Jones Lang LaSalle

February 2007

Sustainability: Bridging the Knowledge Gap

"We cannot solve problems using the same kind of thinking we used when we created them." – Albert Einstein

EXECUTIVE SUMMARY

- The Australian real estate market continues to demand greater environmentally sustainable performance at a time when the skills required to achieve performance enhancements are decreasing in the industry.
- The skills shortage is compounded by a 'knowledge gap', which has occurred as critical knowledge of building design and operation is lost between different stages of the building life cycle.
- A focus on a single rating number is contributing to a lack of the specific data that is required in order for performance uplifts to be achieved and maintained.
- The introduction of tools that rate environmental performance, such as Green Star and ABGR, has brought about a change in the way real estate is designed and operated and has lifted awareness across the property sector.
- The take up of the rating tools has been high, with over 100 projects having received or been registered for certification under Green Star and some 29% of the national office market having been rated using ABGR.
- The rating tools have the potential to facilitate the transfer of knowledge, and to improve understanding of the real issues around sustainability performance outcomes, by focusing on data reporting at a more specific level.
- If the knowledge gap is addressed, the Australian market environment presents a unique opportunity to achieve innovation and global best practice in measurement and reporting on sustainability performance.
- Environmental performance rating tools have the potential to drive this change; however the industry must play a role in ensuring that Australia takes advantage of this opportunity.

INTRODUCTION

In the global context, Australia enjoys a unique convergence of needs and drivers that have increased the focus on environmentally sustainable performance in the property market. These include shortages in peak energy capacity, diminishing water availability and increasing waste and transport costs, as well as increasing demands from government, occupiers and investors. The commercial benefits of sustainable buildings, and the growing focus on sustainability improvements for corporate social responsibility purposes, have been well documented in recent years. These issues are discussed in Jones Lang LaSalle's white papers *Commercial Buildings Going Green (2004)* and *Assessing the Value of Sustainability (2006)*.

The introduction of two rating tools, ABGR and Green Star, has led to a fundamental change in the way property is designed, delivered and operated in Australia. These tools are moving Australia towards improved sustainability outcomes while developing a sound baseline for sustainability performance. Over time, these tools are raising awareness of the importance of establishing improved building design and operational skills across all property sectors.

As a result, organisations are continuing to demand more from their property in terms of sustainability outcomes. This is creating a significant challenge for the property service industry to achieve improved performance standards.

Today, increased skills are required in all facets of a building's life cycle and Australia is confronting a shortage of both knowledge and skills. To date, the rating tools have largely been used as mechanisms to increase the commercial potential of one asset when compared to another, all other factors being equal. The tools could also facilitate knowledge transfer between stakeholders across the different phases of design, construction, management and review. This sharing of knowledge underpins the property industry being able to take full advantage of the current focus on sustainability.

> The absence of an understanding of this issue both in the short- and longer-term may see Australia fail to meet its full potential in terms of improved performance in the property sector.

In this paper we examine the current tools for rating environmental performance of property in Australia and propose an alternative approach to facilitate knowledge transfer across the building life cycle. We also evaluate the type of information necessary for the real estate market to achieve its desired sustainability outcomes. Finally, we discuss what could be achieved if feedback loops and access to specific data was integrated into the environmental rating systems for Australian property.

THE CURRENT MARKET ENVIRONMENT

At a time when there is renewed focus on improving property performance, the industry is facing a shortage of the skills needed to bring about change at the required rate. A range of factors have contributed to the diminution of the real estate industry's ability to deliver improved building performance and quality.

A major contributor to this lack of skills has been the focus on cost, rather than quality, as a measure of maintenance performance. There are currently no commonly applied quality measures in the market. Maintenance is often delivered within a standardised 'minimalist' approach, is scheduled around individual items of plant rather than whole systems, and involves very little tailoring to particular building requirements. In response to price pressures, many maintenance organisations have also chosen to reduce or even eliminate the supervisory level in their business. This focus on cost and lack of quality drivers has seen the technical and management skill base become diluted.

