JOG integrated computer grouting

Computer Controlled Re-Levelling

Mainmark Ground Engineering (UK) Ltd
www.mainmark.co

mainmark

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Mainmark Ground Engineering (UK) Ltd [Mainmark (UK)] services projects across the UK, Europe and the Middle East. We lift and re-level even very large and complex structures and stabilise foundation sub-soils.

The methods used by Mainmark (UK) involve unique cementitious grouting technologies - not chemical grout. They have been proven in New Zealand and in Japan over the past 26 years. As a result of this long term experience of delivering exceptional results, safely, accurately and economically, Mainmark (UK) can be relied on to bring homes, buildings and other structures back to level.

Our mission is to be the best at solving your structural settlement and foundation problems with a minimum of disruption to your life or business. We are committed to providing the most advanced and accurate systems of injection techniques for ground engineering.

Mainmark (UK), working with international colleagues, continues to evolve techniques and to play a key role in industry developments.

Our site operations require a relatively small footprint. Generally all plant and equipment is fully self-contained within one or two shipping-type containers, truck mounted if required. Alternatively, equipment can be removed and relocated inside, or alongside, the subject structure. For all but the simplest projects, computer control involves fully integrated, robotic survey stations.

What is JOG integrated computer grouting?

JOG integrated computer grouting is a proprietary method for correcting subsidence of buildings and other structures.

It is a computerised level-correction system that involves, in sequence and rapid succession, grout injection via multiple injection ports. This creates multiple localised hydraulic forces, strategically arranged over large areas, to effectively 'float' a structure back to its design level.

This unique system enables the level correction of even complex, heavy-weight structures without the use of piles, hydraulic jacks or the like.

- Developed in Japan to satisfy stringent construction and environmental conditions.
- Whilst new to most countries, the JOG method is backed by over 20 years' experience.
- Widely used in Japan and New Zealand for post-earthquake settlement correction, from simple houses and home units to very large buildings and public infrastructure.
- Commonly understood material characteristics, i.e. inert cementitious grout.
- Computer controlled for load balancing, efficiency, accuracy and quality assurance.
- JOG application is dependent on footing/foundation design and is suitable for settlement from any cause and for most ground conditions.

Some key features of JOG

- JOG grout is cementitious.
- Grout will not affect ground water and has no detrimental biological implications.
- It is extensively used in Japan and New Zealand where environmental responsibility is paramount.
- As with most cementitious grouts, set strength increases with time: 1 hour, 700 kPa (approx.) and up to 5 MPa at 28 days, (as required).
- Akin to keyhole surgery, the diameter of the injection port penetrations in the slab or footing is generally 40mm (cored), for heavy lifting. This is usually reduced to 25mm or 16mm diameter (drilled) in houses; and even less where preservation of floor finishes (e.g. tiles) is required.

Re-levelling by JOG integrated computer grouting

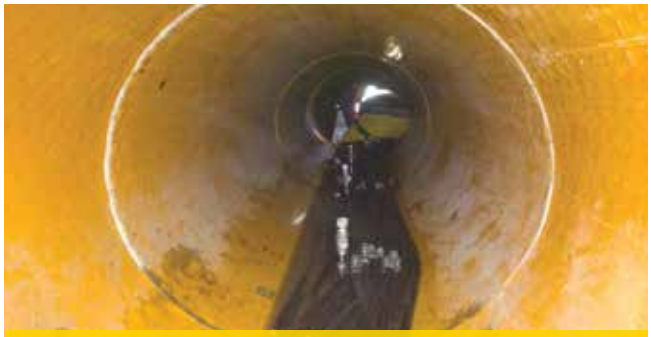
JOG integrated computer grouting is a unique process of multi-point cementitious level correction-under computer control.

Each computer can be programmed to control up to 128 injection points at once, in a sequence designed to raise a very large and complex building very gradually and safely.

We have used JOG extensively for re-levelling settled structures, from houses and flats, to culverts and to a 12-storey office building. (record lift - 1300mm!)

