IPRO 315 Spring 2008

Project Administration:

Project Recorder to record weekly activities: Irina Magdel
Project Engineer to oversee all activities including managing iGroup: Veselin Velichkov

Project Plan and Objective

The plan for this IPRO is to develop a design for a large scale parking garage that can accommodate about 500 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.

Class Composition

The class is composed of students majoring in architecture and aerospace, mechanical, and civil engineering. This diversity of students' background is very well suited to achieve the objectives of this IPRO.

Outline and Milestones

Week 1: Introduction of the project and identification of the Tasks
Week 2: Development of architectural design, selection of structure types and approval by the client
Week 3: Building envelope design, start of structural analysis
Week 3: Structural analysis and design
Week 4: Structural design (continued), foundation design completed
Week 5: Design of mechanical systems (elevators, escalators, etc.)
Week 6: Mechanical system design continued – Architectural and structural design finalized
Week 7: Mechanical system design completed
Week 8: Progress report presentation
Week 9: Electrical design initiated – traffic flow study started.
Week 10: Building serviceability reviews
Week 11: Electrical design completed – traffic flow study completed
Week 12: Overall design review and evaluation
Week 13: Cost estimating and bill of materials
Week 14: Cost estimating finalized; begin preparation of presentation materials

Week 15: Final report and presentation

Deliverables

Deliverables include:

(i) Complete architectural drawings
(ii) A complete calculation report (structural and foundation design; mechanical system design, lighting/electrical design; cost estimation).
(iii) Poster presentation describing various drawings, design descriptions, details, conclusions, etc. and a PowerPoint presentation

Group Designation and Task Assignments

Name	Major	Group	Task
Brady*, Brian	AE	2	Elevator Analysis/Design
Butkovich, Paul	ME	2	Elevator Analysis/Design
Chung, Chun	CE	4	Structural Design/Details
Dominikowski*, Marek	ARCH	1	Architecture/Model
Herbert, Greg	ME	2	Elevator Analysis/Design
Hussaini, Muddasir	ARCH	1	Architecture/Model
Magdel**, Irina	CE	4	Structural Design/Details
Mallinger, Nicolle	ARCE	5	Foundation Design
Omeralovic, Enis	ARCH	1	Architecture/Model
Palma, Jennifer	CE	3	Specs/Traffic Flow/Cost Estimating
Rathakrishnan*, Malar	CE	5	Foundation Design
Ratnani*, Shoaib	CE	3	Specs/Traffic Flow/Cost Estimating
Russeva, Diyana	CE	6	Wind Load Analysis/Structural Design
Russo*, Ben	CE	4	Structural Design/Details
Shim, Mary	ARCH	1	Architecture/Model
Sisay, Mary	CE	3	Specs/Traffic Flow/Cost Estimating
Varhegyi, Aron	ME	2	Elevator Analysis/Design
Velichekov*+, Veselin	CE	6	Wind Load Analysis/Structural Design

* Group Leader
** Project Record Keeping/Liaison with IPRO Office
+ Project Engineer and manager

Tasks, Estimated Time, Start and Finish Dates

Task	Groups	Estimated hours	Start and End Time
Architectural Design and model (Roof, façade, and stair design)	1	Arch design 12 hrs Model 12 hrs	Arch design January 29 – March 14, 2008
Elevator Analysis and Design	2	Elecvator analysis 10 hrs Design and animation software 10 hrs	Analysis: January 29-March 14, 2008 Design and animation software: March 24th, April11, 2008
Specs/Traffic Flow/Cost Estimating	3	Specs: 6 hrs Traffic analysis: 10 hrs Cost estimating 12 hrs	Specs: January 29 – March 14, 2008 February 11 – March 7, 2008 Cost estimating: March 24th – April 18
Structural Design/Details	4	Structural design: 16 hrs Details: 16 hrs	Structural design: February 11 – April 11, 2008 Details: March 4 – April 11th, 2008
Foundation Design	5	24 hours	February 11 – April 11, 2008
Wind Load Analysis/Structural Design	6	Wind load analysis: 24 hours Structural design: 16 hours	Wind load analysis: January 29 – April 11, 2008 Design: February 11, April 11, 2008
Preparation of final report, poster and presentation	1, 2, 3, 4, 5 and 6	32 hours	January 29th – April 25th, 2008

Detailed Project Plans by Groups

Architects:

1. To finalize the roof design.
2. Design the stairs within the structure for maintenance and emergency cases.
3. Elevations and building sections will be drawn up to compute a construction document.
4. To complete the façade design of the structure so we know as to how we will enclose the parking structure.
5. Attempt to build a physical model, this will depend on time and funds available to the class.

Structural Engineers (Wind Load Design):

1. For the floor plan with 5 elevators we suggest 12 moment frames for lateral support in North–South direction and 2 combined moment-braced frames for East-West direction. The proposed frames are shown on a preliminary floor plan.
2. We need to further examine the architectural layout to verify what kind of frame we'll be the best solution for East-West direction, due to the open spaces in the elevator areas. We think that the one solution is to provide 2 frames at column line "A" and "E" respectively.
3. The open area of the elevators is possible to cause uplift for the roof diaphragm. To resolve this problem the roof structure has to be clarified – We suggest pre-cast planks or steel deck with concrete toping.
4. We would like to coordinate with the architectural group and the other structural group the roof structure selection in order to be able to discuss with Doctor Shen the uplift support of the roof diaphragm.

Structural engineers (Connection/Steel Frame):

1. Consult Dr. Shen about the suggestions for the design.
2. Work closely with other structural group on the design.
3. Check the gravity loads, make modifications as necessary.
4. Design connections

Mechanical Engineers:

1. Conducted research on GE motors, elevators, Comb/Pallet/Roller System, equations pertaining to electric motors
2. Familiarize with past semester's mechanical/CAD files
3. Vibrations Analysis
4. Attempt to contact GE Representative

Foundation Engineers:

1. Check for errors in last semester's calculations and make sure the plans haven't changed since then.
2. Find the actual soil profiles of the construction site to ensure correct bearing capacity.
3. Determine the reinforcements in the rest of the footings.

Cost Estimators/Transportation Engineers:

1. Parametric cost estimate completed.
2. Reviewed section A201 of the AIA and kept as it is
3. Review AutoCad drawings and need more information about units, lengths, site plan and footprint of building