

Executive Summary

The Virginia Advanced Shipbuilding & Carrier Integration Center (VASCIC) is home to Northrop Grumman, a leading global security company and is used as the company's base for designing and testing ships. The thesis study performed includes the complete structural redesign of the office building and analysis of the advantages and disadvantages of this redesign. The office building originally used steel wide flange columns and beams and a composite steel deck to support gravity loads and two steel member k-braced frames to resist lateral loads. The thesis redesign will be a design using two-way reinforced concrete slabs with drop panels as well as reinforced concrete columns to resist gravity loads and reinforced concrete shear walls to resist lateral loads.

A complete redesign of the column layout was done as well. The original layout of the columns led to many irregularly shaped bays. The new column layout made use of a standard grid system in order to obtain more rectangular bays. Rectangular bays are easier to work with, design, and construct and an attempt to keep as many bays as possible in a rectangular shape was made.

The effect this redesign had on the architecture of the building was considered as well. The redesign of the column layout had a large effect on the architecture. More columns needed to be created due to the new grid layout in order to keep the bays at a reasonable size. The VASCIC looked light and open architecturally and used steel to easily satisfy the look. This was taken into consideration when redesigning the building using concrete. Column sizes would potentially be increased and take up more space within the floor plan. To make sure the large concrete columns did not dominate the building they were placed in open areas that would ultimately make the columns look small in comparison. The redesign of the floor system allowed for a reduction in height by 5 feet. The original floor-to-floor heights were kept unchanged to keep the architecture in this aspect intact.

The second breadth conducted was a cost analysis of the structural systems. A cost analysis was done for the existing steel structure as well as the new concrete redesign. Both were compared to see which design was cheaper. After completing the cost analysis, the costs of each design was analyzed and different factors as to why one was chosen over the other were considered.

A further depth topic of flood control was considered as well. The VASCIC is located on the shore of the James River. Flood loads were taken into consideration and a flood-retention system was created. A levee system was designed using slurry walls to prevent seepage.

Throughout the rest of the report, the existing system and building will be referred to as the "current" or "existing" system or building. The thesis redesign will be referred to as the "redesign" system or building.