



## EXECUTIVE SUMMARY

This thesis report is intended to provide technical breadth studies on the Geisinger Gray's Woods Project and to provide further research on an issue facing the construction industry today. The breadth studies deal with how a proposed change will effect the building systems. Further analyses of the breadth studies include a cost analysis as well as a recommendation of the success or failure of the proposed change.

The goal of the first analysis is to investigate the effects of relocating the current green roof on the boiler/chiller building to the sloped front roof of the building. Building envelope calculations along with solar radiation calculations will be used to evaluate the effects on the mechanical equipment. Additionally, building sections and renderings will provide the aesthetics of the relocation of the green roof. It was found that by implementing a green roof system on the sloped front roof, the cooling load on the building can be reduced by 7% each year cutting back nearly \$1,000 on utility costs. By selecting the Xero Flor Green Roof System, the Owner can additionally save an initial \$26,000. Selecting this system would have little effect on the project schedule due to the metal roof having intricate detail connections and requiring a substantial amount of time to begin with. It is recommended that the Xero Flor Green Roof System be implemented on the front slope roof so long as the aesthetics of the building façade are still acceptable.

Second analysis objectives include lowering the total building costs through value engineering the concrete slabs and still maintaining the structural integrity of the medical office building. With the comparison of the concrete slabs, the structural steel design will need to be re-evaluated for the normal weight concrete as well as a cost comparison. With over 60,000 SF of lightweight concrete being used for the slabs, the lower material costs of normal weight concrete could have substantial impacts on the project. In addition, an investigation of a form deck slab construction on steel joists will be completed for value engineering. This option would require even heavier girders than the normal weight concrete option because they will no longer be composite girders, but form deck construction can be less expensive. It has been found that the form deck system for the typical bay areas reduces the project costs by about \$16,000 if the current system of composite beams is used for all other areas. Joists, however, would affect over head installation scheduling and coordination but not add any additional time to the structure erection.

Through continuing education of the ICC codes and increasing the amount of plans examiners within each municipality, tension created between code officials and project members could be greatly reduced. Furthermore, initial project delays from approvals and permits could be greatly reduced. After surveying several municipal code officials from central Pennsylvania, the need for continuing education for the designers is apparent as well as the importance of preliminary meetings with code officials early in the design process. Studying other permitting offices, such as the Department of Planning and Development in Seattle, Washington could bring their success to other regions.