In addition to re-levelling one and two storey houses

and multi-storey buildings, JOG technology has been used in New Zealand to re-level 900 and 1500mm Ø sewers buried six metres into the ground - working from inside the pipeline!

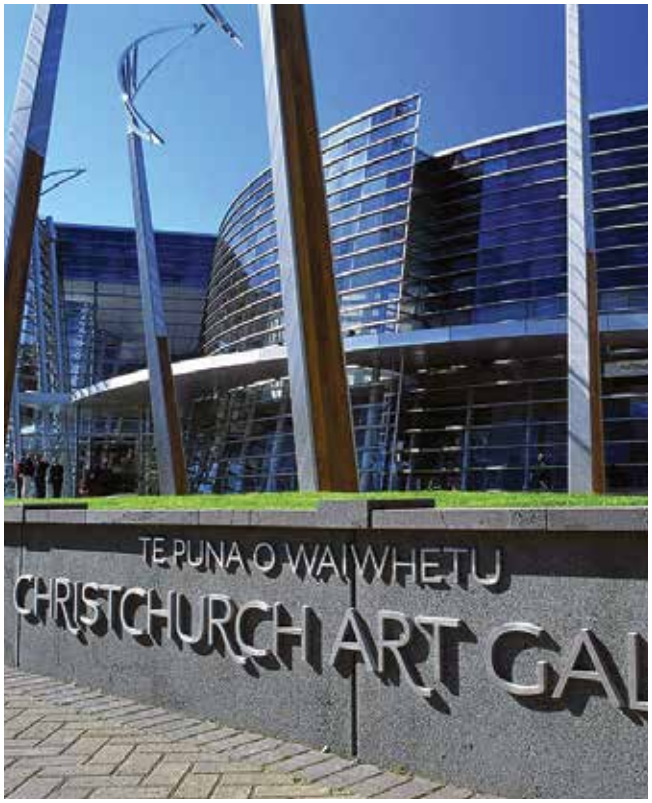


Pipeline level correction

Residential level correction

6 storey apartment building re-levelled

Re-levelling by JOG integrated computer grouting



Proprietary, high performance, low volume grout pumps deliver cementitious grout to a multitude of grout monitors, set up in injection circuits. Each monitor operates up to 8 injection ports.

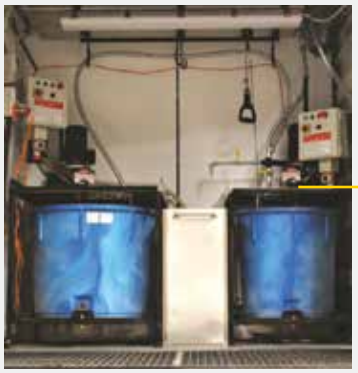
We establish pump systems according to the exact requirements of each specific project. For instance, in re-levelling New Zealand's Christchurch Art Gallery some 180mm, we utilised 10 pumps continuously monitored to inject grout at 350 points sequentially across the building's 6500m^2 basement footprint.

Computers control the monitors to inject via the multiple ports, by-the-litre, a few seconds at a time, to gently raise the structure. Grout setting time can be varied from seconds to minutes. Clever design enables injection ports to remain in place for the duration of the works.

Lifting of even large areas is controlled to the millimetre. A very high degree of accuracy is achieved with minimal differential stress placed on separate sections of structures. All parts are supported and brought up together by the small, sequenced injections of high-mobility cementitious grout. Quality assurance techniques ensure all voids are filled.

