The DoubleTree by Hilton Hotel at Berkeley Marina

The DoubleTree by Hilton Hotel at Berkeley Marina is located less than 5 miles from Emeryville and only 20 minutes from Oakland International Airport. The hotel is situated on Berkeley Marina.

In early 2011 Helfrich-Associates was asked to examine the hotel and evaluate the structural integrity of a portion of the hotel.

The hotel, built in the 1970s, had a building that was suffering from titling due to uneven soil conditions. The building in question, number three (3), was built on a 12-inch thick, reinforced mat foundation that was not sufficient to deal with the settling of soft soils. As a result the building had tilted more than 20 inches.

Built over a former landfill, the hotel was as close as 20 feet from the bay. Over the years differential settlement had caused cracking of floor tiles, racking of doors and window frames, separation between cabinets and walls, and roof runoff to enter the building.

The project included analyzing the structural conditions of the building, determining subsurface conditions below the building, evaluating the tilting history of the building, and preparing foundation lifting and stabilization recommendations.

During the initial phases of the project, we drilled a boring to about 75 feet depth, and performed laboratory testing on the samples. This information supplemented six borings that were drilled before the building was constructed. It was determined that the subsurface conditions comprised fill that was placed on bay mud. The fill, ranging from 6 to 33 feet thick, was comprised of wood, garbage, and brick and concrete pieces. Lab data also found that the soil was generally un-compacted and contained significant amounts of organic debris.

Helfrich-Associates determined the best way to level the building was to design and implement a deep underpinning solution to support the building on deeper, more uniform soils. The proposed solution included building a new foundation under the existing foundation using 3 inch diameter steel resistance piers. This type of system is installed by using the weight of the building as a reaction force to push the piers into the ground until they reach sufficient resistance. Due to the very soft soil conditions, combined with the weight of the building (more than 10,000 tons), the solution required installation of 252 resistance piers.

In addition to designing the solution, Helfrich-Associates was asked to supervise the contractor's work. The work began in November 2012 and was completed in March of 2013.

To gain access to the foundation, approximately 2 feet square holes were drilled through the 12 inches thick slab to attach steel brackets to the building. These brackets were bolted to the slab, and hydraulic rams were installed to apply the required 90,000 pounds to each pier. After the 252 piers were installed to the required depth and load criteria, hydraulic jacks were used to lift the building.
The building was lifted between 17 and 21 inches, and its hallway was lifted between 8 and 12 inches. This resulted in the building slab being level to within one inch of level within any of the hotel rooms. Depths of the piers averaged about 130 feet, and some piers were installed to more than 200 feet depth.

After the building was lifted, the void space under the building, formerly occupied by the sunken portion of the structure, was filled with structural foam. The foam, no heavier than 10 pounds per cubic foot, restored the building slab support to the soil, and assisted in preventing settlement of the building on the weak soils.

Once the lifting and stabilization was completed, Helfrich-Associates determined that the building is structurally sound. Our team made its evaluation based on published criteria for evaluating building floor and foundation tilt. These criteria are:

- Original construction criteria
- Structural limit on settlement that occurs after a building is constructed
- Human perception of floor tilt

Based on the original construction criteria, we concluded that the building did not meet the requirements for newly constructed floors. With regard to the criteria for structural

limits, the building met required standards. And finally, we were able to conclude that the building fell within standards for human perception of floor tilt.

Upon finishing the project, Helfrich-Associates was able to declare that the building was structurally sound. However the building is slightly out of compliance for structure tilt limits, but that should not affect the performance of the building in the future.