Rachel Gingerich
Option: Structural
AE Faculty Consultant: Kevin Parfitt
Building: The Duncan Center
Location: Dover, DE
December 18, 2007

BREADTH TOPICS

EXECUTIVE SUMMARY

The Duncan Center is a premium office building located in Dover, DE. There are a total of six floors with the building reaching an overall height of 93'-0". Open flex office space is located on the first four floors, a reception and banquet hall on the fifth floor, and a penthouse holding the building management offices on the sixth floor. Small electrical and mechanical rooms are also located on the sixth floor with the larger electrical and mechanical room located in the basement along with storage space. Balconies augment the fourth and fifth floors and the overall structure is crowned with an arched penthouse.

Structural steel frames the building with a composite metal deck floor system and a moment connected frame lateral system. This proposal presents the redesign of the building to a potentially more economical solution of a concrete structural system with a two-way flat plate conventionally reinforced floor system and a concrete shear wall lateral system. After completion of the proposed system redesign, the two systems will be compared to determine which system is more suitable.

In order create a more complete comparison between the two systems; two breadth studies affected by the system change will be performed. The first breadth study will be in acoustics with regards to the performance of the floor systems in sound transmission and reverberation. The second breadth study will be in construction management to compare the cost of the two systems and duration of schedule.

After the proposed work presented is executed next semester, Spring 2008, and the final results will be presented in a final report and formal presentation.

BREADTH TOPICS

Acoustics

The fifth floor of the Duncan Center houses The Outlook Center, an elaborate reception and ballroom space available for rent to the public. As the ballroom is positioned directly above office space available for rent, an acoustical sound transmission and reverberation study will be performed to see which floor system performs the best in these respects. Contribution of the results of this study will be utilized to determine which floor system performs best under the given conditions.

Construction Management

As the primary reason for selecting a different floor and lateral system is mainly cost driven, a comprehensible cost analysis between the two systems will be performed. Also, duration of schedule will most likely vary between the two systems. A construction schedule comparison between the existing structure and the proposed will also be analyzed to determine which system is most advisable.

TASKS AND TOOLS

Acoustical Breadth

a. Calculate Reverberation Time of Existing System according to Architectural Acoustics by David Egan
b. Calculate Sound Transmission Class (STC) of Existing System according to Architectural Acoustics by David Egan
c. Calculate Reverberation Time of Proposed System according to Architectural Acoustics by David Egan
d. Calculate Sound Transmission Class (STC) of Proposed System according to Architectural Acoustics by David Egan
e. Compare Existing System and Proposed System
f. Draft Acoustical Breadth Portion of Final Report

Construction Management Breadth

a. Perform Take-off and Calculate Cost of Existing System with aid of RS Means
b. Perform Take-off and Calculate Cost of Proposed System with aid of RS Means
c. Create Schedule of Existing System with aid of RS Means
d. Enter Schedule of Existing System into Primavera
e. Create Schedule of Proposed System with aid of RS Means
f. Enter Schedule of Proposed System into Primavera
g. Compare Existing System and Proposed System
h. Draft Construction Management Breadth of Final Report