



**EXECUTIVE SUMMARY**

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This final report is a culmination of the year-long thesis work undertaken on Memorial Sloan-Kettering Cancer Research Center. Located in Somerset County, New Jersey, this four story health-care facility will open its doors in the summer of 2006 to serve as one of the premiere cancer treatment centers in the nation. A combination of steel, concrete, and masonry, MSK's layout includes a plethora of exam rooms, offices, and chemotherapy bays to compliment a Laboratory, Pharmacy, and radiotherapy treatment area. Furthermore, an 80,000+ square foot addition is still in its design stage and will later be constructed to the north side of the building, doubling the facility's size.

For this thesis, a study was performed to determine whether Memorial Sloan Kettering's Outpatient Addition would be both structurally and economically feasible if it were built vertically on top of the existing structure instead of to adjacent to it. The objective of this study was to design a 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 was now experiencing. 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 the largest lateral forces. In respect to axial loading, the existing structure now has the weight of an additional five stories acting on it.

To help determine whether MSK displayed acceptable performance criteria under the necessary loading conditions, RAM Structural Program was used to analyze the infrastructure. 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 systems were investigated and the most efficient design was incorporated into the structure. The foundation of Memorial Sloan-Kettering was also examined and with the exception of a few increased footing sizes, everything remained structurally sound.

On top of 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 illustrated that a vertical expansion would be the more expensive option. 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. Also, the 5<sup>th</sup> floor of Memorial Sloan Kettering was deemed a mechanical floor and now accommodates five air-handling units. To supply these units with outdoor air, louvers were designed to allow airflow into the area. Finally, an acoustic study was performed to determine whether additional soundproofing was needed between the mechanical room and those floors surrounding it. From the study, it was concluded that noise would not be a problem.