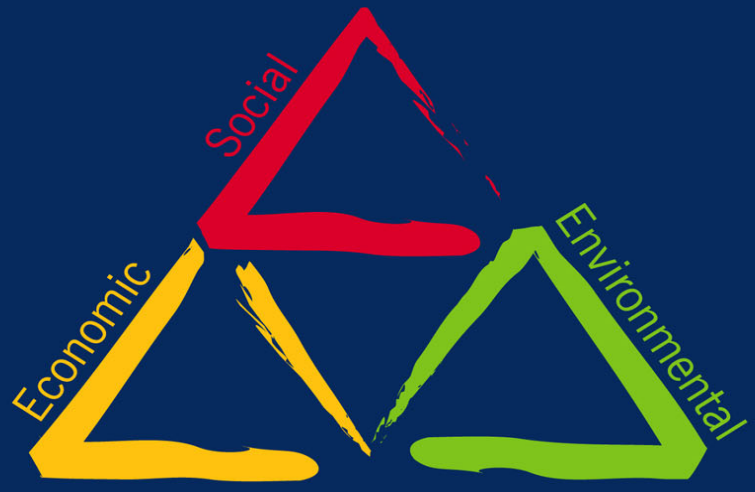
Queensland Government
Department of Housing

SMART HOUSING

Smart Housing Design Objectives



Smart Housing Design Objectives

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Smart Housing Design Objectives

1.0 Introduction

In this, the Year of the Built Environment, urban and residential design and sustainability have come into focus. The Queensland Government is committed to promoting sustainable development that not only showcases environmental best practice but also addresses lifestyle issues such as accessibility, safety and security as cost-efficiently as possible.

Through its Smart Housing initiative, the Department promotes good practice in designing, planning and building homes to make them more socially, environmentally and economically sustainable. The 'triple bottom line' approach to sustainable design gives equal priority to social, environmental and economic outcomes. Smart Housing design will enable families to live in their home now and accommodate people's needs as they inevitably change in the future, while minimising the impact on the environment.

2.0 Smart Housing – triple bottom line sustainability

Social sustainability

Social sustainability refers to the way the design of the house impacts on people's lives. While 'designing for people' is a core component of every designer's brief, Smart Housing suggests that designers should also consider the clients' future needs throughout the different stages of their lives as well as the temporary needs clients may face due to illness or injury.

A sustainable house is one that should be around for a long time, so it makes sense to consider future use at the design stage by looking to the future needs of the community. Realistically, someone other than the original client may one day occupy the house. A 'universally designed' home is safe, easily adaptable to suit a diverse range of needs, and comfortable for people with varying abilities and at different stages of their lives.

Advice from agencies such as Queensland Health, the Department of Communities, the Department of Emergency Services and the Queensland Police Service suggests that more can be done at the design stage of a home to improve accessibility, design flexibility, safety and in particular, child safety and security around the home.

A socially sustainable house will contribute to safe and more satisfying communities that reinforce social networks, discourage neighbourhood crime and allow people of every age and ability to participate in their community throughout their life. An aesthetically pleasing and stimulating built environment will strengthen the sense of wellbeing of residents and people in the community.

Environmental sustainability

Environmental sustainability has probably become the most understood and accepted element of sustainability in recent years. Environmental sustainability within residential dwellings relates to resource efficiency in terms of water and energy use and waste minimisation.

Resource efficiency in housing is concerned with water efficiency in the house and garden; waste efficiency during construction and occupancy; and the reduction of greenhouse gas emissions due to good passive design in relation to house orientation and air flow through the house. It also relates to the efficient energy consumption of lights and appliances, including hot water systems, room heaters and air conditioners. Resource efficiency equates to lifestyle benefits for residents in terms of improved thermal comfort (social sustainability) and reduced running costs (economic sustainability).

Designers' local knowledge is a valuable asset when working with the community to find appropriate housing design responses to regional issues of land use, climatic conditions, biodiversity, water catchments, suburban sprawl and growth.

Economic sustainability

An economically sustainable house is cost-efficient over the lifespan of the house. It balances up-front and construction costs against ongoing running costs, living costs, long-term maintenance costs, and the likely costs of future modifications, to provide a clearer picture of affordability.

Economic sustainability considers cost savings at the community level. Safe and secure housing will save on the cost of policing, potential litigation expenses, insurance premiums, treatment of injuries and the associated losses of income and productivity.

