

NEW FACILITIES FOR THE ANGLICAN DIOCESE

**REPORT TO
THE ANGLICAN CHURCH'S ENVIRONMENT COMMISSION, CANBERRA
ON
BUILDING "GREEN"**

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What is a “green” or “sustainable” building?

The Organisation of Economic Co-operation and Development OECD defines Green Buildings as those buildings that have minimum adverse impacts on the built and natural environment, in terms of the buildings themselves, their immediate surroundings and the broader regional and global setting.

A Green Building is designed to minimise the total environmental impact of its materials, construction, operation and deconstruction while maximising opportunities for indoor environmental quality and performance.

Green Buildings are constructed and operated in ways that enhance their impact on the environment and on the building occupants.

A Green Building will save money, reduce waste, increase worker productivity and create healthier environments where people live and work.

A Green Building incorporates design, construction and operational practices that significantly reduce or eliminate the negative impact of buildings on the environment and occupants . It includes strategies for addressing:

- energy efficiency
- greenhouse gas emission abatement
- water conservation
- waste avoidance, reuse and recycling
- pollution prevention - noise, water, air, soil & light
- enhanced biodiversity
- reduced natural resource consumption
- productive and healthier environments
- useable buildings
- social amenity
- transparent reporting

The benefits of a Green Building are:

- one set of green rules
- lower development control costs
- improved risk mitigation and management
- higher tenant retention
- lower renovation costs
- lower overheads
- higher returns
- more flexible space planning
- more productive and healthier environments
- access to financial incentives and tax credits
- a baseline measure to earn carbon credits
- lower insurance costs
- increased interest by Ethical Investment Funds
- a better industry image

Productive and healthy environments

International studies demonstrate daylight, fresh air, good indoor air quality, acoustic quality and personal control over comfort levels improve the productivity and wellbeing of building occupants. Productivity gains of between 4 and 10% have been achieved by incorporating these features into buildings.

Improved indoor environments can increase productivity through reduced sick days and improved employee efficiency. Poor indoor air quality is one of the principle causes of sick building syndrome.

Improvements in thermal comfort can be linked to increases in productivity while poor thermal comfort is another principle cause of sick building syndrome. Individual control over thermal comfort is thought to further improve productivity.

The common conclusion in all the literature is that the additional capital costs required to improve the indoor environment of a building are quickly recovered. Refer to "The Business Case for Building Green".

Who supports the implementation of green building strategies?

Green building strategies have been introduced gradually throughout the world since the late seventies by both private sector and government bodies.

In the USA a major lead has been taken by the US Green Building Council (USGBC) that provides policy and support services and has an ever increasing membership. The USGBC has developed the Leadership in Energy and Environmental Design (LEED) Green Building Rating System to rate new and existing commercial office buildings and high rise residential buildings according to their environmental attributes and sustainable features. New York State has recently introduced tax legislation to encourage green or sustainable buildings through tax credits for meeting new standards. Most of the States are following with some form of regulation or incentive.

In Australia, several States have introduced regulation and/or incentives for both commercial and residential buildings. Individual bodies such as The Melbourne Development Authority 'Vic Urban', Melbourne City Council, Adelaide City Council, The Sydney Olympic Park Authority and many other similar bodies have environmental design guidelines and established targets for performance. In NSW the Government introduced BASIX (Building Assessment Sustainability Index) as a regulation for new homes and dual occupancy dwellings for the Sydney area on 1 July 2004 and will extend this to all of NSW on 1 July 2005.

The Sustainable Energy Development Authority of NSW, prior to absorption into a new Department, developed and promoted the use of a national Australian Building Greenhouse Rating Scheme (ABGR) as a rating tool for energy use and performance measurement in office buildings. The NSW Government Department of Energy, Utilities and Sustainability is also developing the National Australian Building Environmental Rating Scheme (NABERS) which proposes to be an

operational performance-based tool for office and residential buildings. NABERS may measure the operational behavior of a building's occupants.

