

THAPANAT  
TREWATCHATRANON

PORTFOLIO

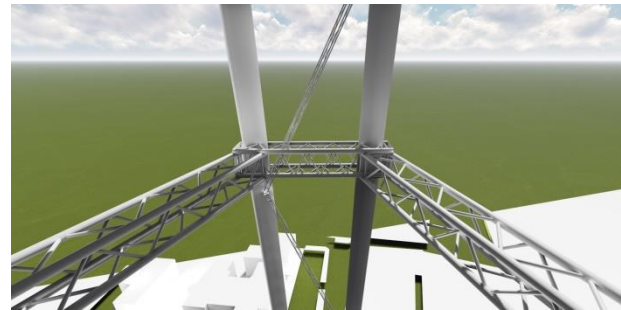
## Belfast Tower project

This project is a presentation of the conceptual design of a proposed 'skyscraper' structure to be constructed in Belfast, Northern Ireland. The process involved the development of two distinct and viable solutions, identifying clearly proposed framing systems and arrangement of ensuring stability and load transfer of each scheme. After qualitative analysis, one of the solutions was chosen for further development, the selected solution was subject to design of all principal structural elements and production of general arrangement plans, sections and elevations. A 1:100 model has been constructed representing the final solution. The aim of the project which is not only to reach new heights with to design of the tallest building on the Island of Ireland but regards to modern construction in the area.





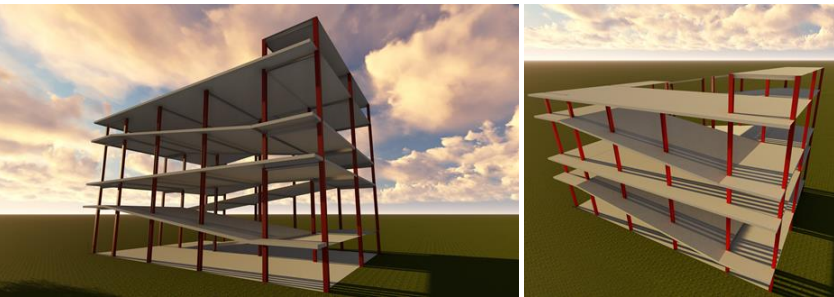
A 1:100 model created by  
Medium-density fibreboard



A 3D model of the proposed structure was create using the Skectup and Lumion software. The model, when placed in the context of its surrounding environment allows the client and members of the public to ascertain an idea with regards to location of the structure and how the structure may present itself when compared to the surrounding infrastructure in the area. The model also, portrays the proposed structural layout of the building, showing all of the structural elements including beams, coloumns, core and outrigger bracing in the context of the entire structure.

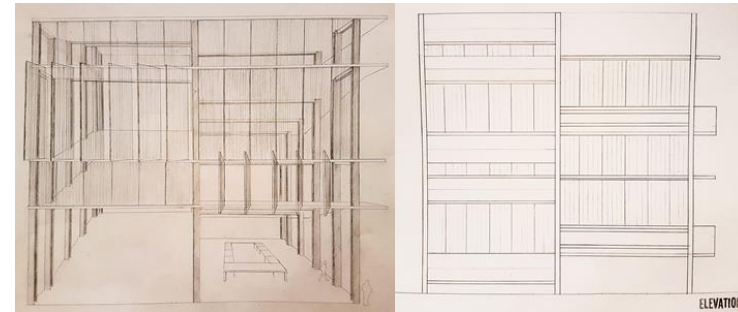
# Car park Project

This project requires engineering student to act as a structural member of a design team consisting of architecture students engaged in the design of demountable car park above a covered but open sided column-free market place. Engineering students were collaborated in the development of several schemes, concentrating on structure and construction. The primary structural material was steel and analysed with ETABs software.



The 3D structural building, rendered by Sketchup and LumenRT

1



## Design / Features

The architect came up with the parking ramps design. These ramps might be used with good success where there are frequent users such as beside a large office building. However there are some disadvantages for the driver, such as difficulty of parking due to the slope of the ramp. The shape of the building will be visible from outside. Wooden cladding and metal cladding of the building are to be visible. It's cantilevered at the front of the building.