Housing that better meets the diverse future needs of the community is likely to have broad market appeal, continue to increase in demand and attract higher resale value.

3.0 Purpose and scope of the Smart Housing Design Objectives

By considering Smart Housing design objectives at the earliest design stages of a house, triple bottom line solutions can be creatively integrated with the client's design objectives and site constraints. This document is designed to be used as part of a design brief for a house, and the design objectives aim to expand the range of solutions available to the designer.

Solutions that have proven to work in the past have been provided for each of the design objectives, as an example of an acceptable solution. They are intended to capture current best-practice knowledge, but not to limit innovation.

The design objectives and acceptable solutions in this document apply specifically to the construction of new detached houses, but the underlying principles could be easily adapted for renovations and medium density housing.

4.0 The designer's role

Smart Housing encourages designers to think about how they can combine aesthetics and functionality to design homes that are environmentally sensitive and support their clients' changing needs into the future. Triple bottom line sustainable design will add significant value to what is likely to be the client's largest lifetime investment.

This approach to sustainable design requires designers to apply their design decision-making skills to meet the aims of the three elements. Triple bottom line design suggests that an environmentally sensitive design may not necessarily be sustainable if, for example, people do not want to live there because it presents safety hazards, poor security, is too expensive to run and maintain, or requires additional economic and environmental resources to renovate to meet the residents' changing needs. A truly sustainable house is one that balances social, economic and environmental aspects.

Approached individually, the separate social, economic and environmental aims may create design challenges and conflicts. Solutions will vary from house to house depending on the unique requirements of the site and the client, and it is at these times that the designer's ability to find a holistic, balanced solution through innovation and creativity is necessary.

The Smart Housing Design Objectives describe the functional design principles that will allow a client's house to be more holistically sustainable. Smart Housing leaves the form and expression in the hands of the designer, thereby encouraging creativity in housing solutions.

5.0 Advice for consumers

Building or buying a home is often the largest financial commitment a consumer will make in their lifetime. Obviously, the general style and look of the home is very important. Smart Housing encourages consumers to understand that functionality and the way the house works for them is equally important. A Smart House will be more liveable, comfortable, environmentally friendly and cost-efficient and will accommodate residents' needs as they change over time.

The Smart Housing Design Objectives is designed to provide home builders and renovators with information on simple design solutions that can be discussed with a building designer at the outset.

6.0 Definitions

Accessible path	A clear path of travel from the street or car parking area. An accessible path has a maximum gradient change of 1:8 over short distances (maximum 1.5m) and 1:14 over longer distances. Level entry thresholds (maximum of 10mm change in level), passageways at least 1200mm wide and doors at least 870mm wide.
Natural surveillance	Natural surveillance can be achieved through the design and placement of physical features to focus activities and people in a way that maximises visibility and increases surveillance opportunities. Natural surveillance gives people the opportunity to observe the space around them. One of the benefits of natural surveillance is that potential criminals are less likely to act if they feel there is a high risk of people witnessing their actions.
Passive design	Passive design is design that does not require mechanical heating or cooling. Homes that are passively designed take advantage of natural energy flows to maintain thermal comfort (Australian Greenhouse Office, 2004, *Good Residential Guide – Your Home – Technical Manual*)

7.0 Smart Housing Design Objectives

7.1 General criteria

A house that is socially, environmentally and economically sustainable will allow people with a diverse range of needs to comfortably live in and visit the house throughout its lifetime. The application of Smart Housing design principles at the outset will mean the house will require minimal alterations, maintenance and expense. It will be more comfortable and less expensive to run because it will be resource efficient. The social and environmental features will be cost-effective over the lifetime of the house, and represent economically sustainable features that similar houses could reasonably adopt. The house will make a positive contribution to the quality of the built environment while minimising its impact on the natural environment.

