

guidelines for sustainable development

March 2005

The Sustainability Guidelines are an evolving resource for all applicants, including planners, developers and builders, who wish to lodge a Development Application with Brisbane City Council.

Each Guideline corresponds to a principle from Council's *15 Principles for Sustainable Development* and provides supplementary information that explains Council's intent, proposes acceptable outcomes and provides links to relevant sources of information. These are not definitive lists and it is expected that these will continue to be updated and revised to reflect changes in technology and practice.

The advices in the Guidelines relate only to sustainable practices that broadly fall within Brisbane City Plan 2000. They are in no way meant to discourage applicants from considering innovative and best practice solutions that are currently beyond the scope of Council's regulatory framework, especially where they are clearly quantifiably superior outcomes. The exception will be where these might conflict with existing State and Federal Laws.

Council would further advise applicants to liaise with the Development Assessment Sustainability Team early on in the conceptual/planning stages of their application. This allows issues that might be positive sustainable outcomes, but conflict with other Council policies to be identified early and solutions sought that will improve processing when the application is submitted to Development Assessment.

The Development Assessment Sustainability Team is able to advise further on the Guidelines and how Council can best respond to your sustainability project.

Principle 01 - Establish agreed sustainable design values

Starting with a clear and agreed outcome and priorities on sustainable development before commencing the project will save time later, avoid conflict and help communication with Council, community and during development.

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Project concept and design

From conception of the project, every decision should have regard for sustainable outcomes. Applicants should refer to the *Principles for Sustainable Development in Brisbane* to help identify the desired outcome and appropriate sustainability elements in the development, and consider a prelodgement meeting with Council.

Integrated design

Some of the benefits of integrating sustainability into the initial design are that this can save costs in retrofitting and on operating costs over the life of the building. The outcome is also more comprehensive and effective when all sustainability elements are addressed together.

Communication and engagement with design team, Council, community and end users

Once the design team has been commissioned it is important to clearly communicate the desired outcome and sustainability features to all members of the design team, Council, community, and end users to reduce potential conflict and to ensure that the sustainability intentions are achieved. Communities vary in their knowledge about planning and sustainability concepts, so it is useful to listen to their input as experts about their local community, as well as offer opportunities for them to learn more.

further information

- **Brisbane City Council, Principles for Sustainable Development in Brisbane.** For a copy please contact the Development Assessment Sustainability Team via the Council Contact Centre on 3403 8888.

Principle 02 - Apply an integrated and collaborative design and construction process

Sustainable development is not the business of any one profession, trade or group. By working together as a team with common values and aims, a better outcome can be achieved. This means professionals working beyond traditional boundaries and Council being open to alternative and innovative solutions.

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Design Team

As identified above, it is important to have a good working relationship within the *design team*, between *Council and the applicant*, and also with *construction team*. For these three teams to work effectively a clear outcome must be defined at the beginning of the project.

Design materials

Applicants can reduce the impact of the design and documentation process by:

- utilising recycled paper or paper alternatives
- reducing the number of coloured inks used
- using low volatile organic compounds (VOC) inks or ink alternatives
- recycling toner cartridges
- providing an electronic copy of the application, in addition to the required number of hard copy documents
- providing relevant sections of the approved construction drawings on A4 or A3 for use on-site as not everything on each A1 page is relevant to each subcontractor. These smaller sizes are easier to manage on-site, and save paper and ink.

further information

- **Earth Graphic Design** <http://www.evc.com.au/enviro.html>. Information on 'green' practices for the design industry
- **Corporate Recycling** <http://www.corporaterecycling.com.au/cartcollection.shtml>. Information on recycled products and recycling processes of some products
- **Sustainable Gardening Australia** <http://www.sgaonline.org.au/aboutsga.html>. Information for sustainable landscapes and nurseries.

Principle 03 - Design for our subtropical place

Brisbane has a subtropical climate. This influences our lifestyle, built and natural environments. Design to respect and work with our climatic dimensions, contribute to Brisbane's unique subtropical landscape and provide for a relaxed outdoor lifestyle is important to ensure that Brisbane's point of difference is maintained.

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Site analysis

A first and critical step in reinforcing the City's subtropical landscape, image and lifestyle is site planning, which involves

- choosing a site with consideration to orientation, access and topography
- reflecting the site's history
- incorporating significant features of the site
- maintaining the topography and minimising cut and fill
- retaining significant trees and other vegetation
- understanding the character of your local neighbourhood and designing your development sympathetically
- orientating the development towards streets or open space to improve casual surveillance and amenity
- orientating for passive heating and cooling
- considering how to protect natural features such as bushland and waterway corridor
- understanding context of the site in terms of landscape values and aiming to enhance and protect existing values, including shade cover, scenic amenity, sense of place and natural bushland
- considering overland flow paths when orienting buildings, landscaping etc.

Site processes

Careful consideration of site works can assist to preserve the City's subtropical feel by:

- avoiding unnecessary disturbance to vegetation and soil
- limiting clearing outside the building footprint.

Built environment

Express sustainable subtropical design elements (eg energy, water and waste minimisation) in the building form and detailing by:

- supplying large overhangs / eaves to shade building and create a comfortable indoor / outdoor edge
- connecting living areas directly with generous balcony space or indoor / outdoor areas
- maximising breeze and light
- providing large openings to further link inside and out and provide and encourage good natural ventilation
- using varied materials, roof forms and building setbacks in light colours
- creating identifiable and distinctive entries
- utilising adjustable screening for sun-shading and privacy
- designing contemporary buildings which are in keeping with local character
- elevating building to permit airflow beneath floors
- considering high or raked ceilings.
- designing and building for cyclonic conditions.
- setting garages and carports away from the house frontage to minimise their visual impact.
- limiting the width of driveways
- including awnings, active frontages and pedestrian amenities
- avoiding high solid fences on the front / street boundary as they isolate the home from the neighbourhood.
- respecting your neighbour's privacy, sunlight and views

- incorporating water recycling opportunities and on site water sensitive urban design
- using insulation with the highest R-value available (the higher the R-value, the greater the insulating effect).