The Green Building Council of Australia was founded in mid 2002 and now has ever increasing membership and a wide range of beneficial services to Members including its Green Star Rating Tools for a range of building types, training programs for assessors, advocacy and technical assistance.

Green Building Council of Australia Green Star Rating Tools

The Green Building Council of Australia developed Green Star as a brand and method of communication for the property industry to identify and demonstrate green building initiatives.

The Green Star environmental rating system for buildings was created to:

- Establish a common language;
- Set a standard of measurement for green buildings;
- Promote integrated, whole-building design;
- Recognise environmental leadership;
- Identify building life-cycle impacts;
- Raise awareness of green building benefits; and
- Reduce the environmental impact of development.

The Green Star environmental rating system recognises and rewards Best Practice, Australian Excellence and World Leadership.

To date the Council has focused on Green Star rating tools for Class 5 commercial office buildings:

Green Star - Office Design (for the development application design phase of a project)

Green Star - Office As Built (for the construction and procurement phase)

Green Star - Office Interiors (for the tenants to design and procure fitout elements)

Green Star - Office Asset (for owners of existing assets)

Green Star rating tools will be developed for the additional building types.

The Green Building Council announced this month its commitment to develop environmental rating tools for the following building types:

Green Star - Convention & Exhibition Centres (March 2005)

Green Star - Retail (Shopping Centres 2005)

Green Star - Residential (commencing with single dwelling homes 2006)

Green Star - Education (including laboratories & teaching facilities 2006) and

Green Star - Health (2006)

The Council's program of rating tool development over the next two years depends on appropriate funding and resourcing - the Green Building Council is now seeking appropriate public and private partners to support the development of these tools.

Each Green Star rating tool is based on a standard framework. Green Star establishes a number of categories under which specific key criteria are grouped and assessed. These categories include:

- Management
- Indoor Environment Quality
- Energy
- Transport
- Water
- Materials
- Land Use, Site Selection and Ecology
- Emissions

The use of the Green Star rating tools without formal certification by the Green Building Council does not entitle the user or any other party to promote the achieved Green Star rating.

The use of the Green Star rating tools is encouraged on all projects to improve environmental design inclusions within a project. No fee is payable to the Green Building Council for such use, however, formal recognition of the Green Star rating and the right to promote such requires a certified rating awarded by the Green Building Council of Australia.

Currently the Green Building Council can only certify Class 5 Commercial Office projects as the Green Star tools available relate only to this sector.

The business case for building green

The costs and financial benefits of green buildings have been identified for some time but there have been few general publications produced on the subject. Today most progressive enterprises are able, through internal management, to make decisions about investment in buildings and facilities with a well-informed view on both the relatively small increased initial capital cost, the benefit of reduced operational cost and the additional benefits associated with improved workplace comfort and productivity of executives and employees.

Perhaps the most definitive publication on the subject, a recent highly regarded report on the business case, is "The Costs and Financial Benefits of Green Buildings" – a report to California's Building Task Force, October 2003. This report was commissioned by the State of California and it involved an intensive study of buildings incorporating green initiatives. An important extract is:

"This study, The Costs and Financial Benefits of Green Buildings, represents the most definitive cost benefit analysis of green building ever conducted. It demonstrates conclusively that sustainable building is a cost-effective investment and its findings should encourage communities across the country to "build green".

Ms Eileen Davis, Secretary State and Consumer Services Agency, State of California.

The study utilized cost data gathered from 33 individual LEED registered projects (25 office buildings and 8 school buildings) with actual or projected dates of completion between 1995 and 2004. These 33 projects were chosen because relatively solid cost data for both actual green design and conventional design was available for the same building. The Average Green Cost Premium is summarized in the following table:

| Level of Green Standard | No of Buildings | Average Green Cost premium |
|-------------------------|-----------------|----------------------------|
| Level 1 – Certified | 8 | 0.66% |
| Level 2 – Silver | 18 | 2.11% |
| Level 3 – Gold | 6 | 1.82% |
| Level 4 – Platinum | 1 | 6.50% |
| Average of 33 buildings | 33 | 1.84% |

The Study concluded that the “..benefits of building green include cost savings from reduced energy, water, waste; lower operations and maintenance costs; and enhanced occupant productivity and health. As the extracted Table – Figure ES-1 shows, analysis of these areas indicates that total financial benefits of green buildings are over ten times the average initial investment required to design and construct a green building. Energy savings alone (noting that California energy costs are significantly higher than those in Australia) exceed the average increased cost associated with building green.”

