

## Executive Summary

Throughout the 2013/2014 school year multiple technical assignments and analyses have been produce on this library in metropolitan Washington, D.C. Past Technical Assignments can be found on the CPEP website. With the help of the project team, industry members, and professors this year long capstone project included four analysis (found in this report), one of which acted as a research topic. These analyses were for educational purposes only and are not direct comparisons to accrual scenarios encountered.

### Research Analysis Topic 1- Early Involvement in Design

This analysis looked at specifics of implementing early involvement on a project. Information from Design-Build Institute of America points out that early involvement projects have the potential to save 6% in costs from reduction of change orders and less rework. Schedule can also be reduced with this type of project delivery. However, funding of these types of projects can be challenging because they require higher upfront costs. Scope selection of early involvement should be carefully considered. Complex and high cost project specific scopes benefit the most from early involvement. On the library project, curtain wall, MEP, and structural installation would benefit from early involvement. Time frame inclusion should be based on specific project needs.

### Analysis Topic 2- Structural Steel Sequencing

This analysis looked at comparing the current top-down sequence to an alternative shoring sequence to weigh complexity, costs, schedule, site, safety, and other trade impacts. This build's structure is complex and dynamic. Structural sequencing was a concern even when this project was being bid. Using a shoring system to support the structure over the future train stop until truss erection can be completed would reduce the already delayed schedule by 3 weeks. This savings would result in a general conditions cost savings of \$30,000. A structural breadth was included in this analysis, in which involved calculating temporary load supporting requirements of 291 psf. A 26 feet high Mabey Mass 25 shoring tower design was chosen to support 100 kips per tower at a spacing of 20'x18' across the future train stop. An overall better work flow, safer site, schedule reduction, and cost savings would be experience in using the shoring sequence approach.

### Analysis Topic 3- Mechanical Penthouse vs. IPEC

This analysis looked at the differences between an IPEC and a penthouse construction. A penthouse would give the designers more flexibility in their design. An estimated \$1 million could have been saved with a penthouse. This comes with an addition of a 10 week onsite penthouse construction, which would have negatively affected site productivity. In the acoustical breadth included in this analysis, both mechanical rooms met the 55 dB property line and 35 dB conference room noise level requirements. In conclusion, a MEP design-build company could have provided a rooftop penthouse mechanical room meeting owner needs and is recommended for this project. A decision tree was also produced to aid owners and designers in considering their mechanical room options.

### Analysis Topic 4- Caisson Rebar Cage Fabrication

This analysis looked at comparing rebar cage fabrication and installation methods to minimize wasted costs and schedule delays. The number of splices required and length of rebar added/ removed from cages will change significantly between fabricating methods and was the key player in this analysis. The original baseline fabrication method was the best choice in comparing costs and schedule (prefabricating 100% of the planned rebar cage lengths). The baseline method had the most potential positive impact to the schedule. For this project, it is recommended to use the baseline fabrication method and to always overestimate caisson installation schedules in accommodating for unknowns because caisson installation often times causes delays.