Industry trends with a focus on price have further reduced the number of technical specialists managing maintenance contracts. There are also far fewer consultants providing support in this area compared with 15 to 20 years ago. The scope and quality of maintenance is often determined by service providers, either through their standard schedules or their interpretation of standard maintenance specifications.

Over the last 20 years in Australia, as the speed of change has increased, there has been a decreased opportunity to train staff at all levels of the property cycle. The time available to transfer knowledge in the design, construction and operation of a building has diminished, or has been absorbed in meeting increased risk management requirements.

As an example, it is only in recent times that formal dedicated training courses have been developed for Heating, Ventilation and Air Conditioning (HVAC) maintenance technicians. The training infrastructure in this area is in its early days and is far from consistent throughout Australia. HVAC is arguably one of the most technical areas in the industry and also the prime consumer of energy in buildings. While there is some specific energy efficiency maintenance training offered it is not available in the mainstream. Similarly, there are no formal industry training courses in the important area of building controls. The only training available is provided in-house by building controls companies themselves on their proprietary equipment.

The property industry will need to fund the majority of the training required to meet the skills shortage. It may be prudent to consider what role the rating tools could play in this process to better understand cause and effect.

EXISTING RATING TOOLS

In Australia there are two widely used rating systems for environmental performance in commercial real estate, the Australian Building Greenhouse Rating (ABGR) Scheme and Green Star.

Green Star

By recognising and rewarding environmental leadership in the top 25% of the market, Green Star, administered by the Green Building Council of Australia (GBCA), aims to assist the building industry in its transition to sustainable development. Projects are evaluated against eight environmental impact categories, plus innovation. *Green Star Design* rates the potential environmental performance of building design, while *Green Star As Built* rates how well what is delivered at construction completion reflects the design promise.

> The minimum accepted standard for Green Star is four stars.

Take up of rating tools in Australia

Green Star as at November 2006

- 21 Projects have received a Green Star certified rating
- 2 projects have been certified under Green Star – Office As Built
- 13 projects have been awarded a Green Star – Office Design rating
- 2 projects have been awarded 6 star Green Star – Office Design ratings
- 4 projects have been certified under Green Star – Office Interiors
- Over 78 other projects are registered for Green Star certification

Source: Green Building Council of Australia

ABGR and NABERS as at September 2006

- 29% of the national office market (by net lettable area) has been rated using ABGR
- 43% of offices in NSW have ABGR ratings
- 35% of offices in WA have ABGR ratings
- 52 accredited NABERS Office Water ratings have been processed

Source: NSW Department of Energy, Utilities and Sustainability

The Building Code of Australia

The Building Code of Australia (BCA) now includes minimum energy efficiency measures for all building classifications. This is part of a comprehensive strategy by the Australian Government, and State and Territory Governments to reduce greenhouse gas emissions.

The BCA 2006 Part J starts to define mandatory requirements for the transfer of critical information from the design and construction stage into the operational stage. The BCA is becoming the fundamental driver of change in how energy efficiency, and ultimately broader sustainability aspects, is delivered in all new building projects.

Whilst these new energy efficiency provisions are primarily structured to eliminate worst practice they are also causing more far reaching effects in at least two areas. The requirement to consider energy efficiency as a structured process within a compliance regime promotes energy efficiency in all new projects. Arguably this will result in better, more energy efficient buildings across the board, not only the elimination of worst practice buildings.

The second important area relates to renovation and refurbishments. The application of the BCA to new works in existing buildings currently depends on the extent and type of the works and varies between jurisdictions. With the inclusion of minimum energy efficiency provisions in the BCA we are starting to see relatively straightforward refurbishment projects act as the catalyst for significant energy efficiency upgrades.

