

## ***Foreword***

The Australian Green Buildings Mission travelled to Europe and the United States in November 2003 to investigate leading edge green building design, technologies and construction. It came away in no doubt about the growing demand for green buildings on both continents.

This demand will grow exponentially throughout the world as the environment and health emerge as key factors affecting business decisions.

Australia is well-positioned to service this demand as we already have the expertise and the technology to make significant improvements to the sustainability of our commercial buildings. However, we need to start applying it in the areas of building design and construction.

This expertise presents a valuable export income opportunity to offer our skills to the commercial buildings of Asia's expanding cities. At home, applying this expertise will help rehabilitate our environment.

The Mission found the case for green buildings to be compelling, however, local research is required to quantify the economic, environmental and health benefits that green buildings will deliver in the Australian climate.

Having said this, there are many in Australia who believe so strongly in the benefits that they are already forging ahead to design and construct green buildings.

The pace of change is increasing and I urge the Australian building and construction industry to take the lead. Those that are not constructing buildings that display good sustainable design will be left behind as the market demands a better built environment.

A handwritten signature in black ink, appearing to read 'T Arnel', with a horizontal line drawn through the middle of the letters.

Tony Arnel  
Building Commissioner  
Building Commission (Victoria)

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## ***Executive Summary***

While international trends show green commercial building design becoming mainstream among developers and preferred by tenants and employees in the United States and Europe, Australia continues to lag. However, with commitment and immediate action, Australia can take a lead role in the design and construction of green commercial buildings in the Asia-Pacific region.

Victoria already leads the way in the domestic housing market with the 5 Star standard coming into effect on 1 July 2004. South Australia is well advanced in the commercialisation of water expertise and New South Wales is leading the way in energy efficiency in commercial buildings.

One of the challenges for green buildings is the higher construction costs. There is growing evidence that green designs can be cost competitive - they have good paybacks over the life cycle of the building and some designs actually have lower up-front costs with major savings in heating and cooling plant capital costs.

There is mounting evidence to suggest that good design can justify any increase in construction costs through the savings that are achieved during the life cycle of the building. In some overseas examples, developers have integrated design and technologies to actually reduce construction costs.

Research is showing that savings come from the following areas during the life cycle of the building:

- Reduced energy use;
- Emissions value;
- Reduction in water use;
- Improved employee productivity ;
- Improved employee health; and
- Reduction in construction and demolition costs through debris recycling.

The markets in Europe and the US are also beginning to show a premium for environmental design - corporate tenants, in particular, are willing to invest significantly more in a building that supports their credentials as an environmentally responsible corporate citizen. This is, in fact, a far more powerful business driver than building operating costs

Australia has the expertise to design and construct green buildings that incorporate features that deliver these savings and benefits. However, for this to occur there needs to be a shift in attitudes throughout the industry, including developers, tenants and financiers.

This shift needs to acknowledge that with good design, any increase in upfront constructions costs can be returned during the life cycle of a building through lower operating costs and employee productivity and health.

However, more scientific evidence is required to quantify the benefits of green buildings. While some research is occurring overseas, Australia needs to initiate its own research based on local climatic conditions.

The Australian Green Buildings Mission has made a number of recommendations in this report. These recommendations will ensure that:

- Green building design is selected for the majority of new commercial buildings in Victoria by July 2005
- Victoria will be a world leader in green building developments by 2010.

These ambitious targets can be reached through industry regulation or leadership. The recommendations focus on a partnership approach between industry and government that will achieve the aims through both industry and government leadership and regulation.

## **1. Introduction**

This report is structured to provide a general overview of trends identified by the Australian Green Buildings Mission, detailed observations of overseas developments and recommendations for action in Australia. The recommendations have been grouped under the headings of Policy and Regulations, Body of Knowledge and Education and Training.

The recommendations involve action by a variety of bodies. The Mission has developed a communication strategy to promote the recommendations to, and seek support from, the relevant bodies.

The Mission believes that communicating the benefits and opportunities of green building design and construction to the Australian industry is absolutely vital in order to capitalise on the opportunities.

