Cost-efficiency

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and the Insurance Industry Council.

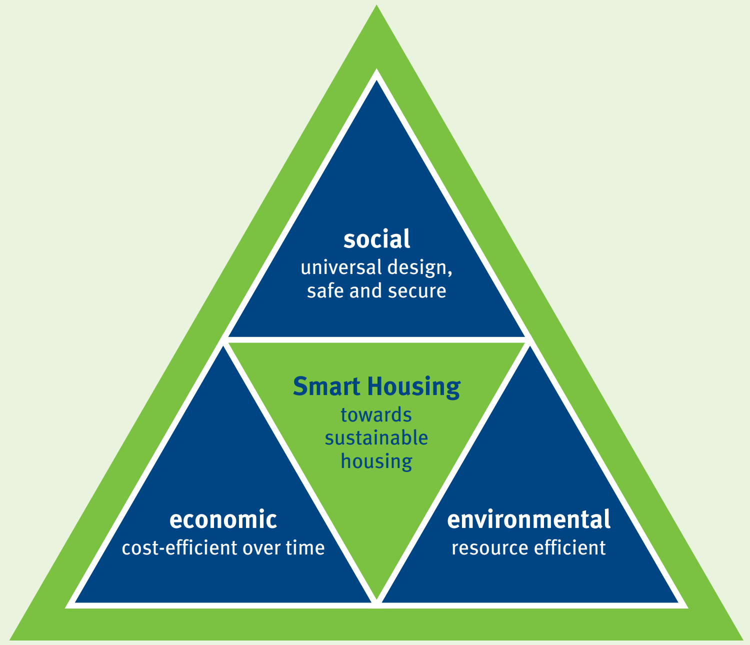
Cost-efficiency

Cost-efficiency 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 highlights the cost-efficiency, value for money features of Smart Housing and how they can be achieved. It considers design features, choice of construction materials, and ways to make housing more economically sustainable in the long-term.

This booklet is designed to assist

- Builders and developers
- Building designers and architects
- People intending to build a home
- Elected officials
- Home buyers
- Home insurance providers
- Home owners and renovators
- Housing professionals
- Landlords
- Lecturers and students

Contents

Incorporating the principles of cost-efficiency helps to create homes that can save you money now and over time. Now that's smart!

What does cost-efficiency mean?

As an individual or a family, purchasing or constructing a home is one of the biggest investment decisions you can make. Yet it's a decision we are often forced to make with only limited information about the true costs involved.

There are many hidden costs in housing that can dramatically add up over time. There are the operational costs of ongoing maintenance, heating, cooling, water bills, insurance and landscaping. Over time, there may also be the cost to modify your home as your lifestyle changes, lost income from an injury in the home or the cost of replacing belongings after a break-in.

While some design features may cost more initially, these costs can be minor compared to the savings over time. Smart design and appropriate construction materials can also increase the resale value of your home.

When looking to build or renovate a home, it is important to understand how the decisions made today will affect cost-efficiency over the life of the home. Consider the effect design decisions and construction materials have on the initial construction costs and over the life of the home.

Cost-efficiency is measured both in terms of the initial construction costs and in terms of the cost-benefit over the life of the home. Therefore, when designing a home, or choosing construction materials, it is important to compare the initial costs with the savings that can be realised over time.

Cost-efficient housing also means savings for our community by reducing the cost of housing on the environment; reducing the likelihood of injury and consequent burden on the health care system, and reducing the incidence, and the associated cost, of crime.

The cost-efficiencies of Smart Housing mean value in housing.

By considering Smart Housing features and fittings at the architectural and design phase of the project, you can create cost-efficiencies that will last the lifespan of the home.

Installing sensor taps in your home that will automatically turn water flow on and off according to usage is one smart way to limit water consumption and the associated costs. The savings are both financial and environmental.

Smart Housing is cost-efficient now and over time – creating savings for both the home owner and our community.

Cost-efficiency for the home owner

SAVE ON CONSTRUCTION COSTS

A Smart House achieves cost savings at the design and construction stage through the use of cost-efficient building materials, economic planning and 'smart' ideas.

'Smart' design can reduce construction costs without reducing the street appeal or the quality of the internal layout.

For example, simplifying the home's roof design can save up to $2,000 on the cost of flashings, gables and similar features. Minimising external corners of the dwelling will reduce the cost of the foundations, external walls and internal lining. Reducing the overall length of the outside wall by four metres can lead to a saving of $1,500 on the cost of construction without reducing the size of the house.

Figures prepared by the Queensland Department of Housing based on average construction costs in the Brisbane area.

Choosing a design that is appropriate for the site can save money by reducing the need for expensive site works or variations. It can also provide you with the choice to naturally heat and cool your home.

Specifying standard size and using readily available and recycled building materials can also save money.

There is no limit to the 'smart ideas' that can save you money in construction. Your builder or building designer will be able to recommend ways to save on the construction of your home.

Ensuring that your house design meets your needs is another important way to save money. You can do this through smart use of space. A formal dining room or extra square metres in the living area will be of no value if your lifestyle means that you never use them. Allocating the money to eaves or an outdoor living space may be more appropriate for a Queensland lifestyle.

Similarly, another strategy is to design for 'double duty'. For example, the spare room can be designed to double as a home office, a media room, or as a room for guests. The design could also allow for an extra room to be added if your family grows.

Specifying readily available materials such as locally manufactured or recycled and second-hand materials can also save you money.

"Consider how much painstaking design detail goes into every part of a car. The better the design, the better the car looks, feels and performs. The way your home looks, feels and performs will ultimately depend on the amount of detailed design that goes into it.

Building a more compact home to meet all your needs will save on material and building costs. Good design creates quality living space for a quality lifestyle.

Poor design wastes space and wastes your money, especially in the long term. Spending time in preparation is like depositing money in the bank."

Your Home: Design for Lifestyle and the Future, Australian Greenhouse Office.

When seeking to make savings on construction costs, it is important not to compromise long-term savings, comfort and liveability, where possible.

Refer to the example below. Although the homes are different shapes, they both have the same floor area. The cost difference between the two as a result of design are:

1 House A has a simpler roof and the initial construction costs will be less expensive because compared to House B, it has 12 metres less wall length;

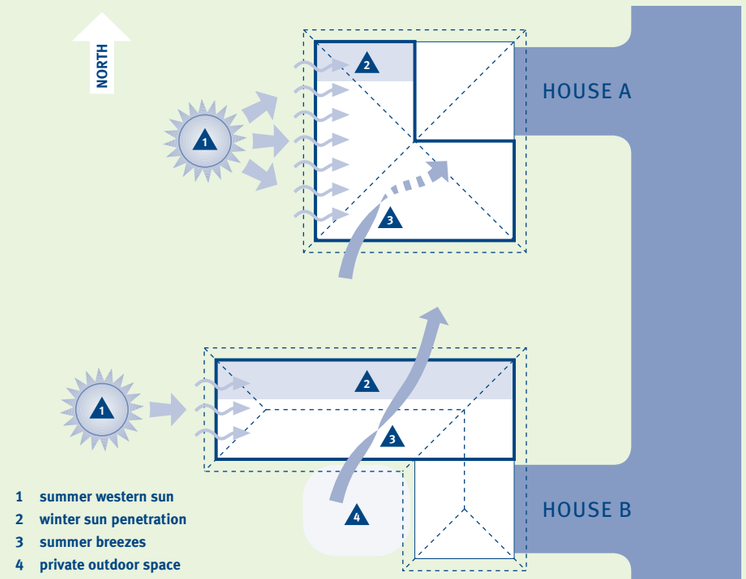
2 Although the initial construction costs will be more expensive, House B will actually be a more comfortable home because it has been built to take advantage of the orientation. Furthermore, the long-term running costs will be significantly less as it will cost less to cool in summer and heat in winter (in the cooler parts of Queensland).