The principle of minimum energy performance standards is long overdue in Australia if we are to minimize the projects requiring major rework into the future, when the bar is reset to higher levels of performance. To ensure that ongoing and long-term benefits from improved design are realised, the level of information transfer required by the BCA from designers and constructors must be increased. It will take some considerable lobbying from the industry to ensure that this occurs.

ABGR

ABGR is a 'world first initiative' to help building owners and tenants across Australia benchmark their greenhouse performance. It is administered nationally by the NSW Department of Energy, Utilities and Sustainability (DEUS) and locally by leading state agencies. The ABGR scheme rates buildings from one to five stars according to actual energy performance, using 12 months of data. It can be used for the base building (central services), whole building, or individual tenancies.

> Current market best practice for ABGR is three stars.

DEUS also administers the National Australian Built Environment Rating System (NABERS) which is comparable to Green Star. *NABERS Office* rates buildings and tenancies based on measured operational impacts on the environment and is focused on existing buildings. It incorporates ABGR and also a specific *NABERS Office Water* rating.

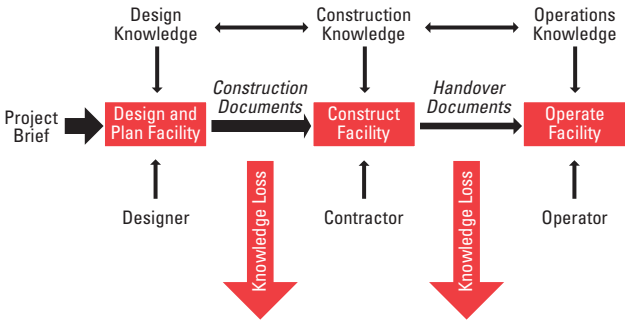
All of these rating tools are voluntary and can be initiated by a building owner, manager or tenant. For the first time this is giving life to a paradigm shift in the delivery process, from adversarial to collaborative. This provides opportunity to develop a process where, from the project briefing on, the entire life cycle of the project becomes a fully integrated process.

HOW DO WE BRIDGE THE GAPS?

At each phase in the project cycle at present we have knowledge loss (Figure 1) and the primary reason for this is that there is generally no linkage between the phases in terms of 'total ownership' of the final performance outcome. While good design may establish sustainability potential, good performance can only be achieved when all the operational issues are fully understood.

The reality is that all the stages of the building life cycle are interconnected and the market requires an integrated tool to ensure knowledge transfer both within individual projects and across the industry. This is fundamental to the long term improvement cycle in property performance, as designers seek to

