

THE ODYSSEY

ARLINGTON, VA



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Structural Option

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Structural Technical Report III

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Lateral System Analysis and Confirmation Design

Executive Summary:

The Odyssey is a 475,650 SF luxury residential complex located in Arlington, Virginia. The site features 2- 3 story townhouses adjacent to 3 levels of underground parking with adjoining skewed towers rising from the lower parking levels clad with glass curtain walls and brick facade. There are 16 stories of apartments with suites located on the top floors and retail space on the ground floors. The Odyssey is a perfect example of the latest designs for the rising market of luxury apartment and condominium construction with a structural system almost entirely composed of concrete. The floor systems are 2-way flat slabs and the lateral systems are shear walls located throughout the plan of the Odyssey and concrete slab frames.

The lateral system analysis and confirmation design report is a look into the design and interaction of lateral design elements. Lateral load cases analyzed in the Structural Concepts and Existing Structural Conditions report are distributed throughout the lateral elements by logical loading paths through stiffness. Lateral elements are then checked by strength, drift, and overturning effects from the resolved lateral load distribution.

The Odyssey consists of two lateral resisting systems integrated into the building design. An assumption that shear walls controlled the lateral design was made to check if in fact the two systems worked as dual system or were redundant. The analyses and checks provided a better understanding of individual contributions of each system. The design shear reinforcement for shear walls was inadequate to resist the full distribution of the direct and eccentric loading. The nominal strength of the shear wall would only contribute to a third of the distributed load. An overturning check revealed the requirement of the slab frame contribution to distribute moment throughout the foundation with a resulting uplift by the shear wall lateral reaction. A further analysis into the combined deflections of the dual system must be addressed to determine the interaction of each system upon one another, thereby reducing overall drift.

A general conclusion can be made that the lateral system design of the Odyssey is two systems working together to distribute lateral loading. The interaction and economical implications of a dual system may be the basis of a proposal to study and redesign the system.