

## **Executive Summary**

Currently the gravity system of Building A consists of lightweight concrete on metal deck. Composite action is achieved through the use of shear studs attached to the supporting beams. The floor slab is supported by W-shape members, which are supported by W-shape steel columns. This floor system spans over three bays in the short direction of the building and eight in the long direction. In the short direction, the outer two bays are roughly 40' x 30' and the middle bay is 26' x 30'. Lateral forces are resisted by braced frames, located in the core of the building. Overall, the structure works well to transfer the factored loads across these large spans.

The proposed thesis will include a complete redesign of the building using concrete as the primary structural material. The floor will be supported by either normal reinforced concrete girders or post tensioned girders, which in turn will be supported by concrete columns. The large spans in the short direction of the building will be decreased with the creation of a different column layout. Instead of three spans, the outer two bays will be decreased, and an extra column will be introduced at the midpoint of the building. Between the girders an optimal one-way floor system will be implemented. All columns will be redesigned using concrete, and will replace the existing steel columns. This particular design alternative is being proposed to gain a better understanding of concrete design, and it also could potentially have a floor depth either equal to or less than the existing. A minimal floor depth is desired because of height restrictions in the Ashburn, VA area. A significant increase in building weight will result from changing the building structure, and as a result the foundation will be engineered to support the heavier dead load. The lateral force resisting elements will be switched from braced frames to concrete moment frames because it will be more difficult to implement shear walls if the column layout is changed.

The breadth proposal will include a study of the cost and schedule impact, created by constructing the building with concrete. Comparisons will be drawn between the original costs/schedule and the new costs and schedule. Cost and schedule impacts are not necessarily being conducted because a concrete structure is believed to be less expensive or quicker to build, but is primarily being done to gain a better understanding of the differences between building with the two different materials.

The second breadth study will focus on architectural impacts of the proposed column layout. Great care will be taken to place the columns in locations that have the least impact on the open floor space. In the core of the building, some spaces will need to be restructured, and a functional alternative layout will be created. A typical office layout will be superimposed onto the new column layout to make sure the column locations do not conflict with office plan.