## **2. Green Buildings: A global trend gathering momentum**

Green buildings are becoming part of the mainstream building industry in both Europe and the United States. Leading-edge design now inevitably involves ESD features, with a shift from the concept of a building as a shelter against the elements, to the concept of a building that delivers comfort, amenity and economic performance through a symbiotic relationship with its natural and social environment.

However, the mix of regulation and market demand that is driving green buildings is different in the United States and Europe. This has led to significantly different outcomes.

### **2.1 Europe: tough regulations deliver extraordinary buildings**

Europe, with tougher regulations driven by an active green political and consumer movement tends to invest far more in their building stock generally and companies are more willing to pay for leading-edge design. Consequently, Europe has the most technologically advanced buildings and defines the leading edge of green architecture for commercial buildings.

Several European building executives commented that they often can only get project approvals from government if they can show superior environmental performance. The visually arresting Swiss Re Tower in London, the Deutsche Post Tower in Bonn and the Commerzbank in Frankfurt (see case studies in Section 5) all obtained waivers of height restriction, partly because of their environmental credentials. While other factors were also relevant, such as the need to free up space in London and Bonn's desire to retain the Deutsche Post Head Office, green design was a critical demand of the authorities.

An example of the impact of a building regulation is the requirement in Germany that no workstation is located more than 6m from a window. This drives a fundamentally different approach to building design, with the traditional square floor plan of the tall commercial building no longer feasible. Modular and disjointed design with light wells to maximise external walls relative to space is needed, with consequent higher building costs.

***'Increasingly, there is no choice in this country ... we need to demonstrate a sustainability protocol to get project approval.'***

Michael Beavan, Arup Associates, London

## 2.2 The US: the prospect of market-led industry transformation

The US market is far less regulated in terms of environmental performance, reflecting the general preference of that country for minimum restrictions on markets and individuals. US investment in building stock is correspondingly lower, and environmental performance has to be achieved within existing budgets or offer a quick payback. The exception is when a building owner or occupier wants to make a statement about their corporation's value or brand. An example of this is the Aspect Communications head office in Silicon Valley.

*There is preference in the US for minimum regulation on environmental performance.*

This building was conceived when the Chief Executive of that company wanted to create a unique and welcoming work environment that his IT workers could regard as a second home. This, he hoped, would enable him to attract and retain the best skilled workers in what was then a highly competitive market for IT skills. William McDonough, a leading US proponent of green design, showed the CEO that green buildings could achieve just this. The CEO became so converted to the sustainability cause that the investment in the green building proceeded well above what could be proven through a rigorous business case.

At the other end of the market, the financial bottom line has dominated thinking on the Dearborn Centre in Chicago. The Dearborn Centre is marketed as a comfortable, low operating cost building with advanced IT services. The comfort and lower operating costs were achieved primarily through the use of raised-floor displacement ventilation, which also delivers significant gains in energy efficiency. This green feature, however, is a minor part of the marketing campaign, which is very much targeted at mainstream tenants such as the legal and finance industries.

However, the building developer, Don Faloon, has become an enthusiast for green as a result of his experience with Dearborn. He says that his capital costs were 4% lower as a result of the design innovations to incorporate the raised floor. The new green features that he will incorporate are meant to enhance profit, rather than a "road to Damascus" conversion to green, as was the case with Aspect Communications.

The Dearborn Centre, while less dramatic in terms of efficiency gains than the leading-edge buildings in the US, let alone those in Europe, may portend a more

fundamental shift in the market. Mr Faloon told the Mission that he has had numerous colleagues from the development industry inspecting the Dearborn Centre's raised floor space, with one leading developer commenting that '... all our buildings are redundant'.

The prospect of a market-led transformation of the mainstream industry in the US cannot be discounted. There is now a phenomenal growth of interest in green buildings. In 2001, the US Green Building Council attracted several hundred delegates to its conference. In 2002, this jumped to nearly 4,000. The 2003 conference in Pittsburgh, which the Mission attended, had 5,500 delegates. Mission participants observed that there was an almost evangelical feel to the conference, and a confidence that both commercial and environmental change would progress in tandem.

