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Guidelines for Sustainable building development

The design and construction of buildings that comply with ecologically sustainable principles require attention in the following areas :

- Energy efficiency
- Water conservation
- Indoor environmental quality
- Materials
- Waste minimisation

1. Energy efficiency

The energy requirements of a building can be reduced by as much as 60 percent through a range of energy efficiency initiatives.

Designing for the sun is the most cost-effective and environmentally friendly way to heat New Zealand buildings. Passive solar design strategies can dramatically affect building energy performance and this should be the first consideration when planning a building. A passive solar building is one that derives a substantial fraction of its heating, and/or cooling, from the sun, using only natural processes to provide the necessary energy flows.

Some key approaches to energy efficiency are to:

- **develop strategies to provide natural lighting.** Studies have shown that daylighting has a positive impact on productivity and well-being as well as reducing energy needs
- **install high-efficiency lighting systems** with advanced lighting controls. Include motion sensors and dimmable lighting controls where practical (fluorescent bulbs use 70% less energy than a standard bulb and last up to 20 times longer)
- **use a properly sized and energy-efficient heat/cooling system** in conjunction with a thermally efficient building. Having air conditioning and heating systems that are bigger than needed for the size of the building is one of the most common problems in modern buildings
- **maximise light colours for roofing and wall finish materials**
- **install high R-value (thermally resistant) wall and ceiling insulation**
- **use minimal glass on east and west exposures**
- **double-glaze windows; draught-proof doors and windows**
- **minimise the electric loads** from lighting, equipment and appliances. Look for appliances with the most energy stars. Check existing appliances for efficiency
- **consider alternative/renewable energy sources** such as photovoltaic or fuel cells now available in new products and applications

Useful resources and information

Ministry for the Environment – Towards sustainable practice, www.mfe.govt.nz
Checklist for Environmentally Responsible Design & Construction,
www.buildinggreen.com/ebn/checklist.cfm
Whole Building Design Guide, www.wbdg.org/wbdg_approach.php
Design for the sun, www.waitakere.govt.nz/Abtcit/ec/bldsus/pdf/energy/designsun.pdf

2. Water Conservation

A number of strategies can be used to reduce the amount of water consumed by a facility. These strategies include system optimisation (ie efficient water systems design, leak detection, and repair), water conservation measures, and water reuse/recycling systems.
In practice water conservation includes:

- water-efficient plumbing fixtures (flow regulators on basin taps & showers)
- ultra low-flow toilets and urinals, waterless urinals

- rainwater collection and use (often used to flush toilets)
- water recycling or reuse measures (grey water reuse in toilets/garden)
- construct a garden that requires minimum water with drought resistant species and plenty of organic mulches. This reduces water demand and also reduces the strain on surface water drains during heavy rain

Useful resources and information

Australian Department of Environment and Heritage,
www.deh.goc.au/settlements/publications/government/water-efficiency-guide.html

3. Indoor environmental quality

Indoor environment quality refers to the quality of the air and environment inside buildings, based on pollutant concentrations and conditions that can affect the health, comfort, and performance of occupants. Allergies such as asthma are increasing, as are cases of multiple chemical sensitivity. Some materials, for example many paints and carpets, give off harmful gases.

Indoor environment quality can be improved by:

- maximising natural ventilation where possible (have opening windows to ventilate the building naturally)
- avoiding unnecessary indoor pollution sources (emissions from paints, adhesives, carpets, furniture etc)
- using hard flooring and avoid carpets/coverings that will harbour dust mites, chemicals
- providing individual control of the thermal environment. Ideal humidity levels are between 30 and 70 percent
- maximising natural daylight (day lighting has a positive impact on productivity and well-being)
- specifying mechanical systems that generate low noise levels
- soundproofing office and meeting room partitions, and ceilings, to prevent noise transfer
- designing layouts with sufficient quiet rooms and meeting rooms so staff can have the opportunity for uninterrupted phone conversations and meetings
- using plants, earth banks, and screens to block external noise sources.