Your designer can help you to achieve a cost-efficient structure without compromising on your comfort, lifestyle and ongoing running costs.

Clever use of space – consider whether it is more important to have the extra living space indoors or to include eaves and outdoor living space which make the home more comfortable in a Queensland summer.

HOUSE A
Floor area is 144m². External wall length is 48m.
Advantages:
- **Less expensive to build initially;**
- **This design achieves the same floor space as House B with 12m less external wall length; and**
- **Simpler roof design.**

HOUSE B
Floor area is 144m². External wall length is 60m.
Advantages:
- **The following design features mean this is a more comfortable house to live in and the long-term electricity costs are dramatically reduced:**
  – better cross-ventilation
  – better northern sun penetration in winter
  – decreased heat from the western sun in summer
  – better natural lighting; and
- **The house form provides potential for private outdoor space.**



1 summer western sun
2 winter sun penetration
3 summer breezes
4 private outdoor space

Considering the design of your home before construction can save you money without having to make any compromises.

Cost-efficiency for the home owner continued

SAVE ON ONGOING RUNNING COSTS

Ongoing costs can really add up over the life of the home.

Significant savings can be achieved by careful consideration of the design of the house and selection of fixtures and fittings to suit your lifestyle.

For example, incorporating passive solar design features, such as orientation, ventilation, insulation and shading, which work with nature's elements to keep the home cool in summer and warm in winter, make the home more comfortable and reduce heating and cooling costs and the need for artificial light during the day. The Queensland Environmental Protection Agency conservatively estimates that running a 2000 watt air-conditioner for five hours a day over the three hottest summer months costs $135 each year. This does not include the cost of the unit or any ongoing maintenance.

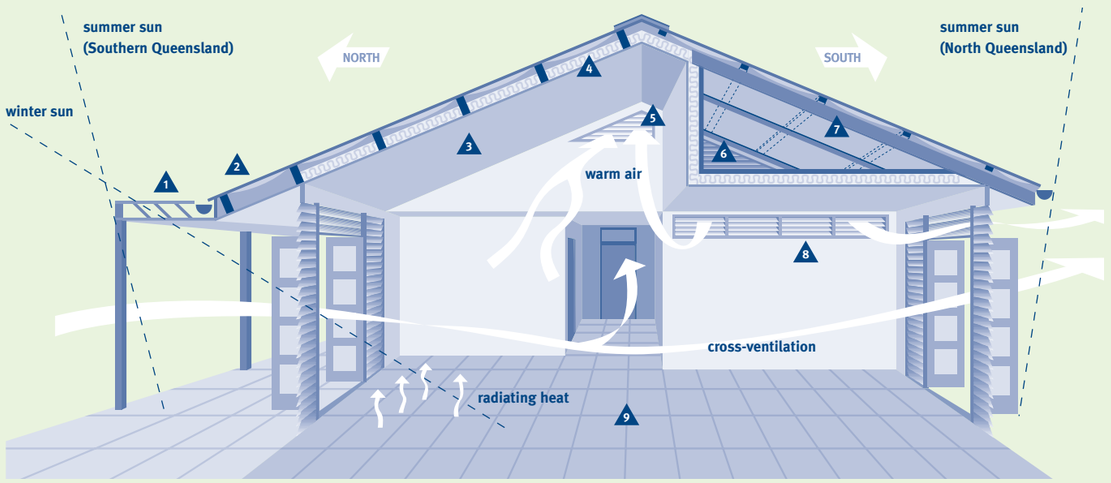
Positioning 'wet areas' such as the kitchen and bathrooms together and close to the hot water system can substantially reduce the amount of water that it is necessary to heat. The longer the pipes, the more cold water that flows through these pipes before hot water reaches the tap. Furthermore, the longer the pipes, the more hot water that is left to go cold in the pipes once the tap is turned off. On average, water heating accounts for 38 per cent of domestic energy use in Queensland, making it an important area where money can be saved. **Environmental Protection Agency.**

Landscaping is another important way to save on water use and to save money on pesticides and fertilisers. For example, while a lawn requires a high level of water and maintenance, native ground cover will look good and require little effort. Native plants around the garden will also remain healthy with less water and maintenance. These plants may also attract native birds to eat garden pests, which also leads to a saving on pesticides.

Energy efficient showers and taps use less hot water and can save $100 per year on energy bills.

Green Home Guide: Brisbane City Council.

Passive solar design



Passive solar design principles – orientation, insulation, ventilation and shading – help to keep the home cool in summer and warm in winter and avoid expensive heating and cooling bills.

1 fixed louvre pergola will provide extra shade in summer and allow the sun to enter the house in winter (particularly relevant to cooler regions)
2 large overhangs provide shade in summer and allow the sun to enter the building in winter (particularly relevant to cooler regions)
3 high ceilings
4 insulation
5 innovative ceiling or gable vents allow warm air to escape in summer and can be closed in the colder regions during winter
6 ventilated ceiling space
7 sarking
8 adjustable louvres allow air movement in summer
9 tiled floor warmed by the winter sun during the day will help to warm the room at night (particularly relevant to cooler regions)

The trend out of the United States

"As the market for green products and materials grows, their cost should decrease."

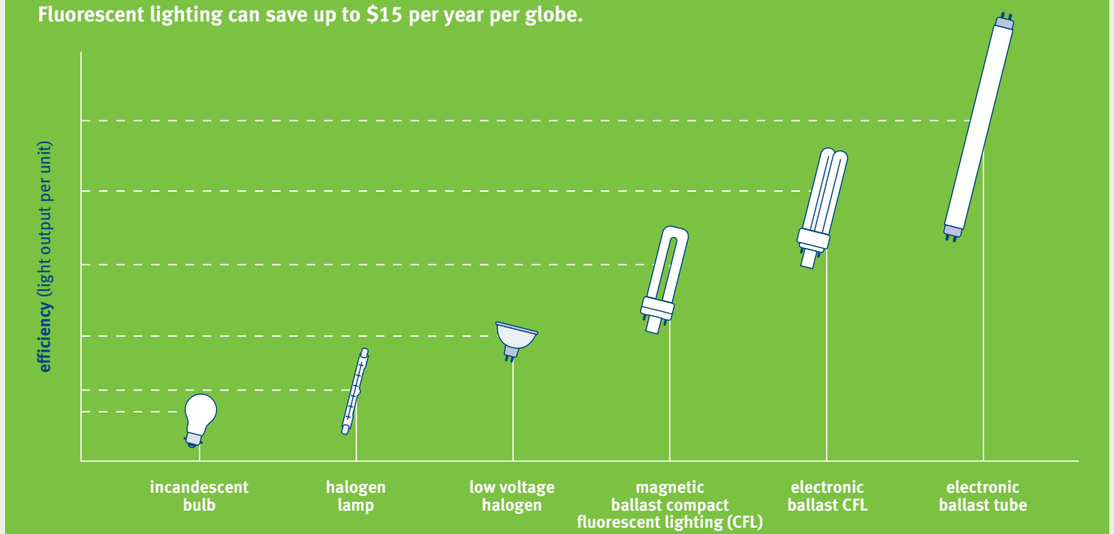
Kristin Shewfelt, Director of Environmental Programs for McStain Enterprises, a medium-sized homebuilders in Colorado that has embraced green building techniques, has seen this happening over the last couple of years. Five years ago, building green cost McStain five to 10 per cent more than building conventionally would have cost but today a green house costs McStain less than four per cent more than a conventional house.

