IPRO 315 Final Report

Abstract

The objective of this project was to design a new structure to replace Gunsalus Hall, a residential building currently residing on the Illinois Institute of Technology campus. A team of civil engineers, architectural engineers, and architects coordinated together to design the functional and aesthetic components of a seventeen story residential building. The main focus of IPRO 315 was to design the structure and foundations of the building using current design techniques and accepted building practices. No innovative or cutting edge technologies were used in this aspect of the design, as all building codes were followed.

Background

This project is strictly a conceptual exercise, and therefore no customer/sponsors were involved in the project. Also, this was the initial IPRO for this project, and no previous research or preparation had been done. All technologies and design processes used in this project are accepted practices commonly used in the design of residential buildings, and nothing exceptionally innovating or cutting edge was done. The only ethical or moral issue that existed was the responsibility of the designers to follow accepted codes and practices to create a building that protects the safety of the public.

Objectives

The main objectives of this project were to design three key elements of the building, including the main superstructure, the foundations underpinning the superstructure, and the earth retaining system using current design methods. In addition, team members were motivated to learn and utilize computer programs including Mathcad, SAP2000, different sheet pile programs in an effort to streamline and facilitate the design.

Methodology

For each design project, the same process was used. First, the team members responsible for the design researched different components, including the positive and negative aspects of each selection. After the research was completed, professors in

that particular area of expertise were consulted to further discern which systems (structural or foundations) would be suitable for the project. Once these steps were completed, the design team discussed the available options and made a selection based on the steps previously described.

Once a selection had been made, the design team researched the accepted practices and codes governing the design of the structure and again consulted with professors to learn how to design various aspects of the structure and foundations. Using this information, the team designed the components of the building using Mathcad and other programs to quickly and effectively complete the design. Using computer programs and electronic files made it easy for team members to share calculations and drawings, and made revisions and corrections much faster. Also, professional quality documents were easily produced at the conclusion of the project.

Team Structure and Assignments

IPRO 315 was broken into 2 design teams and a website/miscellaneous team. The responsibility of the structural team was to design the complete superstructure of the building, including the columns, beams, connections, shear walls, and load resisting systems. The Geotechnical Design team designed the drilled shaft foundations, the earth retaining structure and analyzed the subsurface conditions. The Website team put together a website describing the accomplishments of the team and related information.

Structural Analysis and Design

-Qudsia Khan

-Bogdan Rus

-Helen Yeung

-Ryan Freund

-Miguel Urdiales

-Kyle Cantone

-Lucian Muresan,

Geotechnical Analysis and Design

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-Qudsia Khan,

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Report Writing/Website

- Amanda Stenson

- Hon-Kyu Chong

Budget

The only money expended on this project was the cost for printing and calculations and drawings, approximately $20 dollars, and the cost for model materials, approximately $50.

Results

The structure, foundations, and earth retention structure were all designed and drawings were produced in AutoCad of all major design futures. In addition, a structural model was created in SAP2000 and analyzed for different load cases. Steps that were not completed included connection design for the structure, and finalization of the basement design. No moral or ethical issues were encountered.

Obstacles

The major obstacle that was encountered was coordination between the architectural design team of IPRO 335 and IPRO 315. Since IPRO 335 did not have a finalized design, it was difficult to start on the structural design for the building, and half of the semester passed before any of the teams were able to start the actual design process beyond research.

Recommendations

In conclusion, it would be beneficial for future projects if the architecture team started a full semester before the civil engineering teams. This way, the engineering team would have a more complete design with which to work, and the process would be more efficient since fewer changes would have to be made.

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