IN THE CANTERBURY EARTHQUAKES
INSURANCE TRIBUNAL CEIT-0068-2019

IN THE MATTER OF	CANTERBURY EARTHQUAKES INSURANCE TRIBUNAL ACT 2019
BETWEEN	P J & S J Applicant
AND	HOLLOWAY BUILDERS LIMITED (IN LIQUIDATION) First Respondent
AND	IAG NEW ZEALAND LIMITED Second Respondent
AND	QBE AUSTRALIA LIMITED Third Respondent
AND	HFC CIVIL AND STRUCTURAL (SOUTH) LIMITED Fourth Respondent (REMOVED)
AND	CHRISTCHURCH CITY COUNCIL Fifth Respondent
AND	STAKE CONSULTING LTD Sixth Respondent

Date: Hearings: 3-5 August 2021 (openings and witnesses)
30 September 2021 (closings)

Appearances: T Brown and M Borcoski (3-5 August) for applicants
B Cuff and M Booth for the Second Respondent
G Carter for the Third Respondent
M Cavanaugh for the Fourth Respondent (3-5 August)
M Russell for the Fifth Respondent (via video link 30 September)
G. Riach and J Liu for the Sixth Respondent

Decision of Chair C Boys on Preliminary Issues

20 April 2022

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INTRODUCTION

[1] This decision is largely about an unknown; the source of moisture which is permeating the repaired floor slab in the front rooms of P & S Js' home (the front slab). Mr and Mrs J say that this moisture shows the repairs which have failed, and the front slab must be replaced. The other parties, who were involved in the repair work, say the moisture cannot be explained, is not related to the repair, and even if it is, the front slab can be treated to deal with the moisture.

[2] This is a preliminary decision. The parties identified that the adequacy of the grout injection repairs to the front slab was a significant issue. A finding that the repairs were either inadequate, or improperly done, would require reinstatement work which would see a number of the other issues in dispute fall away. From the outset, it must be remembered that this decision only considers a slice of the full picture of the issues at the home. It is also alleged that the home suffers from repair defects affecting brickwork, structure, joinery and internal finishing. I cannot consider these, as the evidence is not yet before me. The reader must be mindful that the foundation and slab discussions occur in the unstated context of the wider list of alleged defects.

[3] The preparation for the hearing involved a detailed engineering conferral process, during which alternative solutions arose. Much of the hearing involved discussions about three key issues: the source of moisture which has intermittently risen through the front slab, whether the moisture ingress is a defect for which the respondents are liable and whether a concrete treatment, Krystol, will prevent the moisture ingress from recurring.

[4] In summary the moisture ingress has occurred due to a combination of the poor draining capacities of subsoils when saturated, the effect of the repairs on the drainage capacity of the original slab substrate, and capillary action at the grout injection sites and an expansion saw cut. Under rare heavy rain conditions water accumulates beneath the original slab. Due to capillary action moisture then rises through small cracks in the front slab formed either during the grout repair process, or by thermal effects as a consequence of the repair, where it has been observed and recorded on the surface.

[5] The moisture ingress is a consequence of the repairs and earthquake damage. The repairs have not returned the performance of the home to its 'when new' condition. Therefore, IAG is liable for remedying the issue under its obligation to indemnify.

[6] The Krystol treatment will prevent capillary rise from occurring. This combined with drainage works will stop the moisture ingress from recurring.

BACKGROUND

The Home

[7] The construction and location of the home is particularly important in this case. It is a modern, single level home with brick cladding on timber framing, built in 2004 on a slab cast on a tailings substrate.[1] The slab is the focus of this decision. The slab was built to the standards set out in NZS3604. It is approximately 100 mm thick and is unreinforced, except in tiled areas and the garage. The slab was cast over tailings and a polythene damp proof membrane (DPM).

[8] Groundwater is an issue at the site. The home is in the Burwood/Brooklands area, which before pakeha settlement was an area of swampland, dunes, and an old oxbow lake. The site is less than 100 m from the edge of the Travis Wetland Heritage park. Settlers deposited sand onto peaty soils in the area to "improve" the land. Stable 'good' gravels are 30-35 m below ground level. To deal with the challenges of the subsoils, when the neighbourhood was established, 2 m of sandy gravels were laid down and compacted in an attempt to provide stability. This is the base on which the home was built.

[9] As discussed below, even with the ground improvements in place before construction, there is a high degree of variability in the soil profile. This presents as sandier, free-draining soils to the west/street end of the home, and less permeable cohesive silty sands to the east/ rear yard end of the home.[2]

[10] Mr and Mrs J purchased the home in 2005. They lived there with their two sons until April 2015.

