

CASE HISTORY

»» SITE PREPARATION

NEW CONSTRUCTION

»» REMEDIAL REPAIR

HELICAL PULLDOWN® MICROPILE

ATLAS RESISTANCE® PIERS

»» HELICAL UNDERPINNING

EARTH RETENTION

RETAINING WALLS

HELICAL TIEBACK

SOIL SCREW®

PIPELINE STABILIZATION

TELECOM/SUBSTATION

UTILITY/SOLAR

New Zealand Earthquake Repair



PROJECT

Correct subsidence problems caused by earthquakes and level floor of house to meet building code requirements.

PROBLEM

The house at 12A Chardale St. in Christchurch, New Zealand, is in a residential neighborhood that was built on top of liquefiable soil. In the last five years, hundreds of earthquakes have hit the area and the soil has shifted, subsided, and been forced up, out of the ground.

When work began, in July of 2014, the concrete slab under the house was tilted by more than three inches (85 millimeters). This is outside building code requirements, but is repairable. That is good news for the elderly owners of the house but, unfortunately, not all of their neighbors fared as well. About half of the houses in the area had to be torn down.

Anthony Hammond of Pile-Master in Christchurch, New Zealand, explains the all too familiar situation. “Basically, the house is sitting on old swamp land. We have a high water table over here; I think it is about one meter below the surface. We have sand and moisture underground and, if you give everything a good shake, you are going to mix those two together and they liquefy. The weight of the house creates a downward force and an earthquake creates an up and down motion. As a result, the house sinks and the sandy soil wells up to the surface.”

Although the city was founded more than 150 years ago, structures were still being built through the 1990 with little concern about earthquake vulnerabilities. Builders in the area have been dealing with this problem for five years now. The first major earthquake to hit the area occurred in September 4, 2010. It was powerful, but due to the timing and location of the epicenter, caused only minor damage. Six month later, on February 22, 2011, a less powerful but much more deadly earthquake leveled most of the city center of Christchurch, killed 185 people, and caused widespread damage.

continued

CERTIFIED INSTALLER

PILE-MASTER

Christchurch, New Zealand

PROFESSIONAL ENGINEER

DO DAVIS OGILVIE

Christchurch, New Zealand

Hubbell Power Systems, Inc. is the world’s leading helical pile/anchor manufacturer. The CHANCE® brand offers a technically advanced, cost effective solution for the Civil Construction and Electric Utility and Telecommunications markets.

“Now we have a better understanding of the CHANCE® Helical Pile System. It is a better solution.”

-ANTHONY HAMMOND, PILE-MASTER, CHRISTCHURCH, NEW ZEALAND



LIMITED TO 1.5 YARDS OF AVAILABLE WORK SPACE, INSTALLATION REQUIRED USE OF PORTABLE EQUIPMENT

Four years later, the repair strategies are still evolving.

SOLUTION

Hammond explains, “Some contractors just inject grout under the houses to level them, but you have to be careful because that adds more weight--on top of pliable soil. So, we are moving away from using grout as the sole solution. Now, we have a better understanding of the CHANCE® Helical Pile System. It is a better solution.” Houses are now supported on helical piles and slowly leveled as grout is injected underneath the base slab.

The Pile-Master crew installed the helical piles in 10 days, but the overall project took a total of 12 weeks before the homeowners could move back in. To begin, crews stripped the house and removed the external brick veneer. A stone path along one side of the house also had to be removed to provide access to the base slab. After the first injection of grout, holes were dug by hand around three sides of the house and brackets were attached to the slab and later connected to the installed helical piles.

Due to limited work space, the CHANCE Helical Piles were installed using a hydraulic drive motor. “We had to do a lot by hand, due to the tight spaces. That was our main challenges I assure you. We have done some commercial projects using a little Bobcat, but in this case we had to run hydraulic lines connected to a hydraulic drive motor.

The motor was designed to be on the end of a small digger, but we designed a torque bar and other equipment to make it work,” explains Hammond.

Following the engineering design by DO Davis Ogilvie, Pile-Master installed a total of 16 CHANCE SS5 Helical Piles with 8, 10, and 12 inch helical plates around the three lowest sides of the house. Each was installed into load bearing soil at a depth of 3 meters, providing between 5,400 to 7,000 lbf (24 to 32 kN) of support each.

Adding to the complexity of the work was the garage. Poured on a separate slab and also tilted by the shifting soils, the garage itself did not have to be leveled, but a required 2.4 inch (60 mm) step-up to the house had to be maintained. After installation, the helical piles were attached to brackets mounted on the base slab and the house was slowly lifted until level. Once grouted in place, the house and exterior were restored.

KEY BENEFITS

Besides being a better, more stable, solution, Helical Piles are also cost effective in this situation. “This is a less expensive option for insurance companies. For example, this house is probably valued at around NZ\$450,000. If it was to be destroyed, then that is what the insurance company would have to pay. But, the repairs cost about NZ\$150,000, and that is including all the restoration work, too,” points out Hammond.

