A Giant Step In San Francisco

A Look At How Driven Piles Assured The Success Of Pacific Bell Ballpark

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In 1997, the Giants baseball organization decided to build its new baseball stadium on the China Basin. The site is located just South of the Bay Bridge in an area known as Mission Bay. In the 1850s, the area was used for ship repair, construction and service facilities. Fill placement, first used during the 1860s to create usable land, continued into the early 1900s.

In 1906, much of San Francisco was destroyed by an earthquake and associated fires. Most of the wooden pier structures at the site were demolished after the quake.

The Eastern end of the site was filled with sand, gravel, refuse, the hulls of ships and wooden piles. A sea wall that ran approximately 350 feet to the North of the current entrance of the basin was constructed out of local rock.

In the 1920s, a 900-foot long bulkhead, consisting of 12-inch-think arched, concrete walls cast between caissons, with a deck, was built along the China Basin channel. Each caisson was supported by 15 14-inch timber piles of unknown length. The bulkhead wall was back-filled with a series of rock and dredged sand fills.

Some time before 1949, a 2 1/2 story building was constructed East of the pier 46 building. In 1974, this building and piers 42, 44 and 46 were demolished and the South Beach Harbor was constructed. No other major work was done at the site until construction on the ballpark got underway.

The subsurface conditions of the site varied considerably from the East end to the West end, along 3rd Street. Treadwell and Rollo, a San Francisco environmental and geotechnical consulting firm, did extensive subsurface investigations to determine the soil profile and possible foundation solutions for the ballpark. They determined that the structure would be best supported on high capacity piling, assuming the pile could be driven through the debris and seawall.

Treadwell and Rollo proposed 14-inch or 16-inch concrete pile or HP 14 x 73 H Pile to support the structure. See Table 1.

With the high loads designed into the footings and the problem with lead times on steel piles, the design team selected 16-inch concrete pile. Steel H pile would have performed well in the variable soils at the site, but the long lead times and lower capacities made the concrete pile a better choice. The 16-inch pile had the advantage of being manufactured locally and was the most cost-effective of the four alternatives.

Allowable Dead Plus Live Load Capacities

Pile type	Allowable capacity (tons)
14-inch square, precast, prestressed concrete	155
16-inch square, precast, prestressed concrete	200
HP 12 x 74	120
HP 14 x 73	155

Indicator Pile Test Program

The project had a very aggressive schedule and required an indicator pile program early in the construction schedule. A total of 12 indicator piles were driven throughout the site before the existing structures were demolished. With the total number of piles around 2,300, this proved to be too small a number. Treadwell and Rollo had specified 30 indicators, but, because of the limited portions of the building site available, only 12 were driven.

All of the indicator piles were driven with a Delmag D-46 hammer, which has a maximum energy rating of 107,000 foot/pounds. All the indicator piles required predrilling to assure that all obstructions were clear prior to lofting of the pile. The indicator piles ranged in length from 60 feet to 100 feet, from the West end of the site to the East end.

Steve Abe of GRL tested all the indicator piles with the pile driving analyzer. The piles were monitored for ultimate capacity and any excessive driving stresses.

No retaps were performed during the indicator program. All the capacity was developed by tip loading and initial side friction. Any setup was not considered in the final length determination.

The most difficult part of the indicator program was getting the piledriving rig from one pile location to the next around the businesses and parking lots that were still being used when the project was launched.

From the driving data (hammer blow counts) and the PDA results, pile lengths were chosen. Interpolating was necessary because of the limited number of indicators. The owner recognized this as a potential problem before the job was awarded and allowed in the specifications for 100 percent cut-off of the piles. In addition, the owner took the risk for the furnished length of the pile.

Production Pile Installation

With the aggressive schedule set by general contractor Huber Hunt and Nichols, the Kiewit Pacific Co. crews got started as soon as a portion of the demolition was complete. Piles were driven with two

(Continued On Page 8)