Natural environment

Landscaping should support sustainable subtropical design by:

- considering plant species selection, utilising appropriate locally occurring native species
- investigating water requirements for plants to minimise water requirements
- retaining water on site to reduce run off to stormwater through decreasing hard surfaces, using rainwater tank, raingardens and porous paving
- enhancing the micro-climate through providing shade to solid heat-radiating walls
- providing appropriate seasonable shade and passive cooling / heating throughout the year to outdoor areas
- protecting and planting street trees to enhance the quality of the street
- incorporating deep planting for substantial trees with limited above ground structures and no below ground structures
- encouraging inclusion of raingardens, green roof, eco-walls, permaculture or community gardens
- installing an automatic watering system (it must be a water efficient system with subsoil drip systems and automatic timers with rainwater or soil moisture sensor control override, if necessary).

further information

- **Centre for Subtropical Design** <http://www.dbe.bee.qut.edu.au/resrchcomm/colabresearch/researchunit/centreforsub/index.jsp>. This site promotes design excellence and high quality planning that responds to the City's subtropical and sustainable characteristics.
- **Queensland Government Smart Housing** http://www.housing.qld.gov.au/builders/smart_housing/index.htm. Information on how to make houses environmentally, economically and socially sustainable.
- **Green Home** <http://www.dreamgreenhomes.com/>. Information on sustainable home design and construction.
- **Australian Greenhouse Office, Your Home Guide** <http://www.greenhouse.gov.au/yourhome>. A consumer guide, technical manual and tools to encourage design, construction or renovation of homes to be comfortable, healthy and more environmentally sustainable.
- **Flora of Australia Online** <http://www.deh.gov.au/biodiversity/abrs/online-resources/flora/main/index.html>. Provides detailed information on all Australian plants and distribution maps.
- **Society for Growing Australian Plants (Qld)** <http://www.sgapqld.org.au/>. Provides detailed information on Queensland plants and nurseries.
- **Brisbane Rainforest and Information Network** <http://www.brisrain.webcentral.com.au/>. A Brisbane bushcare group with information about regeneration of rainforest in Brisbane.
- **Queensland Government Department of Natural Resources and Mines** <http://www.nrm.qld.gov.au/factsheets/groups.php?group=Vegetation>. Fact sheets for suitable plants, including information on different soil types or rainfall.
- **Greening Australia** <http://www.greeningaustralia.org.au/GA/QLD/>. Information for landholders, community and business on environmental degradation.

Principle 04 - Protect and restore the natural ecosystems

Protecting and restoring ecological processes, landscape values including vegetation, shade, sense of place, heritage and scenic amenity, and features of Brisbane's unique natural landscape will ensure the long term ecological sustainability of the City. The natural environment is a key asset of the City and is highly valued by the Brisbane community. Enhancing and incorporating natural features and processes is good for all parties.

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Protecting and restoring ecological processes

Ecological processes of the site can be restored and protected through careful planning. Ways to do this include:

- detailed surveying and evaluation of the on-site ecological values, including vegetation communities, significant species, wetlands, waterways, and ecological corridors, and planning development to respond to these features
- recognising and protecting existing ecological processes
- restoring ecological processes appropriate to the site
- providing for future growth, opportunities and maintenance of ecological processes
- creating fauna corridor connectivity through the provision of appropriate fauna furniture – fences, bridges, culvert and bridge design, glider poles etc
- incorporating low impact construction techniques to minimise the development's footprint, such as minimise cut and fill, implement adequate erosion and sediment controls, such as sediment fences, or sediment basins, use common trenching, fence sensitive areas etc.
- Incorporating water sensitive urban design to minimise the impact of the development on ecological processes

Biodiversity

Biodiversity-friendly urban developments minimise their impact on local ecological processes and fauna. Ways to do this include:

- incorporating water sensitive urban design
- employing selective and minimal clearing
- using building location envelopes to minimise the extent and impact of development
- establishing reserves for significant species
- planting native locally occurring vegetation in all landscaping
- using covenants and body corporate structures to protect on-site ecological processes
- implementing pet controls to minimise potential impact on local fauna.

Landscape design

Sustainable landscapes are designed to mitigate climatic factors, create visual interest and restore ecological functions at the site in terms of water and air quality and the provision of fauna habitat. Typically they will:

- minimise water use with gardening practices such as mulching, planting low water use species, minimising lawn, drip irrigation and locating any high water use species in conjunction with stormwater retention areas
- provide opportunities to shade public and private spaces, with shade which is seasonally responsive, adjusts the micro climate, and shades western walls through summer, using trellises and deciduous climbing plants to provide shade in summer and allow light in winter
- retain or restore existing trees and vegetation to public and private domains. The benefits of this include reinstatement of native vegetation communities, provision of local habitat, and re-establishment of fauna movement corridors. For further detail, contact the Ecologist in the relevant Development Assessment Team
- provide a sense of identity and place through landscaping, incorporating and recognising heritage of the site / area.
- utilise on-site water recycling opportunities to irrigate landscape areas eg rainwater tanks and raingardens

Scenic amenity

Scenic amenity can be preserved and enhanced through the development by:

- maintaining vegetation on ridgelines
- promoting or framing views and vistas
- retaining or incorporating appropriate significant landscape trees
- maintaining appropriate existing vegetation
- maintaining waterway corridors
- protecting and enhancing streetscape amenity.

further information

- **Brisbane City Council, Green Home** http://www.brisbane.qld.gov.au/BCC:STANDARD:1775592936:pc=PC_1265. Fact Sheet – Sustainable Gardening
- **Mark Carden and Mary Maher and Associates, Nature Smart**. For a copy please contact Environment and Parks Branch via the Council Contact Centre on 3403 8888.
- **Save Water Plant Selector** <http://www.savewater.com.au/default.asp?SectionId=212&SortTag=323>. A tool to aid appropriate plant selection.
- **Environmental Protection Agency, New South Wales Government, Landscaping Industry Fact Sheets** <http://www.epa.nsw.gov.au/resources/landscapefacts1to6.pdf>. Information on design, materials and plants, chemicals etc
- **SEQ Scenic Amenity project** <http://www.scenicseq.info>. A community research study to identify valuable scenic places in South East Queensland and develop context-appropriate guidelines for development in or near open space.

Principle 05 - Utilise land appropriately

Land is a finite resource and with ongoing growth and development pressure we need to ensure that this resource is managed, protected and developed responsibly. Land matters range from the macro to the micro, such as land use transport integration, context and site analysis, contamination, cut and fill and topsoil protection.

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Context analysis

The development should respond to and integrate any existing and proposed development in the area, for example, linking with existing roads, reserves, vegetation communities and infrastructure movement networks, and providing good access to local shops and community facilities.

Land use transport integration

The development should integrate with transport systems, particularly public transport, by:

- providing the most direct, safe and attractive movement networks to public transport stops where pedestrian use is prioritised
- providing safe access for non-vehicular traffic
- providing priority parking for disabled, parents with children, car poolers, bicycles and motorcycles
- encouraging casual surveillance and amenity of pedestrian and cycle paths by having active frontages and activity at street level
- investigating opportunities to implement car free or car sharing design, and pedestrian only precincts.

Site planning and analysis

Site planning should identify the characteristics of the site and surrounds, as well as opportunities for integration of sustainable design elements by:

- utilising already cleared areas rather than clearing vegetated areas
- avoiding ecological and waterway corridors
- considering passive design to minimise the need for mechanical cooling and heating
- considering solar and breeze access to public open spaces, private living and outdoor spaces
- providing a car washing area which drains to the garden, not stormwater system
- providing access to existing and planned land uses
- designing to reduce car use (particularly single occupancy journeys) and increase use of public transport, walking and cycling
- reducing traffic speeds and improved road safety and personal security particularly for pedestrians and cyclists.

Contamination

Development should ensure that:

- contaminated land, or land with containment facilities, should not be included in public spaces such as road, park or reserves
- construction, landscape and waste materials are appropriately and securely stored on site
- materials being imported to the site are free from contamination and pests, and landscaping materials are certified to AS 4454-2003 (or the current Australian Standard).

Cut and fill

Development should ensure that:

- cut and fill requirements are balanced on site, minimising the need to import or export fill to or from the site
- buildings are designed to maintain the topography and minimise the extent and duration of disturbance.

Topsoil protection

Retention and reuse of topsoil on site has many benefits as it often provides a seed bank of appropriate endemic species, and reduces the need for importation of soil from other sites, reducing the risk of spreading red fire ants.

further information

- **Environmental Protection Agency, Queensland Government** http://www.epa.qld.gov.au/ecoaccess/contaminated_land. General information about contaminated land, and management processes.
- **CarShare Australia** <http://www.csau.com.au>. Information about Australia's only commercial car sharing service.
- **Subdivision for People and the Environment** SNZ HB 44:2001 http://www.smf.govt.nz/results/9038_subdivision_handbook.pdf. Context analysis and design process, design solutions for on-site management of storm- and waste water, energy etc, and land tenure options, and management strategies.
- **Western Australian Government, Liveable Neighbourhoods** <http://www.wapc.wa.gov.au/cgi-bin/index.cgi?page=/publications/content.html>. Alternatives to the design of neighbourhoods that aim to achieve compact, well connected and more sustainable urban communities.

Principle 06 - Apply integrated water management

By considering the whole water cycle on site and aiming to minimise ins and outs, the load on water, sewer and stormwater infrastructure will be reduced and South East Queensland's most precious and limited resource protected. Simple as well as innovative engineering and management practices can reduce consumption and demand while providing a reliable, low-cost alternative to conventional practices. Improving stormwater has benefits for our waterways and Moreton Bay.

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Integrated water management strategy

An integrated water management strategy should be prepared for the development which considers waterways, rainwater, stormwater, greywater, blackwater, the highest available ratings for appliances and fittings, etc for the development. This strategy should consider minimising water into and out of the site.

Rainwater collection and reuse

Rainwater harvesting should be incorporated in developments to ensure collection and treatment to suit the end-use and reuse of the rainwater. Harvesting rainwater can minimise use of potable water. To help minimise water leaving the site, rainwater can be collected and stored on site, for suitable uses, such as gardens. Rainwater tanks should:

- be installed with an appropriate capacity for and connection to suitable uses
- if used for toilet flushing, be fitted with a gravity fed back-up supply of 3 hours in case of power failure
- be plumbed into all uses in accordance with Australian Standard 3500 – *Plumbing and Drainage 2003* (or the relevant Australian Standard)
- include the collection of condensation from any cooling tower or air conditioning plant.

Brisbane City Council is currently offering a rebate for domestic rainwater tanks.

