

NATIONAL HARBOR BUILDING M

OXON HILL, MARYLAND



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Structural Option
Thesis Proposal
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EXECUTIVE SUMMARY

National Harbor Building M is being constructed as part of a large scale development on the banks of the Potomac River which will be known as National Harbor. It is a rectangular building in shape with dimensions of 243'-8" x 60'-5 1/2" for approximately 14,800 square feet per floor. This five story building resists lateral forces through four masonry shear walls in the longitudinal direction, and a combination of six moment frames and two braced frames in the transverse direction.

After carefully and thoroughly analyzing this Building M in three technical reports, it was determined the building efficiently serves its purpose as a tenant fill out office/ retail building. The original design does an adequate job of providing open spaces through the relatively long spans of the column layout. The goal for the further investigation of Building M is to attempt to match the effectiveness of the existing design with a different structural system. A post-tension concrete floor system in a concrete building was selected because of its ability to span longer distances while maintaining a shallow structural depth.

This proposal outlines the methods which will be used, the tasks which will need to be completed, and a preliminary schedule for completion of the redesign of National Harbor Building M. In addition to the conversion to a post-tension floor system, the building's columns and lateral system will be redesigned in concrete for consistency. A mechanical investigation will be performed in an attempt to take advantage of the increase in useable space provided by the post-tension slab. Finally, a construction investigation will take place to see if the proposed system can be accomplished at this site in a shorter time period or at a lower cost than the existing system.

THESIS STATEMENT

Through the research compiled in previously composed technical reports, it is apparent Nation Harbor Building M has no significant problems which need addressed. The building successfully provides open interior spaces with large spans suitable for office occupancy. Building systems such as mechanical and electrical are designed with flexibility in mind to allow future tenants to adapt spaces to their specific needs. Changes or modifications to the building's design or system layouts will attempt to improve upon, or at the very least, maintain the current level of building efficiency.

THESIS PROPOSAL

A post-tensioned two-way flat slab will be designed to replace the existing steel structure and composite deck system. The post-tensioned system will be able to achieve similar results regarding the long spans and open spaces. Additionally, the proposed system will have a smaller overall structural depth, allowing for greater flexibility in the design of the building's systems. Along with the conversion to a concrete floor system, the building's columns, as well as its lateral systems, will be addressed. In being consistent with the concrete floor system, concrete columns will be designed to carry the loading of the new floor system, and will replace the current wide flange columns. The lateral system will be changed from a combination of steel moment frames, braced frames, and masonry shear walls to a combination of concrete moment frames and shear walls. The new lateral system will attempt to not disturb the openness of the current design, while trying to address the large torsional loads the layout of the previous system generated.

Breadth Topics:

- The complete redesign of Building M from a steel based structure to a concrete structure will drastically affect the project delivery. A detailed cost and schedule evaluation will determine if the proposed system can be delivered faster and/or cheaper. Also, a site utilization plan will be constructed to determine if the site can provide access to necessary equipment such as concrete trucks. Should the concrete redesign prove to be cheaper and/or faster to construct while maintaining the goals of the original project, it will be considered a viable alternative solution.
- A mechanical investigation will be performed to try and take advantage of the additional space provided from the switch to post-tensioned flooring. The investigation will look for ways to further increase the flexibility of the space and its ease of adjustment for future tenants.