

# LCADesign™



## Automated Eco-efficiency Assessment of Commercial Buildings

For more information contact:

### Cooperative Research Centre for Construction Innovation

9th Floor, L Block, QUT Gardens Point  
2 George Street  
Brisbane, QLD 4001 Australia

T 61 7 3864 1393

F 61 7 3864 9151

E [enquiries@construction-innovation.info](mailto:enquiries@construction-innovation.info)

[www.construction-innovation.info](http://www.construction-innovation.info)



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Use of LCADesign™ (Life Cycle Analysis of Design) enables building design professionals to make informed decisions on the environmental impact of commercial buildings, by providing detailed environmental assessment measures for different materials, products and designs, automatically from their 3D CAD drawings. LCADesign™, developed through the Australian Cooperative Research Centre for Construction Innovation, meets a growing need from designers and regulators for real-time appraisal of design performance of built assets against an emerging set of sustainability criteria.

### Benefits of LCADesign™ include:

- Automated environmental assessment measures direct from 3D CAD drawings
- Choice of environmental impact and performance measures
- Detailed design evaluation
- Comparative ratings of environmental impacts of alternatives at all levels of design analysis
- Comprehensive graphical and tabular outputs

### LCADesign™ has been specifically designed to:

- Drive innovative and eco-efficient building design through an automated environmental impact assessment design tool for building design professionals
- Harmonise with simpler checklists and environmental rating tools
- Provide a method for environmentally conscious design which aligns with the International Standards Organisation framework for assessment of environmental performance



## Environmental Profiles

Buildings consume significant amounts of resources – both in their construction and operation – including water and energy, and contribute to the pollution of our air, water and soil, but they remain an essential part of the world we live in. The ability to readily assess their impact and to design alternatives to reduce that impact is the core purpose of LCADesign™.

Assessment measures include a range of environmental impacts, as defined through international standards, covering such topics as:

- Resource depletion
- Air pollution
- Water pollution
- Solid waste
- Human impact

## Life Cycle Assessment

LCADesign™ implements life cycle assessment (LCA) for all products in a building. LCA is a technique for assessing environmental impacts associated with a product by:

- Compiling an inventory of relevant inputs and outputs of a product system
- Evaluating potential environmental impacts of those inputs and outputs
- Interpreting the results of the inventory and impact assessment in relation to the objectives of the study (ISO 14043–2000)

For buildings, the inventory includes resource acquisition, transport, manufacture, construction, maintenance, final demolition, removal processes and the recyclability of building products.

## Environmental Assessment

LCADesign™ is fully automated from the completion of the 3D CAD drawing of a building to viewing of calculated environmental impacts resulting from building construction. The automated take-off provides quantities of all building components made of products such as concrete, steel and timber. This construction information is combined with the life cycle inventory database to estimate key internationally recognised environmental assessment measures (indicators).

## Advances in LCADesign™

The LCADesign™ concept is a significant advancement on current tools, in that the LCADesign™ approach:

- Obtains building data direct from a 3D CAD file



- Is objective rather than subjective assessment
- Provides a variety of performance-based measures
- Provides repeatable evidence-based environmental reports
- Makes weighting of environmental impacts transparent to the user
- Evaluates impacts at a detailed product-specific level
- Quantitatively computes absolute values rather than relative values
- Is aimed at compliance for standards, codes and performance-based tests
- Calculates totals from building components
- Assesses a building using comprehensive databases of environmental impacts of building components and materials
- Promotes evaluation during the detailed design stage
- Facilitates ready assessment of trade-offs

