



LCADesign

Automated Eco-efficiency Assessment of Commercial Buildings



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Cooperative Research Centre for Construction Innovation

The Australian Cooperative Research Centre for Construction Innovation is a national collaboration involving industry, government and research partners.

LCADesign™ is an example of the Centre's leading-edge research improving industry practice.

Construction Innovation is developing LCADesign™ to facilitate a paradigm shift to eco-efficient design, construction and management within the architecture, engineering and construction sector.

Use of LCADesign™ (Life Cycle Analysis of Design) enables building design professionals to make informed decisions on the environmental impact of buildings by providing detailed environmental assessment measures for different materials, products and designs, automatically from their 3D CAD drawings. LCADesign™ 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 measure direct from 3D CAD Drawings or Building Information Models (BIMs)
- Choice of environmental impact and performance measures
- Detailed design evaluation
- Comparative ratings of alternatives at all levels of design analysis
- Comprehensive graphical and tabular outputs
- Immediate costing of variations

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 over 70 environmental impacts such as defined through international standards covering such topics as:

- Air Pollution
- Carbon
- Carcinogens
- Climate Change
- Eco Toxins
- Human Health
- Resource Depletion
- Solid waste
- Water Pollution

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 and recycled content of building products. Water and energy use in building operations is also included.

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 indicators.

Advances in LCADesign™

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

- Obtains building data direct from 3D CAD file
- Is objective rather than subjective assessment

3D CAD and IFC Technology

Modern 3D, object-oriented CAD files and Building Information Models (BIMs) 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 organizations 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. It also covers resource use and pollution from material acquisition and transport as is energy and water use in building operations

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.

