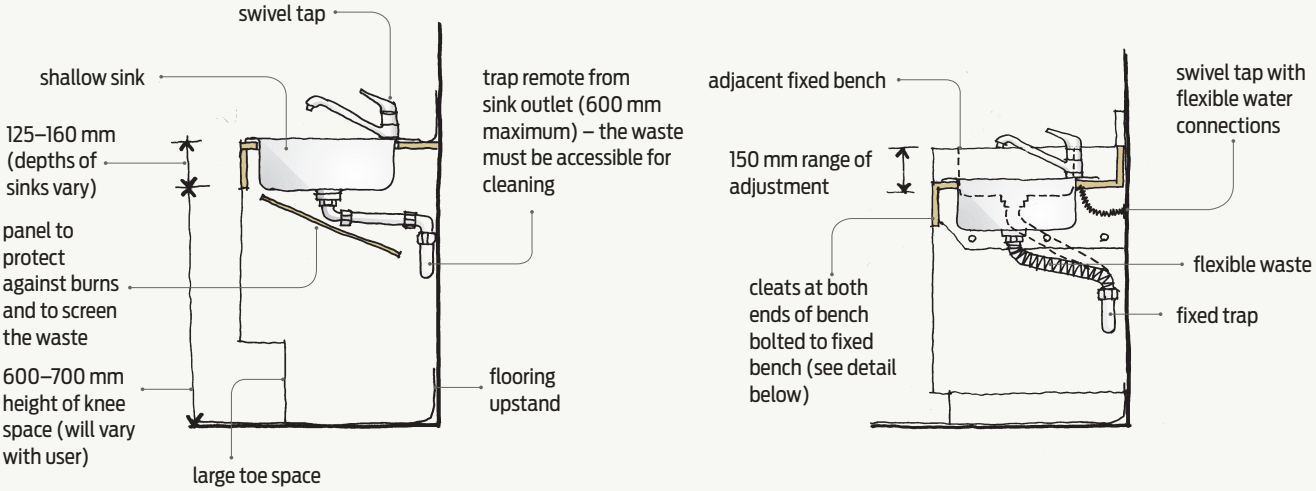


Figure 20 **Knee/wheelchair space beneath fixed sink.**

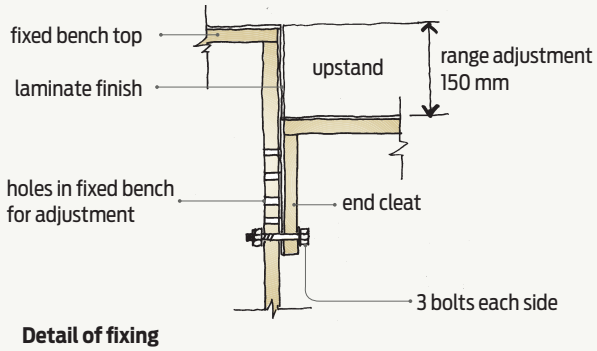
Shallow sinks and lever mixer taps

Allow wheelchair access beneath sinks so that wheelchair users or people who have difficulty standing for any length of time can sit at and work beside the sink. Seated people have a shorter reach, so sink bowls should be shallow.

Lever mixer taps are easier to use, and an extendable hose spray increases the range of use.

Drawer, cupboard and shelf design

A kitchen design that utilises drawers rather than cupboards improves the accessibility of the items within the storage area as the user can access the ➤



Detail of fixing

Figure 21 **Adjustable-height worktops and sinks.**

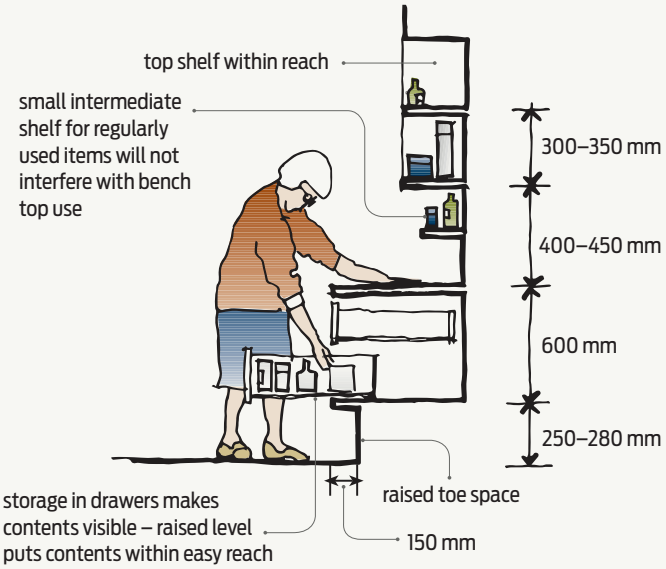


Figure 22 **Accessible storage suitable for elderly ambulant users.**

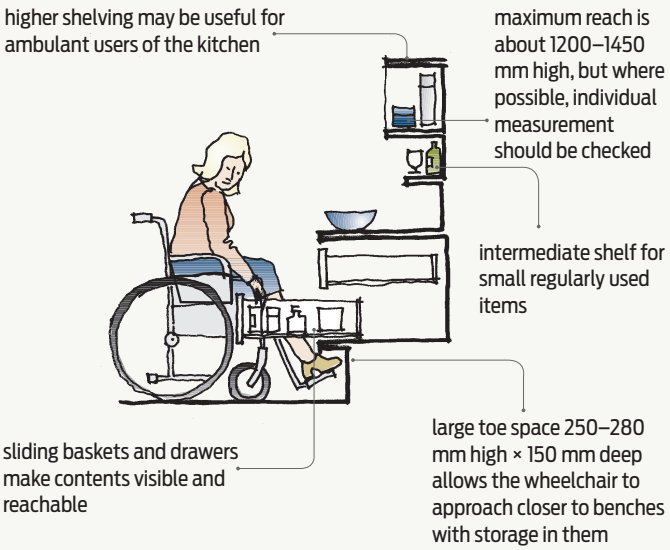


Figure 23 **Accessible storage for wheelchair users.**

drawer from the side when it is extended – accessing the back of a cupboard is not always easy even for an able-bodied user. Kick spaces should be deeper and taller to accommodate wheel chair users (toe space storage can be utilised by drawers fitted with castors so the space is not wasted). Mobile units that fit under benches or can be moved elsewhere provide increased flexibility.

Overhead cupboards and shelves should be set at a height appropriate for the user or be easily adjustable (see Figures 22 and 23). Pantries and walk-in storage can be designed for wheelchair entry with clear wheelchair access below (see Figure 24). Keep pantry shelves shallow (maximum 300 mm depth) so that items on the shelves are always visible and within reach.

A range of proprietary products are available:

- Electric lifts for wall-mounted cupboards that lower cupboards to a height where they can be accessed by a person in a wheelchair. These can be fitted to cupboards 500–700 mm high. One motor lift will raise and lower a cupboard unit up to 1200 mm wide and weighing approximately 100 kg. A typical range of movement is 430 mm lowering extension and 180 mm outwards extension (see Figure 25).
- Pull-down baskets and shelving that can be fitted into wall-mounted cupboards.
- Carousels that can be fitted into corner cupboards for access to items stored at the back.
- Pull-out shelving units that are available in a range of heights and widths. These generally roll out on wheels.

Positioning appliances

Cooktops should be set into easily adjustable work surfaces and have front or face-mounted controls. For stoves, include a bench area on each side so that items taken from the oven can be quickly set down. Staggered burners can also reduce the need to reach across the cooktop.

