BRANZ Appraised
Appraisal No. 698 [2021]

THE TERETEK® ENGINEERED RESIN SOLUTION FOR GROUND ENGINEERING

Appraisal No. 698 (2021)

This Appraisal replaces BRANZ Appraisal No. 698 [2016]

BRANZ Appraisals

Technical Assessments of products for building and construction.

Mainmark Corporation Pty Limited
169 Sailors Bay Road
Northbridge, Sydney
NSW 2063
Tel: +61 2 9958 0079
Email: mge.nsw@mainmark.com
Web: www.mainmark.com

New Zealand Distributor and Applicator:

Mainmark Ground Engineering (NZ) Limited
108 Bamford St
Woolston, Christchurch
Tel: 03 373 6214
Email: mge.chch@mainmark.com
Web: www.backtolevel.co.nz

BRANZ
1222 Moonshine Rd,
RD1, Porirua 5381
Private Bag 50 908
Porirua 5240,
New Zealand
Tel: 04 237 1170
branz.co.nz

Product

1.1 The Teretek® Engineered Resin Solution is a remedial system utilising expanding and hardening structural resins, injected into the ground in order to support, raise and re-level built elements and to enhance ground conditions.

1.2 Built elements include part or entire buildings, as well as driveways, roads and bridge approaches, floors, wall footings, machinery pads and other structures.

Scope

2.1 The Teretek® Engineered Resin Solution has been appraised for remedial use within the following scope:

- Ground replacement.
- Re-establishing dense contact between a footing and the underlying foundation soil.
- Correcting erosion and loss of support immediately below concrete floors and pavements.
- Filling in-ground voids for the purpose of foundation stabilisation.
- Correcting subsidence.
- Lifting and squaring-up buildings as conditions allow.
- Re-levelling or re-grading floors and concrete pavements.
- Ground compaction.
- Increasing the bearing capacity of identified weak and/or collapsing ground at depth.
- Re-establishing dense contact between in-ground built elements and the foundation soil.

2.2 Application of The Teretek® Engineered Resin Solution must be the subject of specific structural and geotechnical assessment, by, or in association with, Mainmark Ground Engineering (NZ) Limited.

2.3 Installation of The Teretek® Engineered Resin Solution must only be carried out using Teretek® proprietary materials, by experienced technicians, supervisors and project managers, trained and approved by Mainmark Ground Engineering (NZ) Limited.

Building Regulations

New Zealand Building Code (NZBC)

3.1 The Teretek® Engineered Resin Solution is only for use in remedial ground work. It is not for use in relation to new building work.

Technical Specification

4.1 The Teretek® Engineered Resin Solution involves the injection of a selected Teretek® material into the ground below a subject element/structure.

4.2 Liquid Teretek® components are machine-mixed together in precise proportions, at the point and time of injection.

4.3 An immediate, irreversible, exothermic reaction occurs, causing the resultant, still liquid, Teretek® material to expand beneath a built element and in the ground. A gradual force of up to 400 kPa for lifting and initially up to 10,000 kPa (1,000 tonnes/m^2) for compaction can be generated. A non-toxic inert solid material results, as hardening completes.

4.4 This hardening process, which begins during the expansion phase, is controlled by material selection with careful and exact controlling of the mix. 'Tack-free' time, at the end of expansion, can be varied from as little as a few seconds to tens of minutes. Then, within a further 15 minutes, the material can reach 90% of its structural strength.

4.5 The final strength of the cured material is a function of its applied density. The applied density is a function of the properties of the selected resin components and increases in-situ, relative to the mass of the overburden and/or element resisting expansion. That is, a heavier mass brings about and requires an even denser, stronger material.

4.6 Resin selection is based on the project-specific application requirements and ground conditions. A range of resins is available. Where water is present, a hydrophobic resin should be prescribed.

4.7 Injection is through holes, 6 mm to 16 mm in diameter, drilled through (or beside) the element and into the ground. No excavation is required under an element and there is therefore no weakening of support.

