

Investigation, Diagnosis and Rehabilitation

JHU CE 565.410

Final Project

Due by Thursday, 5 December 2018

** Turn in via blackboard

Throughout the course, you have learned the principles and methodology behind the investigation, diagnosis and rehabilitation of heritage structures. With this final project, you will is to combine the lessons learned in each lecture and apply these tools to your own investigation project as outlined below:

St. Elizabeth's west campus is composed of numerous historic buildings that need repair and rehabilitation. We (the client) purchased the Center Building and are now in the process of developing a master plan that includes rehabilitation options for a portion of the building, the Center Building (Buildings 1 and 2). We understand and are sympathetic to the character-defining properties of the building; but plan to use this space for office and would like a more open floor plan. The existing structural system includes the following:

Existing Gravity-Load-Resisting-System

1. Foundations
Granite footings beneath load-bearing brick masonry walls
Exterior load-bearing, brick walls vary in width from 3 wythes to 5 wythes at the foundation
Interior load-bearing walls are 4 wythes, interior partitions are 2 wythes
Retaining lateral earth pressure on north perimeter of the building
2. Floor Systems
First Floor Framing: solid-sawn wood joists, load bearing masonry walls
Typical Floor (Floors 2 through 4): solid-sawn wood joists, load bearing masonry walls
Floor 3 at Gymnasium: original solid-sawn wood joists
3. Roof Systems
Roof over wings (A/B and D/E): solid-sawn wood rafters
Roof over center (C): wood and steel trusses and solid-sawn wood purlins

Existing Lateral-Load Resisting System

1. Vertical Elements: unreinforced brick masonry shear walls
2. Horizontal Diaphragms
Floor diaphragms: typical floors: wood decking (existing sheathing or new plywood), gymnasium: existing concrete slab on metal deck
Roof diaphragms: typical roofs: wood decking (existing sheathing or new plywood)
Diaphragm connectors: wood decking nailed to wood framing
Some chord/collector elements are missing.

The two schemes we would like you to pursue are as follows:

Scheme 1 – Preservation

- Evaluate existing structural system with limited modifications
- Repair and reinforce as necessary to satisfy design criteria.

Scheme 2 - Façade Retention with New Structure for Open Plan

- New concrete structural system within existing envelope (you pick floor system and if you will be providing new vertical structural system or supporting it on existing brick masonry walls).

We would like you to prepare a report, concept repair drawings and an outline specification that includes addresses the following components:

1. Provide a background summary on the history of the building that includes a summary of the structure, its heritage and the character defining properties.
2. Prepare a structural design basis that includes the following information:
 - General Description of Project
 - Scope of Work, including rehabilitation concepts
 - Description of Structural Systems (Existing and New) including a description of gravity/lateral load paths
 - Referenced Building Codes and Standards
 - Load Criteria (Dead, Live, Wind, and Seismic)
 - Design Properties of Materials
3. Show calculations for the dead, wind, and seismic loads. Remember to check components and cladding too.
4. Review relevant building codes (IEBC 2012 and IBC 2012) as required to confirm the design implications.
5. Provide a summary of the architectural features including the windows and roof systems to confirm how you will reuse or replace these systems (in kind or with new materials).
6. Prepare a foundation, typical floor and roof framing plans and a typical elevation. Include typical details as needed to show the design intent. Develop an outline specification to show the materials and general scope of work.
7. Summarize your recommendations for the structural strengthening and new concrete systems considering costs. Use R.S. MEANS or contractor contacts to gather supporting cost information to prepare a rough order-of-magnitude cost estimate for each option.