

2013

INTRAMURAL BUILDING ADDITION AND RENOVATION-PHASE I



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Department of Architectural Engineering
Construction Option

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TECHNICAL REPORT III

PART II

Problem Identification and Technical Analysis Option

Analysis Topic 1 – Prefabrication of Building Enclosure (Architectural & Structural)

This analysis is pursued as an effort to accelerate the project schedule. The enclosure of the Intramural Building is a vital portion of the critical path; accelerating these architectural features will increase the chances to turn the building over earlier, reduce labor costs, and preserve jobsite safety. The proposed idea is to prefabricate brick and curtain wall panels in shops, and be shipped to the site to be erected. Being fabricated in controlled areas, the performance of both quality and durability of wall and glazing panels are higher. This will not only reduce the congestion of the site, but also provide a new aesthetic look to the building. Main goal of this analysis is to decrease labor costs and exterior façade durations.

Analysis Topic 2 – Alternate Project Delivery Method

An investigation will be conducted to determine the potential benefits of delivering the Intramural Building using an Integrated Project Delivery Method. The majority of delays in construction projects are due to discrepancies in the design documents and the complexity of the work. By using an IPD approach, the project team will be able to experience efficacy throughout the design and construction phases of the project. This will allow for a decrease in design, field, and management errors while maintaining steady flow of work. A comparison of the current multiple prime delivery method and the IPD approach will be performed, mapping the advantages and disadvantages from the owners perspective, coordination and communication between trades, and success rate based on quality, schedule and costs.

Analysis Topic 3 – Onsite Welding vs. Bolted Connections (Structural)

The erection of the structural steel is on the critical path and was scheduled to start after a major delay from the soil improvement. Connections are essential to hold the structure of the building in place and resist lateral, vertical and moment loads. Due to discrepancies in shop drawings, steel connections were welded on site rather than bolted. Welded connections can cause hazards, create thermal stresses, are labor intensive and requires time as well. This analysis will evaluate the quality, time, and cost implications of this change of connections and the performance of bolted connections over onsite welding. It will also look into taking the proper measures of ordering steel to the site to avoid mistakes with the implementation of a more integrated delivery method.

Analysis Topic 4 –Evaluation of Maintaining Existing Building Occupied

The project is scheduled to be fully operational during the construction of the new addition and renovation. During the project, unexpected events can lead to delays which could potentially disrupt the comfort of the occupants. Therefore, there are certain commitments which must be accepted by the occupants before the construction starts. This analysis will incorporate the positive and negative

costs associated with maintaining the building occupied. In addition, a model will be designed to demonstrate the environment for a building occupant in terms of noise and vibration on a regular work day.

Analysis Topic 5 – Cardio Loft Lighting Plan (Value Engineering)

This analysis will focus on the redesign of the cardio loft's lighting plan. "Fitness 203" contains 45, scattered and suspended fluorescent lighting fixtures of different sizes. This space receives substantial amount of day-lighting, which opens up the opportunity to make a directional lighting design. Only acting as a cardio fitness area, this space will require lighting that will maintain occupants in motion. The space has a two view points, outside from the curtain wall system and down to the weight lifting area. An evaluation and new design will be performed in order to reduce the number of fixtures, promote energy savings, and offer a motivational working area.

Analysis Topic 6 – Evaluation to Incorporate Multiple Phases – Sequencing (Optional)

Penn State University has planned for major improvements to the Intramural Building to not only meet the demands of the current students, but also attract prospective ones to attend the University. Three Phases have been discussed, which consist of the three new additions along the south, east and north sides and ongoing renovations to the existing building. This analysis would focus in the schedule sequencing of these upcoming phases and the opportunity of constructing these phases at a whole. Availability of Phase 3 documents is questionable, so I propose the construction of first two phases simultaneously, while keeping the existing building operational. Sequencing is very critical for maintaining flow of work, with safety as main mentality.

Architectural Breadth | Analysis 1

The architectural breadth will be directly associated with the building enclosure. The areas of benefit for the prefabricated brick panels is along the West and South West portions of the building which contains 20 feet high wall sections divided by windows which are not evenly spaced. Proposed change for the brick portion is to evenly space the windows to allow for prefabrication of same size panels to be shipped and erected on site. In addition, the incorporation of a modular curtain wall system will provide the opportunity to research modular systems which are operational and easier to install than stick built systems. Both structural and thermal concepts will be considered to evaluate the possibility of incorporating these two systems. It is also very crucial to prevent major changes to the façade, while keeping the owner pleased with not only the performance, but also the aesthetic view of the building. Architectural sections, views and details will be included to illustrate the proposed system.

Structural Breadth | Analysis 1 & 4

The structural system of the intramural is oddly shaped and contains complex connections. Since connections were welded on site, an evaluation of how each connection impacts the structure of the building would be very beneficial to understand the structural system. A thorough investigation on the several connections of the building can be performed to identify where it would be beneficial to include welded connections or implement bolted connections in regards of structural support. In addition, prefabricating brick panels and curtain wall systems presents the need of developing a tie in system to hang, erect and connect these two systems to the structural steel and floors.