***'Two years ago, no one knew what LEED was. Now, in the industry, everyone does.'***

Anthony Bernheim,  
SMWM Architects, San  
Francisco

### **2.2.1 LEED in the US: the catalyst of change**

The LEED rating system has been a major driver of change, as it has provided both consumers and the industry with a common benchmark and language. This has facilitated the rise of competitive forces among owners, tenants and builders to have the best rating. The clear power of a single rating tool to focus attention has major lessons for Australia, which is yet to reach a consensus on this issue.

Although LEED has its critics, its acceptance is now dominant, though not universal. There are some who believe it does not adequately address all environmental issues. Others believe it is not flexible enough for the different environments in different parts of the US. However, the progressive refinement of the LEED system (it has had a number of iterations) and local adaptations of LEED seem to be satisfying these concerns. Clear benefits are being achieved in the meantime from the early versions of LEED, rather than deferring its use in the quest for perfection.

Another interesting criticism of LEED comes from, ironically, some of the leaders of the green building movement who helped establish it. Several felt that LEED was restricting them. For example, Anthony Bernheim, a San Francisco-based leader in indoor environmental quality, who helped introduce new standards for green building in the State of California, said he didn't want clients to ask him to build a LEED platinum building. He, like several others with whom the Mission spoke, felt it

commodified their work rather than allowed them to push the envelope. However, they all acknowledged the value of LEED in industry transformation. The discussion was summed up by Mission participant, Dang Hodinh of Lincolne Scott, who commented that 'Rating is a must for industry transformation, but it does not replace design and innovation'.

***Some architects on the leading-edge felt that LEED commodified their work rather than allowing them to push the envelope. But all acknowledged its value in transforming industry attitudes and approaches.***

### 2.3 The concept of a restorative building

The different perspectives on the limitations that LEED could impose on designers reflect the different market segments being targeted by the designers. For example, Anthony Bernheim of SMWM, Bill Browning of the Rocky Mountain Institute, and William McDonough's company, tend to target companies or individuals who want to make a difference, rather than the mainstream market.

***Restorative buildings produce more clean energy and water than they need, and reuse waste from other sites.***

Thus, these designers are beginning to speculate on the potential of creating 'restorative buildings', which actually help improve the environment – producing more clean energy and water than they need, and reusing waste from other sites. These buildings would decrease the impact of the built environment on the natural environment and natural resources.

As discussed in the next section, there remains significant debate and uncertainty about the economic performance of a restorative building, and indeed about green buildings generally. As with all ideas at the leading edge, they need a leap of faith – a 'true believer' who will be prepared to either pay a premium or take the risk on untried design approaches in order to make a statement about their personal or corporate commitment to the environment.

***In future, will the market-driven transformation sweeping the US overtake the regulatory-driven approach of the Europeans – possibly at a lower cost?***

Such a committed company could emerge either in Europe or the US, but at present it seems that the regulatory approach of Europe is resulting in greener buildings.

What will be interesting to observe in the future is how the market zeal currently sweeping the US plays out – whether industry-wide transformation under market pressures overtakes the more regulatory-driven approach of the Europeans, possibly at a significantly lower cost.

## **2.4 Developments outside the US and Europe**

The Mission came across a number of interesting developments outside the US, notably in China and India, though it did not visit these countries. A very senior Indian delegation attended the US Green Building Conference and had a number of discussions and interactions with Mission participants. British Tobacco is constructing a LEED-platinum building in Hyderabad and there was great interest in the whole area of resource efficiency as it applies to developing countries. Several US-based companies are providing consulting services to the Indian market in this field.

Bill Browning, of the Rocky Mountain Institute, also included in his presentation to the Mission details of a new development in Hangzhou, China, on which he is consulting. The development uses advanced Computational Fluid Dynamics to maximise comfort, both internally and in the open spaces around the buildings.

The strong interest in green buildings in these, the world's fastest growing but still developing economies, shows that the logic and drivers of green building are not only applicable to the sophisticated markets and technical infrastructures of Europe and the US.

## 2.5 Comparison with Australia

How does Australia compare with these overseas developments?

