

Executive Summary:

Nemours Children's Hospital as a part of The Nemours Foundation (NCHTNF) is a 7-story building located in Orlando, Florida. The entire complex consists of a hospital, clinic, loading dock data center, central energy plant (CEP), and parking facility. The 600,000 square foot hospital consists of two components: a bed tower and outpatient center. The combined components will provide 85 beds, emergency department, diagnostics and ambulatory programs, educational and research centers, and an outpatient clinic. Stanley Beaman & Sears and Perkins + Will are the architects of the project. Harris Civil Engineers, Simpson Gumpertz & Heger, AECOM, and TLC Engineering for Architecture are responsible for the engineering design of NCHTNF. Skanska USA Building is acting as the construction manager and general contractor of the design-bid-build project, which is scheduled to be completed July 2012 after ground was broken July 2009.

This thesis focuses on redesigning the lateral system using concrete moment frames instead of the current concrete shear walls. The existing structure uses 157 mph design wind speed, far surpassing the minimum code level. This lateral analysis studies if concrete moment frames are feasible for 110 mph, the minimum design wind speed for Orlando, in addition to the 157mph case. Pending a practical design, concrete moment frames create an open floor plan by eliminating shear walls. These changes alter the weight of the building, so the foundation needs to be reevaluated.

Additionally, a flat plate system is considered rather than the current flat slab. Flat plate designs eliminate drop panels and column capitals, thus producing a more cost effective slab system with a reduction of formwork. The slab-column connections require detailed analyses to determine if the connection can withstand the moment transfer and applied shear. If the slab-column connections cannot carry the load, solutions are presented and studied to mitigate the moment transfer.

In addition to the lateral and floor system redesign, two breadth topics are explored. One topic is a daylighting study of the sun management of a south facing façade. This determines if the current louvers can adequately control the sun. Additionally, an alternative interior sun control system is presented. The second breadth topic examines the structural system of the façade, for both constructability and maintainability. An aluminum mullion design is presented as an alternate to the current silicone structural sealant; comparisons of advantages and disadvantages of each drive the final decision.