Design objectives (essential)	Acceptable solution (example)
The **hot water system** supports the efficient use of natural resources and will minimise consequent pollution such as greenhouse gas emissions.	The hot water system is: - a system with a minimum of 24 Renewable Energy - Certificates (RECs); or - natural gas; or - a gas system with a 5-star AGA energy rating label.
Maximise internal comfort without mechanical or combustion heating or cooling.	The house has been designed to: - incorporate the principles of good passive design for the local climate and site conditions; - include or exclude sun and breezes at appropriate times; - insulate against unwanted thermal gain or loss; - allow natural cross-ventilation; and - make appropriate use of thermal mass and/or lightweight construction (refer to the Good Residential Guide – Your Home – Technical Manual).
Natural surveillance of children's play areas is possible.	The main indoor and outdoor living areas have unobstructed views to children's play areas.
A dwelling adjacent to a street or park **addresses the street visually and functionally, and visually addresses the park**. Note: on large multi-dwelling sites, communal open spaces are the equivalent of a public park.	- The main entry and approach to the dwelling are clearly defined and visible from adjacent public space. - Indoor or outdoor communal areas of the house, kitchen, home office, or main bedroom allow natural surveillance of adjacent public space. - Viewed from the adjacent public space, the house appears to offer surveillance of the public space.
The risk of child poisoning is minimised.	At least one lockable cabinet, inaccessible to children, is provided for the safe storage of poisons, medicines and household chemicals.
Design objectives (recommended)	**Acceptable solution (example)**

Allow for **hot air to rise above the living space** and the **safer operation of ceiling fans**.	All living areas, bedrooms, kitchen and rooms with ceiling fans have ceilings at least 2400mm clearance to the underside of the ceiling fan (a flat ceiling is approximately 2700mm high).
Development does not significantly reduce privacy or daylight to adjacent dwellings.	The building design ensures that: - living spaces which may have a clear view into indoor or outdoor private spaces of adjacent dwellings are screened to maintain privacy; and - an effort is made to avoid obstructing beneficial solar access to adjacent dwellings.
Storage reduces the risk of trips and falls**.**	Adequate storage is provided with good lighting and adjustable shelving.

7.2 Entry and front yard

The entry to the house is defined as the transition from public or semi-public space to private space. The point of this transition defines an important location for security issues. The way the house and landscaping address the street has a role to play in clearly defining the transition from public to private space and enhancing the quality of the neighbourhood by visually contributing to community ownership of the street space. A clear sense of community can strengthen security through deterrence and residents' feelings of security.

The designer's responsibility to the public when designing the entry and front yard, including the driveway, is to provide a safe and physically accessible means of entry to the house, and make a positive contribution to the community's built environment.

Design objectives (essential)	Acceptable solution (example)
Access path to a dwelling is clear and unambiguous.	The entry is clearly identifiable and visible from the street or common path or driveway. The internal path network has clear sightlines to the dwelling entry and street access points. Property lines and private areas are defined by plants, paving, screens or fences, and there is direct access for visitors to the entrance and away from private areas.
People of diverse abilities in diverse circumstances can easily access the dwelling.	The dwelling can be accessed along an accessible path (refer to the 'accessible path' definition).
Emergency Services can easily find a dwelling in the event of an emergency.	The dwelling number can easily be seen from the street during the day and night. It contrasts against its background, is of sufficient size (upper and lower case), and a simple style. Consider using a reflective material and stamping the number into the driveway concrete, or painting the number onto the kerb.

Landscaping does not conceal potential intruders.	Planting and landscaping structures are designed not to conceal: - Potential points of entry to the house; - Access to potential points of entry (including climbable structures adjacent to a multi-storey house); and - climbable fences that provide a visual screen between private and public outdoor space.
The risk of low speed run-overs of children is minimised.	The driveway is separated from walkways and children's play areas with fencing or plants.
Safely identify visitors outside the home before providing them with access.	The front door is fitted with a peephole which provides a 180° field of vision or there are laminated safety glass panels within or adjacent to the door.
There is **ample lighting outside the home** with no dark or hidden areas.	A sensor light is positioned to illuminate each entry. All pathways are well lit.
Design objectives (recommended)	**Acceptable solution (example)**
Minimise exposure to car exhaust and fumes.	Car accommodation is sealed or divided from living space.
The **garage is accessible** to people of diverse abilities and in diverse circumstances.	The garage has an internal width of 3800mm to make it easier for people to get in and out of their cars and there is more space for larger vehicles.

7.3 Internal living

Design objectives (essential)	Acceptable solution (example)
A **living room is accessible** to people of diverse abilities in diverse circumstances.	A living room is accessible along an accessible path.
Where **heating systems** are installed, they **are designed to limit adverse indoor and neighbourhood air quality.**	Heating systems are reverse cycle air conditioning or gas with a flue to the outside, and are appropriate to the area to be heated.

