



The Cooperative Research Centre for Construction Innovation is a national collaboration of industry, government and research partners made possible through a \$14 million dollar Federal Government grant to the Centre's program. This was also complemented by a \$50 million cash in-kind contribution from industry partners.

Construction Innovation developed LCADesign to transform uptake of eco-efficient design and project management in architecture, engineering and construction in Australia and overseas.



**Ecquate** Pty Ltd is an Australian company holding the global license for marketing, distribution and development of LCADesign software and databases. It provides unique services to enable clients to assess ecoprofiles of their products and assets.

Consultants from Brisbane, Sydney, Melbourne and Hobart offer practical advice, industry experience and leading edge capabilities to customise LCADesign for in-house, supply, procurement and marketing applications. Service is backed-up by advanced technology, databases and libraries allied to LCADesign. Please email [info@ecquate.com](mailto:info@ecquate.com) or phone +61 (02) 4231 1777.



LCADesign software and database began in 2001. The prototype underwent industry trials from 2003 to 2005 and redevelopment between 2006 and 2008.

The Commercial Version was launch by the Federal Minister for the Environment and The Arts at the World Sustainable Building Conference in Melbourne in September 2008.

The following *Construction Innovation* partners were involved in development of LCADesign software and databases from 2001 to 2009.

# LCADesign

Rapid Commercial Building Ecoprofiling Software



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**Use of LCADesign software provides Life Cycle Analysis of Computer Aided Drafting for Design. It enables professionals to make informed decisions on the environmental impact of whole buildings by providing fast detailed environmental measures for different designs, products and elements. LCADesign meets a growing need from practitioners and regulators for real-time appraisal of design performance against a wide range of sustainability criteria.**

### LCADesign Benefits include:

- Real-time environmental assessments direct from CAD virtual BIM Models;
- A single ecopoint score;
- Choice of environmental inventory, damages, impacts and point-score measures;
- Concept model ecoprofiling;
- Detailed design evaluation;
- Comparative ecoprofiling at all levels of design;
- Comprehensive graphical and tabular outputs and
- Immediate cost variations.

### LCADesign was made to:

- Drive innovative ecodesign through automated environmental impact assessment for building professionals;
- Harmonise with simpler checklists and ratings;
- Inform ecodesign outcomes at every stage;
- Provide a method for environmentally conscious design aligned with the International Standards Organisation: environmental performance assessment framework.



# 2

## Environmental Profiles

Built facilities are essential yet they consume vital resources and generate considerable emissions over their lives. They are major consumers of water and energy resources and also generate significant pollution of communities, air, land and water. For these reasons capability to readily assess low impact design alternatives is the core purpose of LCADesign. Results are calculated against 70 indicators such as shown below of:

- Energy and Fuel use;
- Air and Carbon Pollution;
- Ozone Depletion;
- Climate Change;
- Human Health;
- Ecosystem Quality
- Eco-Toxins and Waste;
- Resource Depletion;
- Recycled content and
- Water Pollution.

## Life Cycle Assessment

LCADesign implements Life Cycle Assessment (LCA) for all material in a building plus energy and water use in operation over its design life.

LCA applies ISO 14040-43 methods to assess environmental impacts of a building, fabrication or a product by:

- Establishing a scope and system boundary and compiling an inventory of in and outflows;
- Evaluating potential damages and impacts of flows from cradle to end of life or re-use;
- Interpreting results of all flows, damages and impacts considering the study's objectives.

For buildings the inventory scope covers resource acquisition, recycling, transport, manufacture, delivery, construction, maintenance and periodic system replacements. Water and energy use in occupancy over a given design life is also included.

## Environmental Assessment

From importation of the 3D CAD model LCADesign is automated to derive, calculate and view results and obtain records of building and product eoprofiles.

An automated take-off provides quantities of all components made e.g. from masonry, metal, glass, polymer and timber. This dimensional information is combined with supply chain inventory data to estimate key internationally recognised indicators.

Encoded algorithms calculate the burdens of, benefits from, damages to and impacts on the earth's carrying capacity and human health.

All calculation routines are fully transparent and inventory, product selections and impact weightings can be manipulated to reflect different site sensitivity, client need or national or corporate supply chain.

# 3

## Advances in LCADesign

LCADesign is a transformational tool as it delivers:

- Output from comprehensive national building industry supply chain inventory;
- Data off 3D CAD Models;
- All data in absolute units;
- Quantitative computation;
- Repeatable consistency;
- Transparent weightings;
- Dimensional relevance;
- Element specific details;
- Comparative profiles;
- Full drill down to detail;
- Fast detailed profiles;
- Totals from all components;
- Gross building ecopoints;
- Concept design profiles;
- Ease of profiling trade-offs;
- Compliance modelling for standards and codes, and
- Objectivity not subjectivity.

## 3D CAD IFC Technology

Modern object-oriented 3DCAD files produce Building Information Models (BIMs) containing a wealth of detailed information for whole of property life applications such as for facility management virtual modelling.

LCADesign accesses this detail using Industry Foundation Class (IFC) data transfer protocols. This global standard file format is used for defining architectural and construction CAD graphic data as 3D real-world objects.

Such virtual modelling allows users to interrogate as well as add data to and manipulate such objects as increasingly intelligent building information models.

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

The life cycle Inventory (LCI) databases provide details on resource use and emissions generated by supply chain operations during product manufacture including of embodied pollution, water and energy use.

Databases also cover resource use and pollution from material acquisition and transport as well as fuels, energy and water use in building operations.

The individual environmental indicators are nested under three main categories of impact: degradation of the physical environment, natural ecosystems and harm to the human population.

LCADesign users can drill down into the source of environmental impacts by design element, individual product, assembly or component all the way to the inventory results to find, for example, fuel use and emissions from transport.

