Executive Summary

The Christina Landing Apartment Tower is a 22 story apartment building located just outside center city Wilmington, DE. The tower provides 250,000 square feet of floor space. The structure is a predominately cast-in-place concrete building. Its floors are supported by a two way flat slab system. The typical floor system also incorporates small areas of reinforced concrete and post-tensioned beams to aid the lateral force resisting system. The floors are supported by square and round concrete columns. Lateral forces induced on the building are resisted by a box of four shear walls. All columns and shear walls rest on a foundation system of H-piles and pile caps. Typical floor loads are 130psf dead load and 40psf live load.

For this report I looked at the lateral resisting system in detail. The system uses both a box of four shear walls, as well as concrete moment frames. By choosing the controlling load case of wind from technical assignment 1 and using those story pressures I found the rigidities of the lateral resisting elements. I found that the shear walls were much more rigid than the moment frames, however, the moment frames resist more load as the story heights increase. Through a series of excel spreadsheets I was able to find the shear forces at each floor in all of my lateral resisting elements. The base shear for the walls was as large as 750k while for the frames was as small as 7k. The shear forces in the frames actually increase as the stories go up which seems unusual. What actually happens is that as you come down the building the shear is transferred out of the frames and into the walls through the rigid floor diaphragms, because the walls are able to carry a much larger shear load on the lower floors. Once all the forces for all the lateral resisting elements were calculated I analyzed them for story drift using both STAAD.Pro and RAM Advanse. I found the drifts to be approximately 8” for both the wall and frame. These deflections were greater than the maximum drifts of L/400 or 6.9”. For my report I also checked one of the shear walls for strength requirements and found it to be inadequate in reinforcement. However, because of the complexities of the wall I will need to look at it in greater detail to actually confirm whether or not it is sufficient.