

Cooperative Research Centre
for
Construction Innovation

Achievements | **2001-08**

Construction Innovation forged a new era of collaboration

In 2001, the CRC model introduced the building and infrastructure sector to a new culture of operation and engagement across industry, government and research. Through its professionally coordinated research program and roll out to industry, the CRC for *Construction Innovation* has succeeded in gaining the sector's confidence in this model at a critical time. Not only is it entering a period where the capacity for government research has been reduced but the industry also faces a phase of massive growth and transformation. Now in 2008, this tested model provides a solid foundation for the conduct of future research activities across this sector.

Sustainability — changing industry behaviour

Your Building — key online resource at www.yourbuilding.org

The *Your Building* web portal is helping owners, tenants, developers, builders, designers and facility managers create more sustainable commercial buildings by providing case studies and practical advice about energy-saving design and technologies, recycling and water efficiency, reducing greenhouse gas (GHG) emissions and other sustainability topics incorporating environmental, business and social outcomes.

Not only does *Your Building* provide up-to-date and reliable information that is comprehensive and relevant, it has a user-friendly and interactive, wiki-style interface.

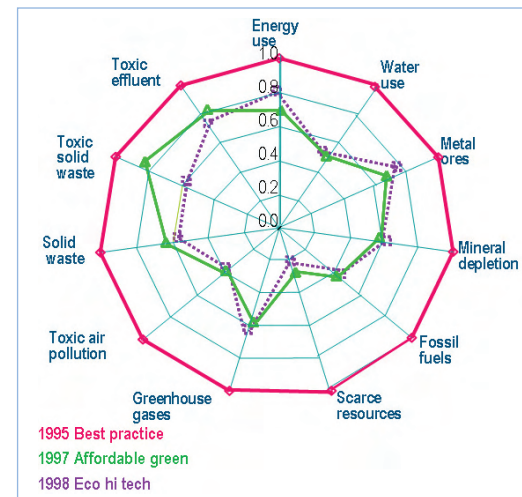
Your Building has a vital role to play in informing the industry, given that in Australia 10 percent of national GHG emissions are produced by commercial buildings.



LCADesign — eco-profiling software

LCADesign is a software tool that can electronically calculate and chart the environmental impact of construction materials and building products. *LCADesign* analyses all elements in a Building Information Model (BIM) using data from its comprehensive Life Cycle Inventory (LCI) database of building products and operations. The software delivers an eco-preferred result at the push of a button, enabling practitioners to produce superior eco-profiles in hours or days compared with weeks of work.

LCADesign has been trialled in the USA, The Netherlands, Germany and in several of Australia's leading design firms to optimise the environmental impact of buildings at the design stage, reducing greenhouse emissions, air and water pollution, and saving energy. It is named as a finalist in the 2008 Environmental Protection Agency Sustainable Industries Awards.



Re-Lifing — life extension for buildings

High construction costs and the increasing emphasis on sustainability are directing the attention of building owners towards alternative re-Lifing solutions rather than demolition and new build.

"Re-Lifing", featured on the *Your Building* website, outlines how to improve the serviceability of buildings and apply the principles of ecologically sustainable development. This includes decision-making processes and critical steps in the areas of project management, floor space optimisation and structural capacity, recycling and waste management, residual service life, and sustainability and building efficiency.

Sustainability and the BCA

The project *Sustainability and the Building Code of Australia* provided a key framework to inform current and future Australian Building Codes Board (ABCB) policy on energy, water, indoor air quality and materials through the roll out of a comprehensive scoping study on the incorporation of sustainability into the Building Code of Australia. The project outcomes continue to inform ABCB policy, as in the case of the study on sustainability tools and the inter-governmental agreement signed in June 2006.



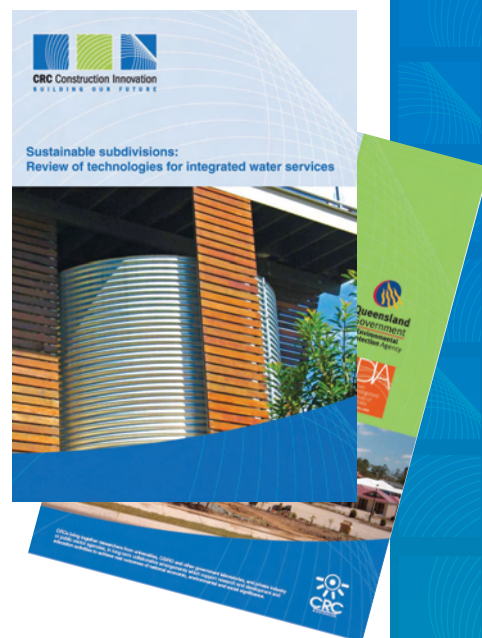
Sustainable subdivisions — improving our suburbs

The *Sustainable Subdivisions* portfolio of projects has created guides for developers in subtropical areas to optimise energy-efficient subdivisions and housing by examining lot size and orientation, minimising water use at the home and estate level, and maximising the benefit of natural ventilation (to come in 2009). These guides and their recommendations are of value to urban designers and greenfield land developers.