4.8 Depending on the amount of Teretek® material and the level at which it is injected, lifting and/or ground compaction results. For lifting, expansion is focused close to the underside of the element. Depending on the foundation material, lifting is accompanied by local soft ground compaction. For specific ground compaction, injection can be contiguous down to 6 m (and beyond) or specifically into identified weak strata.

Handling and Storage

5.1 All plant and materials remain self-contained in one truck, and handling and storage of all materials and accessories as well as necessary plant and equipment appertaining to The Teretek® Engineered Resin Solution is under the control of the Teretek® installation personnel.

Technical Literature

6.1 Technical Literature is available for reference by Teretek® installation personnel. All aspects of design, use and installation contained in the Technical Literature and within the scope of this Appraisal must be followed by the installation personnel.

6.2 Technical Literature is also available to specifiers and includes Teretek® material chemical resistances and mechanical properties and recommended site maintenance post-correction.

Design Information

Use

7.1 The Teretek® Engineered Resin Solution must only be carried out using Teretek® proprietary materials by experienced technicians, supervisors and project managers, trained and approved by Mainmark Ground Engineering [NZ] Limited.

7.2 The Teretek® Engineered Resin Solution is not designed to replace the use of compacted fill or piling in new construction where NZBC compliance is required. It is specified as a solution by structural and geotechnical engineers to avoid underpinning and where other methods of correction are not possible, or not economically viable, or are too disruptive, or cause unacceptable damage to finishes.

7.3 The Teretek® Engineered Resin Solution is designed for use as a remedial system to stabilise foundation soils, pavements and footings and to raise and re-level, or re-grade, built elements that have subsided. For instance it is used for:

- Re-establishing dense contact between a footing and underlying foundation soil, in the case of shrunken or collapsed ground support.
- Replacing sub-base below a floor, lost by erosion.
- Lifting and levelling [including rotating] buildings to assist in squaring up openings, such as doors and windows, and closing cracks in walls.
- Correcting differential settlement along joint lines in concrete floors and roads.
- Stopping machinery vibration.
- Improving skin friction between the sides of piles and the ground.
- Stopping flexing of concrete road slabs [and floors] along joint lines, under traffic.

7.4 There are no free-flowing hydraulic forces involved and as such the spread of injected material can be contained and correction controlled.

7.5 The Teretek® Engineered Resin Solution is particularly suited to situations where pavements must be trafficable immediately after work is complete, or where it is desirable that occupation and use continue [subject to work area safety requirements].

Site Assessment

7.6 The Teretek® Engineered Resin Solution is a controlled process, first requiring careful site survey, then assessment and project-specific planning by a project manager, trained and approved by Mainmark Ground Engineering [NZ] Limited. This includes:

- The built element and the concern relating thereto.
- The cause of the concern.
- Ground conditions and applied loads.
- Location of underground services.

7.7 Prior to correction by The Teretek® Engineered Resin Solution, the cause of failure should be understood, and where available, addressed with the owner's engineer. Any underlying cause of failure, such as tree roots or infiltration into drains [loss of fines causing voiding] or leaking water supply pipes must first be rectified.

General

7.8 The Teretek® Engineered Resin Solution provides a uniform support rather than columns, minimising the possibility of differential movement across built elements.

Durability

Serviceable Life

8.1 The Teretek® Engineered Resin Solution has an international history of use since the early 1980's and has demonstrated satisfactory performance.

Maintenance

9.1 Post completion, monitoring of corrected elements and their environment is recommended. Owners are responsible for ongoing monitoring and maintenance of their condition and environment in accordance with recognised good practice, i.e.:

- On roads and driveways, joint sealants should be maintained.
- Pipes should be pressure tested if a leak is suspected - and repaired promptly.
- Moisture stability should be maintained near buildings by directing excess surface water away and keeping trees and roots well clear. Gardens should not interfere with drainage and care must be taken to avoid overwatering.

9.2 In certain circumstances, where The Teretek® Engineered Resin Solution is chosen for economy or practicality, but where soil conditions cannot be expected to be entirely corrected, additional injection may be scheduled as future programmed maintenance. (E.g. deep, weak or decomposing ground.)

Installation Information

Installation Skill Level Requirements

10.1 The Teretek® Engineered Resin Solution must only be carried out by experienced personnel, trained and approved by Mainmark Ground Engineering (NZ) Limited.