As conventional energy becomes more expensive and as demand for green features in housing and commercial building increases, the cost differential between green and conventional development may become negligible. In fact, some people argue that the added costs of building green is already insignificant. **Urban Land Institute, 2002.**

… and in Queensland

A study by the Australian Greenhouse Office and CSIRO already estimates the cost differential in Queensland to be as little as two per cent. Adding ceiling insulation to a one star home will cost $880 and raise it to two-and-a-half stars. Adding wall insulation will cost approximately $550 and take it to three stars. Adding awnings on the western wall can cost $1,850 and raise it to a four star home. Each of these costs can be reduced even further if energy efficiency is considered from the early design stages. **Johnstone, Ambrose, Tucker: 2002.**

Fluorescent lighting can save up to $15 per year per globe.



From "Your Home" Technical Manual, Australian Greenhouse Office.

Cost-efficiency for the home owner continued

While some design and fitting decisions may cost more in the short-term, once the home's long-term operating cost is factored in, the savings can amount to thousands of dollars. If these savings are invested back into your mortgage, your total savings can be even greater.

Pay-back can occur quicker than you might expect. In the following example, the difference in price between a standard electric hot water system and an electric-boosted solar hot water system or heat pump is paid back in just three years.

Example – water heating options

A recent study prepared for the Environmental Protection Agency (EPA) and Brisbane City Council (BCC) compared the initial capital and ongoing running costs of each hot water option. They were then able to calculate the 10 year total cost in today's dollars.

Table 1

	Installed cost	Annual running cost	Annual savings (compared to off-peak electric storage)	Cost over 10 years in today's dollars
Off-peak electric storage	$1,000	$259	–	$3,590
Heat exchange	$900	$259	–	$3,490
Standard gas storage	$1,000	$343	–	$4,430
High-efficiency gas storage	$1,150	$275	–	$3,900
Standard gas instantaneous	$1,000	$255	$4	$3,550
High-efficiency gas instantaneous	$1,200	$218	$41	$3,880
Solar gas boosted (in tank)	$1,780	$89	$169	$2,670
Solar gas boosted (in line)	$2,130	$45	$214	$2,580
Solar electric boosted	$1,530	$87	$172	$2,400
Heat pumps	$1,530	$87	$172	$2,400

Source: Social, Economic and Environmental Implications of Proposed Energy Efficiency Amendments to BCC's City Plan House Code. Prepared by McLennan Magasanik Associates Pty Ltd, 2002.

These savings would be significantly magnified if the annual savings were invested back into the mortgage.

For example, the table below portrays the true cost of electric hot water systems compared to an electric-boosted solar hot water system or a heat pump. Buying a house worth $250,000 at seven per cent per annum interest, a homeowner can save as much as $10,000 over the course of a 25 year mortgage (or $400 per year) by investing in a solar hot water system. This assumes that the homeowner pays $1,000 for an installed electric system or approximately $1,530 for a solar-electric or heat pump system (refer to Table 1 opposite).

The replacement time of an electric system is expected to be eight years while the replacement time of an equivalent solar hot water system is 15 years. Therefore, when the possibility of replacing systems is factored into the mortgage in the following example, the savings are even greater.

The following table demonstrates the savings associated with the installation of an electric boosted system or heat pump into a home, in place of an electric hot water system. The financial flows of pooling these savings or reinvesting them back into a mortgage are outlined below.

Table 2

Option	1*	2*	3*
Loan principal	$250,000.00	$250,530.00	$250,530.00
Monthly repayment	$1,766.95	$1,770.69	$1,785.02
Increase in monthly payment	N/A	$3.74	$18.07
Extra repayment (monthly savings on electricity)	N/A	N/A	$14.33
Total interest paid	$280,084.40	$280,678.18	$273,551.67
Actual term (months)	300	300	295
Money accumulated	N/A	$4,300.00	N/A
Electricity cost – 300 months	$6,475.00	$2,175.00	$2,175.00
Net cost	$536,559.40	$533,383.18	$526,256.67
		approximately $3,000 saved	5 months and approximately $10,000 saved

*** Option 1**
A base case scenario of a new house installed with an electric hot water system.

*** Option 2**
Represents the financial flows associated with pooling the cost savings accumulated with the installation of an electric-boosted system or a heat pump as opposed to the electric hot water system.

*** Option 3**
Represents the financial flows associated with reinvesting the cost savings accumulated in Option 2 back into a mortgage.

Source: Queensland Environmental Protection Agency: 2003.

Cost-efficiency for the home owner continued

SAVE ON LIVING COSTS

A Smart House can even save you money on a variety of every day expenses.

1 A Smart House has a logical design that is better suited to how people will use the home. This means fewer incidents, spillages and breakages, therefore reducing cleaning and replacement costs.

Take the example of wider hallways – the favourite lounge chair can be moved into the living room, beds into bedrooms and the fridge into the kitchen without damaging the walls. Children will have more room to move around, making it less likely that walls will be marked from falls or collisions with toys etc.

Giving careful consideration to the design of passageways and ensuring that they are not doubling in use is another way to reduce incidents, spillages and breakages.

2 A Smart House can also save money by reducing the cost of insurance premiums.

Check with your insurer or insurance advisor for guidance.

3 It is important to consider location. The cost of travel to and from day-to-day activities such as the shops, work and school can really add up.

Save on living and maintenance costs by designing your home to meet the lifestyle needs of your family.

The cost of your home extends well beyond the initial construction costs. Consider the scenario where you may break your ankle because you tripped and fell on a slippery shower step when entering the shower. A hobless shower (step-free) could save you from slipping, thereby saving you the pain of a broken ankle as well as the associated costs. Use the following table to calculate how much a broken ankle could end up costing.

Hospital costs	
Partner/parent travel to hospital	
Hire of crutches	
Transport from hospital	
Transport to/from physiotherapy	
Physiotherapy (or the co-payment if privately insured)	
Loss of income if self-employed	
Increased income protection insurance premiums	
Transport to/from work (you can't drive with a broken ankle)	
Walking stick	
New clothing to replace items modified because of cast	
Increased burden on partner as the only driver able to transport the children around	
Time to obtain quotes to repair the damage to the house caused by mobility aids	
Actual repair costs	
Time for discussions with the insurance company	
Cost to your employer to hire a temporary replacement	

Additional costs if a visitor to your home breaks their ankle

Solicitor fees	
Time to attend court	
Affect on friendship	

Source: Queensland Ambulance Service.

Cost-efficiency for the home owner continued

SAVE ON LONG-TERM MAINTENANCE AND REPAIR COSTS

Careful choice and selection of materials, and the well thought-out design of a Smart House reduces repair and ongoing maintenance costs. It can also delay or reduce the eventual cost of replacements.

For example, using self-finished materials such as bricks, colour render or a light weight colour-bonded wall cladding can save $15,000 (in today's dollars) on the external painting costs over the life of the home. Even if you do not intend to stay in your home for the long-term, this is value that can be on-sold to the next purchaser.

A Maintenance Management Plan is a good tool to help you identify how much building materials and design choices will cost you over the life of the home.

Ask your builder or designer for advice on the likely maintenance costs when you are choosing the design. Often the ongoing and long-term savings of cost-efficient design will outweigh any extra initial costs.

The manufacturer's warranty can often be used as a guide for the ongoing costs of materials and products.

Smoke alarms are another inexpensive feature that could save not only your life, but thousands of dollars. The Queensland Fire and Rescue Service reports that on average, a home with an operational smoke alarm sustains $1,750 worth of damage compared to $6,500 worth of damage for homes not fitted with a smoke alarm.