“Additionally, the relatively large impact of productivity and health gains reflects the fact that the direct and indirect cost of employees (and occupants) is far larger than the cost of construction or energy. Consequently, even small changes in productivity and health translate into large financial benefits.”

**Figure ES-1. Financial Benefits of Green Buildings
Summary of Findings (per ft²)**

| Category | 20-year NPV |
|--|----------------|
| Energy Value | \$5.79 |
| Emissions Value | \$1.18 |
| Water Value | \$0.51 |
| Waste Value (construction only) - 1 year | \$0.03 |
| Commissioning O&M Value | \$8.47 |
| Productivity and Health Value (Certified and Silver) | \$36.89 |
| Productivity and Health Value (Gold and Platinum) | \$55.33 |
| Less Green Cost Premium | (\$4.00) |
| Total 20-year NPV (Certified and Silver) | \$48.87 |
| Total 20-year NPV (Gold and Platinum) | \$67.31 |

Source: Capital E Analysis

An integrated management approach to sustainable building

1. Key Project Objectives and Holistic Approach

The key project objectives are:

- It must be commercially viable to both owner and tenants
- It must be flexible and adaptable for change in overall layout and usage and change within each element
- It must attract and retain occupants and staff by providing an excellent indoor and outdoor environment
- It must provide an excellent corporate image for the owner and occupants and provide an appropriate relationship to the site.

In addition to these objectives there is a need for greater understanding of the adaptability of the fabric and systems of a building by the Client, owner, users and operators/facility managers in order to realize the full potential of sustainable design. This leads to the concept of a holistic approach that has the following benefits:

- The design team can avail itself of client, owner, user and operator /facility manager inputs early
- There is a focus on financial impacts supported by value management to balance technical, social and environmental impacts
- There is an early commitment to goals so that sustainable design is not seen as an add-on technology
- There is cross discipline synergy
- There is architect and engineer interaction to develop effective active and passive systems
- The scope for aggregation of initiatives and strategies such as façade design, day lighting and HVAC efficiency, domestic hot water and heat recovery from HVAC etc
- Options analysis is speeded up thereby saving valuable time in design development.

2. Range of Approach to be Applied

- Base case minimum capital cost
- Base case best practice considerations – 4 Stars under Green Star or say Silver under LEED
- Meeting broad Ecologically Sustainable Design requirements – Australian Excellence – 5 Stars under Green Star or say Gold under LEED
- Leading edge Sustainable Design – World Leadership – 6 Stars under Green Star or Platinum under LEED
- Value Management to establish evaluation criteria and to assist in the selection of the rating sought for a project.