The Mission found no technological developments that surprised any of the participants. This was to be expected since Australian professionals have access to international literature and are technically as competent as their overseas counterparts. But, clearly, the application of these concepts, especially in tall commercial buildings in the US and Europe, is ahead of anything yet attempted in Australia.

The roll-out and enthusiasm for green buildings in Europe and the US is also more advanced than in Australia, especially at a government level. For Australia to be part of what is clearly a major sea-change in international markets, it will need to keep abreast of developments and apply them in local and overseas markets. The interest of India and China in green buildings also suggests a major market opportunity in our own region. Nations such as these show unequivocally that Australia cannot argue that it is too hard to act in the local market.

***Australia is as good technically as anywhere, but has not applied the concepts in the commercial sector to the same extent.***

Consensus of Mission members

### **3. Recommendations**

#### **3.1 Policy and regulations**

##### **3.1.1 Regulation, planning, market ratings and gradings**

The crucial issue for Australia going forward is the balance between market drive and regulation. It is not yet clear at a macro-level whether the greater emphasis on regulation in Europe or the more market-oriented approach of the US will have the greater impact in the long-term.

Australia will have to make its own decisions on where to strike the balance. The Building Commission's approach to residential housing provides a model that deeply impressed many overseas practitioners. No other jurisdiction has modelled the macro-economic impact of design regulations and created such a clear case for moving to 5-Star residential as the baseline for design. Similar modelling could pave the way for amendments in other sectors, including the commercial sector.

What comes out of the current situation in the US is the power of a market rating tool such as LEED to achieve industry transformation. Its strong influence arises from the clear communication it facilitates between the industry and consumers and the competition it generates between developers and between consumers who vie for the best green building. It acts as a marketing tool as well as a rating tool.

GreenStar is best positioned to play a similar role in Australia. As with LEED, it can be progressively refined to improve its impact on the sector and to adapt to local requirements. Other rating tools, such as the Australian Greenhouse Building Rating (AGBR) can be reconciled with GreenStar over time and discussions are already under way between the AGBC and the Sustainable Energy Development Agency (SEDA) of NSW to achieve this.

The Property Council of Australia (PCA) is ideally placed to act on behalf of the industry by incorporating GreenStar directly into the building grading system. The PCA is currently reviewing the inclusion of environmental performance in its grading system and the Mission hopes that it will adopt GreenStar as the basis for environmental performance in the new system. The PCA can also participate in the process of its progressive refinement via input to the Australian Green Building Council.

#### ***Recommendation 1***

That government and industry agree on GreenStar as the basis for rating buildings, and support its progressive refinement.

The planning and regulatory arms of government can endorse and use GreenStar as the basis for assessment and approvals of buildings and development proposals. There will be a powerful message if the measuring tools used in planning, in regulation and in the commercial market are consistent with each other. It will also help streamline information gathering and facilitate the integration of systems.

The nexus between planning and building regulation is also important. Apart from using the same system of measurement, there is also the issue of when ESD should be considered. The building regulations are the natural place for ESD performance specifications, but on occasions, ESD needs to be specified at the planning stage.

Another consistent theme from the Mission's discussions overseas was that buildings that have been designed to a particular standard need to be actively managed to achieve and maintain this standard in operation.

A building designed to achieve a LEED platinum rating may actually perform far worse if either the building is not constructed in accordance with the key design features that have contributed to the rating, or if appropriate commissioning and management practices are not undertaken and maintained.

To counter this, the US Green Building Council is considering an audit process that must be undertaken periodically to maintain a LEED rating. The Mission understands that the Green Building Council is developing a post-construction tool and an existing buildings tool that will provide building owners with the opportunity to validate their building against the original design intent, and also to periodically rate its performance in operation.

Periodical rating of operational performance may add cost to building owners, but experience suggests that these ratings will more than pay for themselves by identifying areas of sub-standard performance that lead to increased energy consumption and business risk, and also by providing a marketing edge.

Performance ratings will also automatically contribute to the knowledge and data on building performance that is needed to better understand the business case for green buildings. They would also drive continuous improvement

**Recommendation 2**

That a protocol be developed to cover the linkage between planning and regulatory regimes, indicating when ESD performance needs to be specified in planning documentation.

