Universal Design

Queensland – Smart State

Towards Sustainable Housing

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Universal Design is one of the elements of the Queensland Department of Housing’s Smart Housing initiative.

Smart Housing is good practice in designing, planning and building homes to make them more socially, environmentally and economically sustainable.

In a Smart House, you will be able to move around more easily, feel safer, save money and help the environment. You and your family can live in a Smart House through all stages of your lives.

Smart Housing has been developed in response to the demand for housing that better meets people’s needs, responds to the Queensland climate and saves money.

This booklet explains the benefits of Universal Design and how they can be achieved. It is based on a collection of key reference materials and collective experience across the Queensland Government. A list of useful reference materials is included for anyone wishing to access further information on Universal Design.

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This booklet is designed to assist
- Builders and developers
- Designers and architects
- Landlords
- Lecturers
- Home owners
- Home renovators
- Housing professionals
- Students

Incorporating the principles of Universal Design helps to create homes that are flexible and user-friendly both now and over time. Now that’s smart!
Universal Design – a realistic approach to the future

We all know that life does not stand still.
People grow older, families change and children come and go. The home environment should be able to respond to the changing needs of people over time.

Universal Design offers a wide range of benefits to people of all ages and abilities by creating an environment where people can feel more comfortable at home.
It is a practical and modern approach to home design, construction and renovation, bringing together the best of everything we know about building homes where a person’s needs are at the heart of the end product.
Universal Design is sensible design that is useful and appealing to people of all abilities. A universally designed home allows occupants to easily adapt and convert their home to meet their changing needs over time.

On the outside, a universally designed home should look the same as traditional housing.
On the inside, many of its features are barely noticeable. It is the creation of a home for a lifetime which aims to meet everyone’s needs and avoids building barriers that discriminate against any of the people living in or visiting the home.

Universal housing is not a particular house type. It is an approach to building homes using a range of attitudinal, design and construction refinements to create a home that:
▲ meets the needs of people across a range of abilities and ages;
▲ is adaptable for the changing needs of people over time;
▲ increases safety;
▲ ensures that the design works for the person, rather than the person working to fit with the design;
▲ is not stigmatising and is well integrated into the community; and
▲ can be economically adapted in the future if necessary.

Good use of space is an important feature of kitchen layout, particularly when considering safety and functionality. A 1550mm minimum distance between kitchen work surfaces and cupboards will provide sufficient space to allow safe and efficient movement for people working in the kitchen.

Lever door handles can be easily operated by everyone using one hand or an elbow for convenience.

Left: A gently sloping path leading to a wide front door (with no steps) is easily accessible to either a person with a broken leg, a mother with a pram, or a removalist with a wardrobe.

Smart Housing – Universal Design
Changing times

DESIGNING HOMES WITH THE FUTURE IN MIND

The proportion of Australia’s population who are ageing or have a disability is expected to increase. This will result in an increased need for modifications and changes to the layout or physical features of many homes, along with mechanical and other equipment.

In its 1998 survey, the Australian Bureau of Statistics (ABS) found that 19.9% of the Queensland population (686,700 people) had a disability. The most frequently reported area of disability was mobility, with 145,600 people with a disability in Queensland requiring assistance. The ABS projects that the population aged 65 or more will reach 1.5 million persons, or 24% of the total population, by 2051. This represents a 278% increase from 399,400 persons in 1999.

Since the 1950s, Australian homes have mainly been built for two-parent families with two or more children. Kitchens and bathrooms are usually small with narrow doorways, making access difficult for anyone with reduced mobility. Consequently, dwellings may be difficult and expensive to adapt and people are often forced to relocate to meet their changing needs.

A universally designed home’s interior design and features can be changed as required, allowing people to stay within the familiarity and comfort of their home and surrounding area.

OUR CHANGING HOUSING NEEDS

An increasing number of people now work from home. As a result, housing could ideally provide the space and utilities for offices.

Adult children come and go – often residing longer with their families and studying for many years.

Ageing parents may come and stay for extended periods when needing assistance or company.

The ageing population and the changing structure of the Australian family, nature of work, entertainment and education mean that 21st century housing should be able to adapt to the needs of people at every stage of life.

Projected population by age – Queensland

Housing should be designed with the future of people in mind.
In 1999, the United Kingdom introduced elements of Universal Design into its national guidelines for new housing. Some of the features that make housing more convenient for everyone include level entries, main floor bathrooms and wider than usual doorways and halls. As Britain’s population ages, such features are becoming increasingly necessary. Now all planning applications must comply with the new regulations.

