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## Technical Report 3: Lateral System Analysis and Confirmation Design

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### EXECUTIVE SUMMARY

The aim of this technical report is to perform a detailed analysis of the existing lateral resisting system for Gateway Plaza. Lateral loads were computed in Technical Assignment 1 and refined in Technical Assignment 3. These loads were used in order to develop strength, drift, and torsion checks on the frames of the building. Due to the size of the building and the complexity of the frames, RAM Frame software was used to compute frame shears, drift and torsion values.



The report contains a detailed description of the existing lateral resisting system and a discussion of the development of wind and seismic loads. Next, the distribution of these lateral forces to the lateral resisting elements is calculated and illustrated. Finally, using all of the information from the previous sections, checks on strength, drift, torsion, overturning, and impact on foundations were analyzed.

Strength of the members in the frames was computed in RAM Frame and checked by hand calculations. An interaction equation was used to determine stability due to the combined axial and bending forces seen by members in the frames. All of the members in the frames were found to be stable, except one column between levels four and five in frame y3. This could be attributed to differences in modeling techniques, but is otherwise indicative of a successful re-model.

Drift and torsion were both determined in RAM Frame as well. Inner story drift and total building drift were tabulated and compared to the industry standard of  $H/400$ , and there were no instances where this value was exceeded. Although there are no standards for torsional rotation of a building, the greatest rotation seen, at the roof, was  $0.00041$  rad ( $0.0235^\circ$ ). This value is hardly one for concern.

As to be expected, the size of foundations under columns in lateral frames is much larger than the foundations under gravity columns. This is due to the tremendous overturning moments seen at the base of lateral frames.

Despite the number of different lateral frames in Gateway Plaza making construction more difficult, the lateral resisting system does a very good job at preventing drift and rotation accompanied by strong winds. These serviceability issues should not be troublesome to this building.