EXECUTIVE SUMMARY

The Senior Thesis Final Report is the compilation of four individual analyses. These analyses emphasize critical industry issues, value engineering, constructability and schedule reduction of the construction process for the Mansfield University dormitory project. In addition to these construction process analyses, there are structural and acoustic breadth topics reviewed to further investigation into the four individual analyses.

Analysis 1: Flooring System Analysis

An alternative flooring system to the current structural steel and wood was investigated. A 10 inch thick concrete flat plate system was checked during the structural breadth to meet all of the design loads. The acoustical breadth showed that the concrete floor stops the sound transmission about 14 dB better than the steel and wood flooring. Costs estimates were configured using RS Means. The concrete system was estimated to cost $401,974.50. The steel and wood system was estimated to cost $484,358.08. There is an about a $82,000 difference. Other factors that influence the constructability of the concrete system is the availability of large concrete subcontractors in the north central Pennsylvania area and the cold winters of the area. The steel and wood system was found to be easier to construct given the these factors.

Analysis 2: Modularization Preconstruction Planning

After a schedule was created for the stick built construction, the difference between the stick built construction and the modular construction was 82 days or 4 months. For those 4 months, the general conditions savings was estimated at $680,000. The owner saved 4 months of general conditions costs, but also paid for 4 months of preconstruction fees.

During preconstruction, BIM would have increased productivity for the MEP rough ins during the first set of modular units, and created a great starting point for the 3D modeling for the onsite MEP subcontractors. BIM would not have been as effective for the modular MEP crews after the first set of units were completed though, because the units are extremely repetitive. Also, the modular MEP crews work for the same company which promotes better coordination. Most issues that would arise out in the field are easier and faster to fix when building in a factory.

Analysis 3: Exterior Façade Redesign

There was an investigation into a panelized façade system instead of the traditional masonry façade. The owner's expectations influenced the investigation into a thin brick panelized façade and a precast concrete panel system. After cost estimates were completed, the thin brick panels cost about $926,154.06 more than the masonry brick, and the precast concrete system costs $193,928.80 more than the masonry cast stone, with a total difference of $1.12 million dollars more for the panelized façade systems. The schedule showed that the panelized systems reduced the schedule by 60 days in Building C and 89 days in Building D. The owner's expectations made the panelized façade system impossible to have a similar price.

Analysis 4: Modular Unit Connection Procedure

A GPS system similar to the one that dozers use to grade terrain was investigated to see its possible uses during the modular unit setting. After seeing how the modular subcontractor ensured precision, the GPS positioning system would really be helpful, when setting the very first column of units. After the first column, the system would not be needed, because the crew can use the previously set units as a reference. The extreme precision in the factory really made it easy for the crew in the field to set the units. When evaluating the GPS positioning system, the extra value of precision was compared to the cost of over $14,000.