2

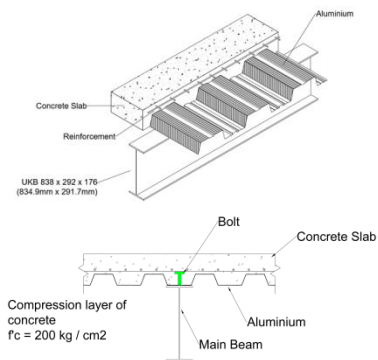
## Cantilever frame structure with 3D drawing

Cantilevered beams run from the back of the building to the front. The cantilevered beams of the building will be invisible from outside because they were covered by gypsum board. The columns will be visible from inside and outside of the building. The façade and cladding do not covered the columns.

3

## Steel deck with Steel beams

The steel decking is used for this building. Also the deck is welded with the shear connector which is beneficial because it enhances the deck as transverse reinforcement is adjacent to the connectors. The shear studs/ shear connectors are abut to the steel beam. Composite slabs are excellent for where speed of construction is considered. The number of crane lifts needed is less than that for precast system. It is also reduce costs. This building used composite slab depth—350mm overall .



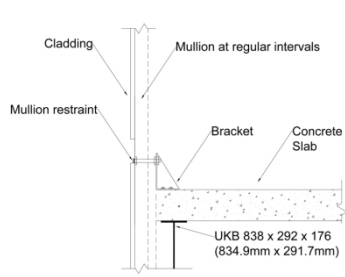
Steel beam with composite slab, CAD drawing



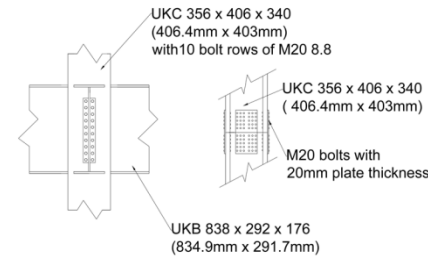
Steel beam with composite slab, 3D drawing rendered by LumenRT



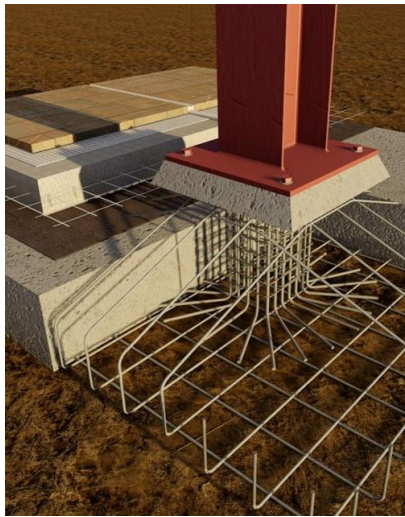
Façade connection, 3D drawing



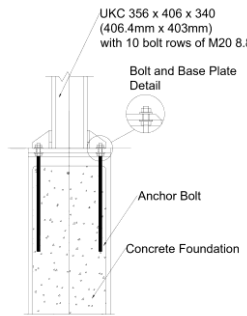
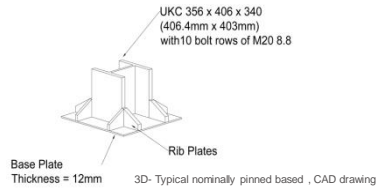
Section view of façade connection from dashed area



