



CONCLUSION





CONCLUSION

For this thesis, a study was performed in order to determine whether or not Memorial Sloan Kettering's Outpatient Addition would be both structurally and economically feasible if it were built vertically above the existing structure. The objective of this study was to design an efficient structural system that effectively resisted both the gravity and lateral loads it experienced. To do so, the existing structure needed to be reanalyzed under the increased loads it now experienced. At four stories, Memorial Sloan Kettering was controlled exclusively by seismic loading. Conversely, once the infrastructure rose to 126 feet, wind loads significantly increased and generated lateral forces exceeding 640 kips. In respect to axial loading, the existing structure now experiences the weight of an additional five stories.

RAM Structural Program was used to analyze the structure and help determine whether MSK displayed acceptable performance criteria under the necessary loading conditions. The lateral loads developed in this analysis came from procedures outlined in ASCE 7-02. In addition, the redesign of this infrastructure utilized a building drift limitation of $H/480$ to ensure serviceability issues were addressed. In order to meet this criteria, a number of plausible lateral system were investigated. The final design makes use of four braced frames in each direction, positioned to diminish drift throughout the entire structure. The foundation of Memorial Sloan-Kettering was also examined due to the increased loads on the structure. It was determined that while the lateral system remained efficient, the increased axial loads on the building required an increase in footing sizes.

In addition to designing an effective structural system, two breath studies were conducted to determine the practicability of a vertical expansion. A construction management study carried out both a cost analysis and time schedule of the proposed addition and compared those results with the initial plan. This comparison concluded that a vertical expansion would cost roughly 17% more and take 41% longer to build than if it were built in its original location. The second study examined the building's mechanical system and how it would supply the five additional stories. A layout was created of the mechanical room in the basement, showing locations of all required equipment. In addition, the 5th floor of Memorial Sloan Kettering was deemed a mechanical floor and now houses five air-handling units. To supply these units with outdoor air, louvers were designed to allow airflow through the floor. Finally, an acoustic study was performed to determine whether additional soundproofing was needed between the mechanical room and those floors above and below it. From the study, it was determined that noise would not be a problem.

After analyzing this building structurally, mechanically, and financially, it has been determined that yes, it is possible to design the Outpatient Addition this way. However, given the circumstances Memorial Sloan Kettering is currently under, I see no need to recommend this design over the existing one. Perhaps if MSK were in an urban atmosphere where space was an issue, this redesign would be more sensible. However, placed on its own 25 acre lot, there is no need to build vertically. Doing so requires additional lateral systems, larger members, and wider footings. More importantly this design breaks up the lateral internal flow of the original design. Offices originally projected to be next to each other are now five stories apart. Especially in a health-care facility specializing in one field, it is far more efficient to have sectors working together as a team rather than sectioned off between floors. Therefore, because of these reasons and others previously determined in this report, I recommend that the original design for the Outpatient Center be used for Memorial Sloan-Kettering.