JOG batching plant

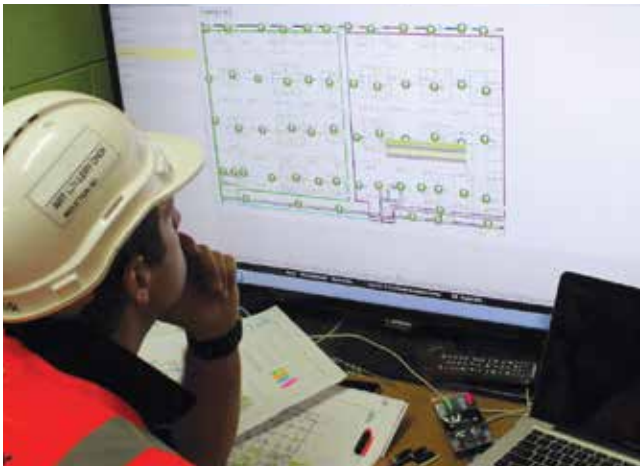
This is where grout is prepared to the required formulation. From here it is pumped to the computer-controlled network of injection points.



Where necessary this equipment can simply be disassembled and relocated inside the premises being rectified.

Monitoring

Monitoring is continuous, with the very fine increments of lift being reported to our control centre either by a network of robotic survey stations such as that shown above, or by laser levels. This enables our technicians to make fine adjustments to the computer programme.



JOG provides many advantages:

- Little or no excavation
- No weakening of support
- No affect on adjacent structures
- No noise, vibration or demolition
- Little or no mess or water around
- Relatively short restoration period
- No disturbance to neighbours
- Accurate within millimetres
- Small injection holes
- Buildings can remain occupied
- Fast - Economical - Permanent

Shopping & office complex re-levelled

Earthquake Remediation

Category	Commercial	**Duration/year**	22 days 2014
Focus	Building	**Technology**	JOG
Location	Christchurch, New Zealand		

Summary

Due to seismic events ,this pair of buildings, that make up a small shopping and office complex, had each subsided, tilting backwards quite markedly.

Mainmark rectified the settlement, with JOG integrated computer grouting,

The two buildings were raised simultaneously, the project taking 22 days.

Problem

The rear of the building pictured on the left subsided and tilted 153mm, and the one on the right sunk 67 mm, in the earthquakes of 2010-2011. The building structures themselves were not substantially damaged but the subsidence was reasonably severe.

Shopping & office complex re-levelled

Solution

84 JOG injection ports were installed to inject beneath the load-bearing elements of both buildings.

The two injection processes were applied at the same time, beneath both buildings. This way the entire complex was brought up, very gradually, and without placing any uneven stress on the structures. The preparation and establishment plus the final disassembly and removal took approx 4 days and the injection took 18 days, but the process saved a great deal of time and cost overall.

Outcome

The process was successful in raising and re-levelling the entire building complex.

Substantial saving of time and cost was achieved by raising the two buildings simultaneously.

Cold storage facility re-levelled by JOG

Earthquake Remediation

Category	Commercial	**Duration/year**	14 days 2013
Focus	Building	**Technology**	JOG
Location	Christchurch, New Zealand		

The freezer building which bore very heavy storage loads

Summary

This freezer store, with walls built of precast tilt panels, suffered earthquake subsidence to the extent where the storage racking could not be fully utilised.

In two weeks Mainmark rectified the settlement, with JOG integrated computer grouting.

Objective

To raise and re-level the building to enable the racking to be used to its full capacity.

Cold storage facility re-levelled by JOG

The grout batching centre

Technology Applied

A continuous JOG circuit of 36 primary injection ports installed along 56 lineal metres of 11metre high wall. We then proceeded with a sustained sequence of injections of JOG cernentitious grout.

Continuously monitored and computer-controlled, the lifting of the very heavy structure was uniform and gentle. This process raised the side of the building as much as 57mm, bringing the area to the required level.

Outcome

The integrated computer grouting was completely successful. The freezer store was returned to 100% operation.

The client's satisfaction resulted in an extension of the remediation with our raising another 30 metre section of wall & drive-through slabs, requiring lifting of up to 30mm.

JOG injection array along the principal area to be rectified

We re-level buildings and concrete accurately and safely with JOG integrated computer grouting.

New to the UK but with 25 years experience, our world-leading technology uses computer-controlled circuits of multiple injection ports to inject cementitious grout in sequence and quick succession.

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