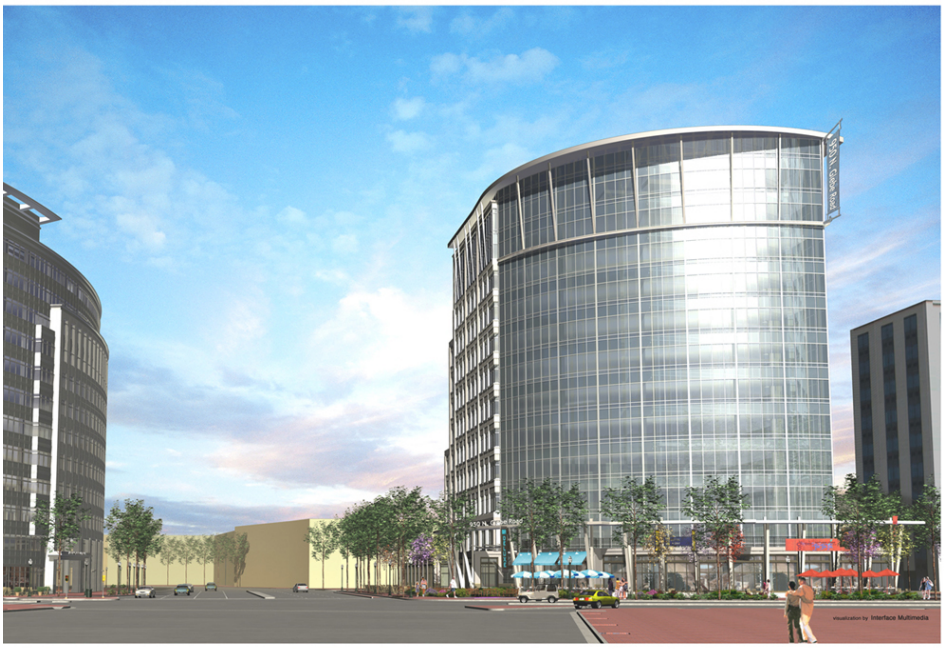
The Regent

950 N. Glebe Road
Arlington, VA



Architect: Cooper Carry Architects

Proposal
Executive Summary

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Option: Structural
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Executive Summary

The Regent is located at 950 North Glebe Road in Arlington, Virginia. The building is a 12-story spec office building with retail space on the first level. There is also a 3-story parking garage below grade. The building is designed to a maximum allowable height of 176 feet. The Regent is currently under construction, and since the building was not pre-leased before construction began, the occupants or tenants are not known at this point.

Based off of the study, research, analysis, and designs of the existing system (steel framing with composite slab) and the four alternative systems (hollowcore planks with steel framing, precast double tees with precast framing, one-way wide module joists with CIP framing, and a two-way flat slab with drop panels and CIP framing), it was determined that the existing system is the most efficient design to meet the needs of the building, the project team, the schedule, and the site.

Having studied the existing steel structure all semester, I wanted to challenge myself next semester by proposing to do a redesign of this building using a concrete system. Although my initial conclusions are that the existing steel design is the most appropriate for this building, I want to do a redesign of The Regent using a concrete system in order to make comparisons between the two systems.

A concrete system design shall be selected that meets as many of the initial design team's criteria as possible in order to make a fair comparison between the concrete system and the existing steel system.

Comparisons between the two systems will be based on the following:

- Cost
- Schedule
- Constructibility
- Labor
- Floor to floor height
- Floor to ceiling height
- Lateral system performance (braced frames vs. shearwalls)
- Weight
- Impact on the foundations

In reviewing the results of the alternative floor systems involving concrete design in Technical Report 2, it has been decided to explore the following concrete system in the redesign of The Regent.

- One-way Joists, Wide Module, with all Cast-In-Place Framing

In comparison to the other concrete systems considered, this concrete system is expected to be the lightest in weight and the shallowest in depth. Another goal is to

keep the same column layout as the existing steel system in order to keep the original design intention of an open floor plan.

The existing structure utilizes a series of 5 braced frames; 2 spanning in the north / south direction and 3 spanning in the east / west direction. Since the redesign will be an all concrete system, a series of concrete shearwalls will be used as the lateral force resisting system. These shearwalls will ideally be placed around the elevator core and/or around the stairwells. Both the elevators and the stairwells are located in the central core of the building.

The loads considered for the existing design of The Regent were research, analyzed and checked throughout all of the Technical Reports. In some cases, the loads determined corresponded to the loads used in the existing design, in other cases they did not. In reviewing the loads considered for the existing design, some of the loads seemed to be very conservative such as the floor live load and the snow load, 100 PSF and 30 PSF, respectively. These conservative loadings may have been minimum requirements set forth by the structural engineer on this project. In the concrete redesign of The Regent, the loads considered will be optimized and will based off of IBC 2000, which was the model code used in the existing design. Although a direct comparison cannot be completed between the existing design and the redesign, the optimized loads will yield a more efficient design for the new concrete design.

The design of the concrete structure will be based off of ACI 318-05: *Building Code Requirements for Structural Concrete*. Analysis for gravity loads will be completed by hand calculations and/or through the use of structural analysis and design software: ADOSS, SAP, and PCACOL. Analysis of lateral loads will be completed by hand calculations and/or through the structural analysis software SAP2000. Trial sizes based off of the preliminary designs, determined through the CRSI Handbook and hand calculations, will be inputted into the computer programs along with the newly determined, optimized gravity and lateral loads. Live loading patterns will be considered and used to properly design the concrete gravity system.

Scope of Structure to be Designed

- Floor System - One-way Joists, Wide Module
- Cast-In-Place Beams
- Cast-In-Place Columns
- Lateral Load Resisting Shearwalls
- Foundations (representative redesign)

As part of the breadth analysis requirements, the following breadth areas have chosen to be studied in order to help compare the two systems.

- Construction Management
  - Cost
  - Schedule

- Mechanical
  - Impact on mechanical layout
  - Possible redesign of mechanical layout of necessary
- Fire Protection
  - Comparison in fire rating between the existing steel floor system and the new concrete floor system
- Acoustics
  - Comparison between the resistance to noise penetrations between the existing steel floor system and the new concrete floor system.

A schedule has been prepared describing what tasks will be completed and when throughout the semester.