Executive Summary

Located in an urban center in Virginia, the Mountain Hotel will soon be the latest addition to one of the largest hotel chains. Light gage steel stud bearing walls are the primary element supporting six stories of precast hollow core plank floors. Prior analysis of this system demonstrated that it was lightweight, economical, and highly efficient.

The primary goal of this thesis was to learn the reinforced concrete design process by a redesign of the Mountain Hotel's gravity and lateral structural systems using reinforced concrete, such that the building is occupiable immediately after a seismic event at a new location in earthquake prone San Francisco. Because all aspects of the design were originally performed for the Virginia location, two of the buildings other systems were analyzed, and modified to maintain the building's original performance level. The new concrete floor system is denser and therefore had the potential to reduce the sound absorbance compared to what would have been achieved by the hollow core planks. The sound transmission properties of the two floor systems were therefore analyzed to mitigate a reduction in the comfort of the hotel's guests. Thermal comfort was also considered. The heat transfer across the specified glazing was analyzed to determine a replacement glazing that would produce a similar thermal load for the new location in California.

Building Loads were determined in accordance with ASCE 7-10 referenced in the 2010 San Francisco Building Code. Design of both the gravity and lateral systems were performed using ACI 318-11. ASCE 41-06 was also considered in the design of the lateral system. A 12 inch floor slab was required in order to mitigate long-term deflections. An 18 x 24 column was chosen to support the floor reactions, which was enlarged to a 24 x 24 for several columns supporting the first and second floor to increase the shear area required to resist the 100psf live loads. On those stories 3 inch drop panels were also required and would not affect the architecture because they are covered by drop ceilings. 12- 18 inch thick shear walls spanning from the foundation to the roof were utilized in limiting the structure to the determined drift limit criteria. Because the soil at this location is not considered to be prone to soil liquefaction, spread footing could be used with thicknesses vary from 10 to 30 inches.