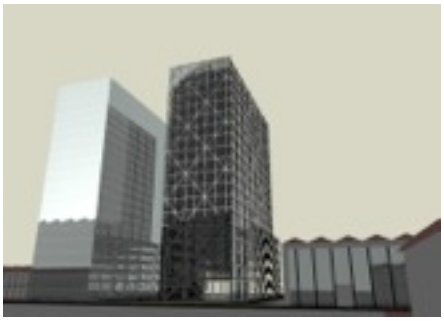
Executive Summary

The final senior thesis report presents a redesign of a building with existing structure in concrete to a structure in steel. The existing building is called The Optimus and located in India. It is a 252 ft tall and 17 story office building with 5 stories of parking garage, ground floor retail and a recreation space at the roof. It is part of a huge redevelopment project that consists of residential and commercial spaces where The Optimus is purely a commercial building.

The floors are flat slabs and provide an open floor plan and customizable space for the offices. The building has a large glass and metal facade, a stone wall and a green wall as part of the building envelope. The overall structural system consists reinforced gravity columns and reinforced concrete shear wall located around the elevator shafts.

Major part of this report presents redesign of the structural system of the building in steel. This is being done to study the advantages of a steel building over concrete in India where, concrete is the usual choice in building material. However, as the country is progressing, the cities are getting denser and richer; this is currently putting pressure on the construction industry to build more efficient, taller and innovative structures. One of the solution to this challenge is to switch the building material from concrete to steel.



The existing concrete gravity columns are converted to steel columns. Interior columns with greater loads are steel columns encased with reinforced concrete. The lateral system is converted from reinforced concrete shear walls in the existing building to braced frames with HSS braces and steel wide flange encased with reinforced concrete columns. The braced frames are moved to the exterior of the building. Also, a typical steel connection for moment frame is designed as part of the structural system. The site for redesign of the building is Mumbai, India and the structural redesign is carried out using ASCE 7-10 specifications and AISC Manual specifications.

The amount of changes in the structural system has a huge impact on the architecture of the building. Hence, as part of the first breadth, the integration of structure with architecture is being analyzed. Each structural redesign has and impact on the architecture which affects the interior and exterior of the building. Therefore, the co-ordination of architecture and structure is discussed in the report.

A part of the integration of structure and architecture is the building facade. The redesign in structure has completely transformed the facade of the building. As part of the second breadth analysis, the architectural design of the facade is analyzed in response the structural changes. The facade of the existing building was design to maintain a healthy indoor environment by controlling amount of sunlight and heat penetrating into the building. Therefore, the report further discusses the strategies to achieve an equally comfortable indoor environment.