St. Vincent Mercy Medical Center
Heart Pavilion

Toledo, Ohio

Thesis Proposal:

Optimization of the Lateral System and Interior Member Sizes

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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 and will have less impact on foundation selection.

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 in order 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. In order to optimize this lateral system, seismically detailed steel moment frames will be utilized to resist lateral loads. These seismically detailed steel moment frames will be placed along the perimeter of the building to ultimately reduce interior member sizes. Structural computer modeling will be used in order complete this design. In addition to designing the new lateral system, the seismically detailed connections will be designed based on applicable limit states.

A geotechnical investigation will also be provided in order to further verify that the site soils are soft in nature. 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.

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: Geotechnical Investigation

The geotechnical contractor will be contacted in order to discuss the soil classification method used and if there are alternative methods that may be used. The use of geopiers will also be discussed in efforts to improve the conditions of the soil.

Within soft soil regions, geopiers are a great solution for a foundation system. They are installed by drilling a 30" diameter shaft and then ramming hard aggregate into the shaft in 12" lifts. This aggregate must be high quality and high hardness, or it will be destroyed. The ramming process is employed using a hydraulic hammer delivering 300 to 400 blows per minute. As seen in figure 1 and 2, this process increases the lateral pressures within the soil creating vertical reinforcement for the soil around the geopier. Installation of this system is very efficient as approximately 40 to 50 geo-piers can be installed per day.

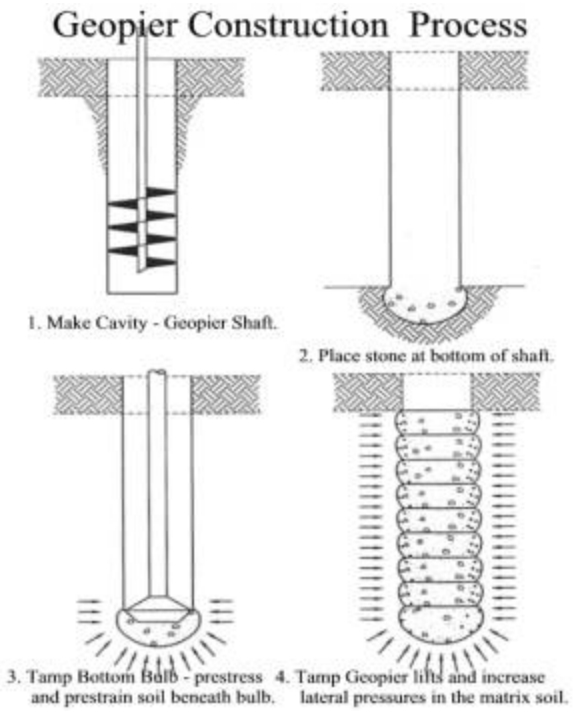

Figure 1: *Detail of Ramming Process*
Photo courtesy of www.farrellinc.com

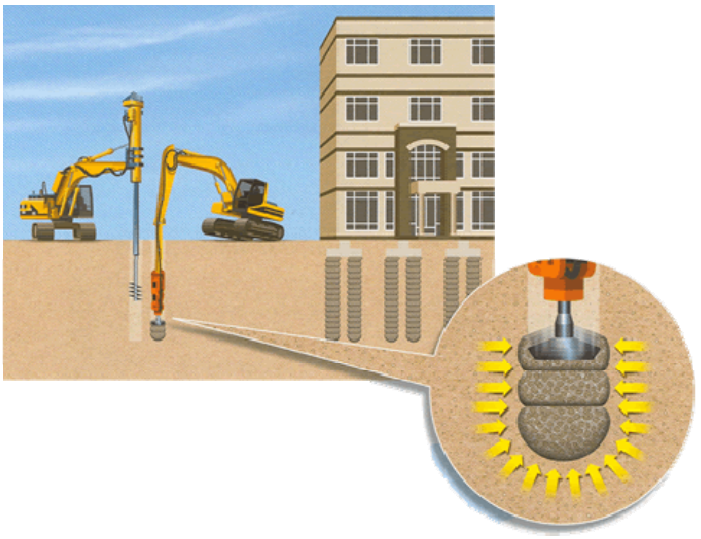

Figure 2: *Geopier Installation*
Photo courtesy of www.farrellinc.com

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.