DesignCheck

DesignCheck and why it is innovative: Legislation requires the construction industry to check building designs for compliance against numerous building codes. This is a complex task and failure by humans to correctly assess designs for compliance can result in high, long term costs. This sort of problem can be eliminated by developing software that automates design checking against building codes. DesignCheck, an advanced software tool, has been developed to automate compliance checking at all stages of the design process.

DesignCheck performs a task that has typically been associated with high level of human error, which increases rectification costs and time frames. While the software is suitable for all building codes, it is Australia's new requirements relating to disabled access that have provided the basis for the development, testing and initial marketing of DesignCheck.

A testimonial was given by the Director of Victoria's Building Commission: "We've been waiting 30 years for someone to do this. DesignCheck has both turned the building codes into a format readable by programming language and then automated the checking process. It's a stunning achievement that could dramatically streamline the building design and approvals process."

Where and when it originated and has been used: The Commonwealth Scientific and Industrial Research Organisation (CSIRO) initiated and led the DesignCheck project. It was funded by Australia's Cooperative Research Centre for Construction Innovation, which facilitated key industry relationships. CSIRO partnered with the University of Sydney on research, and the Building Commission of Victoria and Woods Bagot for government and industry links. DesignCheck has been provided to the building industry and government for testing (including Woods Bagot, Queensland Department of Public Work and the NSW Department of Commerce). DesignCheck has been used in the University of Sydney's postgraduate Computer Integrated Design course.

What the innovation is: DesignCheck is a highly innovative product that meets a very significant industry need. It includes three major innovations: (1) DesignCheck caters for sketch, detailed and specification stages of design; (2) Object-oriented representation of building codes and domain knowledge into rules; and (3) Common building information model to provide adequate information mapping onto building codes.

The first major innovation is linking compliance checking to the design process. Namely, it supports users at different stages of design, from the early stages to the detailed and documentation stages. For example, in the early stages of design, designers are concerned with accessible paths within a proposed building, circulation space at doorway, and so on. DesignCheck encodes associated clauses and semantics interpretations for verification of high level performance into rules for early stage checking. At the detailed stage, designers may be concerned with door width, handrail heights, and so on. DesignCheck encodes associated clauses and semantic interpretations derived from geometrical description into rules for detailed checking. At the documentation (or specification) stage, designers document requirements for objects, such as floor surfaces, handrail materials and signs. DesignCheck encodes associated clauses and specification requirements of objects for designers to check.

The second major innovation is encoding 'hard-coded' design standards into computational programs. DesignCheck has developed object-oriented representation of building codes, and it is capable of sophisticated computation. The object-oriented representation of building codes is linked to Building Information Model (BIM), see below, and integrated with application environments to support automated code compliance checking.

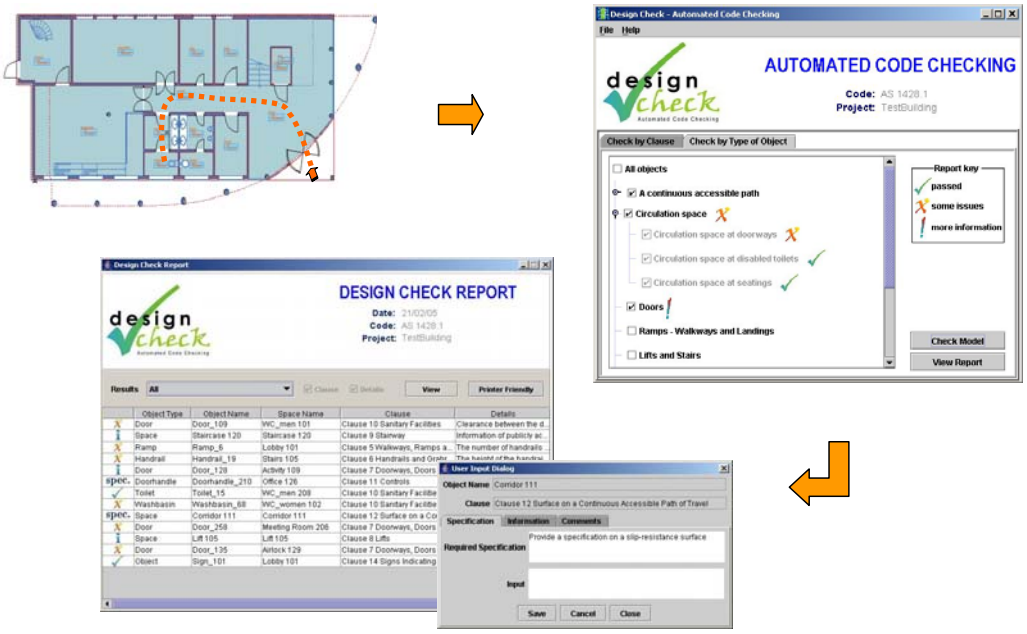
The third major innovation is incorporating Building Information Model into DesignCheck. The process of automated code checking using DesignCheck requires a building model with adequate information to begin with. Existing CAD models used by architects and designers have a number of limitations and cannot cater for many building code requirements. Building information must contain a wide variety of non-graphical and project-related information, with standardised definitions for common conceptual design semantics. This type of building model has been developed in DesignCheck using BIM /IFC (Industry Foundation Classes).