Damage

[11] The home was damaged in the 22 February 2011, Port Hills earthquake. The damage included:

[1] Small round river stones commonly used as hardfill in Canterbury prior to 2011.
[2] See figure 1.

(a) differential settlement of 62 mm over the floor of the home, with the high point being in the west and the low point to the east;

(b) tailings settled beneath the slab under shaking, creating voids which left the slab unsupported;

(c) floor slopes were in excess of 0.5%, particularly to the east/back yard end of the home;

(d) cracking to the brick cladding;

(e) cracking to gib linings;

(f) damage to framing and joinery, including the dynabolt fixings which held the wall between the master bedroom;

(g) walls pushed out of vertical; and

(h) in several areas, liquefaction had infiltrated saw-cut cracks in the slab.

[12] The performance of the foundations and floor slab under earthquake shaking can be characterised as being reasonable for the front section of the home and poor for the rear section. This resulted in post-earthquake floor slopes within MBIE guideline tolerances for the front slab and outside of those tolerances for the rear slab.

[13] Claims were made to EQC and IAG for the damage.

[14] On 28 November 2011, an IAG assessor recorded that the damage was over the EQC cap and that, despite major ground movement and differential settlement, the home was not an obvious total loss. The report records that there was additional damage from the 13 June 2011 earthquake, which worsened the cracking to the brick cladding. The assessor estimated that the repairs would cost $306,890.

[15] On 17 October 2012, an IAG loss adjuster and Quantity Surveyor conducted a more detailed costing assessment. The proposed repair is summarised as a partial slab underpin,

repair the slab cracks and replace claddings and linings. It was concluded that repairs would cost $160,203.30, and a rebuild $233,984.21. Based on these estimates a repair was the option chosen by IAG as both meeting the policy and being economical.

The repairs

[16] In 2014, there were a number of discussions between IAG, Hawkins, HFC the engineering consultants, and Mr and Mrs J about the repairs necessary. There was a proposal to use the smart-lift method to relevel the home. This method involves the use of low mobility grout to stabilise a concrete floor slab once the building has been mechanically lifted. This proposal was rejected by Mr and Mrs J out of concerns about the Smartlift process as a re-levelling solution. I do note that at the time there were widespread concerns about the process. As a result, it was decided to use an approach where the foundations and floor slab at the rear of the building, were demolished and replaced with new TC2 foundation system involving new perimeter footings and a new "waffle" slab (the rear slab).

[17] The joint between the rear slab and TC2 foundation, and the front slab runs north/south under the wall between bedroom one and the kitchen\dining area, across the width of the home under the hallway between the bedrooms and across the bathroom. The rear area was excavated to allow for new footings, and slab to be constructed. To facilitate the work, the roof of this rear section was propped, and the existing walls, slab, and footings were demolished. The repairs were carried out by Holloway Builders, under the IAG managed repair programme which was administered by Hawkins.

[18] During the earthquakes the front slab had suffered from voiding caused by the tailings settling away from the underside of the slab. A problem with river stone tailings when used as a substrate, is that the smooth, round surfaces of the river stones do not bind, and cannot be compacted. When shaken under earthquake conditions, the tailings settle and shift away from the slab, leaving voiding. This leaves the slab above unsupported. In this case ground penetrating radar (GPR) scans showed that the tailings had shifted leaving the U-shaped shaded area shown in figure 1 unsupported. The loss of support left the slab bouncy and "drummy". It was decided to use grout injection to fill the void between the front slab and the tailings. The grout injection was carried out by Stake Consulting Ltd on or around 25 September 2015.

[19] The limited correspondence before me shows that Mr and Mrs J had concerns about the proposed repair, due to the ground conditions, the infiltration of liquefaction ejecta through slab saw-cuts, and the voiding beneath the slab. The revised repair strategy was subject to revisions through the process. Mr and Mrs J felt that they had been assured that should there be more liquefaction ejecta discovered once carpets were lifted, the repair strategy would be changed. However, when ejecta was discovered at the sawcut in the kitchen/living room the repairs continued. There was correspondence which indicated that if the entire slab was replaced, the home would be uneconomical to repair, as the cost of the repair would exceed the cost to rebuild.

[20] As mentioned above there are other alleged issues with the repairs to cladding and superstructure, joinery and finishing. These, and Mr and Mrs Js' concerns about the foundation and slabs, led to them refusing to sign a completion certificate. They have not resided at the home since moving out in April 2015.

[21] While this dispute has been in progress, Mr and Mrs J have been visiting the home to maintain the gardens which were their pride and joy. During these visits they witnessed the moisture ingress. Photos were taken of the moisture and are discussed in detail below.

ISSUES

[22] The issues before me are:

(a) What earthquake damage occurred?

(b) Were the repairs to the slab, as scoped, an appropriate response to the earthquake damage?