Good design can reduce the likelihood of the occurrence of expensive damage such as termite infestation.

Smoke alarms are inexpensive to install and maintain and can save you thousands of dollars in the event of a fire.
Photo courtesy of the Queensland Fire and Rescue Service.

Careful selection of materials such as bricks, colour render or a colour-bonded wall cladding that do not require painting can reduce the time and cost of ongoing maintenance.

MAINTENANCE COMPARISON TABLE OF COMMONLY USED HOUSING FINISHES, MATERIALS AND PRODUCTS.

Note: This table is a guide only. Materials with greater than usual exposure to weather, marine elements, traffic or wear and tear will require additional maintenance and may have a reduced life span. Obtain advice from your designer, builder or product supplier for more detailed maintenance specifications.

All finishes require regular visual inspections and cleaning.

Finish	Maintenance requirements	Life-span
EXPOSED EXTERNAL FINISHES		
Hardwood:		
Bare (untreated) Hardwood species are assigned a 'durability class' ranging in class from 1 (most durable) to 4 (least durable). Select timber with the appropriate durability class for its application.	Inspect six monthly for termite and fungal attack. Maintain good drainage.	In contact with ground: Class 1: 25-50 years Class 2: 15-25 years Class 3: 8-15 years Class 4: 1-8 years (source: AS1720.2)
Painted (untreated)	As for bare hardwood. Apply quality exterior grade acrylic latex paints every 7-10 years, according to the manufacturer's recommendations. Clean every 1-4 years.	40+ years (off the ground)
Treated Timber supplied pre-treated to appropriate 'Hazard Level' ranging from H1 (lowest hazard level) to H6 (highest hazard level).	Treatment protects against fungal and termite attack. No further maintenance is required other than to ensure the timber is not exposed to conditions that are in excess of the Hazard Level treatment.	40+ years
Clear, stained or oiled	As for bare hardwood. Re-apply finish every 1-4 years, according to the manufacturer's recommendations.	40+ years (off the ground)
Softwood:		
Bare (untreated)	External application is not recommended.	1 year
Painted (untreated) Structural external application or contact with the ground is not recommended.	For cladding paint maintain as for painted hardwood every 5-10 years.	30+ years
Treated (H3-H6)	As for treated hardwood.	30+ years
Clear, stained or oiled Structural external application. Contact with the ground or oiled finish is not recommended.	For cladding, apply a minimum of 3 coats of proprietary product every 1-4 years in accordance with the manufacturer's specifications	30+ years
Exterior Grade Plywood (Type 'A' bonded and preservative treated to H3, used as cladding, not in contact with the ground):		
Bare	Not recommended. Weather exposure may result in surface breakdown known as 'checking'.	unreliable
Painted	As for painted hardwood.	30+ years
Stained Water repellent stain that is compatible with the preservative treatment used on the plywood. Not recommended in conditions with high sun exposure.	Maintenance requirements are the same as for bare hardwood. Re-apply a finish every 1-4 years, according to the manufacturer's recommendations.	30+ years
Engineered Timber Products: (LVL, laminated, I-beams)		
Bare Not recommended as an external finish.		1 year
Painted Timber product must be manufactured for the specific level of exposure and supplied with painting and maintenance instructions.	Maintain in accordance with manufacturer's recommendations (typically, these are similar to that of painted hardwood, which is every 5-7 years).	
Stained or oiled Not recommended as an external finish.		1-2 years
Metal:		
Anodised Aluminium and Powder-coated Aluminium	No maintenance requirements	40+ years
Steel	Check for rust annually. Prime with a rust inhibitor and paint every 5-7 years or as required.	40+ years
Galvanised steel Level of galvanising required varies according to the expected level of exposure.	Inspect the surface annually, especially cold galvanised welds. Remove rust, apply rust inhibitor and apply cold galvanising.	40+ years

Roof/wall finishes:		
Zinc/aluminium coated steel	Clean leaves from the roof regularly to prevent corrosion.	30+ years
Pre-painted steel	Clean leaves from the roof regularly to prevent corrosion. Use marine grade pre-painted steel and wash down every 6 months within 2km of the coast.	30+ years
Concrete tiles	Check for mould, broken tiles, cracked mortar and damage by hail and trees every year and after major storms. Replace broken tiles, mortar and clean mould as required.	40+ years
Terracotta tiles	As for concrete tiles.	40+ years
Other Wall Finishes:		
Face clay brick	No maintenance required	50+ years
Painted masonry	Repaint every 7-10 years. Clean every 1-4 years.	50+ years
Painted fibre-cement	Repaint every 7-10 years. Clean every 1-4 years.	35+ years
Painted acrylic render	Repaint every 7-10 years. Clean every 1-4 years.	10-15 years
Painted cement render	Repaint every 7-10 years. Clean every 1-4 years.	35+ years
INTERNAL FINISHES		
Walls and ceilings:		
Painted	Repaint every 10-15 years.	10-15 years (paint)
Wallpaper	Repaper every 10-20 years. Peeling paper should be removed. Wallpaper that is still adhering to the wall can be papered over. If painting, generally remove any wallpaper. Clean, replaster defects, undercoat and paint.	10-20 years
Face brick	Clean as required.	50+ years
Ceramic wall tiles	Clean as required.	30+ years
Floors:		
Ceramic tiles, Quarry tiles and Stone tiles*	Sweep and mop the floor surface regularly with a neutral detergent. Porous stone requires a clear sealant every 2-4 years.	30+ years
Carpet	Vacuum the carpet regularly. It should be professionally cleaned every 6-12 months.	5-10 years
Timber	Depending on the wear. Re-apply an acrylic finish every 4-7 years. Sand and reapply a polyurethane finish every 4-7 years.	40+ years
Vinyl, Linoleum	Sweep or vacuum daily to remove dust and grit. Use a damp mop with the manufacturer's recommended cleaning product.	10-20 years
Painted Concrete	Sweep and mop the floor surface regularly with a neutral detergent. Repaint 5-8 years or depending on the wear.	40+ years
Cork	Sweep and mop the floor surface regularly with a neutral detergent.	5-8 years
Laminate	Sweep or vacuum daily to remove any dust and grit. Use a damp mop.	10-20 years
* Tiles placed on a framed floor may show earlier signs of cracking or lifting if the floor is not rigidly constructed and/or tiles have not been laid with an appropriately flexible grout.		
Landscaping:		
Lawns	Mow the lawn every 2-3 weeks. Trim edges, weed and fertilise (only if potential runoff is contained).	
Locally native landscaping	Trim shrubs and trees once a year if required, and weed as required. Mulch every 1-2 years.	
Landscaping adjacent to the house	Trim shrubs and trees every 6 months. Keep vegetation away from stumps and the concrete slab edge should be a termite inspection zone.	
Driveways, Patios and Paths:		
Bare concrete/exposed aggregate	Avoid planting trees with a root zone beneath the slab. Remove weeds from any cracks in the concrete.	50+ years
Stamped concrete	Avoid planting trees with a root zone beneath the concrete slab. Remove weeds from cracks in the concrete and apply a clear sealant every 1-2 years.	7-10 years (finish)
Pavers (clay or concrete)	Avoid planting trees with a root zone beneath pavers and remove weeds from cracks and between pavers.	40 + years
Bitumen	Avoid planting trees with a root zone beneath the bitumen slab and remove weeds from cracks in the bitumen.	30 + years

Cost-efficiency for the home owner continued

SAVE ON FUTURE MODIFICATION COSTS

People's needs change over time. A couple becomes a family; an individual wants to work from home; or an older person becomes less mobile. Each will require a home that is able to respond to their needs. The cost to modify an existing home can be prohibitive.

