

# Earthquake Damaged Home Re-Levelled Using Teretek® and JOG Computer Controlled Grouting

PROJECT PROFILE

Y20RV048

mainmark



## INDUSTRY

Residential

## STRUCTURE

Two-storey home

## PROBLEM

Earthquake damage

## LOCATION

Christchurch, New Zealand

## DURATION / YEAR

1 month / August 2020

## TECHNOLOGY

Teretek® and JOG  
Computer-Controlled  
Grouting

## BUSINESS UNIT

Mainmark New Zealand

## Summary

A large two-storey home in Lincoln, located 20 minutes from Christchurch, New Zealand, had sustained substantial damage during the 2010 and 2011 Canterbury earthquakes. The property was also located by a river which made it susceptible to liquefaction, which is caused by earthquakes.

During the 2010 earthquake, the extreme force from ground movement resulted in several huge fissures measuring 20 – 50m long x 200mm wide and up to 5m deep to cut through the property; many of these large cracks had formed underneath the home causing extensive damage, including some separation of the home's concrete wall panels and internal linings, and up to a 270mm drop in the concrete floor slab.

Despite the severity of the earthquakes, the home remained intact but suffered structural damage due to differential settlement after it sank into the liquefied soils. The home was constructed from reinforced steel and concrete tilt slabs, with each wall measuring 225mm thick and featuring three layers of 'Thermomass' construction; a 120mm internal layer of concrete with reinforced steel, a 40mm high density poly layer and a 65mm outer layer of concrete that are held together with carbon fibre pitons. The home also features 140Lm of concrete strip footing and 230m<sup>2</sup> slab on grade floor (also featuring 3 layers 120mm sub floor, 30mm medium density poly and an 80mm finished floor), positioned on top of 500mm x 700mm foundations under external and internal concrete wall panels.

The homeowners researched various options, including mechanical jack lifting, and engaged Mainmark after being impressed with how the organisation had successfully raised and re-levelled several large structures, including the 33,000 tonne Christchurch Art Gallery.

## Earthquake Damaged Home Re-levelled using Teretek® and JOG Computer Controlled Grouting continued

Mainmark's non-invasive ground strengthening and re-leveling methods were particularly appealing as it meant the owners could live upstairs while the works were being completed, and the home's heated floors and stone tiles could remain intact. Alternative solutions would have been extremely invasive, requiring major excavation work and floors to be removed.

### Objectives

The homeowners sought a viable solution that would lift and restore the home back to an insurable state. To achieve this, the foundations and floor slab needed to be lifted approximately 270mm and the floor returned to level, within 25mm of the highest point, with a slope no greater than 0.5%.

### Solution

Mainmark's JOG Computer-Controlled Grouting was identified as an ideal solution to re-level the heavy, 550m<sup>2</sup> concrete home. JOG uses a precise and non-invasive application technique to carefully raise the home's footings back to level. The cementitious grout injection process has been used extensively in New Zealand and Japan to remediate large earthquake-damaged structures.

Additional lifting and void filling to the internal floor areas was completed using Mainmark's Teretek engineered resin injection technology. Teretek is a two-in-one ground improvement and re-leveling solution that is injected through very small tubes in a process likened to key-hole surgery. On entering the ground, the components mix together and expand by chemical reaction, filling any voids.

Mainmark used a total of 63m<sup>3</sup> of JOG cementitious grout and 1000kgs of Teretek to lift the entire house, while preserving the home's extensive sandstone tiled areas and underfloor heating system.

By using a combination of proprietary technologies, JOG and Teretek, Mainmark achieved a successful outcome for the homeowners that was relatively quick and cost-effective, without the need to excavate or demolish the property. The owners were very impressed with Mainmark.

[www.mainmark.com](http://www.mainmark.com)

Jacques and Nicki Marchand said, "Mainmark offered a highly specialised earthquake remediation solution that was able to lift our home back to level without the need to rebuild.

*We considered several options but felt most comfortable using Mainmark given their track record and the fact that we could remain living at home while the work was being completed.*

*The staff working on site were highly professional and easy to interact with regarding the process and we felt comfortable with them having access to our home."*



Large crackings in internal and external walls of the house due to differential settlement



JOG Androids placed along the outside the house



JOG Androids placed inside the house with minimal disturbance to the homeowners and without the need to demolish the property