Useful resources and information

U.S. Environmental Protection Agency, Healthy Buildings, Healthy People: A Vision for the 21st Century, www.epa.gov/iaq/hbhp/hbhptoc.html
Greenbuild, Indoor Environmental Quality, www.buildinggreen.com

4. Materials

The materials selected for building projects can have a number of social, environmental, and economic impacts. The occupants of a building are exposed to much higher levels of volatile organic compounds (VOCs) in the first 6 to 12 months after construction or renovation of buildings than any other time, due to the large range of high-emission materials used in construction (eg paints, adhesives, sealants, carpets, wood-based panels, furniture). Use local, renewable, natural materials wherever possible.

When selecting materials

- maximise materials that are natural and from a renewable resource, eg. Wood
- choose building materials that will require little maintenance (painting, retreatment, waterproofing, etc.), or whose maintenance will have minimal environmental impact

- give preference to locally produced products and other products with low embodied energy (manufacture, transport) content
- use building products that contain recycled materials – examples include acoustic insulation manufactured from 100% recycled wool scraps, cement manufactured with 75% recycled content and hardcore containing demolition waste
- use durable materials eg. glass and unpainted zincalume roofing, to minimise the use of surface finishes such as paint
- use treated timber only where required to reduce the amount of preservatives that are needed
- minimise the use of materials that pollute or are toxic during their manufacture, use, or reuse – eg. Low formaldehyde MDF (medium density fibreboard)
- avoid materials that will emit pollutants: Solvent-based finishes, adhesives, carpeting, particleboard, and many other building products release formaldehyde and volatile organic compounds (VOCs) into the air.
- avoid ozone-depleting chemicals in mechanical equipment and insulation: CFCs have been phased out, but their primary replacements--HCFCs--also damage the ozone layer and should be avoided where possible. Avoid foam insulation made with HCFCs. Reclaim CFCs when servicing or disposing of equipment.
- minimise packaging waste: Avoid excessive packaging, such as plastic-wrapped plumbing fixtures or fasteners that aren't available in bulk. Tell your supplier why you are avoiding over-packaged products.

In June 2003, Cabinet approved a procurement policy for timber and timber products. This requires agencies to report to the Ministry of Agriculture and Forestry and document sustainable sources for all large procurements of timber. This is especially relevant when sourcing imported or New Zealand native timber. Ensure the wood you purchase is from well-managed, sustainable forests. Environmental certification of other materials is also available (www.enviro-choice.org.nz).

Useful resources and information

Environmental Choice NZ, www.enviro-choice.org.nz
NZ Timber and Timber Products procurement policy, www.maf.govt.nz/forestry
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5. Waste minimisation

During their construction or refurbishment buildings generate huge amounts of waste that could be dramatically reduced if planned for at the design stage of a project.

Strategies for minimising job-site waste:

- design the building and fit-out for standard material sizes to minimise waste generation in the first instance
- centralise cutting operations to reduce waste and simplify sorting
- have recycling bins on site during construction
- find out where different materials can be taken for recycling
- ask suppliers to avoid unnecessary packaging and take back reusable and recyclable packaging

Also plan for the minimisation of operational waste:

- design easily accessible areas for recycling bins inside and outside the building that allow for easy access of contractors
- build recycling facilities into cabinetry

develop a Waste Management Strategy that incorporates waste minimisation and recycling (eg. purchase recycled office paper and supplies, recycle office paper, use coffee mugs instead of disposable cups).

Useful resources and information

Ministry for the Environment, Construction and demolition waste,
www.mfe.govt.nz/issues/waste/construction-demo/index.html
Ministry for the Environment, Govt^3 recycling and waste minimisation in buildings,
www.mfe.govt.nz/issues/sustainable-industry/govt3/topic-areas/recycling-waste.html

Environmental rating tools

The NZ Green Building Council is currently working on an environmental rating tool for NZ buildings. This tool will rate the environmental quality of the design and construction phases of a building project. This tool is based on the Green Star building tool developed in Australia combined with the BRANZ Green Office Scheme. The tool will be available in 2007.
An environmental audit specifically for churches has been developed by UK based Christian Ecology Link.

Useful resources and information

New Zealand Green Building Council, Rating tools, www.nzgbcservices.org.nz/
Australian Green Building Council, Green Star, www.gbcaus.org/
An Environmental Audit for Churches, www.christian-ecology.org.uk