7.4 Kitchens

The kitchen is often the functional and social centre of the home. It is also one of the areas of the house that can significantly impact on the overall social, environmental and economic sustainability of the home. The functional elements of a well designed kitchen will be energy and water efficient, safe, healthy, minimise costly future alterations, and accommodate the lifestyle of its users.

Design objectives (essential)	Acceptable solution (example)
Plumbing fittings support the efficient use of hot and cold water.	Kitchen sink taps have: - a certified minimum AAA Water Conservation Rating; and - separate hot and cold taps or a mixer tap that automatically returns to the cold water position or provides cold water only in the middle position.
Minimise the risk of a serious injury from sharp corners on benches.	Exposed corners of benches are rounded (in plan).
People of all abilities can easily open and close drawers and cupboards.	- D-shape or bow-shape handles; and - drawers are on runners.
The risk of upright stoves tipping forward is minimised.	- Securely mounted wall oven; or - an anti-tilt bracket or iron stove locks to hold upright stoves in place.
Minimise the opportunity for collisions in the working area of the kitchen.	- The kitchen does not double as a passageway; - the pantry and fridge are located closest to the entry into the kitchen, and stove, oven, sink and cutting area away from the entry; and - there is provision for social and family functions (such as a section of bench-top for doing homework, eating breakfast or entertaining guests) which is kept separate from the working functions of the kitchen.
Ensure the ovens and stove tops are located so as to reduce the risk of injury.	Ovens and stove tops are located safely; that is, away from cupboard ends, drawers, doorways and windows.
Provide for greenhouse gas efficient cooking.	A gas stove located away from drafts and a gas or fan-forced electric oven.

Design objectives (recommended)	Acceptable solution (example)
The kitchen design **accommodates the handling of heavy or hot items.**	Kitchen bench tops are heat resistant and continuous, with a set down space beside the stove or oven and cook top, microwave oven, and sink.
Kitchen construction **supports cost-efficient future modifications.**	Run kitchen floor covering under all kitchen cupboards.
Facilitate the **energy efficient operation of the refrigerator.**	Refrigerator is in a ventilated position away from heat sources. There is a vent behind the fridge flued to the outside.
There is sufficient space for a person in a wheelchair to use the kitchen.	Approach clearance of 1550mm minimum in front of all benches, storage and appliances.
Recycling is made easy.	The kitchen has built-in temporary storage for compost, recyclables and general waste, with fitted lids that prevent pest and vermin access.
Gas appliances are installed to minimise any adverse impact on indoor air quality.	All gas appliances or range hoods over gas cook tops are flued to the outside.

7.5 Bedrooms

In many of today's houses, a 'bedroom' may be a room that is currently used as a study, media room, home office, guest room, studio or playroom etc. This level of flexibility is one of the qualities that can help to make a house flexible enough to meet the current requirements of its residents and be adaptable to their future needs. The challenge for the designer is to balance the requirements of a specific use with this desire for flexibility.

Design objectives (essential)	Acceptable solution (example)
There is at least one room suitable for use as a bedroom by a person with limited mobility.	There is at least one room that can be reached along an accessible path suitable for use as a bedroom with enough room for a 1500x2000mm bed with 1200mm clearance on two sides and 1500mm clearance on a third side.
People are able to **control lights and have access to power and a telephone from the bed.**	Light switches and powerpoints in the bedroom are installed in locations which are within reach of a person in bed. There is a telephone point adjacent to a powerpoint centrally located in the dwelling, suitable for cordless phone connection.

Design objectives (recommended)	Acceptable solution (example)
Provide views to the outside for a person from a bed.	A window is installed in each bedroom no higher than 600mm from the ground, measured from the sill (windows are provided with appropriate shading for the sill height).

7.6 Bathrooms and toilets

Considering their size, the bathroom and ensuite are often the most expensive rooms in the house to build or renovate. These rooms are also the most common locations for injuries to occur, usually as a result of trips or falls. The obstacles in the bathroom that cause trips and falls, usually steps at the entrance to the bathroom, shower hobs and step-downs, are the same features that require costly removal when a family member is recovering at home from an injury or illness. The initial construction of steps and hobs in the bathroom is often the result of standard building practices and a lack of innovation, rather than a consideration of the residents' present and future needs.