While the name may be different, the concept remains the same – to design and build houses that can be adapted with minimum expense and disruption as people’s needs change. “The intentions are clear – to allow home owners to occupy a dwelling that can meet a wide range of needs and to improve the convenience a home can offer its occupants” (Canada Mortgage Housing Corporation 1999).

In 1992, the first issue of the Universal Design Newsletter was published. As part of the copyright search for the first issue of the Universal Design Newsletter, we conducted an Internet search for the term ‘Universal Design’. There were no occurrences of the term. Today, seven years later, a similar search results in a list of more than 5,000 websites that mention the term” (Universal Design Newsletter, July 1999).

What’s happening elsewhere in the world?

What’s happening in Queensland?

The Queensland Department of Housing has made a commitment to build new accommodation where possible, in accordance with the principles of Universal Design (as specified in the Residential Design Manual, 1999). The Department however, only provides 4% of the total Queensland housing stock. The majority of housing (62%) is owner occupied, and a further 26% is privately rented, with the balance of dwellings occupied under other rental arrangements (2001 Census or ABS 2001).

If private developers are willing to take up the challenge of building to Universal Design principles, they will find that it brings the reward of more business. As with any market, providing what people need will always ensure a market share.

A universally designed home will suit the needs of you and your family now and throughout all stages of your life.
Seven principles of Universal Design

Seven principles of Universal Design were developed by a working group of architects, product designers, engineers and environmental design researchers at The Centre for Universal Design, North Carolina State University (NCSU). The Department of Housing has paraphrased the principles and guidelines to illustrate how they apply to housing. To view the original principles of Universal Design, please visit the NCSU web site (see Useful References). These principles are a useful guide for consideration when designing a universal home.

**1. Equitable Use**

Design for everyone and every ability
- The design should be useful and marketable to people with diverse abilities and should avoid stigmatising users.
- The design should provide the same means of use for everyone;
- provide privacy, security and safety equally for everyone;
- avoid segregating or stigmatising people who use it; and
- make the design appealing to people who use it.

**2. Flexibility in Use**

Flexible design and choices
- The design should accommodate a wide range of abilities and individual preferences.
- The design should provide choice in methods of use;
- accommodate right or left handed access and use;
- facilitate people’s accuracy and precision; and
- be adaptable to people’s pace.

At the planning stage, designers should bear in mind that they will not know who will eventually live in the home. The occupants’ needs may change during the time they live in the property and if they move out, the next household is likely to have different needs. Therefore, a flexible approach to design means it will be more desirable to a wider range of consumers.

**3. Simple and Intuitive Use**

Design that’s simple and easy to use
- The design should be easy to understand, regardless of the person’s experience, knowledge, language skills or current concentration level.
- The design should be simple (eliminate unnecessary complexity); be consistent with people’s expectations and intuition;
- accommodate a wide range of literacy and language skills;
- arrange information consistent with its importance; and
- provide effective prompting and feedback during and after task completion.

Design that naturally makes sense
- The design should communicate necessary information effectively to the user, regardless of ambient conditions or the person’s sensory abilities.
- The design should use different modes eg. pictorial, verbal and tactile for essential information;
- contrast essential information against its surroundings;
- maximise ‘legibility’ of essential information;
- differentiate elements in ways that can be described (so it is easy to give instructions or directions); and
- provide compatibility with a variety of techniques or devices used by people with sensory limitations.

**4. Perceptible Information**

Design that protects users
- The design should minimise hazards and the adverse consequences of accidental or unintended actions.
- The design should provide warnings of hazards and errors;
- minimise hazards and errors (eg. eliminate, isolate or shield); and
- discourage unconscious action in tasks that require vigilance.

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**5. Tolerance for Error**

Design that requires minimal exertion
- The design should ensure that the dwelling can be used efficiently and comfortably with a minimum of fatigue.
- The design should allow the person to remain in a neutral body position;
- use reasonable operating forces;
- minimise repetitive actions; and
- minimise sustained physical effort.

A house should be easy to tidy, easy to clean and easy to use.

**6. Low Physical Effort**

Design that works for all sizes and shapes
- Appropriate size and spacing should be provided for approach, manipulation and use regardless of the person’s body size, posture or mobility.
- The design should provide a clear line of sight to important elements for any seated or standing person;
- make reach to all components comfortable for any seated or standing person;
- accommodate variations in hand and grip size; and
- provide adequate space for personal assistance or assistive devices.

