

Simplifying Complex Problems: Use of Parametric Tools to Design and Build Complex Wood Structures

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Abstract

This paper presents the design, fabrication and construction techniques used to build an off-site fabricated, modular, free-form wooden ceiling soffit for a building in Honolulu, Hawai'i. This architectural feature ceiling used wood in an unconventional way, calling for innovation at all stages of the Project: modelling, structural analysis, fabrication, transportation and installation.

Dynamic relaxation was used to define the architectural surface, Grasshopper for the generation of a fully customisable 3D model, real time Finite Element Analysis for structural checks, and CNC machining for fabrication. The panels were shipped in containers and chain-hoisted into place.

Keywords: Freeform; Complex Geometry; Timber; Parametric Design; Rhino; Grasshopper; CNC; Modular; Prefabrication

1 Introduction

The Waiea Tower is the first of four luxury developments for the Ward Village in Honolulu's Ala Moana district, bringing together local and international specialist companies to design and build a unique, world class structure.

This paper is focusing on one of the main architectural features of the Project: the 850m² (9,000ft²) "Feature Ceiling", a freeform wooden soffit made of Alaskan Yellow Cedar 1x6 boards bent on a spruce backing structure. The shape was defined by an organic architectural surface, creating a dramatic entrance to the building.

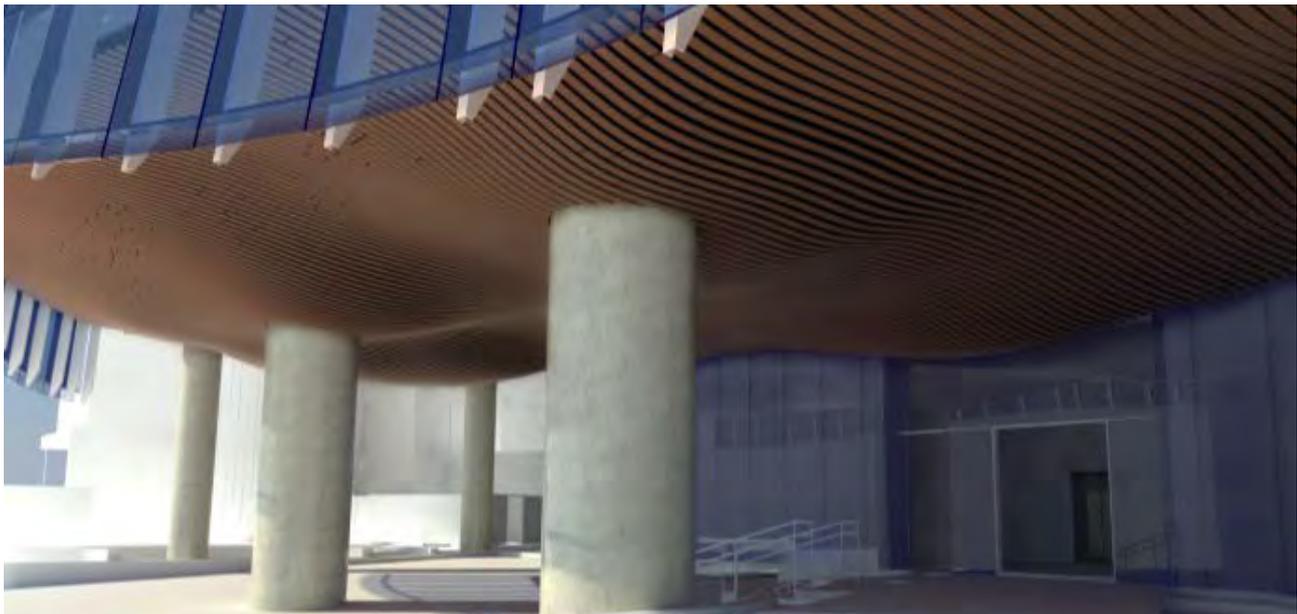


Figure 1: Render of entrance