Design objectives (essential)	Acceptable solution (example)
There is at least one bathroom that can be used by people of diverse abilities in diverse circumstances.	The house has an bathroom that can be reached along an accessible path with: - a vanity that is semi-recessed, wall-hung or pedestal type (not drop-in type); and - a hobless (step-free) shower with an adjustable head height. Walls around the shower are reinforced with 12mm plywood.
There is at least one toilet and hand basin that can be used by people of diverse abilities in diverse circumstances.	At least one toilet and semi-recessed hand basin that can be reached along an accessible path. The two adjacent walls are reinforced with 12mm plywood. Minimum floor dimensions of 1600mm width and 2000mm in length can be incorporated into the bathroom.
Shower taps are easily accessible and positioned to reduce the risk of scalding**.**	Shower taps are located in a convenient location and away from the water source.
Vanity taps and showerheads support the **efficient use of hot and cold water.**	Vanity taps and shower heads have a certified minimum AAA water conservation rating.
Toilets support the efficient use of water.	The vanity has separate hot and cold taps or a mixer tap that delivers cold water only in the middle position.
People of diverse abilities can safely use showers.	All showers are step-free (hobless).

Design objectives (recommended)	Acceptable solution (example)
Discourage the practice of plugging in a lamp at the vanity unit.	A light is positioned so that it adequately illuminates the face of a person looking in a mirror over the basin.
Prevent children climbing up on furniture or fittings to see themselves in the bathroom mirror.	There is a full-length mirror in the bathroom.
Wet areas can dry quickly and naturally to avoid growth of bacteria and mould.	The bathroom and laundry are well-lit and well ventilated.

7.7 Outdoor living and utility space

Throughout Queensland, outdoor living is not just a lifestyle choice, but also a functional necessity for any home that attempts to be at least marginally energy efficient. Queensland experiences hot summers, and without comfortable outdoor living spaces to escape the heat, residents are forced to install air-conditioners or evaporative coolers (in drier climates) and stay indoors. Outdoor living areas can come in a range of forms, often categorised according to the traditional style they most closely resemble such as 'verandahs' or 'patios'. Regardless of what it is called, an outdoor living area uses passive design principles to provide an outdoor space for residents' enjoyment of the natural climate.

Design objectives (essential)	Acceptable solution (example)
The balcony is designed to prevent small children being able to climb over.	Any balustrade (regardless of height) required by the Building Code of Australia (BCA) is designed in accordance with the BCA's non-climbable balustrade requirements.
The risk of injury from items falling off a balcony is minimised.	A balcony positioned over an area used for access or that people may occupy, has balustrades designed so that loose objects, such as pot plants cannot be placed on it.
There is adequate **sun protection** for outdoor areas.	Designated play areas and outdoor entertainment areas are covered with effective sunshade structures (at least 50% coverage to swimming pools). Houses have at least 12m^2 and units at least 10m^2 of covered outdoor living space.
Small children are safely confined in the garden and outdoor play areas.	A fenced area, suitable for small children is provided with lockable, self-latching and self-closing gate.
Private outdoor spaces have a direct relationship to internal living areas.	Internal living areas are provided with visual and direct access to private outdoor space including private balconies for above ground dwellings.

Design objectives (recommended)	Acceptable solution (example)
People of diverse abilities and in diverse circumstances **can easily access storage, clothes drying, rubbish storage and car parking areas.**	There is an accessible path to the rubbish storage, clothes drying and car parking areas.
Garden tools are secured to minimise the risk of injury to children and to prevent access by intruders looking for the means to break in.	There is a lockable outdoor storage area.
Poisons (herbicides, pesticides, mower fuels etc) are secured to minimise the risk of poisoning children.	There is a lockable outdoor storage area.

7.8 Landscape

It is important that a house has a good physical and visual connection to outdoor space that makes a positive contribution to the residents' standard of living. To contribute to environmental and economic sustainability, landscaping should be water and resource efficient and minimise the maintenance impact on the house.

Design objectives (essential)	Acceptable solution (example)
Gardens do not require extensive watering and fertilisers to be maintained.	Plants are native to the local area, appropriate to the soil conditions and exposure and have low watering needs. The size of the lawn has been minimised and if a drip irrigation system has been installed, it is water efficient.
The risk of children and pets being poisoned by garden plants is minimised.	There are no poisonous plants in the garden.
Minimise the risk of injury caused by a collision with an outward opening window (such as casement windows).	Avoid the use of outward opening windows such as casement or awning windows near walkways or paths.