Stormwater

The development should minimise the amount and velocity of stormwater leaving the site by:

- minimising the extent of impervious surfaces
- using gravel paths, soakwells, well mulched garden areas, infiltration trenches and swales
- considering using podium / roof top gardens to minimise run off, and also provide greywater reuse and thermal insulation.

Greywater

Where suitable and where permitted by State Government regulation, identify opportunities for on site collection, treatment and reuse of greywater. Greywater to be treated to an acceptable standard and used for suitable purposes such as watering the garden.

Blackwater

Where suitable and where permitted by State Government regulation, on-site blackwater treatment and reuse for suitable purposes is encouraged.

Landscape design

The development can help reduce the amount of water required through appropriate landscape design by:

- using locally occurring native species
- if high water use plants are to be used, locating them close to stormwater retention areas
- retaining or incorporating deep-rooted trees as they help to maintain the natural water table. This is especially necessary where the site has salinity or acid-sulphate soils
- reducing the area of lawn as lawns require substantial amounts of water and also fertiliser, herbicides and pesticides

- ensuring that gardens are well mulched to reduce evaporation and control weeds
- where necessary, including an underground irrigation system (preferably connection to a rainwater harvesting system) with timing or moisture / rain sensors.

Water efficient fittings and appliances

Fittings and appliances can also make a difference to how much water is used by incorporating:

- flow control devices on all water outlets
- tap aerators in kitchens, laundry and hand basins
- fittings and appliances (shower heads, dishwashers, washing machines, toilets, urinals, taps etc) with as high an A-rating as possible (5A is the best). Waterless toilets and urinals are also available
- insulated covers for outdoor pools to minimise evaporation, and to retain heat during cooler months.

Smart metering

Smart meters help raise occupant awareness of how much water is being used and how much it is costing. Meters should be installed in a highly visible and frequently used area in each dwelling or tenancy, and show current period, previous water use and associated cost of that use. Meters can also display similar information about electricity and gas use in the same device.

further information

- **Brisbane City Council, Green Home** http://www.brisbane.qld.gov.au/BCC:STANDARD:1775592936:pc=PC_1265. Fact Sheets – Water Efficiency, Rainwater Tanks
- **Waterwise Systems** <http://www.watersmart.com.au>. Alternative technology/ products for promote water efficiency.
- **New South Wales Government, A-Rated water fittings and appliances** [http://www.basix.nsw.gov.au/information/common/pdf/designguidelines/w04 a rated water fittings.pdf](http://www.basix.nsw.gov.au/information/common/pdf/designguidelines/w04_a Rated_water_fittings.pdf). General information about water appliance rating and ways to improve water efficiency.
- **Melbourne Water** <http://wsud.melbournewater.com.au>. Information about water sensitive urban design.
- **Environmental Protection Agency, Queensland Government** http://www.epa.qld.gov.au/publications/p00412aa.pdf/Recycled_water_and_you.pdf. General information on water recycling and appropriate uses.
- **Brisbane City Council** http://www.brisbane.qld.gov.au/BCC:STANDARD:276961831:pc=PC_1304. Domestic rainwater tank rebate.
- **Water Services Association of Australia** <https://www.wsaa.asn.au/frameset2.html>. Provides information about the water rating scheme and product search facility.
- **Environmental Protection Agency, Queensland Government** http://www.epa.qld.gov.au/publications/p00414aa.pdf/Recycled_water.pdf. General information on recycled water.
- **Alternative Technology Association** <http://www.ata.org.au>. Promotes solar and wind power, energy saving and water conservation.

Principle 07 - Manage energy use

Energy management involves considering the nature of the development and key energy uses during operation, planning to minimise energy use and incorporating renewable energy sources. Reducing energy demand will result in fewer greenhouse gas emissions, help reduce and create less dependence on non-renewable energy sources.

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Alternative / renewable energy

The development considers less greenhouse intense energy sources other than traditional coal-generated electricity, including gas and renewable energy, such as hydro, wind or solar. Ways to incorporate greenhouse efficient energy into your project would be:

- connecting gas to each dwelling unit or tenancy to enable a choice of gas for hot water, cook top, oven and heater connection.
- considering interchange of on-site generation with grid supply, such as solar thermal or wind technology, or innovative technology such as micro-hydro generators.

Hot water systems

In Queensland, the hot water system is the single biggest use of residential electricity. Alternatives to electric hot water systems are gas, solar or heat pump hot water systems either centrally located in each building or in each dwelling or tenancy. For efficiency, solar hot water systems should have a maximum of 25% boosting. Solar hot water systems generally cost more to install but the reduced running costs means that residents have more disposable income.

Queensland Government is currently offering a rebate for solar hot water systems.

Hot water system location

Locating the hot water systems close to kitchen, bathroom and laundry will minimise the amount of hot water wasted, as well as insulating pipes leading from the hot water system. Designing buildings so that high water-using rooms are located together will result in lower water and energy wastage.

Passive design

Buildings offer protection from the extremes of the outdoor environment. Rather than mechanically heating and cooling buildings, passive design can capitalise on the sun's energy, breezes, topography, vegetation and other elements. In Brisbane, the value of capturing breezes can be as significant as good solar orientation. The development should incorporate passive design by:

- orienting for optimum passive cooling and solar heating
- arranging the floor plan to match solar and breeze orientation to room use
- choosing colour and building materials to enhance heat reflectivity
- maximising cross ventilation through building fabric, internal layout and detailing and use of passive, or low energy consuming technologies
- allowing for ceilings at 2.7m rather than the minimum 2.4m enabling for greater air ventilation and space for ceiling fans
- using thermal mass and protection from summer sun appropriately
- providing opportunities for occupants to adjust indoor climate (eg adjustable shading)
- providing shading to glass and walls to reduce heat gain especially on west facade
- insulating walls, floors and ceilings to minimise heat gain and loss
- protecting windows from rain.