End plate beam to column and Column splices, CAD drawing



The 3D Ground Floor construction



Base of Column Detail z-z axis

Typical nominally pinned based , CAD drawing

4

5

6

## Column splices and plate connections

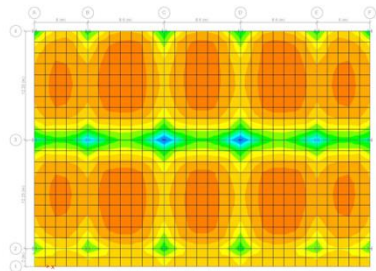
There are 10 rows of bolts of M20 8.8 at 140 gauge and 70 mm pitch for the plate connection . The detail of the calculation can be found in logbook . Typical flexible end plate connections are shown in the figure above and it is welded then bolted to support beam and column on the site . The detailing requirements for the connection is found in ' Green book ' ( SCI P358 ) . For the column splices , this building will provide the bearing type slice ( figure above ) the forces or loads will be transferred directly from upper shaft through to the one beneath. This type is used less than the non-bearing

## Façade connection/ Other fixing and section/ Column bases

The connection of the façade is a curtain walling system to the edge of the steel which is attached to the top of the slab as figure shown above . The gravity loads are applied along the vertical direction. The bolts are used for the bracket through the top of the slab. The pinned base is used for this building. It is generally a less expensive base than a rigid base. It can resist the moment. The stiffness of the base is assumed to be equal to the column stiffness. The Forces and moment were calculated by ULS loading .

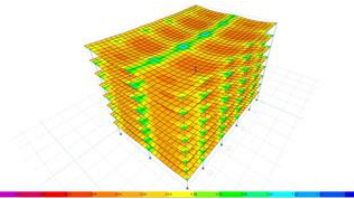
## ETABs analysis

The ETAB ultimate integrated software package was used to test the whole structure and critical sections. This also includes the 3D object based modeling , It shows all types of forces that are related with this building.



For shell element internal stresses. S-max, Maximum principal stress (forces per unit area).

