Executive Summary:

Lexington II is a residential tower located in the Historical Penn Quarter of Washington D.C. To maintain the architectural significance of important buildings throughout our nation's capital, restrictive zoning requirements are imposed on this unique area. In order to comply with the strict height requirement of 130' in this district, the current structural system is two-way flat plate slab.

The structural system of Lexington II allows for this 12 story building to stand at 125', just 5' below the maximum height limit. This was achieved by designing Lexington II with the smallest possible floor sandwiches made possible by the use of 2-way flat plate slab and the smallest bays possible. The irregular column grid allows columns to fit unobtrusively within patron walls while keeping bay sizes to approximately 13' x 16.5'. A core of shear walls located around a centrally placed elevator shaft allows lateral forces to be resisted with no effect on the gravity floor system. By moving MEP ducts into soffits along the interior partition walls, Lexington II was able to keep floor sandwiches to a mere 8" of slab with no additional depth.

With height as the structural design's controlling criteria, it is possible that a more economical solution was overlooked.

I propose to compare the current structural system of Lexington II with two other systems which may have been possible had there been a lesser height restriction. The building will first be analyzed and redesigned using a one-way joist floor system. A one-way joist system will maintain a relatively small floor sandwich while providing other benefits; such as additional stiffness, a more uniform column grid, and ease of formwork during construction.

The second system to be analyzed will be a composite floor system with steel framing. By analyzing a composite deck system, the entire building structure can be redesigned as steel. This completely steel redesign will include a comparison of steel lateral systems, as both moment and braced frames will be investigated.

The proposed systems will be compared to the current system in Lexington II. Criteria for this comparison include material availability, costs (material and labor), scheduling and erection time, and other issues of feasibility.