Heating and cooling

If mechanical heating or cooling is necessary, ensure that the systems are energy and water efficient. Mechanical heating and cooling should be designed to ensure:

- any air conditioning unit or system complies with the minimum energy performance requirements set out in AS/NZS 3823.2.2003 (or the most current Australian Standard)
- where a cooling tower is used it is water efficient and, where appropriate, uses non-potable water
- temperature controls are installed in individual dwellings or tenancies so occupants are able to adjust the temperature to suit themselves.

Thermal performance rating system

All buildings should be designed and constructed to achieve the maximum thermal performance possible. Thermal performance can be estimated using one of a number of different energy rating schemes. If incorporated at the design stage, the cost of additional materials and features required to achieve a higher thermal performance rating should be minimal.

Energy efficient lighting

Energy efficient lighting can help to reduce operating costs to end owners by incorporating:

- sensors, timing switches, dimmers, two way lighting, diffused light, use of high efficiency lamps rather than traditional incandescent lamps
- external security lighting controlled by time switches or daylight sensing switches and / or motion sensors
- individual or enclosed spaces which have individual light switches or automatic occupancy detection
- switching which is clearly labelled and easily accessible by building occupants
- energy efficient configurations eg lights near windows which are on a separate switching system from those in dim areas of the room.

Daylighting

The development should be oriented to reduce the need for artificial lighting by maximising daylight in habitable areas, whilst minimising heat and glare. Ways to achieve this include skylights, atriums or light shafts, and adjustable shading.

Appliances

Appliances can use a substantial amount of electricity in the home and workplace. Installing appliances with the highest energy rating possible will help reduce the amount of power consumed.

Smart metering

Smart meters help raise occupant awareness of how much electricity they use and how much it is costing. Smart meters show previous and current energy use, and associated costs and are best displayed in a highly visible and frequently used area. Smart meters can also be accessed by utility providers for remote readings, reducing the need for utility staff to take manual readings.

further information

- **Brisbane City Council, Green Home** http://www.brisbane.qld.gov.au/BCC:STANDARD:1775592936:pc=PC_1265. Fact Sheets – Passive Design, Solar Energy, Hot Water Systems, Heating and Cooling your Home, Insulation.
- **Environmental Protection Agency, Queensland Government** http://www.epa.qld.gov.au/environmental_management/sustainability/energy/solar_hot_water_rebate_scheme/. State Government rebate for installation and maintenance of solar hot water systems.
- **Environmental Protection Agency, Queensland Government** <http://www.epa.qld.gov.au/publications?id=404>. Information on energy efficient home design.
- **Environmental Protection Agency, Queensland Government** <http://www.epa.qld.gov.au/publications?id=406>. Information on landscaping for energy efficiency.
- **Environmental Protection Agency, Queensland Government** <http://www.epa.qld.gov.au/publications?id=407>. Guide to energy savings for windows
- **Sustainable Energy Development Office, Western Australian Government** http://www1.sedo.energy.wa.gov.au/uploads/lighting_4pg_45.pdf. Lighting for homes
- **Australian Greenhouse Office** <http://www.greenhouse.gov.au/yourhome/technical/pdf/fs45.pdf>. Residential lighting
- **New South Wales Government** <http://www2.livingthing.net.au/action02/info/EnergySmartOfficeTips2001.pdf>. Office lighting
- **University of New South Wales, Key Centre for Photovoltaic Engineering** <http://www.pv.unsw.edu.au/info/solarcell.html>. General information on photovoltaic cells

Principle 08 - Select appropriate building materials

Selecting durable, low-embodied resource materials from renewable and recycled sources saves money over the life of the development and reduces pressure on natural resources. Design strategies and building techniques can be implemented to minimise waste during construction and operation.

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Local materials

Using local materials reduces transport costs and associated greenhouse gas emissions, and also supports the local economy.

Renewable / recycled materials

Using renewable or recycled materials will reduce the overall impact of the development on the environment. Many companies have already recognised the financial and environmental sense of using renewable or recycled materials in common construction products.

Using recycled materials also helps to create a viable market for recycled products which is beneficial to those involved in the demolition industry.

Embodied resources

An embodied resource is the sum of a resource (usually energy or water) that goes into making a material, including raw material extraction, manufacture, packaging, transport and installation. Calculating embodied resources is a sophisticated process and requires a high level of detail. Durability and anticipated lifespan of the product should also be taken into account with the information yielded by this process

Manufacturing process

For larger development companies, using standard material sizes and components will reduce waste and improve assembly and disassembly times.

PVC minimisation

Polyvinyl chloride (PVC) is a commonly used construction product, used for pipes, electrical wiring, flooring and wallpaper. PVC emits toxic compounds from the moment it is manufactured, polluting the whole environment, from indoors through to leaching in landfills. Due to the health hazards associated with PVC, alternatives should be preferred.

Sustainable timber

Using timber products from forests or plantations that have certified environmentally responsible forest management practices, helps protect old growth forests or rainforests and valuable habitat.

further information

- **Eco specifier** <http://www.ecospecifier.org>. A knowledge base of over 1000 environmentally preferable products, materials and resources.
- **Info link** http://www.infolink.com.au/browse_directory.asp. A directory of building products and suppliers.
- **Green Home** <http://www.dreamgreenhomes.com/>. Information on alternative and sustainable home design and construction.
- **Sustainable Architecture, Building and Culture, Embodied Energy and Life Cycle Analysis** <http://www.sustainableabc.com/lca.html>. General information on life cycle assessment.
- **CSIRO Manufacturing and Infrastructure Technology** <http://www.cmit.csiro.au/brochures/tech/embodied/>. General information about embodied energy.
- **Davis Langdon & Everest Construction Cost Consultants** <http://www.bco-officefocus.com/EECost/>. Detailed information on cost of embodied energy.
- **Greenpeace** <http://archive.greenpeace.org/toxics/pvcdatabase/productalt.html>. A complete register of pvc free alternatives and products.
- **SmartWood** <http://www.rainforest-alliance.org/programs/forestry/smartwood/>. An independent forestry certifier.
- **One Stop Timber Shop** http://www.wilderness.org.au/campaigns/forests/consumer/ons_stop_timber_shop/. A guide to environmentally preferable timber, wood and substitute products.