3. Modelling and Simulations

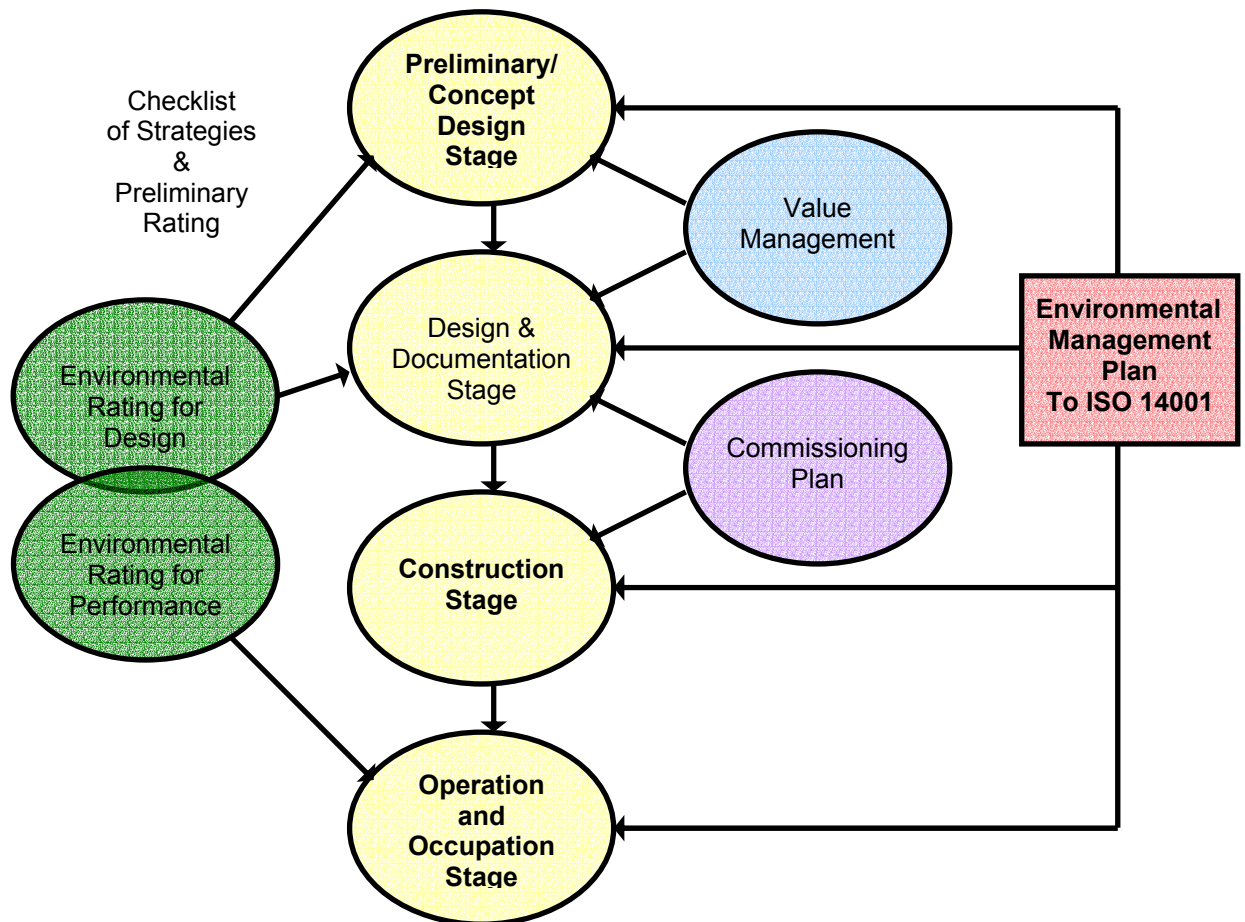
Modelling and simulations are an essential part of both the design process and the value management. The basis for these, the software to be used and the objectives

must be determined and agreed at an early stage to ensure that outcomes cannot be contested at the value management stage. Modelling and simulation tools are being continually upgraded and developed. Typical areas for the use of modelling and simulations are energy use, lighting, daylighting, air flow, heat transmission and façade/glazing design etc.

4. Environmental Management

The key elements of environmental management are shown in the figure below. These are:

- an overall Environmental Management Plan (shown in red) in accordance with ISO 14001 and prepared for the design, construction and operation stages of the project;
- an Environmental Rating System (shown in green) applicable to both the design stage and the operation or performance stage;
- Value Management (shown in blue) to provide a system of determining the value of all strategies against evaluation criteria including financial performance/feasibility and physical characteristics;
- a Commissioning Plan (shown in lilac) prepared during the design stage and implemented at the end of the construction stage. The purpose of this is to ensure that design intent in relation to sustainable/green elements is incorporated effectively and accurately into the construction.



5. Value Management

The starting point for the green building approach is to resolve all issues associated with siting, massing and orientation of the building(s) and access to site services. For all but very unusual sites this step should apply to both the base case minimum as well as the other options although any special strategies designed to utilize climatic factors or ability to harvest water etc should be included only in the designs for Best Practice or better.