**7. Size and Space for Approach and Use**

"Why is it that we continue to design buildings for the members of an elite club made up of physically fit males, between the ages of 18 and 45, who are not excessively tall, short, fat, thin or left-handed?" (p.30, Perspective Safety and Security)
Taking a tour of a universally designed home

Let’s take a tour of a universally designed home, to see how the seven principles of Universal Design improve the ability of people to function in their home.

ENTERING THE HOME FROM THE STREET

Finding the address
▲ The house/dwelling number is easy to find and can be seen easily from the street both day and night. It contrasts against its background, is of sufficient size and a simple style. Consider using a reflective material and stamping the number into the driveway concrete. It is obvious where the driveway, path, front gate and front door are, allowing an easy approach to the house.

Approaching the home
▲ The pavements and paths provide a step-free route around the neighbourhood. Crossfalls in pavements or paths are kept to a minimum, allowing safe access for wheelchairs or prams. At road crossing points there is a dropped kerb or ramp.

▲ Paths are wide (1,200mm), and surfaces are even and firm. Consider a small raised lip along the edge of all paths to minimise the risk of wheels going over the edge (pushchairs, bicycles, wheelchairs).

▲ The gates have a clear opening width to allow wheelchairs, scooters and furniture to pass through easily. Gates open beyond 90 degrees and do not restrict the width of the path. The gate latch is easily reached from both sides and operable with one hand from either a sitting or standing position.

▲ Parking spaces are wide enough (3,800mm) to allow people to get in and out of their car more easily with a pram, wheelchair or shopping bags. The parking spaces also connect to a firm, hazard-free path leading to the entrance of the house.

▲ A roomy garage (minimum internal width of 3,800mm) makes it easier for someone to get in and out of their car and offers space for larger vehicles. There is a remote control for the garage door so people do not have to get out of their car to open and close the garage door.

▲ A person in a wheelchair can reach the door handle with one hand and move into a clear space beyond the opening edge of the door.

▲ The space outside the door is sheltered.

▲ There is slip-resistant flooring on the inside for safety in the wet months.

▲ A porch light allows people to see to unlock the door.

▲ One key fits all door locks reducing the number of keys people have to carry and avoids inconvenience associated with placing the wrong key in the wrong lock.

▲ All window locks are also ‘keyed alike’ so that they can be opened easily in an emergency such as a fire.

▲ All internal and external swing doors have lever door handles, so they can be easily operated using one hand or an elbow. Sliding doors have the large D-shape type handle for ease of operation.

▲ The entrances are designed with security in mind. Security screen doors are fitted enabling an occupant to speak to a visitor before opening the door. This also provides extra ventilation in the summer.

▲ There is a peephole in the door that allows all occupants to see who is at the door from the inside. A well-placed window could also be used.

▲ The doorbell is placed where everyone can see it. It can be reached easily and is easy to operate. The doorbell can be heard anywhere within the house.

In an apartment block, people in a wheelchair and small children can access the door entry system and control panels. Provision is also made for visitors with impaired sight or hearing by using raised signage and audible signals.

Entering the home
▲ The entry is step-free, making it easier for a person in a wheelchair, a mother with a pram or a person carrying a load of shopping bags to enter the home. It also allows occupants to move furniture or heavy objects in and out of the house.

▲ A person in a wheelchair can reach the door handle with one hand and move into a clear space beyond the opening edge of the door.

▲ The space outside the door is sheltered.

▲ There is slip-resistant flooring on the inside for safety in the wet months.

▲ A porch light allows people to see to unlock the door.

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Approaching the home

1 roomy garage for easy access
2 well lit covered entrance
3 gates latch and open easily
4 lever door handles
5 one key fits all locks
6 firm even path surface
7 sheltered entrance
8 security sensor lights
9 slip-resistant surfaces
10 external light

Entering the home

1 lever door handles
2 one key fits all locks
3 glass panels to see visitors
4 sheltered entrance
5 security sensor lights
6 slip-resistant surfaces
7 step-free threshold
8 wide door opening
9 external light
MOVING THROUGH THE HOME

Hallways and doors
- The circulation areas allow any occupant, regardless of mobility, to move easily around the dwelling. This could be someone with a broken leg, pushing a walker, using a wheelchair, or being assisted by another person.
- Layout is simple and logical.
- There is a short hall, and long passages have been avoided. Wider hallways make it easier for families to pass each other in the hallway. Moving furniture and other awkward tasks are also made easier and safer.
- Doors are positioned to assist easy circulation and are wide enough to allow easy access.
- The doors have lever door handles instead of knobs. Everyone will find the door easier to open including people with dexterity problems, arthritis or the shopper with a bag of groceries in each hand.
- People who are right or left handed can access and use facilities in the home.
- There are no obstructions in the hallways.
- Adequate storage is provided beside the back entrance door for outdoor clothes, baby equipment, sports gear or aids for older or disabled people.
- Storage space is accessible to all people. The storage unit has adjustable height shelving, sliding doors and an interior light.