A Smart House has been universally designed, and will work for a range of people of different sizes, ages and abilities. A Smart House can be more readily adapted for the changing needs of people over time and substantially reduce building modification costs to accommodate these changing needs.

A Smart House allows you to change the house rather than change houses.

"Nearly three-quarters (72.2%) of the people relocating within Queensland moved less than 20 kilometres, and almost half of these (48.5%) moved less than five kilometres from their previous home."

This indicates that many people are not looking to leave their neighbourhood but rather that their home no longer meets their needs.

Australian Bureau of Statistics.

The cost to renovate

Bathroom	$6,650 – $17,400
Kitchen	$7,400 – $21,900
Laundry	$2,950 – $6,900
Bedroom	$2,800 – $5,875
Single room (20m^2)	$3,325 – $7,150

Prices include plastering, painting, wiring, plumbing, relocation or replacement of windows, the renewal of fittings and fixtures, cabinetry additions and surfacing (e.g. tiling).

The estimates exclude stormwater drainage, paving, carpets, drapes, appliances or the construction of internal partitions to modify the layout of rooms.

The upgrade standard is to medium-quality brick veneer or timber.

Archicentre, April 2002.

CASE STUDY

The Petersens are physically fit and recently retired. They have raised three children who have all left home. They are in the market for a new home that better suits their new lifestyle – a home that they plan to stay in as long as they both can.

They find a house that looks perfect. Unfortunately, it is not a Smart House.

After ten years of comfortable living in the house, Mrs Petersen is involved in a car crash which leaves her unsteady on her feet and in need of a walking aid. She finds it difficult to use the bathroom without assistance and the step into the shower poses a real problem. They don't wish to move because they love their home and have made many friends nearby. They decide to renovate the bathroom.

The cost to replace the existing shower with a step-free (hobless) one and to reinforce the walls to install grab-rails comes to $4,300. Due to the inconvenience of being unable to use the bathroom during renovation, Mrs Petersen needs to stay in hospital for an additional five days after the doctors are ready to send her home. Their health insurance has a co-payment for each day spent in hospital and they are left with a hospital bill that is $500 more than it would have been, had she been able to return home immediately.

If the Petersens had bought a house with a hobless shower and reinforced walls, the cost would have been around $100 to install store-bought grab-rails that the Petersens could have fitted themselves.

Five years later, Mr Petersen has a stroke and now uses a wheelchair. The Petersens are still happy in their home and, remembering their last experience, look into the cost of renovating to accommodate a wheelchair. Refer to the table below to see what they discover.

Of course, the Petersens can't stay in their home during construction, so they would need to move in with their daughter and son-in-law for a couple of weeks. It is not good timing as the couple have recently had a baby.

The Petersens decide that due to the expense and inconvenience of modifications, they will have to move and end up with $9,500 in costs from the real estate agent's fees, solicitor's fees and removalist's charges.

If only they had bought a Smart House!

Source: Statistics have been prepared by the Queensland Department of Housing and are based on the average current construction costs for a four-bedroom house in the Brisbane area.

Renovation feature	Cost to the Petersens	Cost if included in the initial design
Widen the hallway to accommodate a wheelchair (1200mm)	They have two options – increase the hallway at the expense of the bedrooms and living rooms at a cost of $4,500 or maintain the same living area and move the external walls at a cost of $10,000.	$1,200 to allow for the extra floor area or no cost if the design was carefully considered.
Widen the internal and external doors	$4,000	$300
Ramp to the front door	$700	$0 The house would have been designed with level thresholds.

Cost-efficiency for the home owner continued

RESALE VALUE

Smart Housing features can lead to a greater demand for your home – the greater the demand, the higher the resale value.

People will desire the home's flexible design that can be readily adapted to meet their changing needs. They will appreciate being comfortable in the heat of the Queensland summer and the cold of winter. They will be attracted by the low maintenance and running costs and will want a home that keeps them safer from injuries and more secure against intruders.

A Smart House will also meet the needs of a greater range of people and therefore attract a wider market of potential purchasers. With an ageing population and more people wanting to stay in their own home longer, flexible, accessible and operationally cost-efficient homes will become an increasingly valuable asset.

By 2050, the proportion of people over 55 years of age in your town or suburb will be almost double that of today.

Smart Housing increases the potential value of your home by improving its performance. A Smart House can accommodate a wider range of people. For example, 20 per cent of the population has a disability; 12 per cent is over 65 years of age; and 42 per cent are parents with children.
Australian Bureau of Statistics (2001).

"But now things are changing. Green is starting to sell."

Perinotto, "Builders start to lay a greener foundation" in the Australian Financial Review, 27/2/2002.

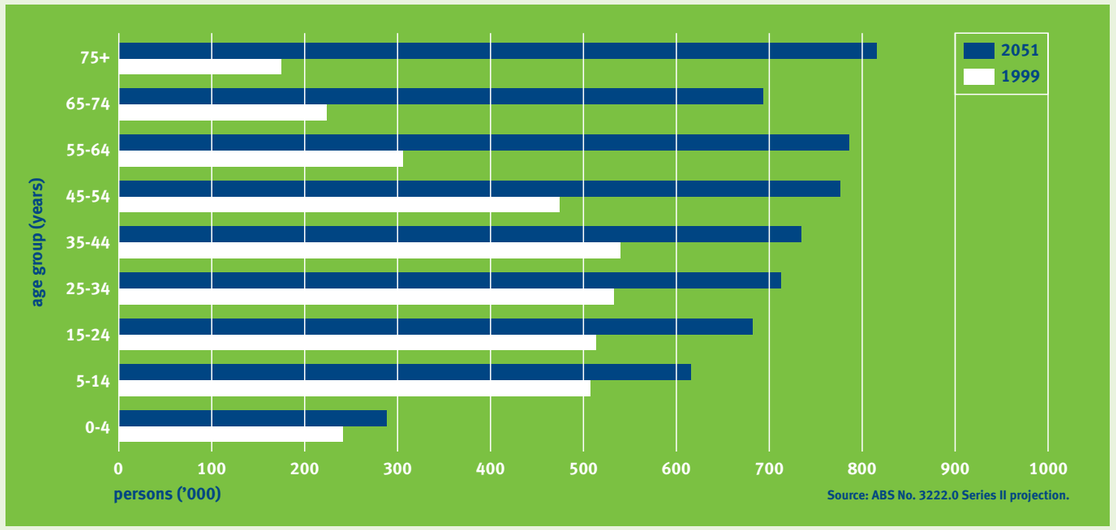
There are 2.7 million Australians in the 50 to 64 age group. These baby boomers have an average personal wealth of around $240,000, almost double the national average.

National Centre for Social and Economic Modelling.

This generation is yet to retire but at present "the housing needs of the elderly are not being met."

Australian Pensioners and Superannuants Federation.

Projected population by age – Queensland



Source: ABS No. 3222.0 Series II projection.

PEACE OF MIND

The design and choice of fixtures and fittings have been carefully thought through in a Smart House to help ensure the safety and well-being of its residents. These decisions contribute to peace of mind by reducing the risk of injuries in the home. This can save on medical expenses, hospital bills, lost wages, and the pain and trauma of injury.

Security features also provide peace of mind by minimising the possibility of burglary and the cost of losing irreplaceable cherished possessions.

A Smart House means peace of mind because you know:

- your children are safer from poisoning, falls, burns and scalds;
- your home is more secure against intruders;
- your home will be more cost-efficient to maintain and run;
- your home will continue to respond to your changing needs into the future; and
- you can recover in your own home after an injury, even if you have limited mobility.

