The Residences of Sherman Plaza
Evanston, IL

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Structural Technical Report 3
Lateral System Analysis and Confirmation Design

Executive Summary

Sherman Plaza is a luxury condominium, located in the heart of downtown Evanston, IL. This 25 story condominium includes a health club, rooftop gardens, and two floors of retail space. The structural system of the building is a reinforced, cast-in-place concrete superstructure. The floor system is made up of two-way flat plates on reinforced concrete columns with deep edge beams surrounding the building's perimeter. The building rests on a foundation of belled-caissons that extend to hardpan at approximately 70 feet below grade. The edge beams also serve as perimeter moment frames to support the lateral loads. These moment frames act in combination with reinforced concrete shear walls to form the lateral resisting system of Sherman Plaza.

The lateral loads are distributed to this combined shear wall and frame system by computing the stiffnesses of each of the members. The elements with the highest stiffness will receive the most load. These loads will then be used to complete a strength check of critical members, the story drifts, the total drift and the overturning moment. The load distribution calculation was performed at floors 25, 22, 14, and 6, and therefore, the design checks were performed for lateral elements on these floors only.

A shear wall check was performed by analyzing the wall as a deep cantilever beam. The allowable shear force was calculated and compared to the actual shear force, calculated by the load distribution described above. Each of the shear walls that were checked was found to be sufficient. The moment frames were analyzed using Visual Analysis, a finite element design and analysis software. The software was used to determine the moments on the frame due to the distributed lateral load. The beams

were then checked for the flexural strength due to this moment. Each beam was found to be sufficient.

The overturning moment was computed by multiplying the story shear forces by the story height. The resisting moment was then found to be the total building weight multiplied by the distance to the center of mass. The resisting moment was found to be much larger than the overturning moment. Therefore, overturning does not need to be considered when designing the foundations.

The story drift and total drift was found using an ETABS model. The drift values were compared to the allowable drift value of H/600. This criteria is higher than the industry standard of H/400, but Sherman Plaza was designed to drift no more than H/600. The 25^{th} floor was found to drift 0.227 inches, which was slightly higher than the allowable drift of 0.217 inches. Most of the drift values, however, were less than the allowable drift. The total building drift was found to be 3.1 inches, which was less than the allowable drift of 5.21 inches.