### 3D CAD and IFC Technology

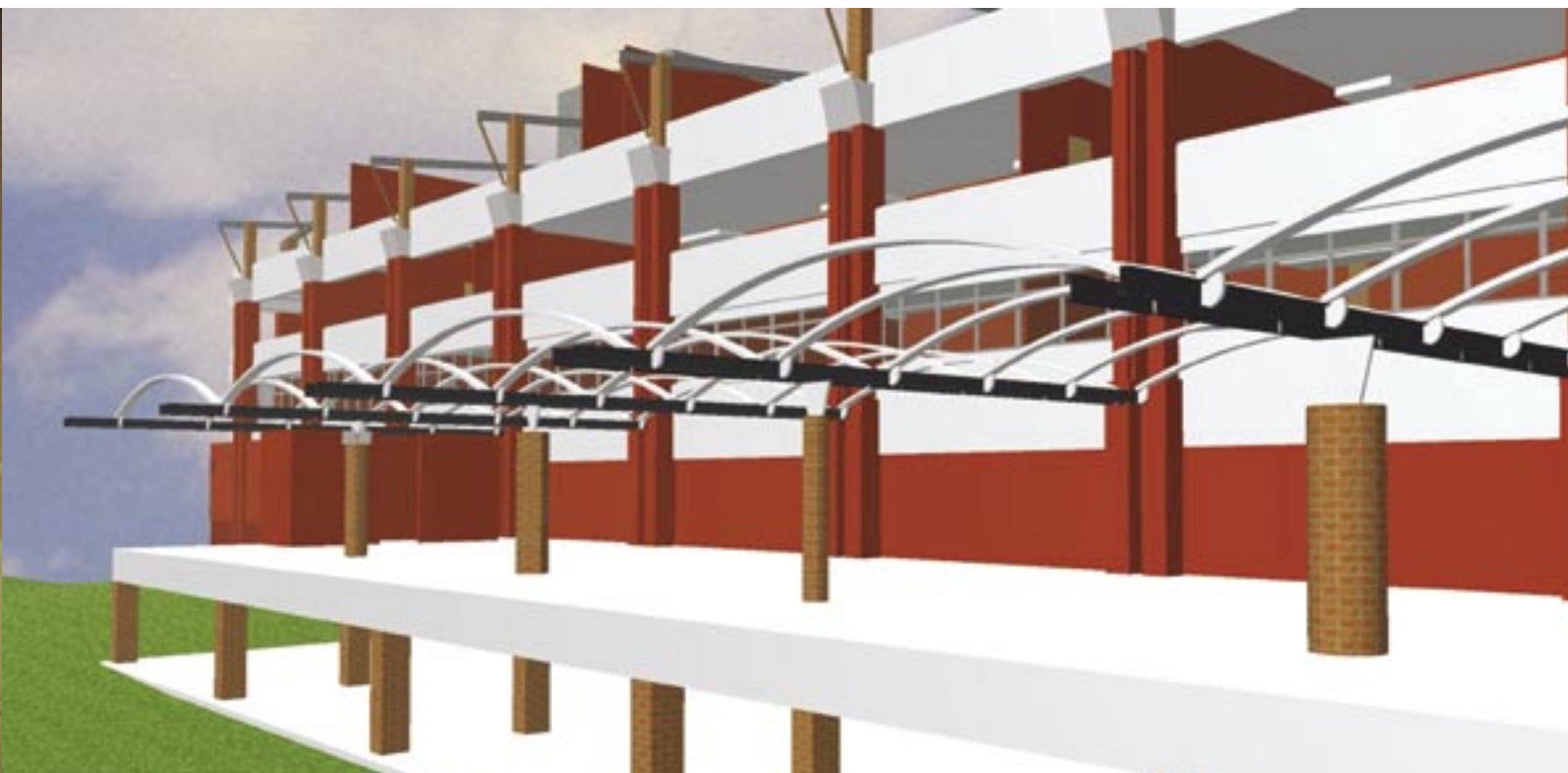
Modern 3D, object-oriented CAD files contain a wealth of building information. LCADesign™ accesses this detail using Industry Foundation Classes (IFCs) – the international standard file format for defining architectural and constructional CAD graphic data as 3D real-world objects – allowing interrogation of intelligent objects by construction professionals.

IFCs have been developed by the International Alliance for Interoperability, a non-profit, global alliance of the building, construction and software industries with over 650 member organisations in 20 countries.

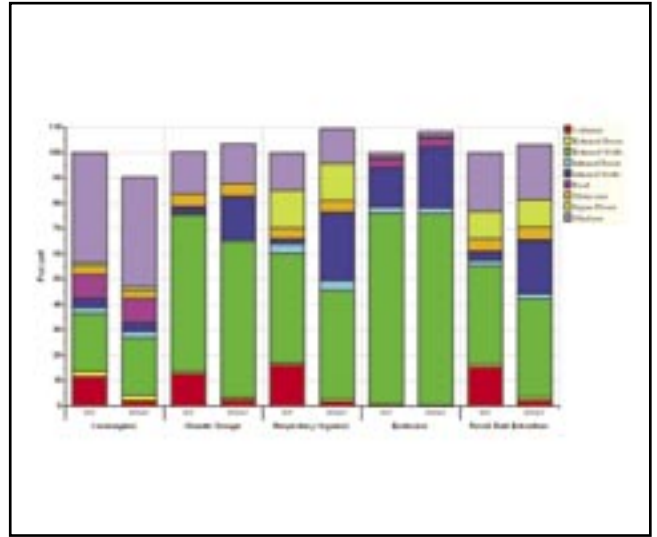
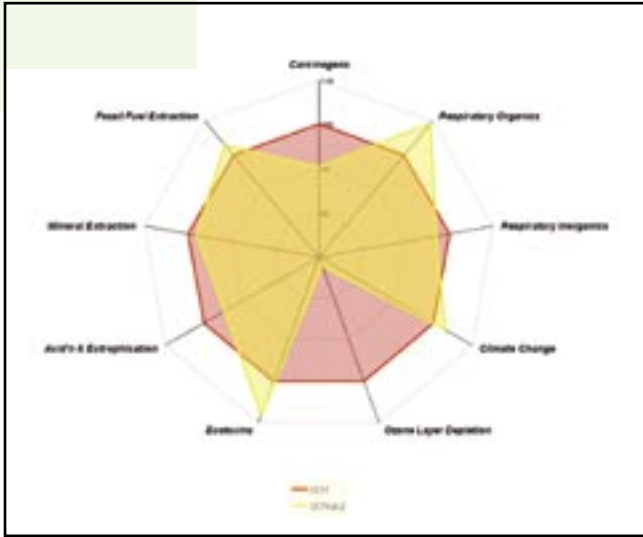
### Life Cycle Inventory Database

The life cycle inventory database includes details of resource consumption and environmental emissions generated during the manufacture of building materials, including embodied pollution and water, as well as energy.

The individual environmental indicators are nested under three major categories of impact: resource depletion, degradation of the physical environment, and harm to human population. LCADesign™ has the capability to drill down into the source of environmental impacts by material category, individual material, building assembly or component.







## Australian Cooperative Research Centre for Construction Innovation

The Australian Cooperative Research Centre for **Construction Innovation** is a national collaboration involving industry, government and research partners, and has been made possible through a \$14 million Australian Government grant

under the Cooperative Research Centres program which is complemented by a \$50 million cash and in-kind contribution provided by industry, government and research partners. **Construction Innovation** is developing

LCADesign™ to facilitate a paradigm shift to eco-efficient design, construction and management within the architecture, engineering and construction sector, both in Australia and internationally.

