



Tel-Aviv Museum of Art – New Building Innovation in Structural Design & Construction

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Summary

The new 19000 m² Museum is located on a triangular plot that includes rectangular galleries without any interior columns. The exterior shape of the building and part of the interior elements consist of a series of "Hypars" in different shapes and length.

The Architectural and the structural design was based on 3D Rhino and Catia software and calculations done by Strap and Sofistik .

The design called for large spans up to 34m and large cantilever parts of the façade.

The 4 story high building (29 meter) includes 36 different levels inside due to spiral twisting core and atrium.

The 3D software included the plans of all elements and was at the disposal of the Architect, the design engineer, the project manager, and the contractor.

Keywords: space frame, steel construction, composite concrete, precast concrete façade, 3D design.

Introduction

The new building for the Tel Aviv Museum of Art that was inaugurated in Oct. 2011 is an Architectural masterpiece that had to be designed using advanced and innovated methods for the structure of the building.

The structural design had to tackle 3 aspects of the architectural design:

- Irregularity of the plans and shapes
- Spiraling and twisting core (Light Fall)
- Folded precast concrete panels façade

Structural Design Concepts and Details

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"Light Fall"- Construction using boatbuilding technology

The center part of the building consist of a twisting rectangular concrete core made of 18cm thick reinforced concrete "Hypar" surface that stand alone at the middle of the building and called a "Light Fall". The special shape of the Lightfall was an engineering challenge by itself. Due to the "Hypar" shapes the thickness of concrete changes from 18cm to 80cm at the junctions, we had to deal with the large openings all across the sides. We designed this structure using 29 space flat shapes forming a "vertical rectangular spring".

The construction of the Light Fall formworks was based on the technology of "shipbuilders" they formed the skeleton of the Hypar and additional layers of plywood to get the designed exposed concrete facing.

Folded Precast Concrete Panels façade

The folded and faceted facade of the building varies on all sides. The Architect developed a special computer program that enable us to divide this spatial façade into flat elements in size of up to 9m long with cuts a various angels as a result, no cladding element is similar to another. In total, it was necessary to produce and assemble 474 such large precast elements each different in its dimensions forms and hanging details. It should be noted that the builder succeeded in developing a special construction methods for assembling the precast elements within the museum space.

A special steel supporting framing was designed in order to enable to connect all precast elements in place.



The model used by Yaron-Shimoni-Shaham for designing the "lightfall" designed by Architect Scott Cohen for the museum

Architects: Preston Scott Cohen – Boston
Amit Nemlich – Israel

Construction Cost: \$55 Million