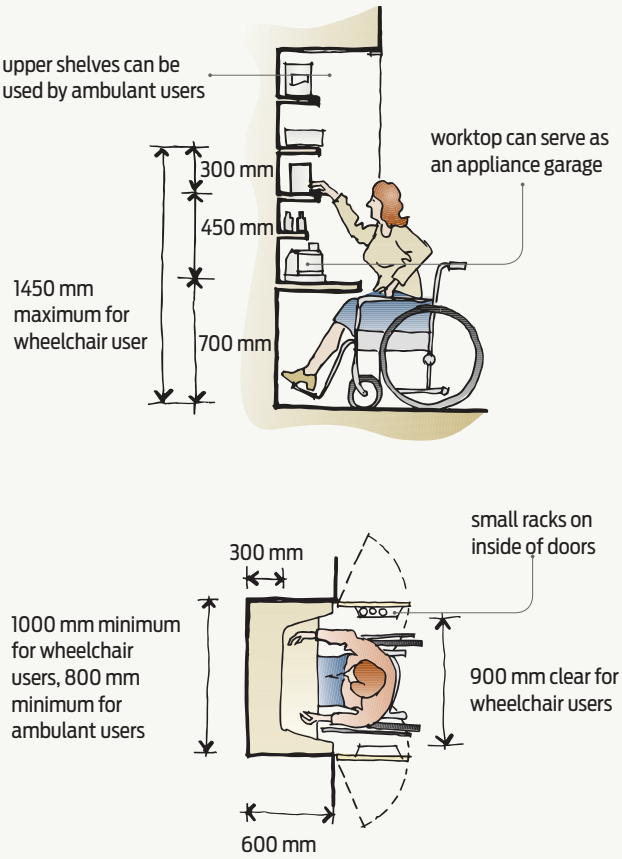


Figure 24 **Wheel-in pantry.**

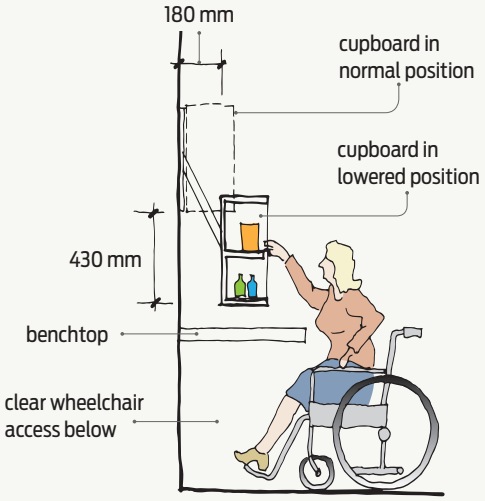


Figure 25 **Adjustable-height wall cupboards.**

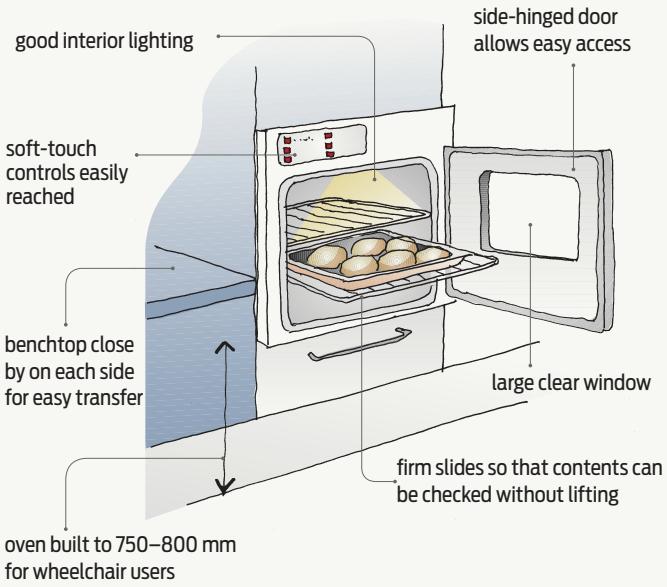


Figure 26 **Requirements for ovens.**

A wall-mounted oven should be at eye level height to suit the user, and the oven door should be side or upwards opening (see Figure 26). Unfortunately, neither of these opening options are commonly available.

Mount a microwave at standard height bench level and have a bench surface or pull-out shelf in front so hot dishes can be safely transferred from the microwave to the benchtop.

7 Indoors

Open-plan living areas make life easier for people using wheelchairs. Sometimes, however, stairs and hallways can't be avoided, so it's important to think about how to make life easier indoors.

WHEELCHAIR and walking frame users and many ambulant people with disabilities need more space to function independently than non users. This doesn't necessarily mean larger homes – good space planning is the key.

Include open-plan design

Universal accessibility is greatly enhanced by designing open-plan spaces so one space flows into another and the manoeuvring area is incorporated in the open-plan area.

Open planning also keeps the number of doors to a minimum or avoids them altogether. This makes movement between spaces easier.

The circulation spaces and position of furniture in an open-plan space should allow enough clear floor space so that a wheelchair can comfortably turn 360º – typically a 1500 mm diameter area (see Figure 27).

New homes can provide universal accessibility by incorporating open-plan concepts. Where possible, alterations to an existing house should aim to minimise or remove hallways and reorganise the layout to create open-plan spaces.

These spaces can be defined in various ways, such as using different finishes for floors, walls or ceilings. Keep the transition between floor surfaces from one area to another flush or with as little change in height as possible. Use materials such as low-pile carpet or non-slip flooring.

Tips for hallways and small areas

Small spaces and narrow hallways can make moving around the house difficult for wheelchair users. A home designed with good accessibility will avoid hallways and incorporate open-plan areas to facilitate movement instead (see Figure 28).

Hallways that can't be designed out of a new house or removed in an existing house should be at least 1200 mm wide. If a house is being altered, it may be possible to chamfer or cut back the inner corner of a narrow hallway to improve wheelchair manoeuvrability (see Figure 29). Avoid dead-end hallways.

Narrow hallways – for example, 900 mm wide – need to be as short as possible. A wheelchair can manoeuvre in a 900 mm width, but there isn't space for an ambulant person to pass, and a 90º turn in or out of the hallway can be difficult.

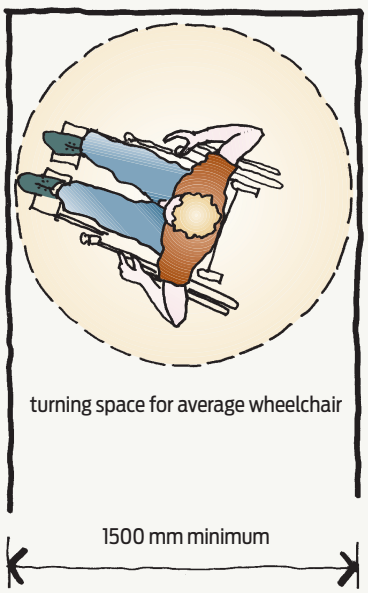


Figure 27 **Wheelchairs should be able to turn 360º at the end of hallways and in all rooms.**

Include good lighting in hallways. Use natural light where possible during the day and good artificial lighting at night. Install two-way light switches at both ends of all hallways so there is no need to negotiate the space in the dark.

Difficulties with doors

Multiple small rooms with doors present a significant barrier to access around the house. When doors are narrow, they are also difficult for wheelchair users to negotiate. The minimum door width accessible for a wheelchair user is 760 mm, but a door that is 860 or 910 mm wide is easier for a wheelchair to go through.

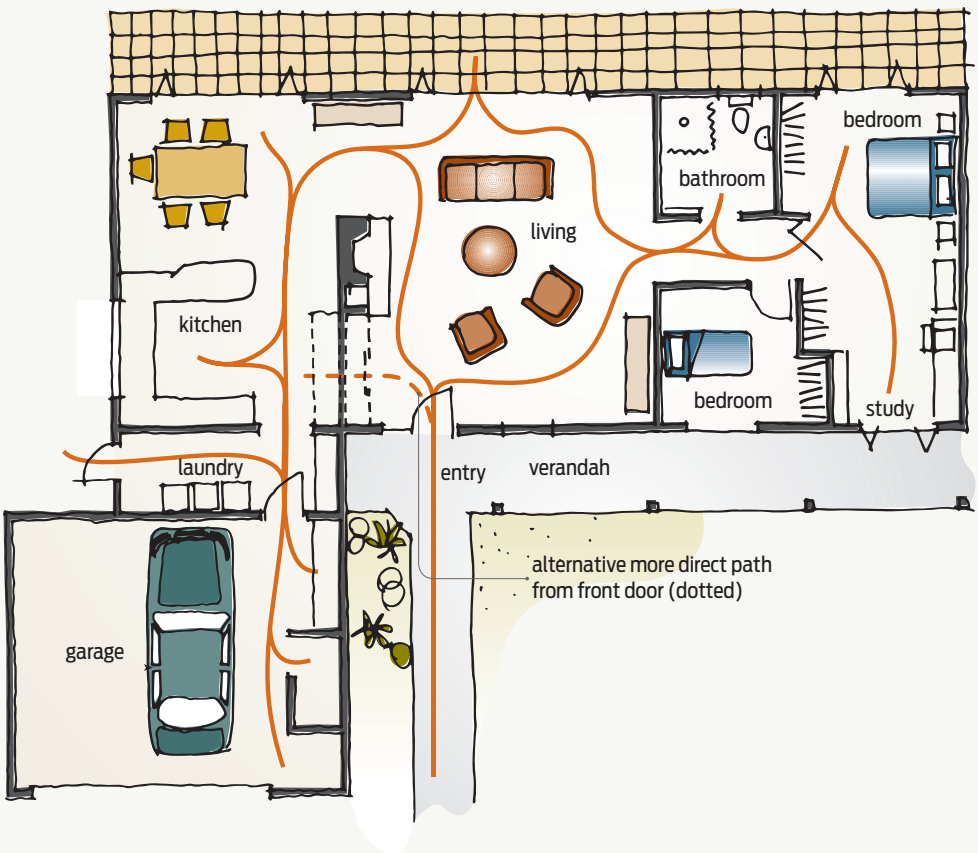


Figure 28 **Plan to keep circulation space to a minimum and allow easy flow of movement.**

A narrow door opening off a narrow hallway is likely to be very difficult or impossible for a wheelchair user to turn into. As a general rule for easy wheelchair access, the narrower the hallway, the wider the door must be opening off it (see Figure 30).