10.2 Personnel must undergo a minimum 9-12 month period of training and on-the-job experience before becoming an approved technician, and a further 1-2 years before taking on a project supervision role.

System Installation

11.1 The Teretek® Engineered Resin Solution must be completed in accordance with the Teretek® process for job assessment and Mainmark Ground Engineering (NZ) Limited's installation instructions for their on-site technicians.

11.2 Following site assessment and subsequent project-specific planning, an injection grid is marked out and small holes drilled usually through the pavement, floor or footing and into the ground. The grid must avoid any underground services, access all required strata zones and allow the built element to be adequately supported during lifting - if lifting is required.

11.3 All plant and materials remain self-contained in one truck and the injection material is delivered to the distant point of injection via temperature controlled plural component hose lines.

11.4 Multiple injections of material in controlled quantities are made at the different grid locations and at precise depths.

11.5 Injection of the expanding material underground will find the paths of least resistance, first filling any voids encountered, both immediately below or around the element and in the ground. As further material is introduced, weak areas of ground are compacted by the reaction between the expanding material and resistance by the mass of the overburden and the entire element above. It is this process that causes stabilisation of the foundation and/or footings.

11.6 Subsequent injection of further material at or above the initial stabilising layer is made to cause the element to be raised by the forces produced by the expanding material.

11.7 Subsequent deep-injection of further material, at progressively lower levels, is made to achieve compaction of suitable ground, when required.

11.8 Control of the spread of material, compaction and lifting is accomplished by precise measurement of injection and careful laser monitoring. Penetrometers may be used to indicate the extent of compaction.

Health and Safety

12.1 Mainmark Ground Engineering (NZ) Limited have identified safety issues inherent in their operations, and have a comprehensive Safety Management Plan.

Basis of Appraisal

The following is a summary of the technical investigations carried out:

Investigations

13.1 BRANZ has assessed The Teretek® Engineered Resin Solution for function and fitness for purpose, based on historical use and documented in-service performance and found it to be satisfactory.

13.2 The Teretek® Engineered Resin Solution has a history of use internationally since the early 1980's, in Europe and the USA, and has been used in Australia since 1996 and New Zealand since 2001.

13.3 An assessment was made of the durability of Teretek® materials by BRANZ technical experts.

13.4 The practicability of corrections undertaken using The Teretek® Engineered Resin Solution has been assessed by BRANZ on-site and found to be satisfactory.

13.5 The Technical Literature and training system for Teretek® installation personnel has been examined by BRANZ and found to be satisfactory.

Quality

14.1 The quality management system in place for the implementation of The Teretek® Engineered Resin Solution has been assessed by BRANZ and found to be satisfactory.

14.2 The on-site assessment, material application, planning, control and injection of the material and the maintenance of plant and equipment has been examined by BRANZ and found to be satisfactory.

14.3 Details regarding the supply, quality and composition of the materials used were obtained by BRANZ and found to be satisfactory.

14.4 The quality of materials, components and accessories and function of plant and equipment used in the application of The Teretek® Engineered Resin Solution is the responsibility of Mainmark Ground Engineering (NZ) Limited.

14.5 Owners are responsible for ongoing monitoring of their property and maintenance of its condition and environment in accordance with recognised good practice.

Sources of Information

- The Building Regulations 1992.

BRANZ

In the opinion of BRANZ, The Teretek® Engineered Resin Solution for Ground Engineering is fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided it is used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to Mainmark Corporation Pty Limited, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
   a) relates only to the product as described herein;
   b) must be read, considered and used in full together with the Technical Literature;
   c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
   d) is copyright of BRANZ.
2. Mainmark Corporation Pty Limited:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions;
   d) warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
3. BRANZ makes no representation or warranty as to:
   a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
   c) any guarantee or warranty offered by Mainmark Corporation Pty Limited.
4. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
5. BRANZ provides no certification, guarantee, indemnity or warranty, to Mainmark Corporation Pty Limited or any third party.

For BRANZ

Chelydra Percy
Chief Executive

Date of Issue:
07 December 2021