

NATIONAL HARBOR BUILDING M

OXON HILL, MARYLAND



Ryan Sarazen
Structural Option
Thesis Proposal
Faculty Consultant: Dr. Andres Lepage

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 rough 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 a good 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 conversion to a post-tension floor system the building columns and lateral system will be design in concrete for consistency. A façade study will be preformed to obtain the best solution for the rear wall, formerly comprised of masonry shear walls. With the rear wall no longer being part of the lateral system a masonry wall, a poured concrete wall, and an architectural precast façade will be investigated as possible enclosures for the building. 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

Though 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 pot-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 buildings systems. Along with the conversion to a concrete floor system the buildings 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:

Construction Breadth

- The complete redesign of Building M from a steel based structure to a concrete one 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.

Façade Study Breadth

- The redesign of Building M from a steel based structure to a concrete based structure eliminates the necessity of locating one of the building's lateral systems in a masonry shear wall. However, the building's location adjacent to a simultaneously constructed parking garage still requires its rear wall (approximately 244'x74' with minimal openings) to completely enclose it. A facade study will be conducted investigating a masonry wall, a poured concrete wall, and an architectural pre cast facade to determine the best solution. The facade study will compare the given system's on their ability to connect into the redesigned system, fire wall properties, acoustical properties, construction implications, and overall system cost.