Australian Sustainable Built Environment Council (ASBEC)

ASBEC is about “reducing ecological impacts, improving economic returns and extending community amenity of the built environment”. As a key founding member of ASBEC, *Construction Innovation* is committed to progressing construction-related sustainability across the country.

With its broad membership, representing expertise across the planning, design, delivery and operation phases of our built environment, ASBEC is evolving to become the peak consultative council on sustainability in the built environment.



Digital modelling — integrating systems

Sydney Opera House Exemplar — moving FM to 3D

The *Facility Management Exemplar* project showcases the Sydney Opera House, Australia's most iconic building and one of the world's busiest performing arts centres, as a case study in developing FM as a business enabler. The project demonstrates that seven existing (and incompatible) digital information systems in the Sydney Opera House could be consolidated to one 3D digital model allowing greater security and cost-effective maintenance.

This research demonstrated that a digital model which provides a three-dimensional representation of the building and the relationship of objects such as lifts, ventilation and fire systems within the building, can also integrate FM functions like condition reporting, energy consumption and room bookings.

This project outcome was acknowledged as speeding the adoption of digital modelling; services procurement and performance benchmarking across the industry, resulting in significant improvements in productivity improvements.



Project of the Year, 2007 Association of Consulting Engineers, Australia (ACEA) Awards for Excellence

Jury's Choice category of the American Institute of Architects Technology in Architectural Practice 2007 awards

Featured in the Bentley Awards for Excellence 2007 for BIM in multiple disciplines

BIM national guidelines

These National Guidelines for BIM will be based on experience, industry consultation and practical examples that promote consistency in the implementation of digital models for building and infrastructure projects.

The guidelines will support stakeholders in achieving interoperability throughout the lifecycle of the facility and will be based on internationally accepted standards. By highlighting open and consistent processes, they will allow any practitioner to work with any other practitioner in developing shared “virtual buildings and infrastructure” projects.





Safety — committed to implementation

Construction Innovation has created an unprecedented alliance of industry, government and researchers committed to saving lives and preventing injuries on Australia's construction sites. It has committed to improving safety on construction sites by providing a consistent, national approach to implementing safety leadership in large and small organisations.

Striving for safer construction

The *Safer Construction Project* was commissioned by Engineers Australia in response to the recognised need to reduce accidents and deaths in construction processes.

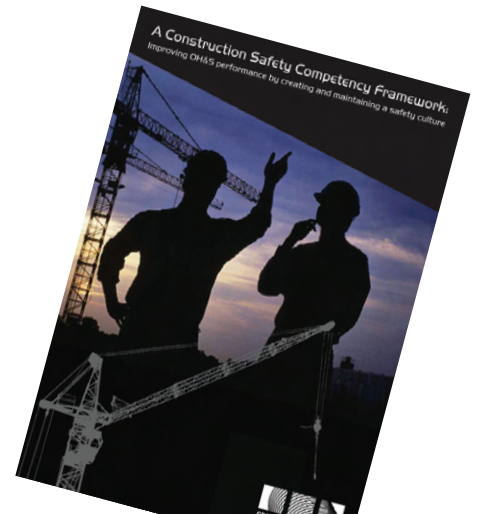
The industry-endorsed *Guide to Best Practice for Safer Construction* is the key outcome of this project. The guide provides a framework to improve safety performance on construction projects and covers all stages of a project: planning, design, construction and post-construction.

Improving safety culture

This *Construction Safety Competency Framework* was designed for safety managers and senior managers to create a positive safety culture by ensuring that key staff such as project managers, supervisors, OHS advisors and engineers can effectively execute tasks needed to better manage OHS.

Training packages and learning tools based on the framework are available to TAFE, industry and other training institutions, better equipping them to understand safety culture and improve the industry's overall safety performance.

2007 Australian Institute of Building's (AIB) Professional Excellence Award in the Research and Development category



Practical guide to safety leadership

This step-by-step guide instructs users on how to implement the award-winning *Construction Safety Competency Framework*. It explains the safety critical positions and safety management tasks that companies should implement to achieve a positive safety culture. In addition to industry case studies from small and large organisations which have implemented the competency framework, the guide's value is enhanced through its concise and hands-on approach.



