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Structural Option
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Executive Summary

Point Pleasant is a 5-building apartment complex located at the New Jersey Shore. This report will focus on building 1, which is 64,000 square feet and has four stories over a partially exposed parking garage. There are sixteen luxury apartments in the building, four on each floor. The apartments are approximately 2,500 square feet and each has a front balcony facing the central courtyard and a rear balcony overlooking the Manasquan River. The exterior of the building is a combination of stone, stucco, and hardshingle siding. This change in material along with the bump out balconies creates an interesting façade and effectively masks its basic box shape. The roof is a simple hip accented with multiple dormers, a dome feature on one side, and steeple at the center.

Based on previous research, it has been determined that the current structural system of open-web steel joists with metal deck and concrete slab may not be the most economical or efficient choice for Point Pleasant Apartments. In the upcoming semester, an alternate system using wood floor trusses will be designed and compared to the existing structure. The wood trusses will be supported by PSL's, wood bearing walls and W shapes, replacing the current W and HSS shapes.

A wood system will drastically change the weight of the building, therefore, the seismic loads will be recalculated and the lateral forces will be redistributed. An ETABS model will be created to calculate this distribution of forces as well as displacements and story drift. With the switch to a wood truss floor system, wood shearwalls will be utilized to resist lateral load as opposed to the braced frames of the existing system. The shearwalls will be design based on the distribution calculated by the ETABS model.

After the loads have been recalculated and shearwalls have been designed, the members will be rechecked to ensure adequacy and the results will be compared to those of the existing structural system. The members will be checked for both strength and deflection.

In addition to the structural changes made to Point Pleasant Apartments, two breadth topics will be explored. The first of these breadths is construction management. Changing from steel to wood will create drastic changes in both scheduling and cost of construction. A detailed schedule will be created for the new structural system and then compared to the schedule of the existing building. An in depth cost analysis will also be performed and compared to the existing cost to ensure that switching from steel to wood will be beneficial.

The second breadth option that will be explored is acoustical performance. Wood is more susceptible to vibration than steel. With the new structural system, the noise barrier created by the 3.5" of concrete is lost and replaced with a subfloor. In the upcoming semester, a vibration analysis will be performed and research will be performed to provide an adequate sound barrier from apartment to apartment.

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Breadth Options

In addition to the proposed structural revisions, two other breadth topics will be investigated. Switching from steel to a wood structural system will cause a significant difference from a construction standpoint in terms of cost and scheduling. Another area of concern that will be addressed is acoustical performance.

With a wood structural system, construction time could be greatly reduced. There is less lead time necessary for wood trusses than the steel system and the constructability is easier. In general, wood is inexpensive when compared to steel and the less labor intensive system would also in turn reduce the cost of construction. The research performed in the next semester will compare both the construction schedule and construction cost to determine if a wood structural system would be a favorable alternative to open-web steel joists supporting a metal deck and concrete slab.

One concern when using wood construction, particularly in a multi-family facility consisting of luxury apartments, is acoustical performance. Wood is more susceptible to vibration than steel. With the new structural system, the noise barrier created by the 3.5" of concrete is lost and replaced with a subfloor. In the upcoming semester, a vibration analysis will be performed and research will be performed to provide an adequate sound barrier from apartment to apartment.