

SELF MASS DAMPER: SEISMIC CONTROL SYSTEM INSPIRED BY THE PENDULUM MOVEMENT OF AN ANTIQUE CLOCK

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Spectacular Projects
of Passively-Controlled
Buildings

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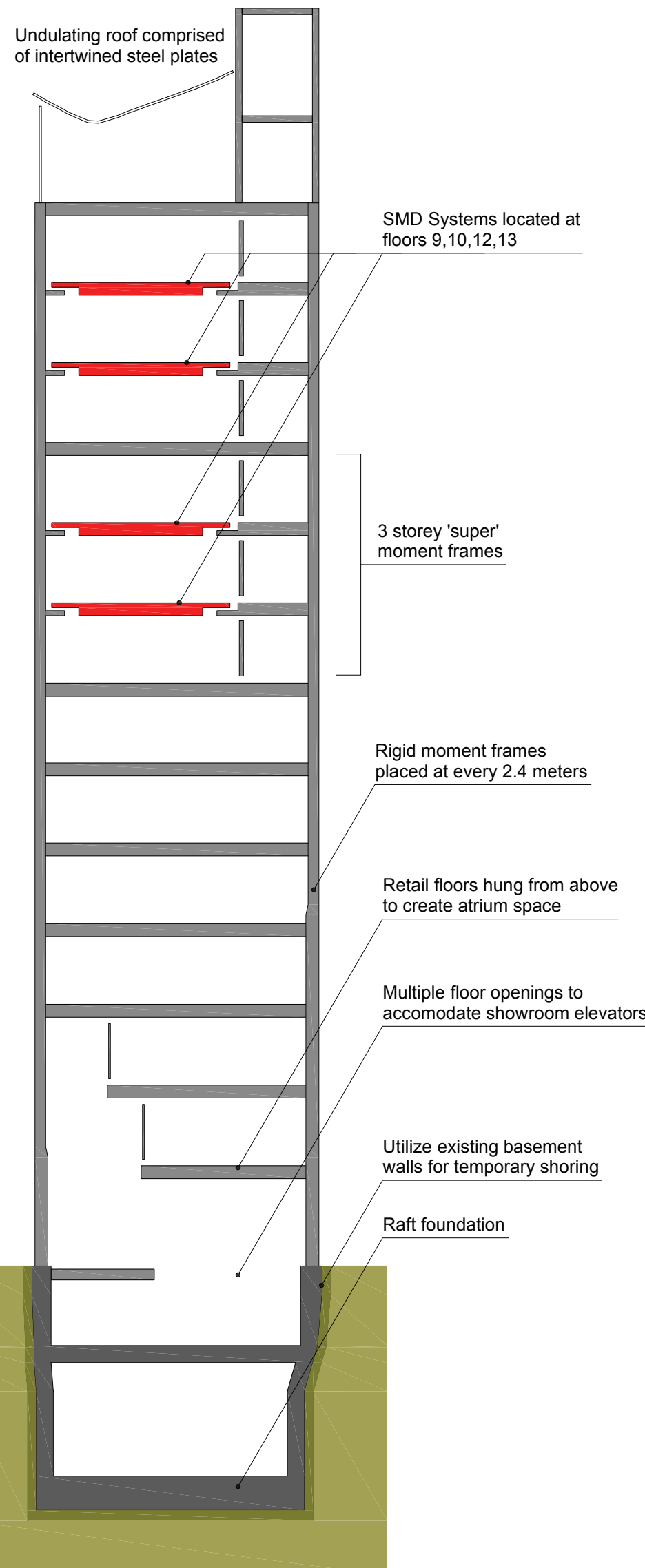
1. INTRODUCTION

Inspired by the pendulum movement of an antique clock, this system is an outcome of an endeavor to resolve the unique spatial layout envisaged by the Architect while satisfying the Client's demand for a highly seismic resistant structure

2. OVERVIEW OF STRUCTURE

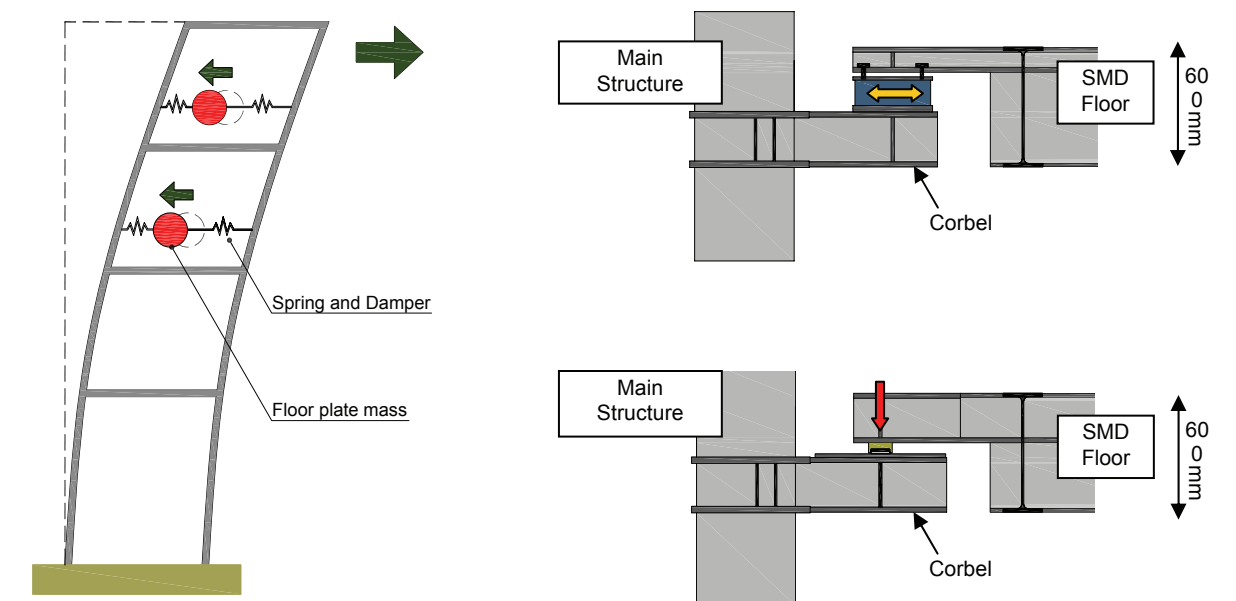
The key structural features of this building include: 1) creation of multiple atriums throughout the building 2) implementation of a new type of seismic passive control system, the Self Mass Damper (SMD) system 3) the sculptural undulating roof at the top level.

The seismic resistance of the structure targets an onerous 'Special Grade' structure with additional requirements of, 1) main structural elements to remain elastic under Level 2 (500 yr return period, $pgv > 50$ cm/sec) seismic event, and 2) and 'life safety' under Level 3 (1000 yr return period, $pgv > 75$ cm/sec) seismic event.



3. SELF-MASS DAMPER(SMD) SYSTEM

The SMD system was implemented by disconnecting four of the upper floors from the main structure through a combination of slider and high-damping rubber bearings placed at the interface. Each floor was tuned to provide the maximum damping to the overall structure while maintaining an acceptable lateral relative deformation limit in all directions.



4. ANALYSES AND RESULT

The SMD system is most effective against earthquakes that resonate with the building's dynamic properties, resulting in a maximum base shear reduction of 37%