Principle 09 - Manage waste

Avoidance and minimisation of waste through the development and building process and in ongoing operation will relieve pressure on landfills and natural resources

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Waste management plan – construction, operation and demolition

A waste management / avoidance plan for construction, operation and demolition of buildings can save money for developers and end owners, primarily through reuse of materials and reduced dumping fees.

This plan should identify opportunities to reduce, reuse and recycle, such as using recycled products, or products with recycled content in the construction of the building. Using materials with a high recycled content also creates a market for recycled resources which is beneficial later on for the demolition phase of the building.

Construction and demolition

A waste management / avoidance plan for construction should consider:

- using products which are durable, reusable, recycled, and recyclable
- using minimal packaging
- minimising construction waste to save money in waste collection fees
- maximising the use of recycled materials which also strengthening the market for recycled materials
- recycling material during demolition such as excavation material, brick and roof tiles, concrete, timber, plasterboard, metal, glass, carpet, underlay and fittings.

Operation

Occupants of the development will be more likely to reduce waste going to landfill by recycling if it is easy for them to do so. Ways to make it easy include:

- providing clearly identifiable and distinct facilities for recycling, general waste and green waste (if applicable)
- providing communal garden spaces for recycling and composting
- locating waste facilities to allow easy access by the collectors and protection for the residents and the public from odour, views and collection noise
- promoting green waste recycling by not installing insinkers
- providing an education program for new residents / owners / tenants regarding the waste minimisation strategies included in the development.

further information

- **Brisbane City Council, Green Home** http://www.brisbane.qld.gov.au/BCC:STANDARD:1775592936:pc=PC_1265. Fact Sheet – Reduce, Reuse, Recycle
- **National Centre for Environmental Design** <http://onsite.rmit.edu.au/>. Information on waste avoidance and resource recovery related to construction and demolition.
- **EcoRecycle Victoria** <http://www.ecorecycle.vic.gov.au>. A Victorian state government agency providing information & advice to business, government & community on waste reduction & recycling.
- **Environmental Protection Agency, Queensland Government** <http://www.epa.qld.gov.au/publications?id=484>. Information about construction and demolition waste management and resource use opportunities.
- **Department of Environment and Heritage, Australian Government.** <http://www.deh.gov.au/industry/construction/wastewise/pubs/guidelines-text.pdf>. Best practice waste reduction guidelines and tools for construction and demolition industry.
- **Environmental Protection Agency, Queensland Government.** http://www.epa.qld.gov.au/publications/p00391aa.pdf/About_WasteWise_helping_industry_profit_by_reducing_waste.pdf. Strategies for industry to profit from reducing waste.
- **Resource NSW, New South Wales Government** <http://www.resource.nsw.gov.au/publications.htm#easyguide>. Information about waste avoidance and recycling systems.

Principle 10 - Consider cost efficiency

The upfront cost of development is one part of the picture. Operational costs are often hidden or not accounted for but can dramatically add up over time for the individual, and in the case of public infrastructure, for Council and other providers. Whole of life cycle analysis is important to ensure that cost-efficiency and affordability over time is addressed.

guidelines

Life cycle assessment

Life cycle assessment is an integrated 'cradle to grave' approach to assess the impact and performance of individual materials, products or services over the life of the building, allowing informed decisions to be made. Adaptable housing design, for example, means that dwellings can readily be converted for use by residents who acquire a disability as they age and need to use a wheelchair or be seated when showering and so on.

Cost efficiency in construction

Sustainable features and smart design can save money through the construction phase of your development by:

- choosing a design which is appropriate for the site
- specifying standard sizes
- using locally available materials
- using recycled materials.

Operating costs

Sustainable and smart design can also benefit occupants by reducing:

- ongoing operational costs through the use of passive design, positioning high water-use areas (kitchen, bathroom, laundry) together to minimise plumbing, and a range of water conservation practices in the garden, energy efficient appliances etc
- long term maintenance and repair costs by using self-finished materials, such as bricks and colour render, rather than painted external walls, or by including rainwater tanks or solar hot water systems to reduce water and electricity costs.

further information

- **Brisbane City Council, Green Home** http://www.brisbane.qld.gov.au/BCC:STANDARD:1775592936:pc=PC_1265. Fact Sheet – Sustainable Purchasing
- **Queensland Government, Smart Housing** http://www.housing.qld.gov.au/builders/smart_housing/index.htm. Information on how to make houses environmentally, economically and socially sustainable.
- **Society of Environmental Toxicology and Chemistry** <http://www.setac.org/lca.html>. Provides information about life cycle assessments to reduce the resource consumption and environmental burdens associated with products, packaging, processes, or activities.
- **United States Environmental Protection Agency** <http://www.epa.gov/ORD/NRMRL/lcaccess/lca101.htm>. Information about life cycle assessment objectives and practice.

