Thesis Proposal

Breadth Topics

MAE/BAE:

The redesign of the structure will include several topics from the Computer Modeling and Design of Steel Connections graduate courses at Penn State. ETABS will be used to complete the design of the proposed lateral system, as well as analyze the lateral force affects on the structure. Extensive lateral force analysis methods used in this course will be applied to design and analyze lateral systems. Three dimensional models will be created in RAM and ETABS that represent the curved structure of the exterior. Below grade parking levels will not be included in the models, as these levels will remain the same in the redesign. Also, after the steel structure is designed, several typical steel connections from the design will be calculated and designed by hand. Concepts learned regarding different types of connections (Shear tab, single angle, double angle, etc.) will be analyzed to determine several connections that are effective for use in the structure.

Breadth 1: Cost and Schedule

The first breadth topic that will be incorporated is in the field of construction management. When comparing the proposed system to the actual design, it will be important to have an accurate cost and schedule comparison. It is anticipated that the reduction of the mat foundations could have significant benefits to the project overall. Additionally, steel erection cost and time will be compared to post tensioning. Overall, this detailed analysis will be beneficial in making a final comparison.

Breadth 2: Architecture/Aesthetics

The second breadth topic will be an analysis and consideration of the architectural aspects of the project. With the redesign of the overall structural system, several key changes occur that may affect the exterior. First, the floor to floor height will vary due to the increase in structural depth. This will have to be considered and resolved, taking into account the MEP space required and local zoning requirements. Additionally, the lateral force resisting system for the existing structure used concrete moment frames. The redesign will need to utilize either shear walls, braced frames, or moment frames to resist the lateral loads. The placement of these systems will have to take into account the interior flow and layout of the rental spaces, as well as architectural issues that may arise.