This picture is performed S-max diagram for live load



3D, S-max diagram for live load

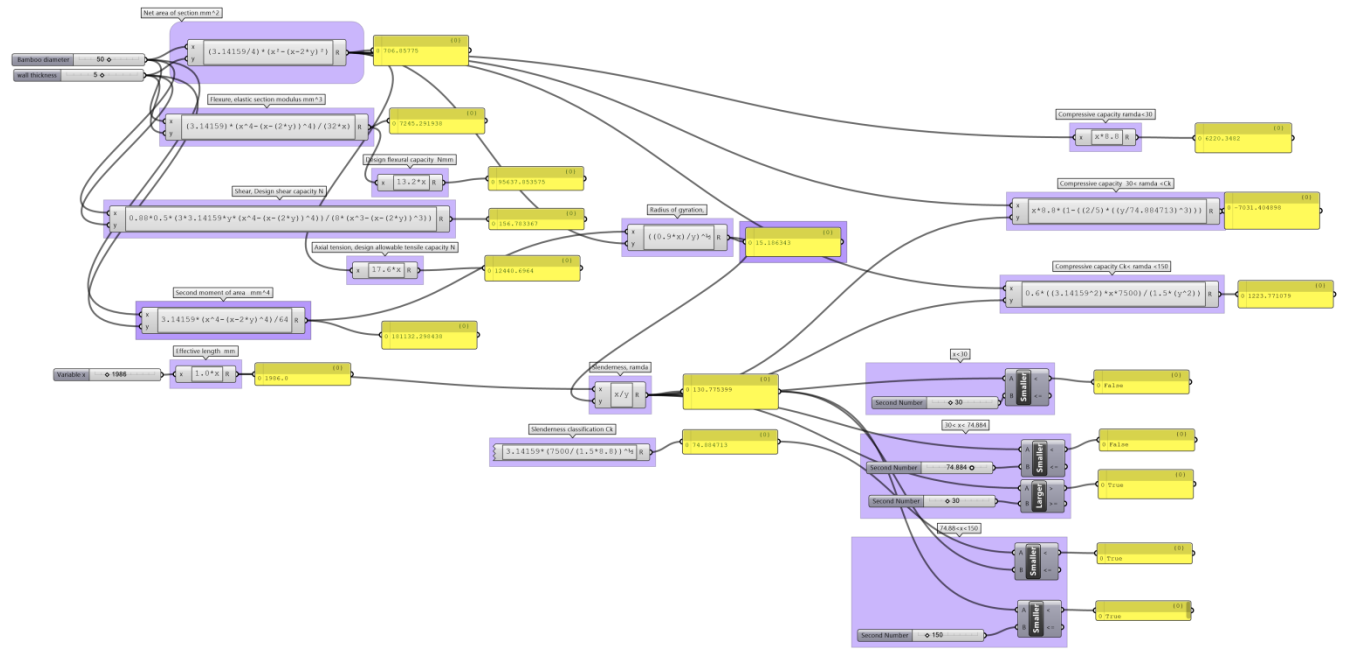
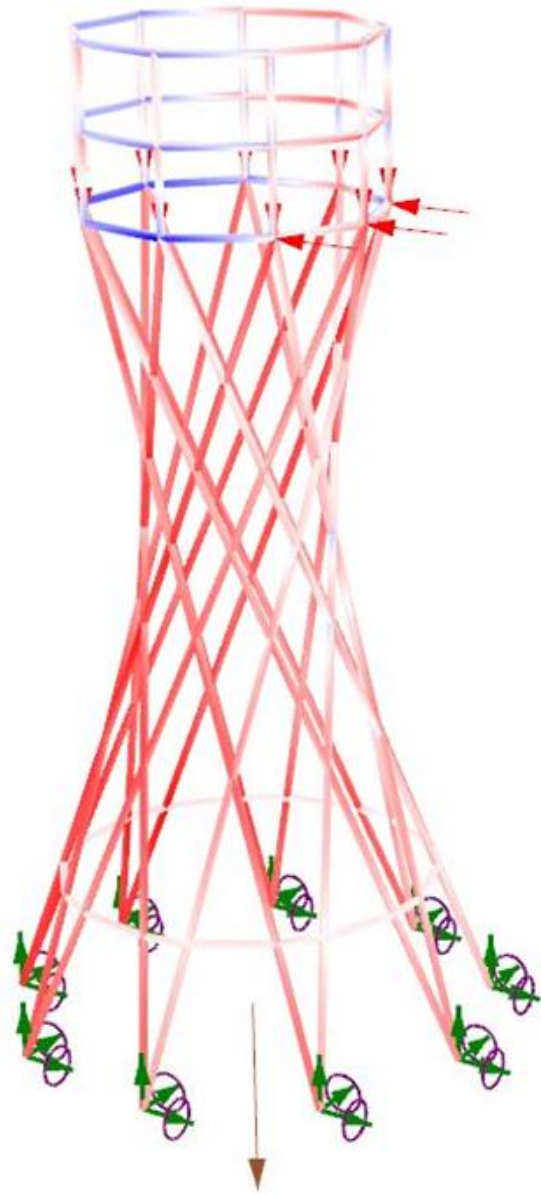


**Structural design analysis  
of bamboo in a water tower**



## Bamboo water tower

Structural design of bamboo for a water tower is the focus of this paper. The paper demonstrates how to design a bamboo structure by using both hand-calculation and Karamba, finite element analysis tools. The design will be parametric modelling done by Grasshopper to design bamboo connection and bamboo structure geometry. A first stage is proposed to check the allowable strength capacity values from bamboo before going to the early design stage. After the designs were done based on hand-calculation. The finite element analysis will be used for checking the structure under lateral loads and vertical loads. This will allow free-form geometry to be constructed for the final assembly. Designing a structure using bamboo is not easy for engineers and architects due to its misalignment, and the material is not homogenous. A design process has been done to investigate.



Grasshopper script

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## Optimised bamboo water tower

In some areas where bamboo is native, it is thought of as a very humble and impermanent building material, mostly due to its heterogeneous makeup and susceptibility to decay and insects. Alternative materials such as concrete, glass, and steel are often preferred for architectural construction. However, the increasing need for sustainable materials in building construction and the extremely fast growth of bamboo has made it a promising choice again.