**Recommendation 3**

That the Green Building Council accelerates the development and release of the Green Star post-construction and existing buildings rating tools.

**Recommendation 4**

Develop standards for IEQ, water reuse and recycling demolition material in all commercial buildings by 2005.

**Recommendation 5**

Introduce regulations by 2006 to govern sustainable commercial buildings.

in the industry as overall knowledge of building performance and economics improve.

Standards for Indoor Environment Quality, water use and recycling demolition material need to be developed for commercial buildings in Australia.

It is a recommendation of the Mission that these standards form a regulatory framework that will govern all commercial buildings. These regulations should be introduced in 2006 to ensure Australia is a world leader in green building design and construction by 2010.

### 3.1.2 Indoor Environment Quality (IEQ)

IEQ is emerging as a major driver of policy, regulation and market interest in both Europe and the US. The upside is that good IEQ offers potential productivity gains. The downside is that should health impacts be conclusively linked to poor IEQ, the potential exists for litigation.

There is still significant argument about IEQ effects. Anthony Bernheim of SMWM Architects, an expert in IEQ who participated in the work of the State of California on an Indoor Environmental Requirements specification, has also undertaken a great deal of research on noxious emissions from different types of materials. Bernheim notes that material used in building fit-out is as important for indoor air quality as are construction materials and ventilation.

He stressed that there was a lot more work needed in the field. Bernheim was aware of significant boosts in productivity in some green buildings – as high as 15% at Lockheed and the ING Bank building, measured on the basis of decreased absenteeism. In some factories, such as at Herman Miller in Michigan, dramatic increases in output per worker (see RMI case studies at [www.rmi.org](http://www.rmi.org)) have been achieved.

However, Bernheim also pointed to a recent study by Professor Bill Fisk that showed a net 2% gain across a number of green buildings – a significantly smaller amount, but still highly significant for an office building where salary costs may be as high as 85% of total costs.

Bernheim observed that the seriousness with which the US market is now taking IEQ is evident in the initiative of the insurance industry in running seminars for architects and engineers on the issue. Apparently the first legal actions have been launched for health problems linked to IEQ, including one against the US EPA itself! The current focus is on mould in buildings, which has been linked to asthma, especially in children. Other pollutants are also under scrutiny.

#### **Recommendation 6**

That Australian regulatory bodies develop a program of research into IEQ to keep up with developments overseas, and to communicate with building owners, tenants, architects, engineers and other building professionals on their emerging responsibilities in this area. Urgent attention is required for developing indoor air quality standards to achieve international best IAQ / health practices.

### 3.1.3 Government leadership by example

Government buildings and leases constitute a major part of the market and can have a strong influence on industry attitudes. In the US, leadership by governments such as California and the City of Chicago in setting standards for their buildings and/or lease arrangements has had a major impact on industry and market awareness of the opportunities offered by green buildings.

Several people with whom the Mission met in the US commented that the stimulus of governments tenancy increased *demand and upskilling* of industry. This led to significant spill-over of green design into the private sector. The architects, engineers, developers and contractors that bid for this work, subsequently applied their skills on other projects – especially for those features that reduce costs or have a rapid payback.

Likewise in Australia, federal, state and local governments could identify opportunities to collectively stimulate strong interest in green buildings by announcing and specifying their intention to raise the standards they require for their building purchases and leases. The Mission noted that the Sustainable Energy Authority of Victoria is already examining policy in this area and that Government Housing Commission properties could be major beneficiaries of ESD upgrades that would reduce tenant utility costs and improve comfort.

The specification of Government standards should be based on GreenStar, to boost awareness of the model and consistency of the buildings.

Another interesting government approach to building was related to the Mission in California. There, the importance of buildings to the economic and environmental performance of the State is recognised through the Heads of State Government Departments. Once a month, State Department Heads whose portfolios include buildings, meet to review progress and develop initiatives to improve the State's built environment.

#### **Recommendation 7**

That all levels of government mandate that their departments will tenant only sustainable buildings (determined by GreenStar) by 2010.

