Rethinking Structural Engineering Workflows
Structural Design of a 340m Tower

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Summary

The paper overviews the various custom workflows and technologies deployed in the design of a 340m tower located in downtown Kuala Lumpur, Malaysia. The technologies used range from custom CAD to analysis package linkages, stiffness optimization scripts, database workflows for efficient post processing and web based data visualizations. These custom workflows rethink and interrogate the standard process of structural design as required by "point and click" methods of structural software usage. Implications for leaner design teams and more thorough structural design are also explored.

Keywords: High rise buildings, Automation, Wind Tunnel Testing, Optimization

1. Introduction

The proposed tower is primarily residential and hotel with a podium stack. The floor plate is generally rectangular with a structural depth of only 32m in the broad direction. This resulted in a slenderness ratio of approximately (340/32) = 10.6 in the narrow direction. Due to the angular floor plate and close proximity to neighbouring high rise towers, the tower was subject to significant vortex shedding and buffeting wind loads. Such negative aerodynamic behaviour resulted in a wind governed (deflection and strength) structural design of the tower despite being located in a relatively benign wind region.

In order to deliver an architecturally acceptable and cost effective structure, close coordination of primary structural elements with the architectural design team was required. To further ensure that vertical structural elements were sized as compact as possible, custom stiffness optimization scripts were used which accounted for both plate (core wall) and beam (columns) elements. This automated sizing technique allowed the structural design to incorporate wind tunnel results quickly and provide feedback to the architectural team regarding the impact of the wind tunnel testing as it evolved.

Other custom technologies deployed included database oriented post processing of structural analysis results, design scripts for link beams using ACI strut and tie provisions and web based graphing of key structural performance characteristics such as axial load distribution and deflection.

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