Sliding versus hinged doors

While a sliding door may be easier for wheelchair users to open than a hinged door, they do have disadvantages. Sliding doors:

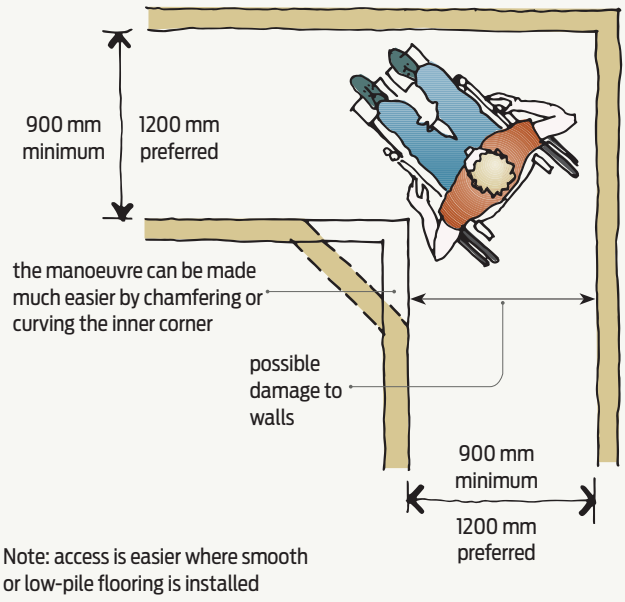
- are more difficult to draughtproof when external
- are more difficult to prevent sound transmission through
- may be noisier to operate than a hinged door.

Hinged doors are perceived to limit the usable floor space in the area of the door swing. In reality, the swing space is also required as access space, and sliding doors also require access space on both sides of the door.

Usually the direction of swing of hinged doors is irrelevant as it varies depending on the direction of the approach to the door. The exception is for toilet cubicles. These typically open inwards, but accessibility improves if the door opens outwards. Then, if a person collapses, they will not block access. An alternative is to install a proprietary dual-swing door hinge and latch set to enable the door to be opened outwards in an emergency. For easier access in critical locations, it may be worth considering an automatic opening door. Hinged doors with closers can be difficult to operate from a wheelchair.

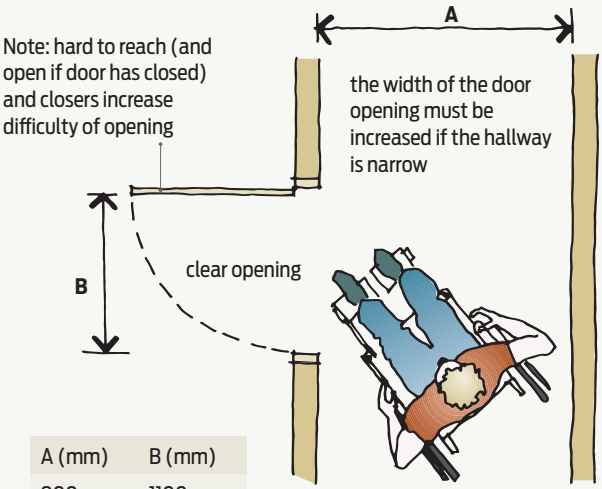
When stairs are unavoidable

An accessible home should ideally be on a single level or have a lift or stairlift incorporated into the design. Stairs are impossible for wheelchair users to manage and can be difficult for semi-ambulant and elderly people.



Note: access is easier where smooth or low-pile flooring is installed

Figure 29 **Minimum dimensions of 90° corner in hallway.**



A (mm)	B (mm)
900	1100
1000	1000
1200	760

Figure 30 **Minimum space requirements to turn 90° from a hallway into a door.**

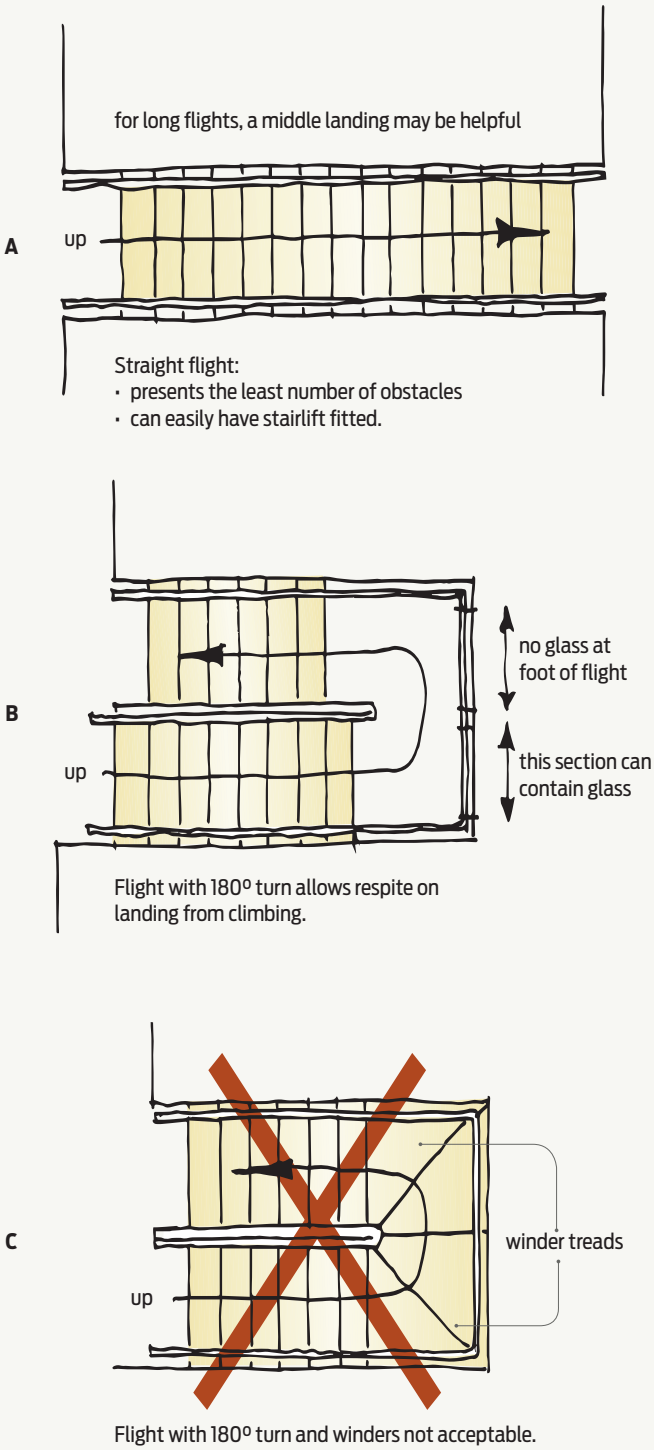


Figure 31 **Some stair arrangements.**

In an existing house 2-storey house it may be possible to adapt the stairs to install a stairlift or lift.

If a change in level is required in a new house design:

- a single, straight flight is the easiest to negotiate for a person with a disability
- a landing should separate each straight flight if the stairs require a 90º or 180º turn
- do not use winder treads (see Figure 31).

The requirements for access in buildings are in New Zealand Building Code clause D1. Specific stair design details are in Acceptable Solution D1/AS1, and these apply to stairs within a dwelling. Additional design considerations to improve accessibility for people with disabilities include having:

- treads deep enough to provide secure footing more than the minimum depth required by D1/AS1
- slip resistance
- either no tread nosings or minimal projections (see Figure 32)
- good lighting
- enough space at the top and bottom of stairs so users can steady themselves before changing direction
- sufficient width for a future stairlift installation if required.