Design objectives (recommended)	Acceptable solution (example)
Minimise the impact that dripping taps and garden watering systems have on the structural integrity of footings.	All external garden taps have been located away from the footings of the house. Alternatively, hard-paved, well-drained areas have been built under the external taps to minimise structural damage.
Minimise energy use to dry clothes.	The dwelling has an external clothes drying area or an area with a fixed clothesline that is open to breezes and receives sunlight (filtered or direct) for at least two hours per day.
Ponds, water gardens and gully traps are safe.	All water features, drains and gully traps are secured against access by small children and maintained to prevent mosquito breeding.
The risk of poisoning, allergies or injuries from garden plants is minimised.	Poisonous or allergenic plants are not used in landscaping and plants have no thorns or spikes.

7.9 Building materials

Building materials impact on environmental sustainability through:

- the amount of energy required to manufacture and transport the material;
- its ability to be recycled;
- the impact of extraction processes on the natural environment; and
- the resources required for ongoing maintenance.

Maintenance of building materials may also affect the economic sustainability of the house. The safe use of materials may depend on the nature of the products and processes used to maintain the material, as well as the compounds it contains.

Design objectives (essential)	Acceptable solution (example)
Safe flooring.	Flooring is slip resistant and non-reflective.
Durable flooring.	Flooring is hard-wearing and easy to clean.
Risk of adverse effects on people's health caused by building materials is reduced.	Low volatile organic compound (VOC) content materials have been used. (For further information, refer to the Commonwealth Department of Health and Ageing's 'Healthy Homes' booklet (PDF file, 3.1MB).

Design objectives (recommended)	Acceptable solution (example)
Minimise exposure to fumes from stored chemicals and paints.	Storage for chemicals and paints is provided away from the main living space and naturally vented.
Reduce material wastage.	The building is designed to minimise the cutting of standard material and product sizes.
Reduce the amount of construction waste and conserve resources through re-use or recycling to reduce the environmental impact from material manufacturing and transport.	A construction waste management plan approved by the local council is developed and implemented.
The risk of fire and toxic gases in the case of fire is reduced.	Non-combustible and low formaldehyde content materials have been used. (For further information, refer to the Commonwealth Department of Health and Ageing 'Healthy Homes' booklet (PDF file, 3.1MB).

The environmental impact of construction materials and products over their whole life cycle is considered.	Construction materials and products are selected based on balancing the following environmental criteria: - ability to be recycled; - sustainable sourcing; - low embodied energy (the energy used in their manufacture and transport); - low pollution from manufacturing; - low transport costs; - minimal environmental impact; - durability and minimal maintenance; - non-hazardous; - locally available; and - eco-labelling or certification.

7.10 Stairs and steps

Stairs and steps are common places where injuries occur to people of all ages due to trips and falls. Minimising the chance of trips and falls on stairs or steps will make the house easier to use and safer for everyone.

Design objectives (essential)	Acceptable solution (example)
Minimise the risk of slipping or falling on stairs.	- Straight flights of stairs are in accordance with the Building Code of Australia (BCA); - no winders, tapered and curved treads or spiral staircases; - no open risers; - stairs have a reduced-slip surface and contrasting, non-slip nosing to each tread; and - the stairway is well lit by natural and/or artificial light, and does not cast shadows or cause glare. Lights are positioned so that people do not descend into shadows and are controlled by a two-way switch located at both the top and bottom of the stairs.

Design objectives (recommended)	Acceptable solution (example)
Length of stair flights is minimised.	Short flights of stairs are provided or long flights (such as over a full storey) are divided into shorter sections by providing landings.
Assist people with visual impairment to safely locate and use stairs.	Handrails are located on both sides of the stairs. They have a smooth surface and run continuously along the full length of the staircase and around the intermediate landings, continuing beyond the first and last step. There are clear approach spaces at the top and bottom of the stairs.
Thresholds are easy for people of diverse abilities and in diverse circumstances to move through. The risk of tripping is minimised.	There is a maximum 10mm variation on all internal and external entry thresholds (ideally level entry). If there is a change in level, it is made clearly visible by contrasting colours and protected by non-slip edging.

7.11 Plumbing

Water is a fundamental requirement for life and providing easy access to water for people of all abilities is a necessity.

Plumbing practices and products, especially hot water plumbing, is an area where significant water and energy savings can be made. In the Department's Smart Housing Research House, located in Rockhampton, the installed cost of flow restriction devices was $316 with annual water savings of around $90 and additional savings on energy costs and greenhouse gas emissions.