Bamboo can be harvested roughly six times faster than other common timber species. Increasingly, research into the potential of bamboo is demonstrating that it has excellent mechanical properties and shows promise as an alternative construction material. Simultaneously, the development of digitisation is altering how the architect and designer interact with materials and manufacturing processes. Inspired by topology optimisation and structural form-finding, this project investigates how to use bamboo as minimally as possible to build a load-bearing structure.



*Conceptual design*



## House design project

internship with Ninegates Engineering Co. Ltd. I worked with the team as a designer for a two story house. My task also included producing all 3D modelling and floor plans of the house. This is my original design.

### Project information

Status:	Completed 2018
Project type :	Single Residential
Site area:	400 m <sup>2</sup>
Designer:	Mr.Thapanat Trewatchatranon

## Skills



## Profile

Thapanat Trewatchatranon

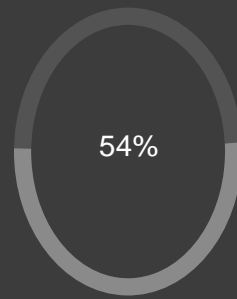
459/95 Villa acadia, Watcharapol Road,  
Thareang, Bangkean  
Bangkok 10220 Thailand

Emails: ttrewatchatranon.17@gmail.com

## Education

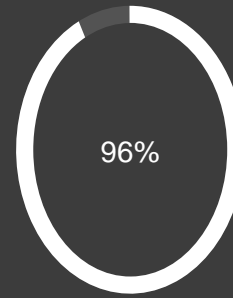
-University College London  
Master of Architecture in Design for Manufacture

-Queen's University of Belfast  
Bachelor of Engineering in Civil Engineering



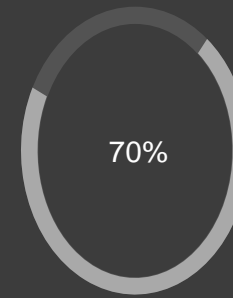
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ETABs



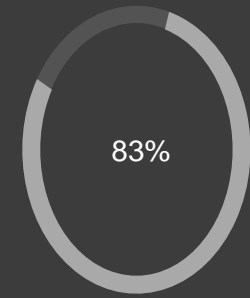
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Lumion /  
LumenRT



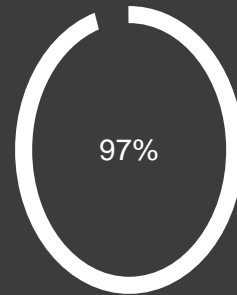
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AutoCAD



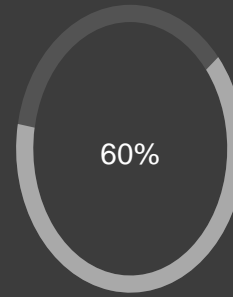
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Sketchup



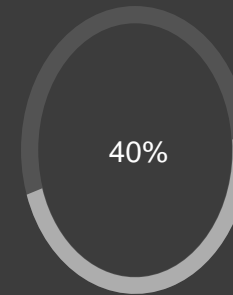
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Karamba,  
(FEA)



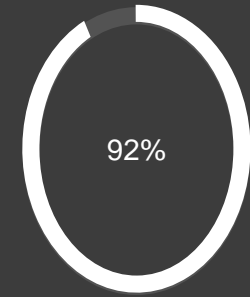
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Rhino/  
Grasshopper



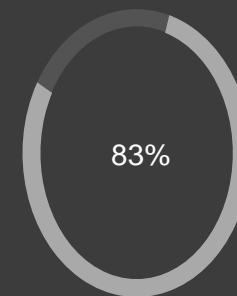
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GeoStudio



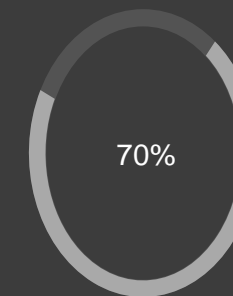
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Adobe  
Lightroom



83%

Microsoft  
office



70%

Indesign