Install two-way light switches at both the top and bottom of any flight of stairs.

Handrails should be in accordance with D1/AS1. Size them to allow a firm grip, provide good support and allow enough clearance between hand and support bracket and between hand and wall (see Figure 33).

The handrail height must be 900–1000 mm as specified in D1/AS1. If possible, have handrails on both sides of stairs so people can use left, right or both hands for support. The width between handrails must be at least 850 mm.

Lifts and elevators

Where a person living in a 2-storey house is unable to negotiate stairs, either:

- arrange the house so the person does not need to use the stairs
- install a mechanical lift – either a stairlift or a domestic elevator (see section 8).

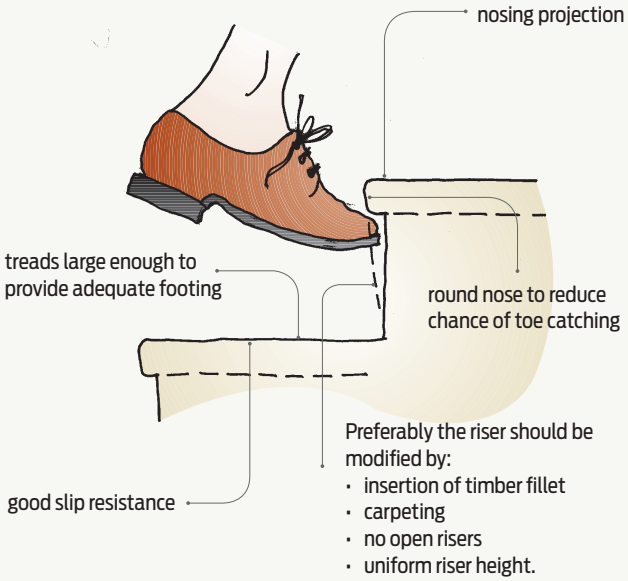


Figure 32 **Principles of step design.**

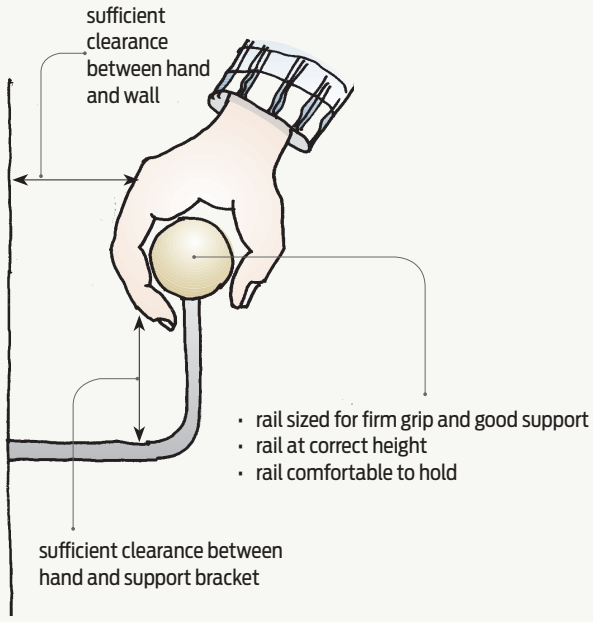


Figure 33 **Principles of handrail design.**

8 Lifts in dwellings

Government policy encourages people to be able to stay in their own home as they get older and lose mobility, so think proactively and consider installing a lift when building or retrofitting a 2-storey house.

WHILE LIFTS in New Zealand houses have tended to be regarded as a luxury feature, there are several reasons to consider installing them in a multi-level home including:

- making the home accessible to everyone
- futureproofing the home to ensure all levels remain accessible as occupants' mobility decreases
- making movement of furniture or goods around the home easier
- potentially increasing the resale value of the home.

Several types of lifts

There are three broad categories of lifts for residential use. These include:

- screw drive, hydraulic or electric traction-type passenger lifts that can carry both people and goods
- stair lifts that attach to an existing staircase and are only for transporting people
- low-rise platform hoists or lifts that allow wheelchair users to be raised up a short height, typically to overcome access where there is insufficient space for a ramp.

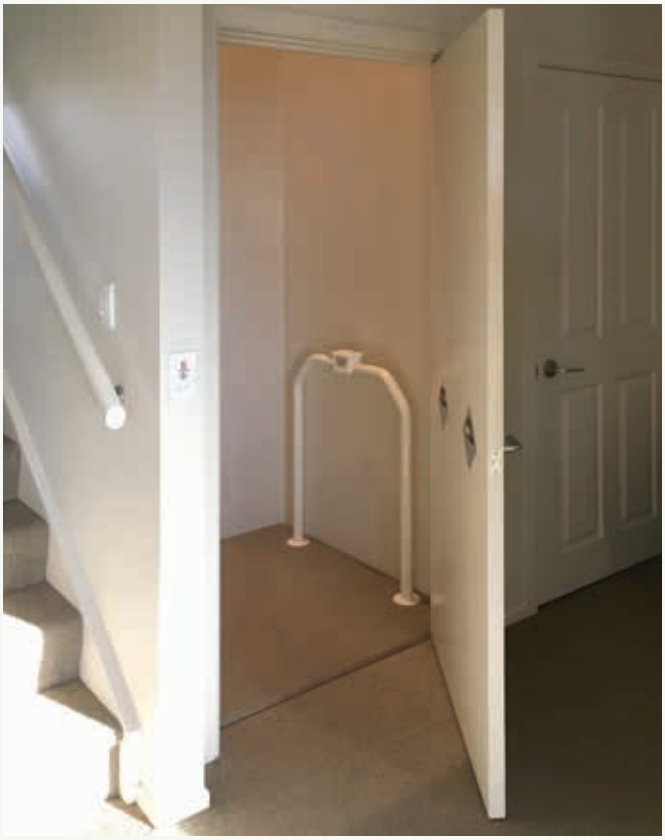
Residential passenger lifts are smaller and slower than their commercial counterparts, but they are also more affordable and less complicated. They can:

- carry maximum loads of 300–750 kg
- typically travel at speeds of 150–300 mm per second
- lift up to a height of 13 m depending on the type of lift.

Installation in new and existing homes

When undertaking a new multi-level home design, it is prudent to install or allow for the installation of a future lift. Although lifts can be retrofitted into existing homes, the cost and disruption of installation will be far less if space for a lift has already been allocated.

Lifts may be retrofitted into existing homes even where no allowance has been made, but depending on space and accessibility, the lift may need to be installed externally. Installing a residential lift may be more cost-effective than either extending the existing home or moving to another, more suitable home.



A basic hydraulic platform lift provides easy access to the second storey.

Selecting the right lift

When selecting the lift that best suits your particular needs, consider:

- expected usage – is it primarily for use by a person with mobility issues or is it likely to be used by more than one person at a time?
- the weight to be lifted – people, goods, wheelchair, mobility scooter
- the amount of space required in the lift
- providing access from a hallway or foyer rather than a bedroom to make the lift more usable for all

- providing an adequate landing area outside each lift level
- providing access at each level from the same or opposite sides of the lift but not from doors perpendicular to one another on smaller lifts as turning a wheelchair through 90º in a confined space can be difficult.

Other factors that may also influence the selection of a residential lift are:

- whether a pit and/or bore is required below the lift shaft
- whether machinery is required in the roof space
- the requirement for plumbing where a water-operated hydraulic lift is selected
- the cost of the lift installation
- the cost of having to build a shaft versus buying a lift that includes a shaft
- the cost of maintaining the lift
- available back-up services from the manufacturer/supplier
- lifts that include batteries for back-up in the event of a power failure.

Stairlift

A stairlift fitted to the side of the stairs moves people on a fixed or fold-down seat or on a wheelchair platform and is simple to retrofit onto a stair. It is also likely to be the least costly option.

To accommodate a stairlift, the stair must be wide enough to allow access for an ambulant person to pass the stairlift. Some models of stairlift are available for straight flights only, while other models can cope with a 90º or 180º turn in the stair.

Obtain advice before installing a stairlift. Think about the transfer on and off the stairlift. Is it possible to install a wheelchair platform stairlift? If not, a fixed or folding seat stairlift will be needed.