Design objectives (essential)	Acceptable solution (example)
Use of 'town water' for gardens and toilet flushing is minimised.	A water tank with first flush device and mesh strainer fitted to the inlet is installed to capture rain roof water, for use on gardens and to flush toilets (where council permits). Note, a management regime is required if tank water is to be used for human consumption (refer to local public health office for advice).
Taps are easy to use.	Quarter-turn lever taps or a lever mixer.

Design objectives (recommended)	Acceptable solution (example)
Minimise the amount of hot water left to cool in pipes.	Wet areas are grouped and the water heater is located near the wet areas but closer to the kitchen.

7.12 Electrical

Design objectives (essential)	Acceptable solution (example)
Minimise the risk of tripping on power cords.	There are sufficient power points, located with regard to likely furniture and appliance arrangements.
Minimise the greenhouse gas emissions from household appliances.	Install appliances with a minimum energy performance rating of 4-stars.
Reduce the risk of injury caused by poor lighting.	- There is sufficient lighting for work surfaces (such as kitchen benches), changes of level at entrances, paths or steps and in all accessible areas including hallways, store rooms and staircases; - light switches are easy to find and operate; - the lighting is directed or diffused to avoid glare; - where practical, skylights and windows have been positioned to maximise natural day lighting (in accordance with BCA Energy Efficiency Provisions); - the stairway is well lit by natural and/or artificial light, and does not cast shadows or cause glare; and

	- lights are positioned so that people do not descend into shadows and are controlled by a two-way switch located at both the top and bottom of the stairs.
Minimise the risk of injury when conducting regular maintenance or cleaning.	Items that are likely to require regular maintenance or cleaning by the homeowner such as light bulbs and windows are placed to be safely accessible by a step-ladder from level ground or floor surfaces.
Light fittings minimise energy use.	Fluorescent or light emitting diods (LED) lights are used for general lighting.

Design objectives (recommended)	**Acceptable solution (example)**
People of varying abilities **can easily operate light switches.**	Large rocker-type light switches are used throughout the house and positioned between 900mm and 1110mm above the finished floor level.
Mains power switches are secured against tampering.	If the ‘mains power’ switch(es) is located in an external meter box, then the meter box is padlocked (contact the electricity provider for details of appropriate locks).
People of all abilities can easily reach powerpoints.	Powerpoints are placed at a level (minimum 600mm from the floor) and out from the corners (minimum 500mm).

7.13 Windows and doors

Design objectives (essential)	Acceptable solution (example)
Doorways are wide enough for people of diverse abilities and in diverse circumstances to easily move through.	Doors are a minimum 870mm wide, allowing a minimum doorway opening of 850mm.
Doors and windows provide adequate security against break-ins.	Hinged and sliding external doors and windows*, including doors linking the garage to the house are fitted with security grilles (triple locks and triple hinges are preferred on hinged security screen doors) or in the case of doors, are of solid core construction, or are fitted with a double cylinder deadlock. Glass panels within one metre of a door latch are strengthened (using security film) or have laminated security glass panels. Sliding panels are secured so that they cannot be lifted from their tracks. Garage door lock is constructed to resist Forced entry. *Applies to doors and windows that may be reasonably reached from the ground without a ladder.
Internal door handles are easy to use.	All internal swing doors have lever door handles between 900mm and 1110mm above the finished floor level.
Internal doors can allow cross-ventilation.	Internal swing doors have a door catch.
Windows are easy to open in an emergency.	- If window locks are fitted they are all ‘keyed alike'. - In the case of fire, the house has a choice of escape paths. - Doors, windows and security screens that form part of an escape path can be opened from the inside without a key.
The risk of child falls from windows is minimised.	- Windows with sills 1000mm or more above the ground and less than 1000mm above floor level are designed to prevent small children falling through (they should have security screens or openings less than 125mm, such as louvres). - Windows that are likely to have a bed, sofa or other climbable furniture immediately beneath or adjacent to the window are designed to prevent small children falling through and have a sill height of at least 1000mm higher than the item of furniture.

Design objectives (recommended)	Acceptable solution (example)
Easy escape in case of fire.	There are security escape screens on windows.
Reduce unwanted heat gain or loss through windows.	Windows have a high Window Energy Rating (WER). Refer to the Australian Window Council's Window Energy Rating Scheme website.
Windows and doors provide adequate protection from insects while still allowing breezes.	Windows and doors are fitted with insect screens.

8.0 Further information

For further information about Smart Housing, contact:

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