- In a two-storey house, there is an area at entry level that could accommodate a bed if required in the future. This allows a parent to care for a sick child while they attend to their other daily duties or a visitor who cannot manage the stairs to stay overnight.

Stairs
- Stairs in two-story houses allow the addition of a lift if required. (Note: a lift is most economically installed on a straight flight staircase, but dog-leg stairs have the benefit of providing a resting place half-way, and are safer if someone should fall). In the future, the stairwell could also accommodate a through-ceiling lift.

- The handrails on stairs run continuously along the full length of the staircase and around and intermediate landings with the handrails continuing beyond the first and last step. This allows people to know where the stairs start and finish and offers support.
- The stairs are evenly spaced and open risers and tapered treads have been avoided.
- The stairway is well lit.

Taking a tour of a universally designed home continued

1. remote controllable automatic door
2. spacious garage for access and storage
3. easily accessible toilet
4. spacious bedrooms
5. bedside light switches
6. wide, well positioned doors
7. accessible storage
8. wider hallways
9. accessible outdoor living
10. simple and logical layout
11. windows providing plenty of natural light
12. lever handles
13. stairway is well lit
14. construction suitable for a lift to be added
15. hand rails continue beyond first and last step
**LIVING AREAS AND BEDROOMS**

- A main living room is accessible from the front door for people of diverse abilities. There are wide halls (1,200mm) and doorways (870mm) with level thresholds.
- Flooring is slip-resistant, non-reflective, hard wearing and easy to clean.
- When furnished, rooms are of a size and shape that offer space for circulation and access to each item of furniture, storage, windows and appliances.
- The windows are designed to allow people of various height and diverse physical abilities to open them easily. People do not have to stand on a chair to reach the controls and all handles, and catches are easy to operate. The height of the windows allows a seated person to see the view outside while maintaining privacy. The view from the window is not obstructed.
- Living areas and bedrooms have several electrical, telephone and cable outlets to ensure flexible furniture arrangement.
- Switches and sockets contrast with the background and can be reached easily from a sitting position.
- General storage is provided for suitcases, equipment and hobbies.

**Outside living area balcony, porch**

- There is a level threshold and wide doors accessing the outside area.
- The outside area has a smooth, reduced-slip surface with level joins to help prevent people from slipping or tripping.
- For easy access by people with diverse abilities, a wide (1,200mm), even and level path leads to the clothes drying, rubbish storage and car parking areas.
- Raised garden beds enable people of all abilities to enjoy gardening.
- The balcony is designed to ensure a combination of view, privacy and a sense of safety.

**Bathroom/Toilets**

- There is at least one bathroom and toilet accessible to someone in a wheelchair or using a walking frame.
- Design features in the bathroom are flexible to accommodate a wide range of users and their changing needs, such as the walls adjacent to the toilet and around the bath which will accommodate grab and support rails at a later date.
- Entry into the shower is level, reducing the risk of people tripping and allowing easy access for a wheelchair.
- The shower floor drains quickly, ensuring that no water escapes into the bathroom and no puddles form.
- The slip-resistant floor, shower and bathtub help prevent accidents.
- The shower head is vertically adjustable to different heights or can be used by hand for maximum flexibility.

**Serviced Areas**

- Free space on at least one side of the toilet improves accessibility.
- The towel rail is strong enough to double as a grab rail if required.
- The space along the full length of the bath makes it easier for parents to bathe small children and to clean the bathtub.
- Entry into the shower is level, reducing the risk of people tripping.
- The location of the shower and bath taps are easily reached from outside the fixture to allow access to adjust the water temperature before stepping in.
- All fittings (e.g. towel rails) should be capable of supporting a person’s body weight (minimum 112kg) to minimise the risk of serious injury from falls.
- The bath is not positioned under a window. Occupants do not have to climb in and out of the bath to open and close the window.
- Fit separate lever taps, which are easy to use and identifiable through colour coding, and minimise hot water use.