Figure 1: The Knowledge Cycle – Pre-Rating



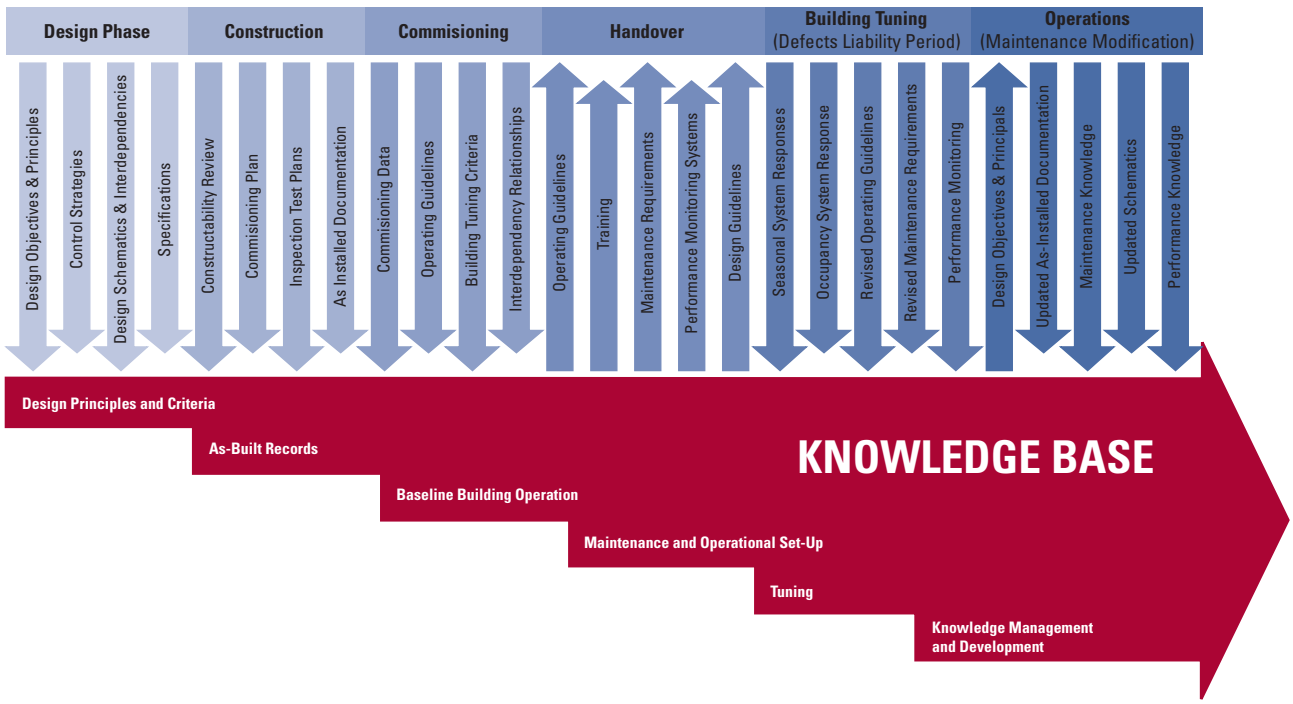
Source: Clowes, Fischer et al.

better understand how their innovations translate into final performance, and building operators come to understand how they can improve management over time to achieve the design intent.

There is currently a lack of the required knowledge transfer to ensure the asset not only meets its target but can maintain that level of performance. Therefore, there is a need to incorporate cause and effect within any rating tool. Each tool has its strengths, and most agree that one tool would be better if we are all to move forward, time and cost effectively.

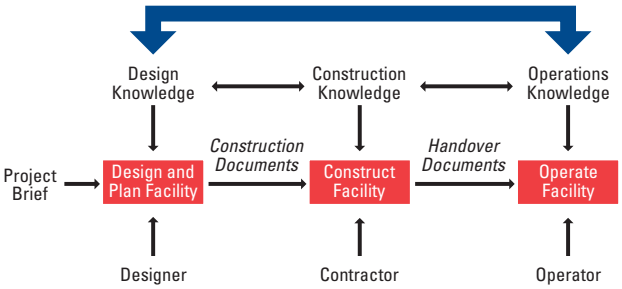
Rating tools provide a framework for developing a project knowledge value chain; a knowledge base in relation to the design, installation, performance and operation of a building that can be continuously developed, captured and managed. The focus is then on transfer of knowledge from one stage of a building's life cycle to the next with an aim and obligation to convert information and learning into retained knowledge. This concept is depicted in Figure 2.

Figure 2: Knowledge Transfer as Part of a Rating Framework



Source: A.G.Coombs Group

Figure 3: The Knowledge Cycle – Post Rating



Source: Clowes, Fisher et al.

A tool that ties design to performance objectives will ensure that stakeholders engaged in the design and construction phases have a vested interest in the final performance outcomes.

This would establish a feedback loop that ensures knowledge and skills are harnessed and built back into the process (Figure 3). The benefits of such an approach would be significant, but primarily it would allow all players to track cause and effect within the constraints of commercial sensitivities, and to identify risks and opportunities that will affect sustainability outcomes over the building life cycle (Figure 4). The end result would not only meet its targets but do so in a time and cost effective manner.