Principle 11 - Create healthy indoor environments

We spend a significant portion of time indoors. The quality of our indoor environments can affect our health, quality of life and productivity. Use of clean and non-toxic materials, daylighting, natural ventilation and connection with the outdoors can help to create a healthy indoor environment.

guidelines

Natural lighting / glare control

Indoor environments should receive good natural lighting with minimal glare or heat penetration. This will help to create a pleasant living or work environment, and reduce the need for artificial lighting or mechanical heating or cooling. Ways to do this include shaded sky lights, light shafts or atriums with daylight sensors, adjustable shading on windows, eaves of at least 600mm on all single storey buildings.

Natural ventilation

Natural ventilation provides fresh air and creates a pleasant indoor environment for occupants. Incorporate natural ventilation opportunities into your development by:

- providing cross ventilation into the building design
- providing natural ventilation in the kitchen and living areas to reduce harmful indoor pollutants
- providing windows in all habitable rooms to allow for views and visual connection with outdoors
- separating garages and car parks from habitable or communal areas. This can be achieved by a weather sealed door, an exhaust fan in the garage on a timer or sensor, or physical air or distance separation
- installing an appropriate air filter, where the development is on a busy road or in an industrial area.

Access to outdoors

A strong connection with the outdoors, whether physically or visually, also provides for a pleasant indoor environment. Developments, both commercial and residential, should provide a strong indoor-outdoor connection to facilitate an outdoor, subtropical lifestyle and maximise natural ventilation. Ways to do this include:

- for residential development, providing a connection through ground level recreation area or balcony directly accessible off the main living areas or having an indoor / outdoor room such as a sunroom, if the development is subject to air or noise pollution.
- locating private / communal open space where it will not be exposed to traffic noise levels higher than 58dBLA10 (1 hour)
- for commercial development , providing a connection through communal outdoor spaces which are shaded and sheltered and non-commercial. Commercial uses, such as cafes, should be provided at ground level or on the first floor with indoor – outdoor connection.

Indoor air pollutants

Paints, varnishes, carpets, flooring, adhesives, sealants, pressed wood and other products emit pollutants such as volatile organic compounds (VOC) in the indoor environment. World Health Organisation studies have show that people are a thousand times more likely to inhale a pollutant indoors than the same pollutant outside. Ways of minimising the amount of harmful pollutants, include:

- using low VOC products. Reduced emission paint, vanishes, flooring, pressed wood products (fibreboard) , adhesives, insulation and more are all available
- maximising floor surfaces such as ceramic tiles, that inhibit parasites like sand mites
- utilising mechanical fixing rather than adhesives throughout the construction / fit out phase as glues are major source of VOC in indoor environment.

further information

- **Brisbane City Council, Green Home** http://www.brisbane.qld.gov.au/BCC:STANDARD:1775592936:pc=PC_1265. Fact Sheet – Air Quality.
- **Australian Greenhouse Office, Your Home Guide** <http://www.greenhouse.gov.au/yourhome>. A consumer guide, technical manual and tools to encourage design, construction or renovation of homes to be comfortable, healthy and more environmentally sustainable.
- **Department of Health and Aging, Australian Government** <http://www.nphp.gov.au/enhealth/council/pubs/pdf/healthyhomes.pdf>. A guide to residential indoor air quality for buyers, builders and renovators.
- **Department of Environment and Heritage, Australian Government** <http://www.deh.gov.au/atmosphere/airtoxics/indoorair>. General information about indoor air pollutants.

Principle 12 - Support green transport

Supporting public transport, walking and cycling at a neighbourhood, site and building level helps to reduce air pollution, emissions and local road congestions, and encourages an active and healthy lifestyle.

Guidelines

Pedestrian and cycle networks and facilities

Low impact transport is about reducing our reliance on private vehicles and making smart choices about our transport and trips. Providing for pedestrians and cyclists supports green transport, and an active and healthy lifestyle. Ways to do this include:

- ensuring that pedestrian and cyclists are given a high priority in the development in terms of connectivity, directness of route, and facilities by:
 - providing access to existing and proposed bicycle and pedestrian networks
 - prioritising pedestrian and cycle movements over vehicle movements within the development
- allowing for higher densities where development is close to services and facilities
- ensuring that accessibility through the development and management of the network is considered in conjunction with location of activities
- providing comprehensive shading along networks to provide climatic comfort
- ensuring that pedestrian networks are uninterrupted, continuous paths of travel (where permitted by topography) that do not exclude people with disabilities from using all services and amenities available
- ensuring the design of the development improves road and personal safety for pedestrian and cyclists
- providing appropriate end of trip facilities(lockers, showers) for pedestrians and cyclists where possible.

Public transport stops

If the development is located close to an existing or planned public transport stop, ensure that the design of the development provides direct and safe access for pedestrians and cyclists.

Parking

Whilst promoting forms of transport other than private cars, parking is still required as part of larger developments. Where possible, promote use of smaller vehicles with multiple occupants through:

- ensuring that parking is provided commensurate to the activity generated
- providing priority parking for disabled people, parents with children, car poolers, small cars, bicycles and motorcycles
- providing general (ie single occupant and / or larger cars) car parking further from the entrance to the activity, accessed along safe paths.

further information

- **Brisbane City Council, The Transport Plan for Brisbane 2002-2016** http://www.brisbane.qld.gov.au/BCC:STANDARD:810361426:pc=PC_73.
- **Brisbane City Council, Bicycle Brisbane Plan** http://www.brisbane.qld.gov.au/BCC:STANDARD:835913197:pc=PC_934
- **TravelSmart Australia** <http://www.travelsmart.gov.au/>. Information about making smart transport choices and reducing reliance on cars.
- **Victoria Transport Policy Institute** <http://www.vtpi.org/>. An independent research organisation dedicated to developing innovative and practical solutions to transportation problems.