Careful home design can help to deter intruders and the associated cost of crime to you and the community. For example, design the home so that the street can be viewed from the main living area and so potential intruders will have the sense that they are under surveillance.

The Queensland Injury Surveillance Unit reports that over 30 per cent of unintentional injuries to adults in the home were the result of a fall (figures from 1998 to 2000 from hospital emergency departments). Many of these falls are caused by obstacles such as steps, showers and awkward corners. A Smart House reduces these hazards.

Domestic household losses from fire and burglary in Queensland totalled $226.6m in the year to 30 June 2001.

Insurance Industry Council.

Cost-efficiency for the community

ENVIRONMENT

According to the Australian Greenhouse Office, Australian households contribute almost one-fifth of Australia's greenhouse gases – more than 15 tonnes per household each year – through everyday activities. Australia has among the highest greenhouse gas emissions per capita in the world and Queensland has the highest emissions per capita in Australia.

The 1995 Australian Greenhouse Office statistics revealed that Queensland, with 18 per cent of Australia's population, produced around 27 per cent of Australia's greenhouse gas emissions.

A Smart House can use less energy than a conventional house, thus decreasing the amount of harmful gases released into the atmosphere.

Because there is lower maintenance required for a Smart House than for a conventional house, there will be less material production, less haulage and fuel and less disposal of redundant materials, which all contribute to a cleaner, healthier environment.

Information provided by the Queensland Environmental Protection Agency.

For every kilowatt-hour of electricity you save, your greenhouse gas emissions are reduced by approximately one kilogram.
EPA Energy Advisory Service.

It is important to foster a sense of community spirit in your neighbourhood where people feel they have an obligation to look out for each other's homes to deter crime in the area.

CRIME

House break-ins represent 20 per cent of all criminal offences reported to the police. This represents a significant burden for our community through the social costs of extra policing and providing care for people who feel insecure in their home, especially older people who may otherwise stay in their home.

The security provisions of a Smart House will reduce the incidence, and therefore the cost, of opportunistic crime in the community. The link between a Smart House and the neighbourhood will nurture community spirit and assist Neighbourhood Watch programs to make it easier for people to maintain a watchful eye on the surrounding areas.

HEALTH CARE

As we spend so much time in our homes, they play an important part in our health and well-being. Smart Housing can lead to a significant reduction in the burden on our health care system in the following ways:

1. A Smart House is easily adaptable and allows its residents to stay in their home for longer before they may need to move to a nursing home or other alternative accommodation. This means reduced demand on institutional care with the associated costs.
2. When discharged from hospital after an injury, many people are forced into institutional care because their home does not accommodate their new needs. For example, a person with a broken leg would find it difficult to negotiate the flight of stairs that are at the front entry of many Queensland homes. A Smart House may alleviate the need for this type of care and the associated costs.
3. With fewer hazards to cause falls, poisonings, burns and scalds, a Smart House can reduce injury and illness and reduce expensive hospitalisation costs. For example, fixtures and fittings with low volatile emissions (off-gassing of harmful chemicals) can reduce the chance of triggering allergies and illness.

For more information on how the elements of Smart Housing can protect your home from crime and reduce the chance of an injury in your home, refer to the Smart Housing Booklet – Safety and Security.

Smart house design may alleviate the need for additional care, or the inconvenience of renovations to accommodate an injured person.

The health system cost of injuries caused by falls in Queensland has now reached an annual cost of $100 million, which is greater than the cost of road injuries. As a result of the ageing population, this cost is expected to increase almost two and a half times to more than $260 million by 2051 (Queensland Health: Statewide Action Plan: Falls Prevention in Older People, 2002-2006). Many of these falls occur in the home and can be easily prevented through smarter housing design.

Kidsafe, the Child Accident Prevention Foundation of Australia, estimates that as many as 20,000 hospitalisations could be prevented each year with simple safety measures in the home.

Taking a tour of a smart cost-efficient home

Let's take a tour of a smart, cost-efficient home. This section highlights a number of important design features, which can reduce the cost of the house to both the homeowner and the community, now and into the future.

GENERAL DESIGN CONSIDERATIONS

- Use a flexible design to allow for additional rooms to be added easily, if and when they are needed, and for rooms to have a dual purpose. For example, including a telephone socket in the extra bedroom will allow it to double as a home office. If located on the ground floor and combined with an accessible bathroom, this room could also be used as a bedroom for an ageing parent or as the main bedroom if one of the residents becomes less mobile.
- Construct wide doorways (at least 870mm or ideally 920mm – this will leave a passageway at least 850mm wide when the door is open); wide hallways (1,200mm); stepless entrances and pathways, and hobless or stepless showers to enable the home to meet the needs of a wider range of people, including older people and people with mobility difficulties. This can mean significant savings in the cost to modify the home and can increase the potential market of buyers when it comes time to sell.
- Incorporate the principles of passive solar design - appropriate orientation, ventilation, insulation and shading. This will keep the house naturally cool, reducing the need for fans and air-conditioning and reducing energy bills. Long-term maintenance costs will also be reduced as the home and its contents are more protected from the elements.
- Use a simple and logical layout without awkward corners or unnecessary steps to help prevent incidents that cause spillages and breakages and in turn, reduce cleaning and replacement costs.
- Minimise the use of steps to reduce the risk of falls and other injuries.
- Minimise plumbing runs by positioning 'wet areas' close together and as close to the hot water system as possible. Locate the hot water system as close to the kitchen as possible. This will mean savings not only in the initial construction but also in ongoing energy bills, because the length of the hot water pipes will be minimised and there will be a reduction in the amount of hot water wasted when left in the pipes to cool.
- Ensure that activity in the street can be observed from the main living areas and similarly, that neighbours can see any potential intruders approaching the house. This will reduce the risk of break-ins.
- Design for standard size materials and products like wall sheeting and windows. For example, match wall lengths to suit wall sheet lengths and brick or blockwork sizes to reduce material wastage and labour costs.
- Specify recycled, local or readily available materials where possible.
- Eliminate slippery surfaces and other hazards that can lead to falls and other injuries.
- Choose a design and construction method that is appropriate to the contours of the site and soil type, minimising expensive site work.

OUTSIDE THE HOME

- Use self-finished materials such as bricks, coloured render or colour bonded finish to reduce the periodic cost of painting.
- Select light coloured roof and wall material that absorbs less heat.
- Avoid over-complicated roofs by considering the roof design at the planning stage.
- Avoid costly external corners that do not contribute to the appearance or performance of the house.
- Limit high maintenance materials in difficult to reach locations (eg. high timber gables over sloping ground) to reduce the cost of scaffolding required during routine maintenance.
- Use wide roof overhangs which protect the house from the elements.
- Reduce the risk of structural movement with an efficient surface drainage system. Locating hose taps away from the house will help, as will providing hard-paved areas under external taps.
- Design your garden to increase on-site absorption of water to help prevent storm water run-off.
- Consider water tanks to capture roof-water, which can be used for flushing toilets and watering the lawn and garden.
- Reduce the need to water by planting only those plants that are native to the local areas and by thickly mulching garden beds.
- Minimise the size of lawns.
- Consider the long-term maintenance of landscaping. For example, umbrella and fig trees have invasive roots which can lead to expensive damage.