Ensure the seat height is adjustable in a seat stairlift. Consider the transfer from wheelchair or walking frame – both wheelchair and walking frame users will probably need a second chair or frame at the other level.

Hydraulic platform lifts

A hydraulic platform lift essentially consists of a floor or platform that is moved up and down by a hydraulic ram. The hydraulic operation may be by pressurising water or oil.

PHOTO – VESTNER NZ LTD

A stairlift can be the best option when retrofitting.

Water-operated hydraulic lifts have a pump that is connected to the water main. They must have external drainage provided in case of water leakage, and some systems have a moisture meter installed to monitor for leaks.

Oil-operated hydraulic lifts are self-contained and do not require plumbing or drainage connections. Another benefit is that they are self-lubricating so they do not tend to wear as quickly as water-operated lifts.

The ram in hydraulic lifts sits below the platform and needs a basement or pit below the lift platform and a bore below the pit in some cases.

Electric lifts

Electric lifts are sometimes referred to as machine roomless (MRL) lifts. They may be cable or winch-operated or run on a self-supporting rail system (similar to a forklift) that guides the car. In some situations, a shallow pit is required below the lift, but this is not always needed. As there is no roof space machinery, no strengthening of ceiling rafters or trusses is required.

Electric lifts typically have battery-powered back-up installed so they will continue to function for a period of time during a power failure.

Installation by qualified person

All lift installation, testing and maintenance must be carried out by suitably qualified people.

Lift systems are generally free-standing structures, some however do require loadbearing walls or other support. Preparation for installation generally requires only provision of space, inter-floor lift shaft wall lining and a concrete floor.

Legislative requirements

Residential lift installation must comply with the Building Act and New Zealand Building Code, and a building consent is required for lifts where the rise is over 1.5 m. In a new build, this will be part of the building consent application.

NZS 4334:2012 *Platform lifts and low-speed lifts* covers all types of lifts for homes, and compliance with this standard is generally accepted by local authorities.

Inspections and maintenance

Although ongoing inspections and a warrant of fitness are not a requirement for residential lifts (as they are for commercial lifts), servicing and maintenance should be in accordance with the manufacturer's or supplier's instructions.

Maintenance depends on the type of lift system. Typically, lifts require annual servicing. Electric lifts should have the back-up batteries replaced approximately every 5 years.

PHOTO – VESTNER NZ LTD

Enclosed platform lift.

9 Hardware

Having designed spaces that are universally accessible, don't forget the hardware - the handrails, door handles, grip rails, cupboard handles and taps/mixers.

EASILY USABLE HARDWARE is an essential part of universal accessibility in homes. It includes handrails for stairs and ramps, grip rails for use with showers and WC pans, door handles, locks, window catches, tap and shower controls, shower seats and other bathroom fixtures.

Handrails for stairs and ramps

Handrails for accessible stairs and ramps that can be used by people with disabilities are prescribed in Acceptable Solution D1/AS1. These provide good guidelines for handrail design for universal design generally (see Figure 34). They require handrails to:

- be continuous and the full length of the ramp or stair
- be the same slope as the ramp or stair pitchline
- be securely fixed to a wall or structure so they can support the full weight of an adult
- be 900–1000 mm above the finished floor level
- have 45–60 mm uninterrupted clearance from a wall or structure so that a user can move their hand along the rail smoothly without striking obstructions such as fixing brackets
- be 32–50 mm in diameter.

Accessible stairway and ramp handrails require a minimum 300 mm long horizontal extension beyond the last riser at each end to signal the termination of the rail to a visually impaired person. If there is sufficient space, this can also be a useful feature in residential stairs.

Grip rails for safety

Safety grip rails provide essential support in bathrooms for toilet and shower use for people with disabilities. A range of proprietary grip rails in different shapes with either smooth or knurled finishes are available (see Figure 35).

Grip rails for general use may be vertical, horizontal, 45º angled or L-shaped. All grip rails need to:

- be securely fixed to the wall so they can support the full weight of an adult
- be 25–40 mm in diameter
- have 50–60 mm finger clearance from the wall.

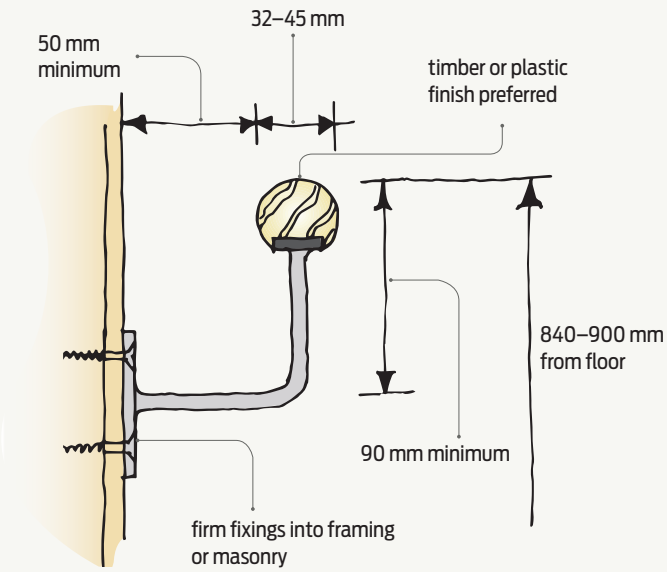


Figure 34 **Handrail design.**

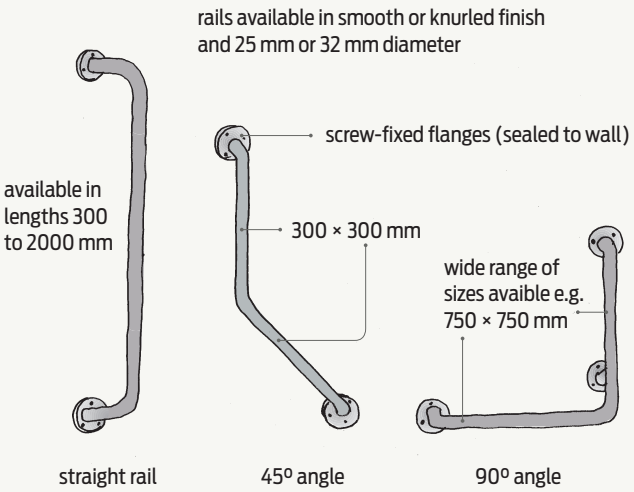


Figure 35 **Grip rail design.**

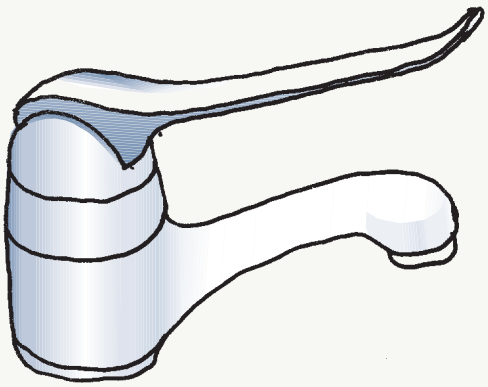


Figure 36 **Extended lever mixer tap.**

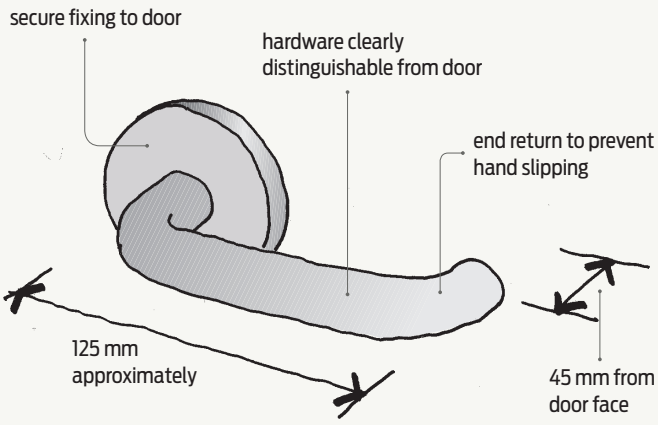


Figure 37 **Lever door handle.**

In addition, the grib rail beside a WC pan (see Figure 11), should:

- be L-shaped or angled
- have the vertical section fitted between 150–250 mm in front of the pan with the horizontal section alongside the pan
- have the horizontal section fixed approximately 700 mm above the finished floor level
- be 30–40 mm in diameter
- be sealed to wall lining in wet areas.