Principle 13 - Develop adaptable buildings and spaces

Careful thought at the design stage can ensure that buildings and spaces have a longer life, longer refurbishment cycle, and greater adaptability during their lifecycle. At the micro scale, universal design ensures that a range of needs are accommodated which is increasingly important as our population age and encourages people to live in their own home and communities for longer.

guidelines

Building and landscape design

Well designed public and private buildings and spaces can vitalise a development and form a focal point for community and social interactions.

Ways to achieve this include:

- ensuring that public spaces are located for appropriate shade and surveillance, appropriately screened or sheltered from any wind-tunnelling effects, equipped with appropriate light and furniture. They should be made attractive and safe through plant selection, water features and public art
- designing all communal / public areas to comply with disability discrimination legislation and Australian Standard 1428
- protecting, incorporating and re-using existing heritage, character or cultural features
- providing for a mix of housing types
- providing for different abilities and ages in the one building or space.

Development size and connectivity

The development should promote connectivity both within the development and between the development and the existing community, by:

- consisting of distinct, walkable and well-defined neighbourhoods, incorporating a mix of uses and activities

- ensuring safe, attractive and direct movement networks are not dominated by cars.

Internal universal and safe design

To ensure the development can be used by people of different abilities and ages with minimal risk of injury by incorporating:

- level entries, exits and internal thresholds
- doorways and halls which allow ease and mobility for occupants
- fittings and fixtures (eg door and cupboard handles) able to be used by people of different abilities
- contrasting floor colours for stairs
- kitchens which are not thoroughfares
- hot water taps which have thermostatic mixing
- a child-proof cupboard for all poisons, medications, and household cleaners
- main living areas which look out to outdoor child play areas
- slip resistant flooring where appropriate
- elimination of sharp edges and corners through good design where possible
- provision of security and insect screens to all doors and windows
- a wide angle viewer at front entry door
- external doors which are visible from street or adjoining properties
- sensor lights at entries
- driveways and play areas which are as widely separated as possible
- pools with sun protection shade, appropriate fencing and self latching child-proof gate.

Services

- provide adaptable conduits and cabling in all new buildings to allow for connection to multiple providers

- in-ground services are provided in common trenches.

Further information

- **Placemaking for communities** <http://www.pps.org/>. Information about creating and maintaining public space that build communities.
- **Queensland Government, Smart Housing** http://www.housing.qld.gov.au/builders/smart_housing/index.htm. Information on how to make houses environmentally, economically and socially sustainable.
- **South East Queensland Regional Organisation of Councils, Draft Sustainable Housing Code (Version 8)**. For a copy please phone the Council Contact Centre on 3403 8888.
- **Australian Standards 1428.1-1428.4** <http://www.standards.com.au/catalogue/script/search.asp>. Information on designing for access and mobility.

- Principle 14 - Build a safe and diverse community

Encouraging social diversity, mixed uses and pedestrian interactivity, and maintaining cultural and indigenous values and linkages will help foster a positive community and give people a sense of security and identity. Designing to address public and personal safety has many benefits for the individual and community and enhances everyone's quality of living.

Guidelines

Social connectivity and diversity

The design of precincts, landmarks, whole communities or commercial and community centres plays a vital part in fostering the growth of formal or informal networks. Buildings and spaces that allow people to meet and gather build those connections and form 'social capital' that underpins communities. Similarly, catering for social diversity may mean consideration of differences in age, ability, gender and culture.

Public safety - Crime Prevention Through Environmental Design (CPTED)

Consider CPTED elements during the design process by providing:

- casual surveillance opportunities and sightlines
- land use mix and activity generators
- clear demarcation of use and ownership
- exterior building design which reduces opportunities for entrapment, concealment and vandalism
- lighting
- easily read street numbers
- wayfinding

- predictable routes and entrapment locations.

These elements are interdependent and not mutually exclusive

Personal safety and security

The development considers safety and security features of the dwellings or tenancies as part of the design. Safety features, particularly in dwellings, reduce the risk of injuries and include non-slip flooring and child-proof chemical cupboards. Security features reduce the risk of crime and include wide angle viewers at front entry doors and external doors being visible from the street or adjoining properties.

Valued features

Protect, integrate and reuse important site features such as heritage or character buildings or elements, significant trees and views.

Links with existing community facilities

The development should promote integration with existing communities by:

- providing shaded links between the development and the existing community
- creating a sense of place by planting trees and providing clearly identifiable spaces within the development to facilitate / encourage social interaction
- promoting opportunities for shared community facilities, for example using school halls out of school hours
- providing equitable access to facilities.

further information

- **International Security Management and Crime Prevention Institute** <http://www.cpted.com.au/home.html>. Provides basic information about crime prevention, links and publications.
- **Queensland Government, Smart Housing** http://www.housing.qld.gov.au/builders/smart_housing/index.htm. Information on how to make houses environmentally, economically and socially sustainable.
- **Australian Government, Disability Discrimination Act 1992** <http://www.comlaw.gov.au/>
- **Australian Standards 1428.1-1428.4** <http://www.standards.com.au/catalogue/script/search.asp>. Information on designing for access and mobility.
- **Local Government Association of Queensland, Social Planning Guidelines for Queensland 2003** <http://www.lgaq.asn.au>. Provides an overview of social planning considerations.

Principle 15 - Inform the end owner and user

Good intentions and design can be wasted if the ultimate owner, resident or user does not understand the sustainability features. Appropriate user guidance will ensure that original design intents and operational savings are delivered.

Guidelines

User guide / body corporate induction

Information about the intention of the dwelling's or development's sustainable features can be conveyed to the end owner / user through marketing, body corporate induction, user guides etc.