Approaching the home

1 neighbours can see people approaching the house
2 wide doorways
3 light coloured roof
4 house orientated to capture breezes
5 locally produced building materials
6 construction method appropriate to the contours of the site
7 street activity can be observed from living areas
8 slip-resistant surfaces

Entering the home

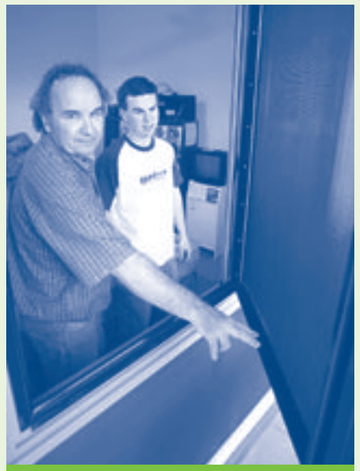
1 light coloured wall absorbs less heat
2 coloured render walls don't require painting
3 large windows are well shaded
4 wide overhangs provide shade and rain protection
5 avoid soft landscaping near the house
6 well drained surfaces
7 locally native planting with low ground cover to front yard
8 step-free threshold
9 slip-resistant surfaces

Taking a tour of a cost-efficient home continued

- Ensure that a termite management system is in place. This is now required under the Building Code of Australia for all new residential dwellings. You should consider the maintenance requirements of the system you select.
- Avoid soft landscaping such as garden beds against the house to allow easier detection of termites. Garden beds against the house also increase the risk of root damage and structural movement from ongoing watering.

HEATING AND COOLING

- Insulate the roof, ceiling and walls. This helps to keep the home comfortable without relying on expensive heating and cooling.
- Ridge vents, ventilated eaves and gables allow cooler air to displace hot air in the roof-space.
- Ceiling vents remove hot air from the house in summer and can be closed in winter to retain warm air internally.
- Ensure living areas have been located for optimum exposure to cooling breezes and main living areas are protected from the hot western sun.
- Ensure that windows are well shaded in summer in hot climates and have a high Window Energy Rating (www.wers.net). This will ensure heat is kept inside the house during winter and outside of the house during summer, therefore reducing heating and cooling costs.
- Louvre windows and correctly orientated casement windows allow the summer breezes to cool the home. If using a casement window, ensure it doesn't open out into pathways.
- Wide overhangs provide shade to external walls helping to keep the home cool and protecting the building from the elements.
- Include higher ceilings (2,700mm) which allow for the safer operation of ceiling fans and allow the hot air to rise above the living space. Fans help to keep the home cooler in summer, reducing the likelihood of requiring air-conditioning. They can also assist in winter by ensuring a better distribution of warmer air. Balance these benefits against the increased construction and installation costs.
- If you must install air-conditioning, consider a reverse cycle system which heats and cools. Ensure you install the appropriate air-conditioner for your home. Ask for expert advice.
- Similarly, if installing a heating system, ensure that it is appropriate for the area to be heated. If the area is greater than 25m^2 consider a reverse cycle air-conditioner, ducted heating or a large capacity gas heater.
- Always insulate before installing a heating or cooling system.
- In areas that experience cold climates, design living rooms that can be sealed off from the rest of the house to reduce heating costs in winter. Rooms that will be occupied during the day in winter should be built on the northern side of the house to receive the winter sun.

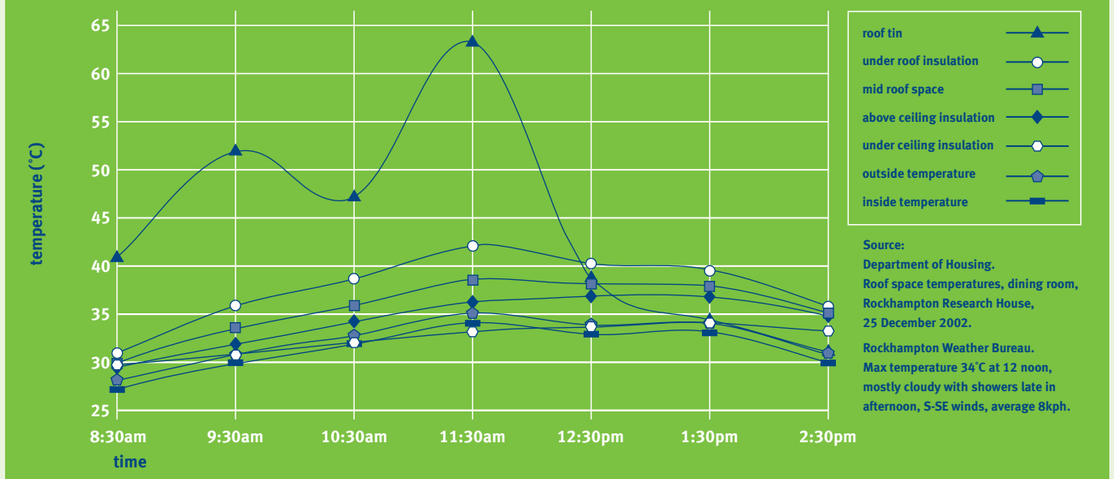


Correctly chosen, well positioned windows will save you money and increase the comfort of your home all year round. Windows are critical to the overall energy efficiency of the home.

Living areas

1 easily accessible light switches
2 level threshold
3 glass door shaded from the sun
4 window provides good natural light
5 sufficient electrical and cable outlets allow flexible furniture arrangement
6 high ceiling
7 living room designed for cross ventilation

The cooling effects of insulation and ventilation



Source:
Department of Housing.
Roof space temperatures, dining room, Rockhampton Research House, 25 December 2002.

Rockhampton Weather Bureau.
Max temperature 34˚C at 12 noon, mostly cloudy with showers late in afternoon, S-SE winds, average 8kph.

Above: The graph outlines the roof temperature monitored in the Department of Housing's Research House in Rockhampton on the hottest day recorded for the summer of 2002 – 2003. Insulation and ventilation cool the house to keep it at a comfortable temperature throughout the heat of summer, reducing the need for expensive air-conditioning.

Taking a tour of a cost-efficient home continued

Moving through the home

1 locally available building materials
2 wet areas grouped together
3 water efficient taps, toilets and showers
4 spacious bedrooms
5 west facing windows are well shaded
6 windows in the exposed western aspect avoided
7 western wall shielded by vegetation
8 bedside light switches
9 wide, well positioned doors
10 accessible storage
11 insulated external walls
12 wider hallways
13 level threshold
14 indoor and outdoor living areas on the north are shaded in summer and receive sun in winter
15 energy efficient appliances
16 windows provide natural light and cross-ventilation
17 landscaping has low water needs
18 street activity able to be observed from living area

LIGHTING AND CONTROLS

- Install sufficient electrical, telephone, television and data cable outlets to allow flexible furniture arrangement. Consider both your current needs and reasonable future needs. These features may incur a minimal cost at the initial construction stage but will be expensive to change later.
- Position switches and sockets in easily accessible locations, (out from the corners and 600mm above the floor) and away from windows where curtains may present a fire risk. This incurs no cost at the initial construction stage but will be expensive to change later.
- The size and location of windows and skylights should reduce the need for artificial lighting throughout most of the day.
- Install insulated skylights to ensure they let in light and not heat. Check its skylight energy rating (www.wers.net).
- Install energy efficient lighting such as fluorescent lights and avoid low voltage halogen downlights. Avoid incandescent lights except in infrequently used areas.

  If using multiple low voltage halogen lights, split the lights into groups that can each be controlled from their own switch. This is especially useful for task lighting.
- Arrange light switching so that a person can safely light the way ahead. For example, use two-way switches at each end of a passage; at the top and bottom of stairs; between the garage and house; between the bed and bedroom doorway; and a sensor light at the entrances to the home.