CIBE — Harmonisation of OHS regulations

In response to the industry's demand for improved consistency in the regulatory environment, a CIBE report has examined and evaluated four attempts to promote consistency of OHS across Australia. It concludes that while there is a high level of information sharing between jurisdictions, particularly from the National Occupational Health and Safety Commission standards, a fragmented OHS policy framework remains in place across Australia. The Office of the Federal Safety Commissioner refers to this report for policy development on the nation harmonisation of safety legislation.

Infrastructure — improving processes

Noise amelioration for roads

This project conducted a comparative cost/benefit assessment of noise amelioration applying alternative treatments outside the road reserve compared with the present practice of treatment within the road reserve. It developed a full range noise abatement strategy encompassing source, path and noise receiver. This provides benefits by mitigating the problem where it is most effective and defusing traditional “authority” boundaries to produce the optimum outcome.

Decision support tools for bridges

A new decision support tool assists in the interpretation of distress symptoms in bridges exposed to aggressive environments. This software will allow Queensland Department of Main Roads (QDMR) to take an informed approach to rehabilitating concrete structures in marine environments.

A second prototype enables asset managers of concrete infrastructure to select the most suitable techniques for rehabilitating aging concrete structures using fibre-reinforced polymer composites.

Road asset management — saving government dollars

Through this research QDMR attained a four-fold increase in the length of road network it could test for the same cost. That is, the adjusted sampling plan for the road network developed by the project makes it an affordable exercise by effectively saving between \$3.5 and \$4million on state-wide data collection costs. It achieves this without losing the quality, reliability or statistical relevance of the data. The project team also developed methods that allow road authorities to produce budget estimates for a project life-cycle cost with defined levels of confidence.

Investment Decision Framework for Civil Infrastructure Asset Management received a High Commendation at the 2005 Queensland Engineering Excellence Awards



Innovation in the decision support process

- Assessing cost effectiveness against a range of roads, bridges, tunnels, buildings and other structures in the road network of Queensland. Road assets were assessed at around \$2-10 billion. As the condition of assets deteriorates over time, costs to maintain or repair an asset increase exponentially (i.e. \$200 million per km).
- To effectively manage road infrastructure, road agencies require sound information based on knowledge of road condition. The ability to support their investment decisions.
- The Queensland Investment Framework Project has developed innovative ideas on the quality of the decision support process for road agencies. Summary:
- Road agencies need to optimise expenditure for road data collection based on the minimum amount of data required to predict maintenance and rehabilitation costs without compromising reliability.
- Road agencies need to develop a systematic approach to the collection, analysis and interpretation of data to ensure that the data can be used for its intended purpose.
- The production of budgets for road maintenance and rehabilitation must be supported by

Effective decisions for road asset investment

- Strategic decisions by the road agency for effective decision making for road asset investment include:
 - Optimising data collection
 - Understanding pavement performance models
 - Assessing the probability of errors in budget estimates
- Optimising data collection**
- What?** A strategy for determining sampling plans for road data collection that gives best value for money.
- Why?** Road asset management requires accurate monitoring of changes in road condition. Monitoring road asset condition is high cost, especially monitoring pavement strength condition.
- How?** The method calls for a probabilistic road asset condition monitoring technique to identify those sampling intervals along the road that do not compromise the statistical relevance of the road data.
- Deliverable:** A case study assessed the statistical properties of road pavement strength data over extensive lengths of road network. The results found that road authorities could reduce strength test sampling rates by 75% to 90% and correspond to current practice without losing any relevant information for relevant applications.

Promoting off-site manufacture

Off-site manufacture (OSM) is recognised as a key vehicle for driving improvement within the construction industry, including better quality control, more efficient site processes, better health and safety control, more environmentally-friendly manufacture and reductions in cost.

This scoping study confirms the benefits of OSM, identifies its real and perceived barriers to widespread adoption and provides an action plan to encourage uptake across the industry.



Procurement — supporting business processes

eContracting and eTendering — advancing eBusiness

By providing recommendations on the appropriate legal and security structures for eContracting and eTendering and hence how to minimise and avoid risk, this research enables construction firms and their clients to operate more confidently in an electronic environment.

Procurement toolkit — optimising strategies

Choosing the appropriate procurement system for construction projects is a complex and challenging task for clients, particularly when professional advice has not been sought. To assist the decision-making process, a range of best-practice aligned procurement selection techniques has been consolidated into the Procurement Method Toolkit.

Knowledge management checklist

This checklist system will enable managers to identify knowledge management issues encountered when handling a variety of external contracts. Improving such processes will be of particular value when these contracts build upon knowledge not residing with the organisation. The system operates by mapping knowledge boundaries of government agencies and how they interface with the knowledge requirements for different contracts.



