

Executive Summary

The Judicial Center Annex is a 210,000 square foot addition to Montgomery County's Judicial Center located in Rockville, MD. The \$67 million dollar project is currently under construction and slated to finish in April of 2013.

The structural system, as designed is a post tensioned slab supported by reinforced concrete columns. The lateral force resisting system is reinforced concrete shear walls and the foundations are core drilled piers.

This report is the result of a semester of research upon the existing structural design. Based upon the findings a proposal was created for a system redesign. Due to the fact that the building lacked a height restriction it was determined to explore a steel alternative to the concrete construction. Also, as seismic design was an interest, the building was "moved" to San Francisco where the greater seismic forces would need to be dealt with.

The redesign in Maryland necessitated a cost and schedule comparison to determine the viability of the change in systems, so this was chosen as one breadth for further exploration. The other breadth was inspired by the sustainable features found upon the roof. The JCA has both green roof and photovoltaic panels. It was determined to investigate if changing the green roof portions to PV panels would be more beneficial for the owner by comparing the life cycle cost, carbon emissions, and LEED impacts of the two systems. The LEED checklist would also be further explored looking for opportunities to improve upon the Gold rated building.

The steel structure was able to be implemented effectively, using braced frames in lieu of the shear walls and maintaining the current grid to avoid impacting the layout. The large floor to floor heights and generous plenum spaces made a height adjustment largely unnecessary, with the total height only increasing by a 1.5'. It was estimated that the system could save in the order of \$700k in cost and a month in schedule.

The steel move to California necessitated changing the ordinary concentrically braced frames to special concentrically braced frames in order to deal with the increased forces. This required special detailing and turned out to be slightly uneconomical due to the one chevron configuration. Changing this to an eccentrically braced frame saved in the order of \$200k and 70 tons of steel. Adding additional frames also took advantage of certain code provisions and helped mitigate torsion problems.

The sustainability study showed that the green roof was the better option, as it had a lower initial investment which it paid back quicker. It also had other benefits in the form of net negative carbon emissions, storm water runoff control, urban heat island reduction, as well as impacting a possible 7 LEED points.