Urinals and showers should be fitted with a grip rail similar to a WC pan grip rail but:

- for a urinal, the horizontal section should be fixed 1200 mm above the finished floor level
- for a shower, the horizontal section should be fixed 900 mm above the finished floor level.

Mixer controls and taps

Lever mixer taps are preferable for kitchens, wash hand basins, baths and showers as they are easier to operate. Consider automatic sensor taps. Extended lever mixer taps are available for people with a weak grip (see Figure 36). Avoid knob-type taps, as these can be very difficult for some people to grip.

The shower mixer should be 1000 mm above the finished shower floor level. A hand-held showerhead with a flexible, 1500 mm long hose on a vertical sliding rail can be used easily by a person showering themselves or by a caregiver. The sliding rail must be securely attached, as it is likely to be used as another grip rail.

Other bathroom fixtures

Other bathroom fixtures include toilet roll holders, soap holders and towel rails. A toilet roll holder should be fixed at least 300 mm in front of the WC pan (but no more than 500 mm) and 600–1100 mm above the finished floor level. It needs to be within reach of the person using the toilet. Soap holders and towels rails should be positioned to provide a clear manoeuvring space and be approximately 1000–1200 mm above the finished floor level.

A shower seat aids showering for a person with a disability. Shower seats should be made from a slip-resistant material, be approximately 800 mm long by 450 mm deep and be fixed 550 mm above the floor.

If the shower seat is hinged, it can be folded out of the way when not required. Shower seats must support the full weight of an adult so should be fixed securely to the wall and oriented appropriately for the showerhead, controls and grip rail.

Door and window controls

Where possible, door and window controls should be operable with one hand. As with taps, lever door handles are the easiest type to use and should

be mounted for easy reach between 900–1200 mm above the finished floor level (see Figure 37). Window controls should also be lever-operated if possible.

Locks should operate independently from door latches, as a simultaneous operation often requires the use of two hands. Bathroom door locks should be able to be unlocked from the outside in an emergency. Proprietary dual-swing hinges and latches are available for bathroom doors for emergency use.

Cupboard doors should generally have D handles for easy use and be fitted with magnetic closers or self-closing hinges.

Light switches

Light switches should have a switching mechanism that projects forward from the faceplate and be mounted at the same height as the door handle if adjacent to a door. Consider sensor lights for common areas such as corridors and bathrooms.

10 Aiding the vision impaired

Whether at home or out in public, vision impaired people have specific accessibility requirements that are different to those of people with physical disabilities. Thoughtful design and new technology can help.

AT HOME, vision impaired people can generally manage well without too many building modifications. However, public spaces are a different situation.

No mandatory requirements

To live as normally as sighted people, the vision impaired need to be able to easily move around public places like malls, cafés, hospitals, airports, railway stations, theatres and education facilities.

While public buildings must be designed to be accessible for people with physical disabilities, designing for blind and vision impaired people is not mandatory, and their needs are not generally well understood.

Designing residential buildings

In the home, there are some design features that improve accessibility for the blind or vision impaired.

Start with good lighting

Good lighting is essential. Light sources may be either natural or artificial, but regardless, there are some basic rules that should always be followed:

- Ensure there is good surface or task lighting for the activity being undertaken, particularly in the kitchen.
- Distribute lights evenly throughout an area to avoid contrast and variations in light levels.
- Locate light sources to avoid creating shadows.
- Avoid glare and reflection from shiny or glossy surfaces.

Where possible, use natural light for daytime lighting, particularly in kitchens.

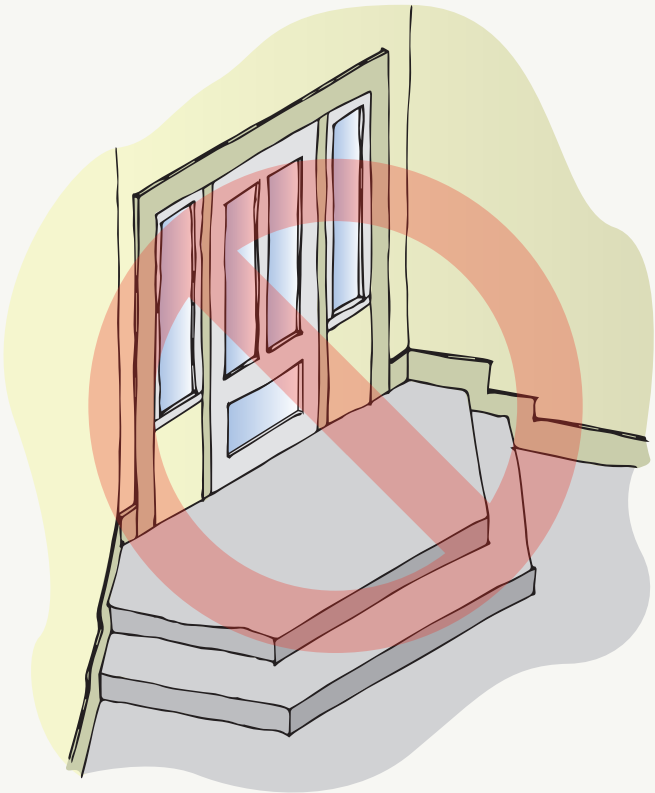


Figure 38 **Avoid small changes of level and angles or curves at tread edges. If necessary, incorporate ramps or stairs with handrails and/or tactile markers.**

Occupants of residential units in retirement villages often have impaired vision, yet a common layout in these units is to locate the kitchen centrally and away from windows and natural light in an open-plan living space. This then necessitates the need for artificial light, even during the daytime.

Include contrast and colour

To improve visibility:

- have colour-contrasted adjacent surfaces such as light walls and dark doors – this is even more important in public buildings where people are less familiar with their surroundings

- avoid heavily patterned furniture and finishes as these can be visually cluttering
- install contrasting-coloured light switches and power points, for example, black switches and power points on a white or light-coloured wall
- select contrasting-coloured stair handrails, grip rails and stair nosings.

Handrails and other features

Other features that can make the home easier and safer include:

- stair handrails that extend beyond the stairs at the top and bottom to give warning that they begin or end
- handrails that are easy to grasp and securely fixed as visual impairment can affect the sense of balance
- avoiding small changes of level or, if this is not possible, avoidance of angles or curves at tread edges or corner steps (see Figure 38)
- a secure outdoor area for a guide dog.

Designing public buildings

Public buildings rely on sight for navigation, so unfamiliar buildings can be very difficult for blind or vision impaired people to move around in.

There are, however, some design features that can be incorporated to facilitate movement through unfamiliar buildings for people who cannot see.

Acoustic design important

Blind or vision impaired people make more use of their other senses, in particular, hearing, to detect sounds such as the ping of an elevator to pinpoint its location. Changes in acoustics in different spaces or the sounds from walking over or tapping different floor finishes are other examples.

When there are too many other sounds, such as music or excessive reverberation from hard surfaces, the sounds that aid navigation may not be audible. Acoustic design and managing sound therefore needs to be a significant consideration in the design of public buildings. For example:

- select materials and finishes that facilitate changes in acoustics, such as indicating the size of a room or the presence of corridors or structural barriers
- provide tactile indicators, such as different floor finishes, to indicate a transition from one area to another.

Good lighting design

As with residential design, good lighting to aid navigation is essential in public buildings. The same rules apply including:

- distributing lights evenly throughout an area to avoid contrast and variations in light levels
- locating light sources to avoid creating shadows
- avoiding glare and reflection from shiny or glossy surfaces
- ensuring there is good surface or task lighting for the activity being undertaken.

Contrast, colour and tactile indicators

Contrast and colour can facilitate movement around unfamiliar buildings by:

- defining a route of travel
- defining areas
- drawing attention to signage.

There should be good contrast between doors and walls and between floors and walls (see Figure 39). A perimeter band of contrasting colour that defines the transition between floor and wall can be effective when the floor and wall colours are similar.

