

JULIE DAVIS  
**STRUCTURAL OPTION**  
 APRIL 9, 2008

CITY VISTA  
**WASHINGTON D.C.**  
 ADVISOR: DR. MEMARI

## EXECUTIVE SUMMARY



City Vista, Building 2 is a mixed use complex located in downtown Washington D.C. Currently the building's gravity system is a flat plate post tension slab, tendons are unbounded and span in both directions. Slabs are supported by a grid of (52) cast in place columns. Resisting lateral forces are (4) cast in place shear walls. The building is supported with a deep foundation system consisting of over 270 augured cast in place piles and a 4" slab on grade. Building 2 is 324,298 sqft and 128'-5" tall at sections taken through the mechanical penthouse.

Developers in the D.C market buildings are driven by the 130'-0" height restrictions. Buildings are designed to maximize rentable space and minimize construction time while keeping the building under the 130 ft height restriction. With a post tension system floor to ceiling height is optimized while creating a finished ceiling with the underside of the slab.

Considering the competitive market, societies interest in "green" design, the finished ceiling incorporated into structural system and height restriction I have propose to redesign the post tensioned gravity system to a pre-cast system. Potentially a pre-cast system presents faster erection, possible leads certification and similar if not the same floor to ceiling height

Before design began preliminary analysis and design consideration were formulated. Different pre-cast construction systems were compared and contrast. Issues concerning cost, shipping, fireproofing, optimization of member and connections were considered.

After preliminary analysis a hollow core floor system with 2" composite topping, interior inverted T-beams, exterior L-beams, and conventionally pre-cast columns was choose. A new column grid was created with span to depth ratios in mind. A lateral check was then conducted using E-tabs to verify the stability of the (4) shear walls. Cost, schedule and initial leads analysis was performed along with architectural alterations to accommodate the new column grid.

After design was complete it was concluded that a pre-cast system would produce a building within the height limit, with a fast erection time, and finished ceiling if incorporated into the preliminary design phase of the project. The current architectural layout was conducive to the irregularly shaped bays that a post tension system allows. The new column grid creates awkward spaces within some condo layout.

Structurally the lateral system was not adequate after redesign to support the seismic base shear. This was un-expected because the building only increased in height by 3ft and weight by 3000 kips.

Economically the post tension system is cheaper after the cost analysis was done and it was discovered that the post tension system is \$2,000,000 cheaper. After examining these results it is obvious this is a result of the beams added to the gravity system.

After completing the gravity, lateral, and constructability analysis it is concluded that in the D.C. building market a post tension building is more economical and provides more rentable space. I feel the pre-cast building could be optimized with longer spans but this would result in larger floor to ceiling heights and a heavier building and ultimately this redesign was driven by building height