The next step is to prepare comparative schedules showing all design parameters for a base case or conventional design and then to match these with the design parameters for the three levels of achievement – Best Practice, Australian Excellence or World Leadership or the equivalent of these if other rating systems are used.

It is then essential to determine the financial appraisal basis for the project. This means establishing that life-cycle costing (capital, operating and maintenance cost) will be used as distinct from initial capital cost and that workplace comfort and productivity benefits will be included in this. It also means establishing all evaluation criteria such as greenhouse gas emission savings, life cycle cost, corporate image etc and ensuring that these criteria are not changed later to suit unexpected outcomes without a holistic view being taken.

Subsequent steps include conceptual or sketch plan design, modelling and simulations, capital, operating and maintenance cost estimates and a preliminary rating of the project using the agreed rating tool.

The approach above is then continued through all stages of the design and documentation processes with regular value management reviews and adjustments to design made as team decisions albeit with the Client making all critical decisions where initial objectives are not being met.

5. Environmental Rating

The environmental rating tool is valuable as both a checklist of objectives and therefore of “green” strategies to be applied in the preliminary or concept design stage. It is then used at the completion of the design to verify earlier outcomes and where necessary adjustments can be made to meet the rating sought and the Client’s design brief.

On completion of the construction a further review can be made using data from the commissioning process. After a designated period of occupation/operation, usually one year a performance rating using an appropriate tool is then made to determine the final rating. Many property owners use regular (usually annual) reporting of key environmental metrics such as energy and water use and waste minimization. The environmental rating tool thus becomes an ongoing management tool for the property.

Case Study

Australia's First Green Star (Extract from the GBCA Website)

The design of an office building at 8 Brindabella Circuit, Brindabella Business Park in Canberra, which is now under construction, has been awarded five Green Stars, giving it an achievement of 'Australian Excellence' after a robust third party assessment using the Green Star -Office Design rating tool.

"Brindabella Circuit is the first Australian office building design to be officially recognised for its excellent environmental initiatives under Green Star and the Green Building Council of Australia congratulates the developer, Canberra International Airport, on this outstanding achievement which recognises their leadership in the industry" said Executive Director, Maria Atkinson.

The certified rating of 8 Brindabella Circuit, along with the registration of other significant commercial office projects either in design or final stages of construction signals a clear endorsement by the Australian property industry of the Green Star environmental rating system and tools.

8 Brindabella Circuit scored five Green Stars for its design, which was evaluated against a comprehensive range of environmental criteria. This represents an outstanding commitment to a comprehensive and diverse set of initiatives in response to environmental and human health concerns, including: access to alternative modes of transport; reduced ecological impact; improved indoor environment quality for better occupant health and comfort; reduced consumption of water and energy; lower harmful emissions; and conservation of valuable resources and materials.

The project's unique design features include:

- small car spaces, and installation of cyclist facilities (storage, showers etc); water efficient fittings including waterless urinals, dual flush toilets, 5A rated shower heads, and hands-free infra-red taps (The design will save 775,000 litres of water a year or, put another way, it will achieve a 53% reduction in water consumption compared with a standard building of similar size);
- 100% outside air (no recirculation);
- low emissions products used throughout including low VOC paint, carpet and adhesives;
- a centralised heating and cooling plant to reduce energy and water consumption;
- extensive use of environmentally friendly materials including recycled steel and timber, and minimal use of PVC-based products;
- storage areas to facilitate the recycling of waste during the building's operation and
- a commitment to recycle more than 80% of construction waste.

Initial construction of the building has started and it is expected to be completed by December 2004."

References

Greg Kats, Capital E – The Costs and Financial Benefits of Green Buildings – A Report to California’s Sustainable Building Task Force, October 2003.

The Docklands Authority, Melbourne – ESD Guide, Ecologically Sustainable Development, October 2002.

The Green Building Council of Australia www.gbcaus.org