

Lightweight Megastructure: Design and Construction of a 100m Span Dome in Manila

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Abstract

Shell structures are usually classified in two categories: Single layer shells, where the structural elements are included along one surface or double layer shells, where the structural elements are organized in space frames. As the spans of the structures get longer and longer, towards becoming megastructures, the exploration of new structural systems enables to discover innovative solutions for lightweight shells that take into account strength, transparency, cost, buildability and schedule. The Cove Manila Dome is a 100m span and 30m high steel and glass dome covering a beach and night club. Using a comparison of the linear buckling load of different structural options considered during the design phase and of their constructability enabled converging to the solution chosen of a hybrid shell, a structurally stable and architecturally lightweight and transparent structure which is easier to erect than a more typical shell.

Keywords: Steel structure, Lightweight structure, Seismic Design, buckling, instabilities.

1 Introduction

The Okada Manila resort is a new high-end integrated entertainment resort developed in Manila and comprising two 5-star hotels, multiple casino zones, retail outlets and a beach and night club called Cove Manila. Cove Manila is housed in a 100m span steel dome supporting 8,570m² of glass panels, as shown in Figure 1.

The fabrication and installation of the steel occurred between November 2015 to June 2016 while the installation of the glass occurred between June 2016 to December 2016. The dome officially opened to the public in December 2017.



Figure 1. Inside of Cove Manila

The maximum rise of the dome is 30m from the ground floor level. The dome is supported at 75% of its perimeter on a concrete buttress situated at the 3rd floor of a concrete building, at 13.5m from the floor level and at 25% of its perimeter on