Skilling, tools and outreach for industry

Smart tools creating a smarter industry

Construction Innovation developed prototypes for a series of smart tools that interact with a BIM to automate environmental and air quality impact, design checks against building codes, estimate the quantity of construction materials, reduce cost, errors and delays — LCADesign, DesignCheck, Automated Estimator, DesignView, DesignSpec and the Indoor Air Quality Estimator.

[DesignCheck won the research and development category at the AIB 2006 New South Wales Professional Excellence in Building Awards and received a High Commendation in the 2006 Professional Excellence Award for Research and Development at the AIB national awards in September 2006.](#)



International conferences — networking and informing

Construction Innovation has held three international conferences and has participated in national and offshore conferences delivering numerous papers.

Selected *Construction Innovation* conferences papers are collected in three volumes: *Clients Driving Construction Innovation: 1 Mapping the Terrain, 2 Moving Ideas into Practice* and *3 Benefiting from Innovation* (for release in October 2008)

Scholars — educating future leaders

Since 2001, *Construction Innovation* has provided support for more than 20 scholars who have investigated a broad range of topics including infrastructure, sustainability, government policy, digital technologies and safety.

Industry publications — widespread dissemination

Repurposing the content of project outcomes for use in industry publications enables the CRC to disseminate the key learnings and benefits emerging from its research into the hands of practitioners in an industry-compatible format. The CRC's access to distribution channels through the website, partners and participants, industry associations, workshops, conferences and other events ensures the wide reach of its publications. A number of these resources have also been incorporated into university and professional association courses.



A forum at the World Sustainable Building Conference

Construction Innovation hosts a special forum at the SB08 conference in Melbourne. The forum focuses on innovating and integrating for sustainability, examining how to maximise opportunities for innovative, integrated processes in the planning, design, construction and facility management of our built environment. *Construction Innovation* has engaged the influential speakers in Ben Schwegler (Chief Scientist of Walt Disney Imagineering Research and Development), Tristram Carfrae (Arup) and Tony Stapledon (Leighton Contractors).

Workshops — engaging with industry face-to-face

Successful industry workshops have been co-ordinated around the country raising awareness, and building skills and competencies in the areas of safety, sustainability, and relationship management. This program, based around *Construction Innovation* research, enables industry speakers and specialist facilitators to address critical issues relevant to participants from across the building and construction industries.

Wayfinding — creating a more accessible built environment

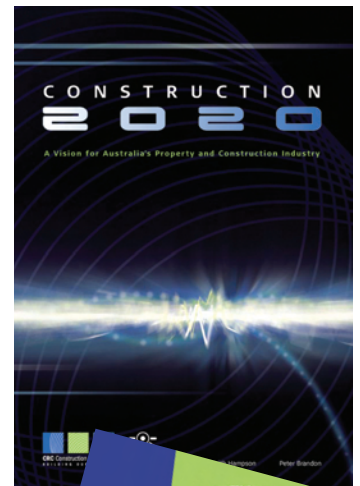
The project identified wayfinding systems, technologies and devices appropriate for people with a sensory impairment, particularly people with vision impairment. The resulting publications provide practical solutions to help designers, developers, property owners and managers do their part in creating a more accessible, more inclusive built environment.

Queensland Government 2007 Disability Action Week Award, Building and Accessible Environments Category



Construction 2020 — A vision for the future

This national initiative involved an extensive process of industry engagement culminating in a report identifying eight key themes for the future of the property and construction industry. Since its release in 2004, *Construction 2020* remains an insightful milestone of construction industry research which will have a long-term impact on developing a robust, informed and strategic research and innovation agenda for Australia's property and construction industry.



BRITE — bringing innovation to industry

The BRITE (Building, Research, Innovation, Technology and Environment) project has been fostering innovation in Australian small business through case studies demonstrating the benefits of innovation, a national database of innovative contractors and a step-by-step guide to becoming a more innovative business.

The BRITE website of resources (refer www.construction-innovation.info homepage) is helping to promote more widespread adoption of best practice. BRITE's success has been demonstrated by external reviews and industry feedback, both showing a strong trend of increased innovation awareness and activity.



Construction Innovation colleagues and staff

The achievements of 2001–08 are thanks to the outstanding collaborative efforts and individual contributions made by the many hundreds of Australian and international colleagues from among our partners, participants and project teams in industry, government and research. This exceptional pool of skill, talent, goodwill and commitment is co-ordinated by our own internal headquarters staff based at QUT and further supported through consultants in skills development, media, business, publishing and event management.

Industry	Government	Research
             	 <p>Queensland Government Department of Tourism, Regional Development and Industry Department of Public Works Department of Main Roads</p>   <p>Department of Housing and Works</p>    	  <p>The University of Sydney</p>    <p>University of Western Sydney Bringing knowledge to life</p>  



The Construction Innovation headquarters team, July 2008.

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