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Structural Option

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Erie Convention Center and Sheraton Hotel

Erie, Pennsylvania

Technical Report #3: Lateral System Analysis and Confirmation Design
Submittal Date: 21 November 2005

Executive Summary

The Erie Convention Center and Sheraton Hotel, located on the Presque Isle Bay in Erie, Pennsylvania, is an eleven story steel frame structure. Technical Report #3 focuses on the lateral system of the building, and its effectiveness to resist lateral wind and seismic loads. The lateral system for this hotel and convention center is located around the perimeter wall. There are braced frames that resist loads in the North/South direction, while the loads in the East/West direction are resisted by moment frames that span in the long direction of the building. The braced frames are comprised of both cross braces, and eccentric knee braces.

This report contains the calculations of the story forces for both wind and seismic loads, as well as the determination of controlling load combinations. A discussion of the transfer of loads, as well as an analysis is also included. Member checks for strength, drift, overturning, and torsional effects are included to compare to the output found by frame models completed using STAAD.

Through analysis, it was found that wind forces controlled in the North/South direction, therefore the load combination $1.2D + 1.6W + L + 0.5R$ governs. In the East/West direction, the load combination $1.2D + 1.0E + L + 0.2S$ controls because of the high seismic forces. The distribution of loads is taken as a simplification due to the symmetry of the building. Therefore, in the East/West direction, each moment frame resists half of the lateral load, while in the North/South direction, each braced frame resists half of the lateral load. From the member checks, it was found that critical members passed for strength, except for a few girders on the second floor, which had stresses that slightly exceeded the 50ksi strength capacity of steel. The over stressing could possibly be caused by incorrect assumptions made about the dead load of the exterior wall, and this impact on a large tributary width to the second floor members. The story drift as well as the overall building drift was found acceptable for the serviceability limitations of $H/400$ for the wind loads in both directions. However, in the East/West direction where seismic loads control, the drift limitations were exceeded. Overturning due to the lateral forces was determined to not be a problem, and torsional effects were found to be negligible as compared to the shear forces on the building.