## 3.2. Body of Knowledge

### 3.2.1 The business case for green buildings

Data that supports the business case for green buildings is patchy. There are a number of reasons for this. Building owners do not have a strong incentive to undertake detailed evaluations of their buildings, as this can be time-consuming and interfere with business. Developers and tenants may not want to share the information that gives them a competitive advantage.

For this reason, there remains significant scepticism in many segments of the marketplace in the US, Europe – and of course, Australia – about the practicality of green buildings. The perception remains that green buildings cost more, at least in initial capital costs.

However, there have been studies which show that in some buildings, savings in the future will compensate for the high initial/capital cost. For example, a comprehensive report recently released by the State of California has found ‘that minimal increases in upfront costs of about 2% to support green design would, on average, result in life cycle savings of 20% of total construction costs’ - more than 10 times the initial investment.

Other studies, such as those undertaken by the Rocky Mountains Institute (RMI) and the C-2000 project of Natural Resources Canada, found no correlation between cost and green performance – sometimes, green buildings cost more and sometimes less than a conventional building. RMI also maintains that there is a ‘cost tunnelling’ effect – whereby once the energy demand has been dramatically reduced, capital savings in plant and equipment more than compensate for the increased design costs (see [www.rmi.org](http://www.rmi.org)).

Part of the reason for the conflicting evidence is that many green buildings mix up commercially viable design and technical innovations with green features that are not cost-effective. The latter features are included to make a statement about the company or the designer’s commitment to the environment for branding or value purposes – just as upmarket buildings in financial districts include plush foyers that are not essential but are intended to make a statement to clients about the firm’s success.

For example, Arup Architects London, whose work includes buildings that push the envelope, presented the table below, showing how some green features made

#### ***Recommendation 8***

That research bodies such as the CRC for Construction and Innovation and CSIRO expand their research into the business case for green buildings, and that government and industry contribute to this research.

#### ***Recommendation 9***

That the Australian Green Building Council investigate the feasibility and resourcing options for it to become a ‘clearing house’ to foster research gather data, impart knowledge and disseminate information.

direct economic sense, but other green features such as solar cells extract a toll on the cost, if not the business equation.

<b>Building type</b>	<b>Features</b>	<b>Additional costs (UKP)</b>	<b>Net gain after 7 years (UKP)</b>
Commercial	Natural light Orientation Natural ventilation Ecological habitat	3.8m	350k
Enhanced sustainable	River and bore hole cooling	2.5m	-159k
Future sustainable	Fuel cells, wind, solar power	18.9m	-18m

The Mission believes that further data on the business case for green buildings, including productivity savings, payback periods for specific designs and technologies and building management strategies will give the more innovative firms and well informed buyers support for pressing for green design.

The 'shopping list' will become a resource for developers responding to both public and private sector interest in green buildings. It could make an important contribution to the body of knowledge about the business case for green buildings.

***Recommendation 10***

That the Australian Green Building Council, with the support of each State Government, develop a 'shopping list' of ESD options for industry within that State, indicating cost and risk, ranging from easy commercial wins (cost savings, quick paybacks, basic design efficiencies) through to ESD-branded buildings (non-economic features such as solar cells), and through to the leading-edge restorative buildings. (A state-by-state basis will allow local conditions such as climate to be incorporated.)

### 3.2.2 Green building investments

The growing interest among investors in environmental and ethical investment vehicles is well documented. Funds in such investments in the US exceed \$US1 trillion. Property funds have been launched in the UK, specialising in green investments, while in US, green finance advice has become a consulting niche.

As the business case for green buildings becomes better understood, the possibility of establishing a green property investment fund could become a good commercial opportunity in Australia, with its a strong tradition of investment in property. While a possible downturn in the property sector looms, the green fund could actually provide a point of differentiation that would be a distinct advantage in the marketplace.

### 3.2.3 Water in the built environment – an untapped opportunity for Australia

Europe and US, (except California and the south-western states) generally do not face water shortages. Their concern is more about water quality issues and drainage. Consequently, the Mission's discussions tended to make only passing references to water.

