

Executive Summary

The following report explores the viability of a concrete moment frame structural system instead of the steel moment frame system in CBD Chemical's Production Building. This building is a five story, 55,000 GSF chemical production building with a mezzanine on the first floor, main production floor, and penthouse roof. Due to the heavy loads sustained in the Production Building, a concrete beam and girder system was designed and analyzed. The effects of a concrete frame on the foundations were analyzed as well as a cost and schedule analysis to determine which framing system would ultimately be cheaper.

The gravity beams were designed as 12x22, the lateral beams and girders were determined to have to be 12x30 and the columns are 30x30. Due to the heavier dead loads of the concrete structure compared to the steel structure, earthquake loading controls the lateral design throughout the building. The heavier building would increase the cost of the deep foundation, concrete piles. The total cost of the concrete structure was determined to be less, however it would take longer to construct than the steel structure. This makes the concrete system a viable solution to the existing structure.

On the other hand the existing steel structure could be cheaper if designed compositely. Using the amount of shear studs already placed in the building, it was determined roughly 95,000 pounds of steel could have been saved if the structure were designed to take advantage of the added strength. This would save about \$144,000. The recommended structural system for the Production Building is a concrete moment frame.

To determine if some of the large energy usage could be offset, a photovoltaic panel study was performed. The roof would have 60 Solon Black XT 290 Wp panels which would save roughly \$7,723.10 in energy costs per year. Due to the price of photovoltaic panels, however, the payback period would be 8.5 years. Therefore, the PV panels are not recommended for this project.