TRANSFER OF THE RIGHT INFORMATION

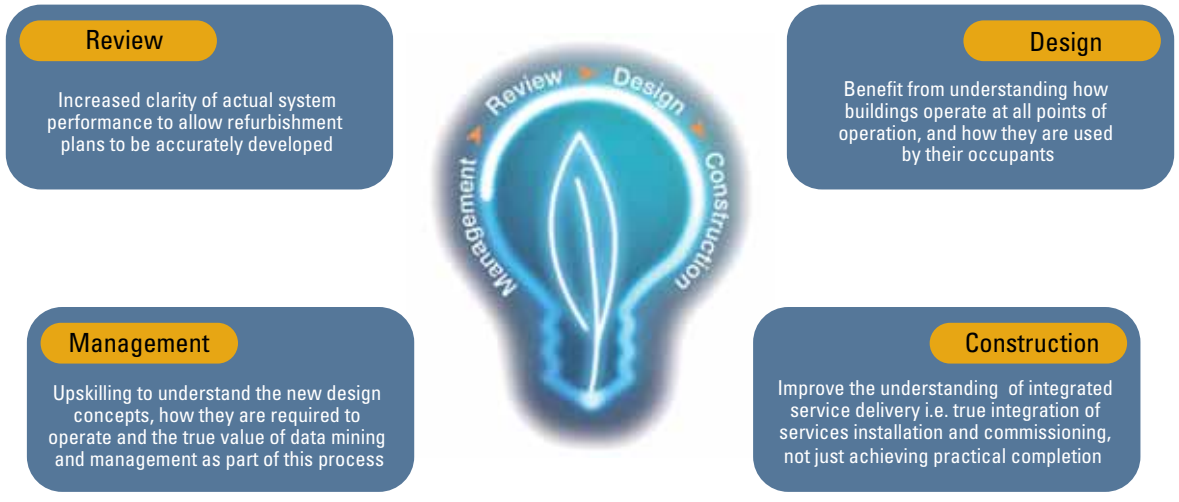
In each of the rating processes there is a requirement to transfer relevant information. The tools are still relatively new and the types of information required as well as the form of transfer, are unfamiliar to a number of industry participants.

To determine the required knowledge base it is necessary to consider the data, information or knowledge generated at each stage of the project. What needs to be retained for future reference by the various stake-holders in the project? What documentation is typically available as the project progresses? Are new information acquisition processes necessary, and at what cost? As discussed in the A.G.Coombs report *Integrated Systems Commissioning (2005)*, typical information that should form part of the knowledge base includes:

Design Phase

- A project description providing an overview of the project and the design objectives, including factors such as energy or environmental rating requirements
- A description of the services and systems, including any special requirements or design features
- Design criteria
- Schematic drawings, including key design information, control strategies and equipment sizing

Figure 4: Outcomes Across the Building Life Cycle



Source: Jones Lang LaSalle

- Control strategies
- Commissioning requirements and acceptance criteria

Construction, Commissioning, Handover and Building Tuning

- Initial review of the design and proposed equipment selections to ascertain potential issues
- Review of the control strategies and system schematics
- Review of the shop drawings to ensure that the installation can be adequately maintained
- Preparation of the commissioning management plan, outlining the sequence of activities, key dependencies and inspection test plans
- Preparation of inspection test plans, which are fully integrated into the design process by tracing their acceptance criteria back to the specification or relevant performance standard
- Completion of pre-hand over commissioning activities and preparation of the records
- Completion of seasonal building tuning activities during defects liability / warranty period and preparation of tuning records and guidelines
- Input to energy and water efficiency and any other sustainability related improvements to achieve building performance (rating) targets
- Progressive operator / maintainer training
- Input to operating and maintenance manuals

Maintenance and Operation

- Key information from the specification forming the inputs to the project including system description, design criteria and possibly relevant fire engineering requirements in a performance based design
- The functional control descriptions
- Final system schematics
- Key user intervention actions relating to the operation of the system including clearing faults
- Inspection test plans for the essential services and critical plant
- Warranties

The information to be captured in this knowledge model is significantly more than is delivered today by most construction processes. Much of this knowledge already exists in the building delivery process. Any additional costs involved in capturing this are more likely to be investments in organisation and forethought rather than costs for additional resources.

