NP2005

Evaluating prefabricated modular constructions

Research Question

Curtin University will develop its property surrounding the existing campus to create a *City of Innovation*. Buildings will play a strategic and active role in this vision.

The proposed research will evaluate building prefabrication methods and will show how they can be energy efficient, modular and carbon neutral over their life time.

Figure 1: Multi-storey residential prefabricated building in Perth, one of the case studies of the PhD.

Methodology

The first part of the project will be to gather the best practices around the world in sustainable prefabricated buildings with a focus on carbon footprint. This will be done through literature review, visiting factories and existing buildings, attending conferences and exhibitions and interviewing various stakeholders.

The second part of the literature review will organise these findings into a guide that Greater Curtin could follow to design, procure and develop the most advanced, environmentally friendly and adaptable buildings, and thus fulfil its objective of proposing “visible research” in its City of Innovation.

Results

After listing and sorting the different types of building prefabrication methods, the best practices will be studied for their economic and environmental impacts.

The economic approach will look at the time and cost of construction from an occupant and developer point of view, while the environmental aspect will be composed of analysis of:

1. Thermal performance by simulation of energy demand,

2. Carbon footprint by Life Cycle Analysis (LCA),

3. Waste during construction and potential for reuse and recyclability.

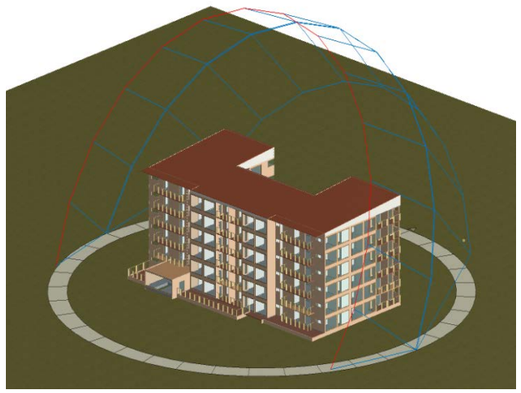

Figure 2: 3D model of case study multi-storey residential prefabricated building, for the Thermal Performance simulation.

A building design most likely to be constructed on Greater Curtin will be selected as a reference and will be used to evaluate and compare the economic and environmental impact of the selected prefabrication methods of construction.

The thermal performance will be evaluated for Perth climate and the LCA will consider Perth resources.

The research results will then be collated into a guide that will aim at helping the planners define the city, the architects design each building, the procurement managers seek the best technology and the engineers select the best services.

Conclusions

As industrialised buildings are still considered an innovation and many different methods and techniques are used around the world, the objective of this research (and hopefully its conclusion) will serve to define and organise the existing state of the art, and show these buildings are more sustainable than the traditional ones.

Figure 3: Industrialisation of the fabrication of bathroom pods

Anticipated impacts

It is hoped this research will provide a foundational framework for other building markets around the world to follow in their own evolution towards innovative and sustainable prefabricated buildings of the future.

One of the impacts of this research would be the recognition of the low carbon best practices in the industrialised building industry to ensure prefabricated buildings are not only chosen for their weight, construction time or cost, but also for their environmental impact.

At a Federal level, it could lead to modification of the J section of BCA to better take into consideration the energy efficiency advantages of efficient prefabricated buildings.

This research may help the industrialised building industry move forward, increase sales volume and eventually offer more job opportunities to workers coming from the ceasing automotive industry.

Key statement

Industrialised prefabricated modular construction methods may be the best solution for Australia to get rid of its obsolete, non-evolving and non-sustainable traditional building methods and catch-up with developed countries in terms of energy efficiency, thermal comfort and low carbon emissions.

Further information

www.prefabaus.org.au/ PrefabAUS is the peak body for Australia's off-site construction industry

ARC-CAMPH [website to come]: Australian Research Council’s Training Centre for Advanced Manufacturing of Prefabricated Housing is the new research hub and training centre

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