

Executive Summary

The University Academic Center was designed as a composite steel structure with braced frames. It houses all elements of a typical education center including classrooms, staff offices, a library, dining facilities, and fitness center. The building has three main wings and multiple roof levels including a roof garden. This report will focus in on the south office wing and its redesign as a concrete structure separated from the main building.

In the beginning of this process of redesign, the office wing presented itself as the best choice for a concrete structure. It had relatively repeatable floor plans which could save on formwork costs. This also made reinforcing layouts more uniform throughout since each floor saw similar loading. When considering architecture, the floor plan of the office wing was also compatible with a concrete redesign where the new column locations did not interfere drastically with any of the spaces.

Overall this redesign consisted of a one-way pan joist floor system with an ordinary moment frame system to resist lateral forces. All concrete used on for this redesign was 5000psi except for the foundations which kept the 4500psi noted in the construction documents. Joists and beams were designed 20" thick cast integrally with the 5" slab, totaling a 25" overall depth. This floor system was repeated on all floors and roof for sake of time. Columns were also all designed the same with a 24"x24" section and (12)#8 vertical bars as reinforcement. Together these members resisted the calculated wind and seismic loading with seismic controlling most of the design.

The added weight of concrete versus steel created several issues, one of which was column line L-2 (referenced in both the ETABS and RAM models used in this report) located above the exterior walkway. This was corrected by a 36" deep beam spanning across the walkway that took the load from the columns above into the foundations. Another issue was the increased demand on the foundations requiring a redesign. This was done using RAM Foundation with spot checks to determine validity of results. Foundation sizes increased but were still reasonably sized so spread footing could still be used effectively.

In addition to the structural depth, two breadth topics were discussed. The construction breadth focused on the cost and scheduling concerns with the redesigned concrete structure. This resulted in the concrete system costing less but construction time being considerably longer than that of the original steel. For that reason the steel system was determined the more preferable design.

The other breadth, a lighting redesign of a computer lab located on the 2nd floor of the office wing, focused on changing the current recessed lighting to a pendant lighting design as an alternative. This redesign reduced the number of fixtures, which also reduced the power consumption, while maintaining a recommended illuminance value of 30 footcandles.