Final Report for the Large Scale Structure Design

The plan for this IPRO is to develop a design for a large scale parking garage that can accommodate about 300 cars. The objective of this project is to develop a design that goes beyond the standard parking systems used today. Rather, the attempt is to have a design which is more representative of "parking garages of future." And as such, such features as quick handling of incoming and outgoing cars, efficiency in storage and aesthetics are considered in design.

The building will be completely self-sufficient and will have to incorporate the architecture of the various buildings on campus. The design could have separate entrance and exit ramp towers, ramps incorporated with parking, or the futuristic design may be automated. An automated system will include a vehicle elevator of lift system to move the vehicle so the driver does not have to. The structure could be built with reinforced concrete or steel. The design will also include accessibility following the requirements set forth in the Americans with Disabilities Act.

This project is the continuation of the previous two semesters' work. In the Fall of '06 the idea was first incorporated, the project was done in steel, but the design did not go through. In the Fall of '07, this project was done but reinforced concrete was used instead. In the Spring of '08, the parking garage is again designed using steel as the main material. This project is divided into 5 groups – Civil group, Architectural group, Mechanical group, Construction Management group, and a Structural group which was divided into three subgroups. On the first week of the semester, each group researched the previous design and proposals, and announced their objectives and goals for the current semester.

Civil group used the data for traffic flow and site plan from the Fall of '07 IPRO group, and based on it designed horizontal curves and intersections for traffic flow conditions. They have also updated the site plan. Architectural group had done the renderings of the parking garage which include a set of plans and elevations and a staircase. The first subgroup from the Structural group concentrated on designing typical beams and columns for the gravity loads and a connection between the column and a beam. Second subgroup worked on designing a frame for the lateral loads and moment

connection design. Third subgroup worked on designing foundation reinforcement and the plate connections. Mechanical group worked on choosing the appropriate engines, developing elevators, and Comb/Pallet/Roller System. They used SAP analysis to determine the deflection of the structure and to find the resonant frequency. Construction Management group worked on developing all legal documents for the parking garage between Contractor and Owner. They also compiled a separate Contract for Construction Management.

Some of the references for the research include:

http://www.otisworldwide.com/k2-elevators.html
http://www.otis.com/file/display/0,1394,6309,00.pdf
http://science.howstuffworks.com/elevator5.htm
http://web.mit.edu/2.972/www/reports/elevator/elevator.html

as well as

http://www.geindustrial.com/cwc/marketing/Motors/catalog/TableOfContents.pdf
http://www.geindustrial.com/cwc/marketing/Motors/deam0377.pdf
http://www.geindustrial.com/products/brochures/GET-6812D.pdf

SAP and AutoCad were the primary software used for the design.

Professors who were contacted for questions: Dr. Mohammadi, Dr. Shen , T.A. for Professor Lemming, and Professor Arditi.