What it changed or replaced, and the impact is: DesignCheck assesses building designs against complex building codes. Through early identification of potential problems, DesignCheck overcomes inefficiencies in code compliance checking by reducing both time and cost, and significant potential for human error. It has the potential to dramatically streamline the building design process and also to be applicable in code compliance associated with building maintenance, refurbishment and re-development.

Building designers are not the only professionals likely to benefit from DesignCheck. It will also be useful to building certifiers, consultants, building code authorities, specification writers and builders, and could smooth the way for everyone involved in complex building projects – from office blocks to home extensions.

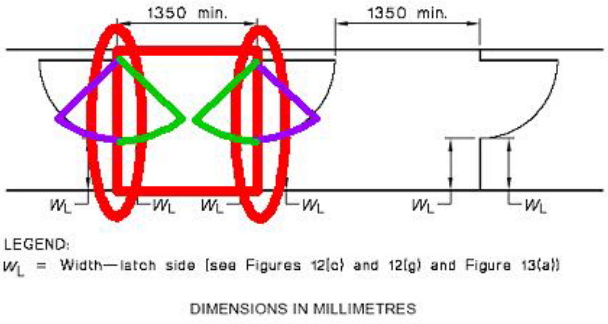
A STEM (Strategic Technology Evaluation and Management) market analysis report estimated the value of DesignCheck to the Australian AEC (Architecture, Engineering and Construction) industry over 10 years as worth $77.4M and earned value of $69.6M.

DesignCheck

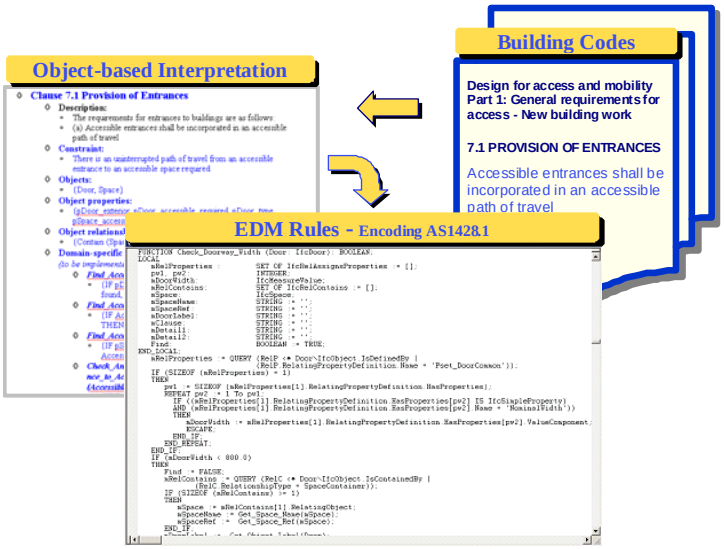


DesignCheck tool

Example Application of DesignCheck™



Example Application of DesignCheck



Building codes are interpreted into object-oriented representation and then encoded into rules

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