This actually creates an opportunity for Australia as water is a major issue for countries such as India and China, and indeed much of the developing world. The Mission believes that Australia has the potential to develop an important niche for itself as a centre of expertise in the management of water as a scarce resource in the built environment.

#### ***Recommendation 11***

That Mission participants explore interest in a green property investment trust with the development and investment community in Australia.

#### ***Recommendation 12***

That water authorities investigate developing a cluster of expertise among themselves, suppliers, researchers and consultants, specifically targeted at the use of water as a scarce resource in the built environment, with a view to applying this expertise both in Australia and abroad.

### 3.3. Education, training and professional practice

#### 3.3.1 Integrated Building Design and Execution

In both the US and Europe, early involvement by owners, designers, engineers, developers, tenants and operators is universally recommended as the key to successful green building. This is not generally accepted in the Australian market, where there is strong pressure to move quickly to construction to minimise financing costs and to get to market as quickly as possible.

However, the increased design time and cost that this involves is easily paid back in economic and environmental gains. The principles of integrated design are well understood and training for industry executives and professionals in Integrated Building Design and Execution methodologies would be beneficial. Incorporation of these concepts into University programs would also be timely.

The Mission understands that the University of Melbourne is developing a training program incorporating these concepts as a module in Engineering at Masters level, and that it will also be available as a stand-alone course. The Mission believes that such initiatives should be encouraged and supported by government and industry associations, in industry and the community.

#### ***Recommendation 13***

That industry and professional associations promote education and training programs that incorporate Integrated Building Design to their members.

### 3.3.2 Project briefing/specification

Often owners and developers who want to do the right thing don't know where to start. A template of 'green building briefs' could help owners, developers and tenants to articulate their environmental specifications in a clear concise format that building professionals could follow.

The PCA already has a 'green building guide' and there are also detailed accompanying notes to LEED, which perform many of these functions.

### 3.3.3 Energy modelling and use of advanced Computational Fluid Dynamics (CFD)

Energy modelling and the use of advanced CFD is being used in all major green building design and development (see Swiss Re and Post Tower). CFD allows ready optimisation of natural light penetration, ventilation, heating, cooling, humidity and internal emissions. The payback is in the form of reduced design time, better cost performance and improved comfort levels.

Australia has highly advanced CFD capability in organisations such as CSIRO, and this should be better used in the building sector.

#### ***Recommendation 14***

That the Australian Green Building Council adapt the PCA Green Building Guide and the LEED accompanying notes to align with GreenStar ratings. This will assist local industry to implement green building projects.

#### ***Recommendation 15***

That use of energy modelling and CFD be encouraged, and relevant planning and regulatory authorities evaluate the feasibility of including them as a requirement in the approvals process for large developments as supporting evidence of projected performance.

# ***Appendixes***

## **A.1 Mission Objectives**

The Australian Green Buildings Mission comprised senior representatives from the Australian building industry, as listed in Section 1.3. The objectives of the Mission were to:

- Investigate international developments in consumer demand, design principles, technology and regulations for ESD building;
- Obtain input to future environmental regulatory frameworks for commercial buildings;
- Create a cluster of expertise across industry, government and the professions that understands and promotes a sustainable Australian built environment; and
- Promote Australia as an active participant in the international green building industry and establish networks with leading practitioners of building design, engineering, construction and operation.

The Mission visited examples of green buildings in United States and Europe, and held meetings and seminars with leading practitioners. In addition, the Mission attended the US Green Building Conference in Pittsburgh, which is the world's largest gathering and showcase of green building expertise and products. The Mission also jointly hosted a reception in Pittsburgh for industry leaders, including the Board of the US Green Building Council.