**Taking a tour of a universally designed home continued**
**Smart Housing – Universal Design**

**Fit** a mixer tap where hot water will run for a longer period, for example the shower and the bath (shower roses and taps have as a minimum a certified AAA Water Conservation Rating).

**A** thermostat control is installed on the hot water supply to avoid scalding of older people and children.

**Kitchen**

**The kitchen is designed to be convenient and safe for all users. It accommodates the appliances and equipment that users are likely to need and has adequate, accessible and clearly identifiable storage for food and utensils.**

**The stove space is situated away from a window to avoid curtains creating a fire hazard.**

**Storage and shelves are easy for people to reach and are of an adjustable height. They have pull-out drawers on easy gliders.**

**Walk-in cupboards and shelved kitchen units make access easier. A spinning carousel is also a good solution for deep or corner cupboards.**

**D shape or bow handles allow people to open and close drawers easily.**

**The worktops are continuous, providing a set down space near the fridge and stove.**

**All worktops have rounded, post-formed edges as people may lean against them. The edges and splash-backs are defined with a different colour assisting people with failing sight.**

**Adjustable worktops and kitchen units allow for different heights. This allows young children, people seated, or older people to be involved in preparing dinner or doing the dishes.**

**The height of the sink is adjustable and all pipe connections are flexible enough to do this. Pipes are situated through the rear wall or ducted against it. There is insulation to the bottom of the sink and pipes that will prevent people from being burned. The sink bowl is convenient for use and yet is shallow enough not to interfere with knee space below it.**

**Sockets can be reached by people standing up or sitting down.**

**All appliances are functional and convenient to use.**

**Fit separate lever taps, which are easy to use and to minimise hot water use.**

**Laundry**

**The laundry facilities are located near the kitchen or work areas.**

**Machines have front-mounted controls that are easy to use.**

**There is a work surface that allows people to sit and fold laundry.**

**The laundry room has easy access for a laundry trolley to a drying area.**

**The clothes line is adjustable.**

**There is a contrast between the floor, walls and ceilings.**

**There is provision for task lighting in the kitchen, work areas and over the bathroom hand-basin.**

**The lighting design allows for uniform lighting, thus avoiding pools of light and dark that can cause disorientation. Lighting is positioned so that it does not produce glare from surrounding materials or dazzle occupants. Occupants are able to control lighting levels, including natural daylight, to avoid being dazzled or to increase lighting to perform a task.**

**Controls such as lighting switches, air-conditioning, heating and lift call buttons are easy to find and easy to use.**

**Powerpoints are placed at a level (minimum 600mm up from the floor) and out from the corners (minimum 500mm) so they can be easily reached by people of all abilities.**

**Equipment such as fans, air conditioning or the fuse box are easy to locate and operate. All components can be comfortably reached from a seated or standing position. Variations in hand and grip size are accommodated.**

**Essential information can be found, read and easily understood.**
Smart Housing frequently asked questions

Does Smart Housing cost more?
Designing and building a home with Smart Housing features may cost no more than building a conventional home. Well-planned designs can incorporate durable, reliable and economic materials.

Smart Housing’s cost-efficiencies mean value in housing. This is measured both in the initial construction costs and in the cost-benefit over the life of the home. Information on ways to save on construction costs are outlined in the third booklet of the Smart Housing series, entitled ‘Cost-efficiency’.

Will people want to buy a Smart House?
Flexible, user-friendly designed houses meet the needs of more people and therefore a larger number of people will want to buy and live in these houses. For that reason, Smart Housing is a smart choice benefiting both homeowners and investment buyers.

A Smart House incorporates design features that offer flexibility and comfort, making it more desirable to consumers and a better investment in the long-term. Incorporating practical design features and features that can be adapted to suit people’s needs at different stages throughout their life, can increase the resale value and marketability of the property.

Buyers can purchase a home that provides the space they need today, with features that can be adapted later to suit their needs as they change. They can enjoy the home for as long as they choose to live in it.

Does Smart Housing look boring, predictable, weird?
Smart Housing is not about ramps and handrails.

An example of Smart Housing was an Endeavour Prize Home in the Samford Valley near Brisbane which was open to the public during February 2003.

The Prize Home showcased many of the benefits of Smart Housing – increased liveability, comfort and peace of mind; lower expenses and maintenance costs; the option of being able to stay in your home longer; and helping the environment. This house was a good example of how Smart Housing design principles can be incorporated within a dwelling without compromising the visual appeal of the home.

Many builders are already including features such as step-free showers as standard because more and more of their customers realise the benefits of Smart Housing.
More information and useful references

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