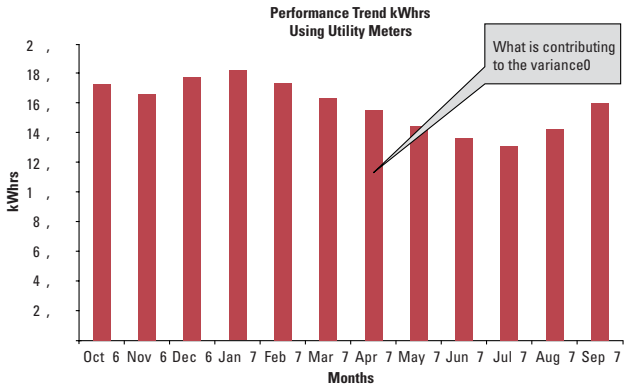
IMPROVED BUILDING PERFORMANCE DATA

Within the market at present there is a growing demand for full business cases on potential opportunities to save energy and water. To ensure the desired outcomes of any initiatives are both achieved and maintained, access to specific building data is essential. It has become evident that the delivery and maintenance of reduced environmental impact for buildings is heavily dependant on accurate and up to date information and record keeping. Not only information relating to the design and set up of the building but also relevant and timely information relating to a building's performance is essential to monitor performance, identify areas of avoidable environmental impact and to demonstrate the effect of improvement activities.

Building performance is made up of various items of plant and equipment, the energy and water consumption of which vary day-to-day and season-to-season. A building system designed to run efficiently in peak summer may operate poorly at periods of part load. Equally some buildings operate efficiently at full occupancy but poorly at low occupancy or during after hours periods.

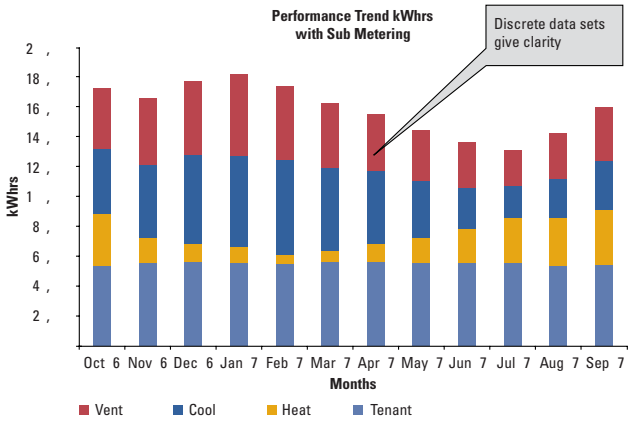
Current master metering trends give only a snapshot of the overall consumption for a building or tenancy (Figure 5) and in older buildings this is the only data that is readily available. If the rating tools incorporated additional data sets it would be possible to not only see the overall rating outcome but also the sub-elements of consumption that make it up. Installation of additional sub-meters (either temporary or permanent) makes

Figure 5: Current Master Meter Trends



Source: Jones Lang LaSalle

Figure 6: Sub-Meter Trends as Part of a Rating Process



Source: Jones Lang LaSalle

this level of data accessible and provides a more complete understanding of the real issues and the potential savings that could be delivered.

Figure 6 provides an example of the type of data that would be available as part of a rating process that evaluates consumption at the level of each sub-element. This data could be quantified in terms of consumption (KWHRS) or greenhouse gas emissions (CO^2).

> There is a growing awareness in Australia that all facets of the property industry are looking to achieve a better understanding of consumption patterns and where losses can be trapped.

