

Flexible Glass Tube Sculptures: Dynamic Seismic Analysis Meets Craft and Digital Manufacture

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Abstract

The "Mangrove" sculpture by Nikolas Weinstein activates a huge atrium space, and rewards viewing from different floors and locations around the atrium. The visual interest of the piece comes from its complex twisting tapering form and from the thousands of clear glass tubes that reflect and diffuse light, defining the twisting surfaces and introducing elusive colour that changes as you move. The engineering challenges were: to attach the tubes securely and efficiently, in a way that allows the piece to flex and minimises the risk of glass falling if damaged; to minimise the cross sections of the tubular steel 'spines' that run along the edges of the arrays of glass tubes; and to minimise the size and number of cables that suspend and locate the strands of the sculpture in the atrium space. The form of the sculpture is so irregular, flexible and complex that it took hundreds of hours of highly advanced computer modelling to predict how it would move during earthquakes, which are frequent in Manila, and what the forces would be in all the cables, spines and glass tubes. The parts were developed and produced specifically for the work, evolving from an extensive portfolio of smaller works and innovating new connection details for metal and glass, in a parametric model from design to production.

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Keywords

Glass, Seismic, Non-linear, Tube, Art

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