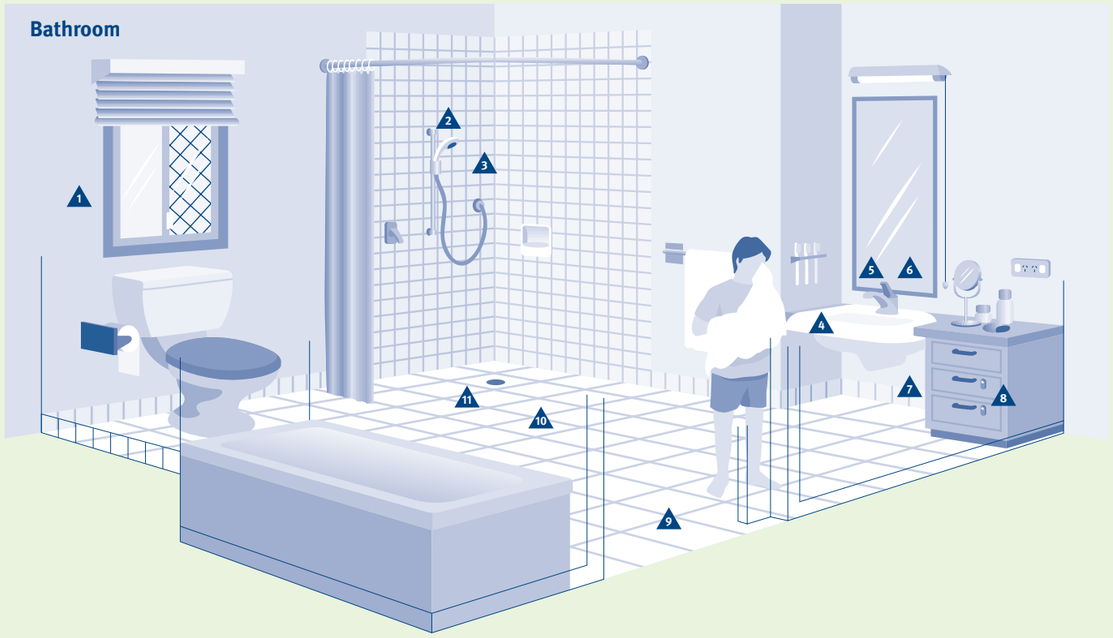
KITCHEN

- Use standard sized kitchen cabinets where possible.
- Install AAA-rated water efficient taps.
- Give careful consideration to the kitchen design to reduce the likelihood of collisions and therefore injuries such as burns and scalding. In particular, do not design the kitchen to double as a passageway.
- Position the fridge away from the stove and direct sunlight and provide enough space for air to circulate freely around it. This will enable it to operate more efficiently, saving on electricity.
- Install a gas stove or a fan-forced oven, as they use less energy.
- Install a child-proof cupboard where poisons or medicines can be safely stored.

Taking a tour of a cost-efficient home continued

BATHROOMS AND LAUNDRIES

- Design for standard size bathroom vanities.
- Run the tiles under cabinets and through to the walls. This will save on tiling costs in the future if the cabinets are replaced.
- Reinforce walls in areas where grab-rails may be required. This is only a minor expense at the initial construction stage but will mean significant savings on the cost to modify if grab-rails are required in the future.
- Install an efficient water heating system such as gas, solar or heat pump.
- Use AAA rating low-flow shower heads and low water-use toilets and taps to reduce water usage.
- Ensure step-free reduced-slip, surfaces throughout, including a hobless shower, to reduce the chance of a fall and to make cleaning easier.
- Ensure that the positioning and locking features of cupboards and fittings keep poisons, medicines and detergents out of reach of children.
- Provide space inside or undercover for drying clothes to avoid having to rely on a clothes-dryer during wet weather.
- Ensure that all areas likely to be affected by water are protected to prevent water damage. For example, extend bathroom wall tiles out past the end of the bath.



1 reinforced walls
2 water saving shower
3 use an efficient water heating system
4 standard size fixtures
5 lever taps
6 water saving taps
7 tiles continued behind cabinet
8 lockable cabinets
9 reduced-slip floor
10 level shower entry
11 shower floor drains quickly

FIXTURES AND FITTINGS

- Install an efficient water heating system such as gas, solar or a heat pump.
- Select durable and low maintenance fixtures and fittings.
- Ensure that the floor covering has a reduced-slip surface to reduce the risk of falls.
- Use standard sized wardrobes, windows and cupboards where possible.
- Install security features such as security screens and deadlocks. This may reduce house and contents insurance premiums in many towns and suburbs.
- When renovating, wire smoke alarms into the electricity supply and have a battery back-up. This feature is legally required in all new residential dwellings.
- Where water pressure exceeds 500 kilopascals (kpa), consider fitting pressure limiting valves (350 kpa or similar) on the home main water supply line. This will reduce pressure on water supply accessories such as taps, and therefore reduce wear and tear and prevent premature replacements and maintenance.


Heat pump

Careful thought as to the fixtures and fittings used throughout the home can impact dramatically on energy and water use which in turn, means financial savings for you.


Water tank


AAA low-flow shower

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 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 'Cost-efficiency for the home owner' section of this booklet.

Will people want to buy a Smart House?

Providing flexible, user friendly housing will maximise the number of people who want to buy and live in the home. Potential buyers who are attracted to the Smart Housing features in your home may be facing thousands of dollars to retrofit similar features to other houses they have inspected. Therefore, Smart Housing features potentially increase the value of your home. As a result, Smart Housing will benefit the home owner and investment buyers.

A Smart House offers more flexibility and comfort, making it more desirable to consumers and a better investment in the long-term. Practical features and the ability to adapt to what people need can increase the resale value and marketability of the property.

Buyers can purchase a home that provides the space they require today, with the option of adapting it later if their needs 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. In fact, if designed well, many of the features will go unnoticed. The house will feel better and be more liveable.

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; being able to stay in your home longer; helping the environment; and more people interested in your house when it is time to sell.

Endeavour Prize Home, designed by Waratah Colonial Homes.

above: Designed by City Design, Brisbane City Council.

above: Research House, Rockhampton. Designed by the Queensland Department of Housing and the Department of Public Works.

Smart Housing features can be applied to detached, medium density and high rise residential dwellings. Smart Housing is a cost-efficient, resource efficient approach to housing design and construction that will meet your changing needs and have less of an impact on the environment.

Designed by Iezzi Design Enterprises and Architects.

More information and useful references

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Web sites

Australasian Window Council Inc. for information on the Window and Skylight Energy Rating Schemes **www.wers.net**

Child Home Safety Construction Guidelines, Queensland Health **http://www.health.qld.gov.au/phs/documents/shpu/12685.pdf**

Design Matters, a catalogue of exemplary affordable housing located throughout the United States. Complied by the City Design Center at the University of Illinios at Chicago **www.uic.edu/aa/cdc/AHDC/website/**

EnergySmart Allies, a directory of suppliers of energy efficient products managed by the NSW Sustainable Energy Development Authority **www.energysmartallies.com**

Energy Advisory Service, Environmental Protection Agency **http://www.epa.qld.gov.au/sustainable_energy/**

Green Home Guide: Sustainable living, renovating and building in Brisbane. Brisbane City Council **http://www.ourbrisbane.com/home_garden/index.htm**

Lifetime Homes. Joseph Rowntree Foundation: UK **http://www.jrf.org.uk/housingtrust/lifetimehomes/**

National Association of Home Builders Research Centre (America's Housing Technology and Information Resource) **www.nahbrc.org**

Sustainable Energy Development Authority: NSW **www.energysmart.com.au**

Thisplace.com – a comprehensive building price guide **www.thisplace.com.au**

Wilderness Society, a fully searchable database of recycled timber and second-hand building materials **www.timbershop.org**

Your Home: Good Residential Guide. Australian Greenhouse Office: Canberra **www.yourhome.gov.au**