## A.2 The Buildings

A review of each of the buildings inspected by the Mission is contained in Attachment 1. These buildings included:

- Pier One (San Francisco – hosted by SMWM architects)
- San Francisco Public Library (hosted by SMWM architects)
- Aspect Communications (San Jose – hosted by William McDonough and Partners)
- Chicago City Hall (hosted by the Office of the Mayor)
- The Dearborn Centre (Chicago – hosted by Dearborn Centre Managing Agents)
- David Lawrence - Pittsburgh Exhibition Centre (hosted by US Green Building Conference)
- Swiss Re (London – hosted by Arup Associates and Foster and Partners)
- Plantation House (London – hosted by Arup Associates)
- ING Group HQ (Amsterdam – hosted by Meyer and van Schooten) (architects)
- ABN-AMRO (Amsterdam – hosted by ABN-AMRO)
- Commerzbank (Frankfurt – hosted by Commerzbank)
- Deutsche Post Tower (Bonn – hosted by Transsolar)
- Waldorf School (Cologne – hosted by Transsolar)

### A.3 Mission Participants

The participants in the Australian Green Buildings Mission were:

	Mr Tony Arnel	Commissioner	Building Commission (Victoria)
	Mr Chris Chesterfield	Director	Melbourne Water
	Mr David Craven	Sustainable Buildings Development	Sustainable Energy Authority Victoria
	Mr Lorenz Grollo	Managing Director	Equiset
	Ms Eloise Gucciardo	Principal Planning Officer	Melbourne City Council
	Mr Dang Hodinh	Director, Victoria	Lincolne Scott
	Mr Lee Williams	Research Director	Davis Langdon
	Ms Ann Keddie	Chair	Building Appeals Board
	Mr Bruce Mathews	Managing Director	Meinhardt (Vic)
	Mr John McDonald	Director	DesignInc
	Robert Peck	Director	Peck von Hartel Architects
	Roger Poole	Chairman	Bates Smart
	Pru Sanderson	CEO	Monash Property Management
	Lindsay Bevege	Tour Co-Ordinator	Business Outlook & Evaluation

## **A.4 Summary Recommendations**

### **Policy and Regulation**

1. That Government and industry agree on GreenStar as the basis for rating buildings and support its progressive refinement.
2. That a protocol be developed to cover the linkage between planning and regulatory regimes, indicating when Environmentally Sustainable Development performance should be included in planning documentation.
3. That the Green Building Council accelerate the development and release of the GreenStar Post-Construction and Existing Buildings Rating Tools.
4. Develop standards for IEQ, water reuse and recycling demolition material in all commercial buildings by 2005.
5. Introduce regulations by 2006 to govern sustainable commercial buildings including IEQ, water reuse and recycling.
6. That Australian regulatory bodies develop a program of research into IEQ to keep up with developments overseas, and to communicate with building owners, tenants, architects, engineers and other building professionals on their emerging responsibilities in this area.
7. That all levels of government mandate that their departments will tenant only sustainable buildings by 2010.

### **Body of Knowledge**

8. That research bodies such as the CRC for Construction Innovation and CSIRO expand their research into the business case for green buildings (costs, energy savings, health and productivity benefits etc) and that governments and industry contribute to this research.
9. That the Australian Green Building Council investigate the feasibility and resourcing options for it to become a 'clearing house' to foster research, gather data, impart knowledge and disseminate information.
10. That the Australian Green Building Council, with the support of each State Government, develop a 'shopping list' of ESD options for industry within that State, indicating cost and risk, ranging from easy commercial wins (cost savings, quick paybacks, basic design efficiencies) through to ESD-branded buildings (non-economic features such as solar cells), and through to the leading-edge restorative buildings. (A state-by-state basis will allow local conditions such as climate to be incorporated.)
11. That Mission participants explore interest in a green property investment trust with the development and investment community in Australia.
12. That water authorities investigate developing a cluster of expertise among themselves, suppliers, researchers and consultants, specifically targeted at the use of water as a scarce resource in the built environment, with a view to applying this expertise both in Australia and abroad.

### **Education, training and professional practice**

13. That industry and professional associations promote education and training programs that incorporate Integrated Building Design to their members.
14. That the Australian Green Building Council adapt the PCA Green Building Guide and the LEED accompanying notes to align with GreenStar ratings. This will assist the local industry to implement green building projects.
15. That use of energy modelling and CFD be encouraged, and relevant planning and regulatory authorities evaluate the feasibility of including them as a requirement in the approvals process for large developments as supporting evidence of projected performance.