This makes it possible to assess and evaluate clearly each of these sub-elements and identify not only a building's rate of consumption, but also precisely how different sub-elements are contributing to usage patterns. These additional data sets will allow all contributors to the process, including designers, contractors, managers and maintenance staff, to make accurate and more informed decisions on improving the efficiency of a building or tenancy.

The availability of detailed building information is required for any ongoing building rating and accreditation process. The data and information requirements in some rating situations are particularly detailed and onerous, and future environmental accreditation is likely to require lodging of design information and operational records with the accrediting authority. The commercial sensitivities of new innovations also need to be considered, as those seeking to fund previously untried design solutions want to see an increased return from the capital invested. The cost and complexity in providing all this data and information is emerging as a significant concern, particularly in relation to accreditation. Going forward the costs associated with rating buildings and reporting on performance could become prohibitive if the industry does not develop cost effective methods for acquiring, storing, analysing and reporting on rating related data.

Beyond data acquisition the real challenge is turning this 'data' into useful information for the management and improvement of the building and to underpin the ongoing rating and annual accreditation process. There is tremendous potential with new metering technologies, modern Building Automation Systems, data management and reporting applications, and web based data repository and reporting systems to provide this information in a cost effective way. Realising this potential will require a constructive coming together of designers, commissioners, building managers, operators, and technology providers.

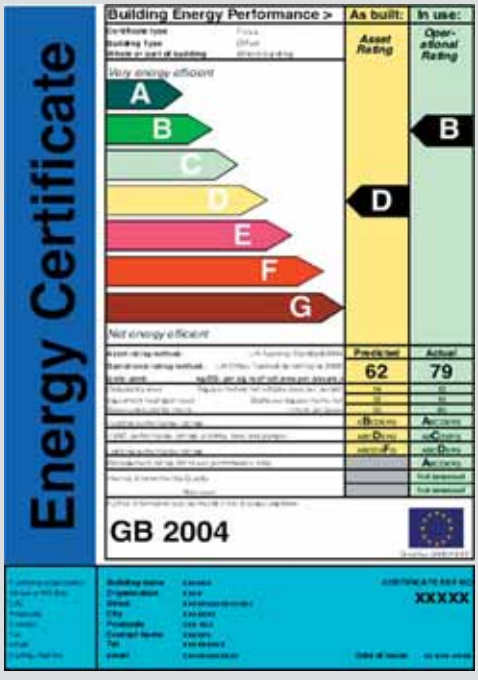
A New Reporting Approach

"A certificate is not an end in itself, but a means to improvement"
– Bordass, Cohen and Field

A UK team, Bill Bordass, Robert Cohen and John Field, identified the gap between design and performance – which they call the 'credibility gap' – where the design approach is not informed by practical operation, and operation is not informed by design intent. They have proposed a certification process and energy certificate to help identify and close the gaps.

Based on the energy efficiency labels used on domestic appliances, the certificate demonstrates an 'Asset Rating', which details the potential for energy efficiency and an 'Operational Rating', which measures performance when in use. The aim of this is to close the gap between design and operation and also to enhance transparency between modelled data and actual performance data.

Below is an example of a possible first page of the energy certificate, demonstrating predicted usage against actual performance using CO^2 as the measurement unit.



Source: Bill Bordass, Robert Cohen and John Field

RECOMMENDATIONS

Those seeking to achieve and maintain improved sustainability performance for a property or portfolio should demand high quality performance outcomes from maintenance staff and service providers. It is not adequate to focus on cost as the only measure of performance or to settle for minimum standards.

Consultation with both design and operational teams when assessing the commercial viability of new projects or innovations will ensure that information is gathered from all stages of the project and knowledge is retained and transferred across all levels. Analysis of specific building data will allow any gaps between design intent and actual performance to be identified and addressed effectively.

