

St. Vincent Mercy Medical Center Heart Pavilion

Toledo, Ohio

Thesis Proposal:

Optimization of the Lateral System and Interior Member Sizes



EXECUTIVE SUMMARY

St. Vincent Mercy Medical Center Heart Pavilion is a four story hospital that provides diagnostics, surgery, and patient care. It was constructed for St. Vincent's Mercy Medical Center Campus, established in 1855, in downtown Toledo, Ohio.

The facility is approximately 144,000 square feet and reaches a height of 57'5" above grade with a typical floor to floor height of approximately 14 feet. A typical interior bay is 30 feet by 35 feet and is comprised of composite steel with a concrete slab on deck. Non-seismic steel moment frames are utilized to resist lateral forces at every column in both directions. This structural system was evaluated in previous technical reports and it was determined that the system meets architectural, strength, and serviceability requirements. Upon investigation of the soil classification within the site, it was determined that the soil was classified as Site Class E. As a result, it was concluded that the best solution for the Heart Pavilion is a structural steel system as this material is lighter than concrete.

The current site of St. Vincent Mercy Medical Center Heart Pavilion was chosen by the owner because it was already owned by Mercy Health Partners and it is adjacent to the main hospital. For these reasons, the Heart Pavilion will be kept on the existing site.

This thesis proposal outlines steps that will be taken to optimize the existing lateral system as well as interior member sizes. Classified as Site Class E, the soil is very sensitive to seismic forces. As a result, it was necessary at the time of design to place non-seismic steel moment frames at every column in both directions. To optimize this lateral system, seismically detailed steel moment frames will be utilized to resist lateral loads. Structural computer modeling will be used to complete this design. In addition, the seismically detailed connections will be designed based on applicable limit states. The use of geopiers will also be researched and designed. By utilizing this foundation system, lateral pressure within the soil will be increased, creating vertical reinforcement for the soil.

In the original design concepts, a surgery suit and conference spaces were located on the third floor. To provide natural day lighting to these spaces, a curtain wall is utilized along this entire level. However, the surgery spaces were later moved and patient rooms were added in its place. Therefore, the façade of the third floor will be changed to the brick veneer system. Heat loss calculations will be provided and conclusions will then be drawn on which system is more efficient for the Heart Pavilion's needs.

Implementing special detailing of the lateral system will require special welders to install the connections and special inspectors to regularly visit the construction site. For this reason, a construction schedule will be provided for the existing lateral system as well as the proposed lateral system. Conclusions will then be drawn based on viability of the new lateral system with respect to cost and constructability.

Breadth Study I: Façade Study

In the original design concepts, a surgery suite and conference spaces were located on the third floor. To provide natural day lighting to these spaces, a curtain wall is utilized along this entire level as seen in the picture to the right. However, the surgery spaces were later moved to a lower floor and patient rooms were added in its place. Since the functionality of the third floor became just like the floors below it, the curtain wall system will be removed and the brick façade will continue up the entire height of the building. Once this change is implemented, heat loss calculations will be provided for the existing curtain wall system and for the new brick veneer system. Conclusions will then be drawn on which system is more efficient for the Heart Pavilion's needs.



Breadth Study II: Construction Management

Implementing special detailing of the lateral system will ultimately affect the construction schedule of the Heart Pavilion. Special welders would be required to install the seismically detailed connections. In addition, special inspectors must be available for regular visits during construction to ensure that the lateral system is being constructed properly. For this reason, a construction schedule will be provided for the existing lateral system as well as the proposed lateral system. Conclusions will then be drawn based on viability of the new lateral system with respect to cost and constructability.