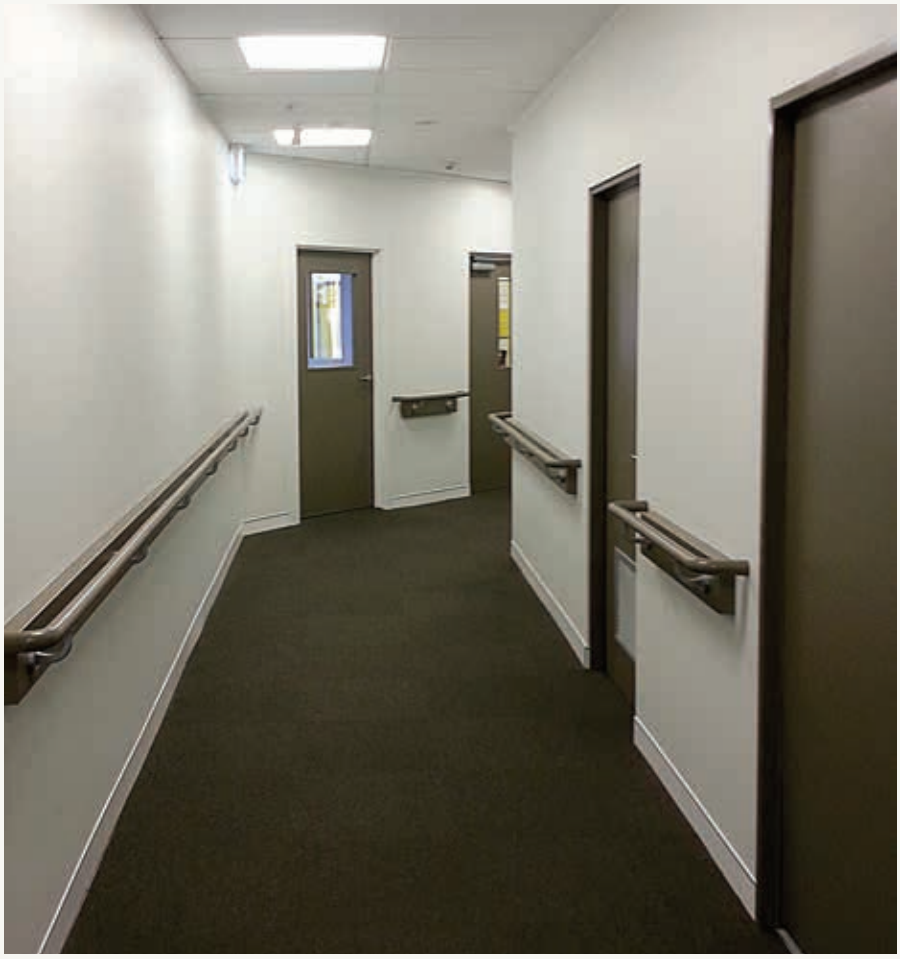


Figure 39 **Dark doors, floor coverings and handrails provide good contrast with white walls.**

Stair handrails should be colour contrasted with the walls and stair nosing colour contrasted at the front edge of each step.

Tactile indicators should be installed at the top and bottom of stairs, escalators and travelators.

Colour can be used to define specific spaces – for example, the same colour can be used for each area with the same function in the building. Keep colour schemes simple, limit use of colour and, for adjacent blocks of colour, select colours with good contrast. Avoid the use of large-scale patterns as too many colours can create confusion.

Tactile signage

Low-level tactile signs help people who are blind or visually impaired to read the information, but it is common for signs to only have raised characters. Braille can be read more quickly and easily than raised print, so information in Braille should always be included on signage.

Signage should be located at a consistent height and distance from the area it is identifying. Signage lettering should be raised and colour contrasted with the background of the sign, and the background colour should contrast with the surrounding wall surface.

Building layout generally

Hallways should be straight with 90º turns rather than curves as these can disorientate. They should have a clean, uncluttered design and no obstacles.

Stairs should have handrails that extend beyond the stairs at both top and bottom to give warning that they are about to begin or end. Handrails must be easy to grasp and securely fixed.

Glass doors should have contrasting markings at their leading edges. They should also have two horizontal bands of contrasting colour across the glass at heights between 850–1000 mm and 1400–1600 mm above the floor level.

Outdoors

A simple, logical outdoor layout is easier to navigate for those people who are blind or have low vision. Permanent outdoor furniture such as seats, tables, drinking fountains and so on should not protrude into an accessible path of travel. They should be a contrasting colour to the surroundings.

Where bollards are installed, they should be at least 1.0–1.2 m high and a contrasting colour to the surroundings. Low bollards can be a stumbling hazard.

Technology aids

Technology is contributing to the field of building and spatial design and, in recent years, has made enormous advances for blind and visually impaired people.

Although there have been specialist devices to aid navigation for some time, the introduction of Apple's screen-reading technology for iPhone and iPad now provides low-cost options for navigation tools for the blind. This technology, called VoiceOver, speaks everything that is displayed on the device's screen.

BlindSquare

BlindSquare is a GPS app for blind and visually impaired people that uses the VoiceOver technology from Apple to describe the surroundings, such as street intersections, locations of buildings and points of interest. Information is provided both on the device's screen and in a spoken format through a headset or speaker.

While it provides excellent outdoor navigation assistance, information about the inside of the building is not available.

BlindSquare BPS

Specifying an indoor navigation system, such as BlindSquare BPS (beacon positioning system) can fill this gap. This uses iBeacons – small, low-energy Bluetooth transmitters installed in buildings that provide information about the interior spaces.

iBeacon transmitters are battery operated, cheap, small and easy to install in different locations in the building. Each transmitter broadcasts a unique ID that can be received by Apple devices. Data about the building must be created for each transmitter and published to the cloud.

When the app is launched, it accesses the information in the cloud and provides it as audio messages to navigate the user through the building. Information may include distance to the next door, whether the door is on the left or right side and the room or space that the door accesses. If the user turns 180º, the information they receive will be relevant to the direction in which they are now facing.

Several messages can be associated with one transmitter. If there are a number of messages, the message read out depends on factors such as the user's walking direction, the direction in which their device is pointing or the other transmitters that have already been detected. This helps BlindSquare BPS to be context aware as it relates the user's current location to where they have come from and to the direction in which they are moving.

The nature of storing information on the cloud means that, if information about a space needs to be changed, the new information is available for use as soon as it has been published to the cloud.

BlindSquare BPS can be installed at little cost and is ideal for large public buildings and spaces.

11 For more

Want to know more? Try these resources.

Standards and guide

- NZS 4121:2001 *Design for access and mobility – Buildings and associated facilities*.
- AS/NZS 1428.4.1:2009 *Design for access and mobility – Part 4.1: Means to assist the orientation of people with vision impairment – Tactile ground surface indicators*.
- AS 4586-2013 *Slip resistance classification of new pedestrian surface materials*.
- RTS 14 – *Guidelines for facilities for blind and vision impaired pedestrians* (NZ Transport Agency).
- *Pedestrian planning and design guide* (NZ Transport Agency).

Publications

These useful resources available from the BRANZ Shop at www.branz.co.nz:

- BRANZ *Homes Without Barriers – A Guide to Accessible Houses.*
- BRANZ External Research Report ER19 (2016) *Getting universal design into new builds and major renovations*.
- BRANZ Study Report SR263 (2011) *Lifetime housing – the value case*.

Web resources

These are some of the many useful web resources available on universal design:

- BRANZ Universal Design provides a hub of resources for designers on universal design for housing. See www.branz.co.nz/universal_design.
- The Auckland Design Manual is a free resource for public buildings and mixed-use developments and includes a section on universal design. This has many resources including case studies and the Universal Design Tool. See www.aucklanddesignmanual.co.nz/design-thinking/universal_design and universaldesigntool.co.nz.
- Lifemark offers advice to designers and builders on how to make the best use of space in a home, based on the principles of universal design. The Lifemark® Star Rating shows how well a home or retirement village will suit a family's needs over a lifetime. See www.lifemark.co.nz.
- Barrier Free NZ help public and private clients create buildings, spaces and transport networks that are accessible and welcoming to all. See www.barrierfree.org.nz.
- Enable NZ provides government-funded disability equipment and support services, such as housing modification. It contracts to the Ministry of Health, ACC and DHBs. See enable.co.nz.
- Smarter Homes includes a smart guide on designing an adaptable home that includes design advice. See www.smarterhomes.org.nz.
- Be. Accessible is a New Zealand social change initiative and a holistic framework for accessibility. See www.beaccessible.org.nz.