Future reporting requirements, both legislative and voluntary, are likely to become much more onerous. Planning early will ensure the required knowledge is at hand and the skills are in place to meet any increase in standards. Investing in organisation and forethought, understanding what knowledge should be gathered at each stage of a project, will identify opportunities to avoid additional cost by harnessing existing information.

Australia is in a unique position; we are the driest continent on the planet with most climates covered within our geography. There is a growing realisation internationally that we can make a meaningful contribution to the property sector in a range of areas.

Environmental performance rating tools have the potential to drive this change; however the industry must play a role in ensuring that Australia

> Our design approach can be fresh and truly reflect our geography, our geo-political position and our capacity to innovate and lead – not follow.

takes advantage of this opportunity. Pressure can be applied by continuing to demand improved performance and investment can be made in the training necessary to address the skills shortage. Most importantly, partnering with government and rating tool administrators will ensure that rating tools are developed that will truly capture cause and effect and bridge the sustainability knowledge gap.

ABOUT THE AUTHORS

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Chris Wallbank has 25 years experience in the design, construction, commissioning and maintenance of building services, with the last thirteen years focused on building performance improvements with new and existing property. Chris brings his engineering expertise and experience to develop Jones Lang LaSalle's sustainability platform, building on the firm's existing delivery capability. His focus is on demonstrating the tangible benefits of a well documented and cost effective sustainability program for new and existing clients. He has worked in a multi-discipline environment to develop an intimate knowledge of the relationships within, and between engineering and services disciplines. His skills have been developed over numerous new and existing projects and his approach is heavily biased towards practical solutions tailored to project specific requirements.

Bryon Price
Director
A.G.Coombs Group

Bryon Price is a mechanical engineer with notable experience in energy efficient buildings. He is Director of Business Development for the A.G.Coombs Group of companies. Prior to joining A.G.Coombs Bryon was responsible for a range of energy and environmental projects. These included innovative and award winning long term energy management roles with a number of major financial, commercial and retail organisations, and various Commonwealth and State Government Departments, and the preparation and management of a number of innovative energy performance briefs for major building developments. Out of this experience his particular area of knowledge and interest is 'whole of life' energy and environmental management in buildings.

ABOUT JONES LANG LASALLE

Jones Lang LaSalle (NYSE: JLL), the only real estate money management and services firm named to FORTUNE magazine's '100 Best Companies to Work For' and Forbes magazine's '400 Best Big Companies', has approximately 150 offices worldwide and operates in more than 450 cities in over 50 countries. With 2006 revenue of over USD$2.0 billion, the company provides comprehensive integrated real estate and investment management expertise on a local, regional and global level to owner, occupier and investor clients. Jones Lang LaSalle is an industry leader in property and corporate facility management services, with a portfolio of over 1.0 billion square feet worldwide. LaSalle Investment Management, the company's investment management business, is one of the world's largest and most diverse real estate money management firms, with approximately USD$40.6 billion of assets under management. For further information, please visit our website, www.joneslanglasalle.com.

Jones Lang LaSalle has over 45 years of experience in Asia Pacific. With over 11,500 employees operating in over 30 markets across the Asia Pacific region, the company is positioned to partner with clients to provide the quality advice needed for making quality decisions.

The Little Book of Real Estate Definitions – Asia Pacific by Jones Lang LaSalle is a useful resource to gain a better understanding of the most commonly used real estate terms in the region. To enhance your knowledge, please visit www.joneslanglasalle-dictionary.com.

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The A.G.Coombs Group is a specialist provider of engineering and building services to the property, facility management and construction markets. These include air conditioning and mechanical services, fire protection and electrical systems. The group's expertise extends from single system installations to large sites with responsibility for all technical services over extended contract periods.

The Group provides a comprehensive, 'whole of life', range of technical skills for effective, efficient and safe buildings. These embrace engineering systems design, construction, installation and commissioning, project management, ongoing service and maintenance management, and technical advisory services. For more information please go to www.agcoombs.com.au

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