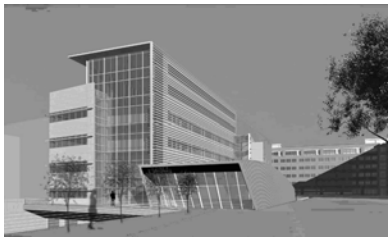
Timothy Mueller
Structural Option
Ali Memari, Advisor



FDA CDRH Laboratory
Silver Spring, Maryland

Summary & Conclusions

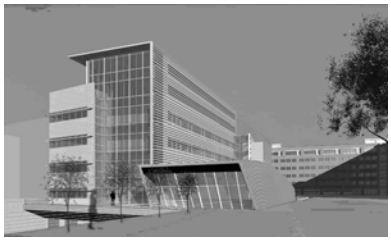
After looking at many types of construction scenarios, my final recommendation for the design of the CDRH Laboratory would be to utilize steel construction with beams spanning in the east-west direction (design b), with an exterior façade made of precast brick. This recommendation comes from many components. First, the cost savings of a steel building as compared to the concrete structure that was designed for this laboratory. Using the same façade with the concrete system, as compared to an equivalent steel structure, including the cost of the façade, results in a 16.7% savings.

Current Buiilding Total (Concrete+Steel Façade)	$5,578,368.35
Proposed Building Total (Steel + Steel Façade)	$4,647,927.50
Total Savings	$930,440.85

There is still a 7.9% cost savings found when comparing a steel structure with a more expensive façade and equivalent blast and vibration control.

Current Buiilding Total (Concrete+Steel Façade)	$5,578,368.35
Proposed Building Total (Steel + Precast Façade)	$5,136,827.60
Total Savings	$441,540.75

The drawback to the steel as compared to the concrete is the vibration control that could be lost when going from a building with very deep concrete beams to one with conventional steel construction. However, by utilizing a non-composite system in my steel design, additional concrete was used on the slab, and the vibrations were less likely to travel though the building. When looking at the cost of this building, the savings of not using shear studs almost negated the additional cost of the concrete slab. To be confident of the vibration control provided by the steel design, calculations were performed and proved that although the system may not be as resistant as the concrete structure, it was more than adequate for the function of the building. The necessary addition of fire protection to the steel design also did not cause a great price increase, as compared to the concrete construction in which additional fire protection was not



needed. Another addition to the steel building that was not needed in the concrete building was an additional lateral resistive system. This, again, was not a great price increase.

Two large braced frames help a great deal in savings as compared to moment connections, and many of the moment connections found in the building were also needed in the penthouse construction in the concrete building. The moment frames that were needed were only provided in one direction and on less than half of the small frames. Although there were fewer frames required in the first design, the lack of vibration control, as well as the additional cost for many more members completely negates any savings in the lateral system. Additional savings could be found in the decreased amount of materials needed in the foundation design. There was a slight increase in height, causing for the need of additional façade material. This, however, is not a concern for the overall aesthetic of the building, due to the extremely large floor heights already provided in the current design, and the lack of height limitations in the area. Finally, time savings can be easily provided in a steel building, from the use of available lead time, to the ease of bay progression construction as compared to floor progression construction. Blast control of equal comparability to that found in the concrete building can easily be provided in a steel system, at a price that still allows for a great cost savings as compared to that of the current building. Additional blast protection can be found in the solidarity of the precast panels, which I have proposed for the façade of the building. The precast panels, although slightly more expensive than the current system, provide a more unified look to the FDA White Oak Campus, and provide increased safety against attack by having a more solid façade material along with less glazing (the weakest point in a façade against attack). By providing the FDA with the changes that I have recommended in my thesis, as compared to the current design, not only do they save a great deal of money—almost 1% of the $63 million total cost of construction—but they will receive a building more resistant to attack, without giving up required vibration control.