Welcome to BRANZ Find

Enter Search

SEARCH

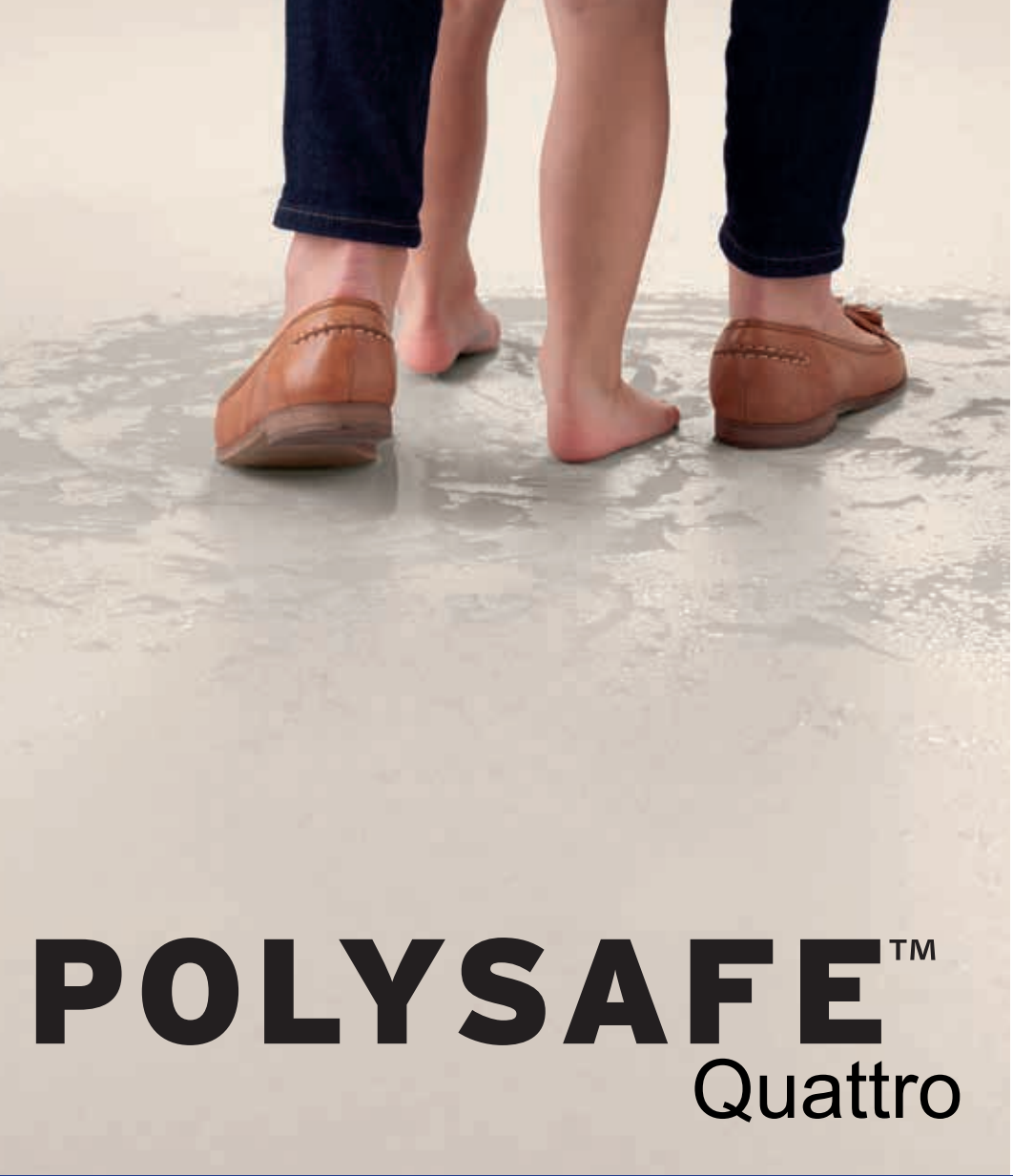
BRANZ search and locate tool

The BRANZ Find digital helpline is a useful, comprehensive directory of New Zealand building and construction industry information.

BRANZ Find provides free online access to building information and the documents commonly requested from the BRANZ 0800 advisory service.

Use it to search and find links to resources including study reports, online tools, guidelines, Codes of Practice, technical guidance, the Building Code, standards and legislation.

www.branzfind.nz



POLYSAFE™ Quattro

Education
Adapted Living
Healthcare
Social Housing
Leisure

Safety Flooring for Barefoot & Shod, Wet & Dry environments

Polysafe **Quattro** has been specifically designed to provide a degree of slip resistance whether wearing footwear or being barefoot in continually wet areas where additional contaminants such as shampoo and shower gels may be present.

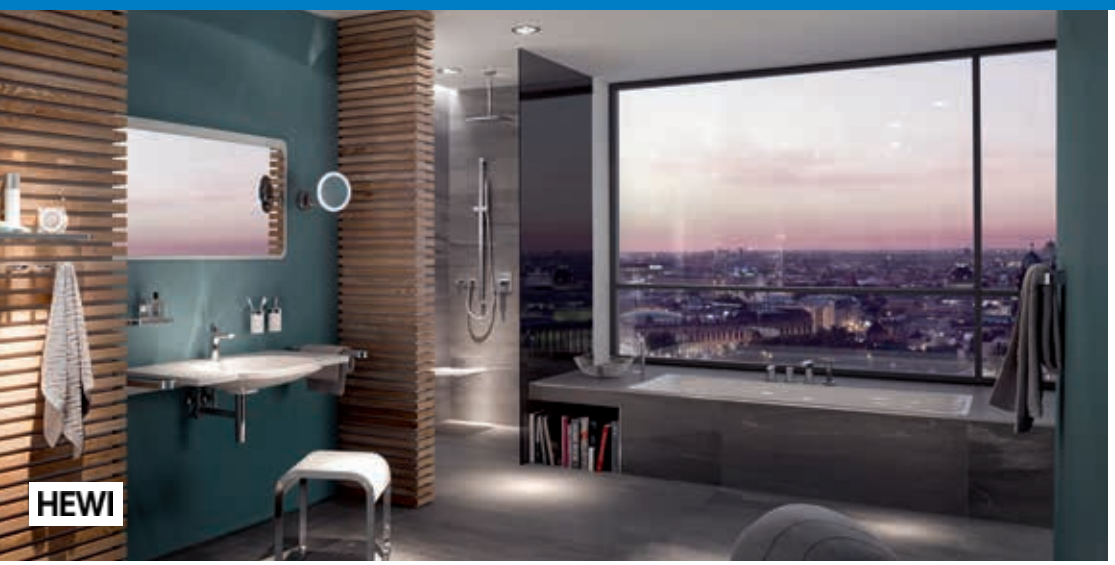
The choice of floor covering in healthcare, aged care and specialist care environments can have a significant impact on the health and well-being of residents and staff. **Quattro** can also make a difference in education and leisure environments, where changing rooms, wet rooms, spas and pool sides require a high degree of slip resistance.

Quattro has been engineered to achieve a pendulum wet test result of 50+, most importantly this performance is sustainable and assured throughout the product's guaranteed life.

- ✓ Hardwearing & easy to maintain
- ✓ PUR reinforcement
- ✓ Commercial & Residential use
- ✓ Dementia friendly
- ✓ 100% recyclable
- ✓ R11 slip resistance
- ✓ 12 shades to choose from

POLYFLOR™
COVERING THE WORLD

2 Narek Place, Manukau, 2104
0800 765 935 | sales@polyflor.co.nz
www.polyflor.co.nz



SA Plumbing Supply
A Shipwright Agencies Company

For decades the only choice for fit out of an accessible or universal bathroom were products that belong in hospital.

NO MORE!

SA Plumbing Supply has **HEWI** & **GOMAN** products that provide all the function required without the institutional look.

Universal with Style!

Lifemark
PRODUCT PARTNER

- Support Rails
  - 300mm to Custom
  - Hinged Support
  - Mobile
- Shower Rails
  - Straight
  - L Shape
  - T Shape
  - Custom
- Seats
  - Fixed
  - Folding
  - Mobile
- Basins (Wheelchair Accessible)
  - Single
  - Double
  - Custom
  - Height Adjustable
- Baths
  - Walk In 950mm - 1700mm
- Mirror
  - Hinged
  - LED
  - Height Adjustable
- Taps
  - Chrome
  - Black
  - Brushed Stainless Steel
- Accessories to Match
  - Soap Dispensers
  - Soap Trays
  - Toilet Roll Holders
  - Toilet Brush Units
  - Tumblers
- Finishes
  - Gloss Colours
  - Matt Colours
  - Warm Touch
  - Chrome
  - Stainless Steel
  - Brushed Stainless Steel

info@sapsltd.nz **09 524 8639** **www.sapsltd.nz**

HEWI made in Germany
GOMAN made in Italy