(c) Are the repairs to the front slab defective or did the repairs cause consequential damage?

(d) If the repairs are defective, or caused consequential damage, how should the policy respond?

(e) What other work is necessary due to unrepaired earthquake damage or defective repairs to the front slab?

APPROACH TO THE EVIDENCE

Burden of proof

[23] The burden of proof is the description given to the need for a party to prove a fact or circumstance to further its arguments. In an insurance claim the burden of proof lies on the insured person to put forward facts to support their claim. However, Mr and Mrs Js' argument is that the steps taken to repair damage were inadequate or defective. There is no question that the underlying claim was valid. The issue is whether the repairs in question meet IAG's obligations under the policy, and if not, what steps are necessary for those obligations to be met.

[24] Due to the effects of ss 40 and 56 of the Canterbury Earthquakes Insurance Tribunal Act 2019, and in light of the approach taken by the High Court when considering similar provisions in the Weathertight Homes Resolution Services Act 2006, I am able to consider all material before me in an inquisitorial manner. I am not bound by pleadings.[3] This means that a strict application of the burden of proof is not appropriate. Rather each allegation will be evaluated in light of all of the evidence. The purpose of the process is to get to the truth of the issues not to reward parties for tactical superiority in putting forward their case.[4]

[25] In *A G v Earthquake Commission & Vero* this Tribunal found that:[5]

> The Tribunal must apply common sense to this determination, as it is accepted that it may not be possible to determine causation with absolute certainty. The Tribunal may draw "robust inferences of causation", but must do so only where there is sufficient supporting material to prove causation.

The Evidence

[26] To conclude on the issues, I need to consider the evidence of the physical effects of the earthquake on the home, the effect of the repairs on the home, and the appropriate remedial

[3] See *Safforti v Jim Stephenson Architect Ltd* [2012] NZHC 2519 at [40]-[45].
[4] *E v IAG* CEIT0013-2019 (16 December 2021) at [85].
[5] *A G v Earthquake Commission & Vero Insurance New Zealand Limited* [2021] CEIT 0056-2019, at [40]; and *ACC v Ambros* [2007] NZCA 304 at [32] and [67].

response to those effects. The evidence of the effects of the earthquakes and the repairs is a mixture of documents, photographic records, the observations of various witnesses, the outcomes of destructive testing, and the opinions of the expert witnesses. The evidence on the response are the opinions of the various experts, with reference to technical data.

[27] Expert witnesses may provide opinion evidence to a Court or Tribunal if they are qualified by experience, study, or both, to offer opinions of substantial help to the decision maker. While the expert witnesses are each in turn appointed by a party to the litigation, their duties are to the Court or Tribunal. Experts must behave impartially. Impartiality is not the same as independence, it is a behavioural quality of neutrality. An expert may lack independence but behave impartially.[6] In this Tribunal, which is inquisitorial, and is required to provide "*fair, speedy, flexible and cost effectives services for resolving disputes*", there is less scope to exclude evidence which is or may be relevant to an issue, than under the rules of Court.[7] However, evidence must be cogent and reliable, and these factors will drive the weighting given to an expert's opinion.

[28] In this case pre-hearing expert conferrals were facilitated and attended by Murray Frost, the Tribunal's structural engineering expert, who also attended the hearing. Mr Frost was not sworn as a witness but sat with me during the hearing providing insight, analysis and assisting in testing the expert witnesses' evidence. The structural engineering experts before me and their instructing parties were:

(a) Gregory Clark, instructed by Mr and Mrs J;

(b) Ivo de Vocht, instructed by IAG;

(c) Daniel Kennet, instructed by QBE;

(d) Timothy Day, instructed by HFC;

(e) Simon Finn, instructed by CCC; and

[6] See *Prattley Entreprises Limited v Vero Insurance New Zealand* Limited [2016] NZCA 67, at [93] - [102]; and John Katz QC *Expert Evidence in Civil proceedings* (Thompson Reuters New Zealand, Wellington, 2018) at 8.3.

[7] Canterbury Earthquakes Insurance Tribunal Act 2019, s 3; and the District Court or High Court Rules for instance.

(f) Nitesh Patel, instructed by Stake Consulting Ltd.

[29] Geotechnical engineering evidence was provided by:

(a) Bjorn Raasch, instructed by Mr and Mrs J; and

(b) Andreas Giannakogiorgos, instructed by IAG.

[30] These experts gave their evidence in a so-called "hot-tub" where witnesses for each area of expertise give their evidence simultaneously. This enables discussion between the experts. In this case there was vigorous and robust debate between the structural experts which I found helpful.

[31] Other witnesses gave their evidence individually, because they were the sole witness in an area of expertise;

(a) Philip Tolley, a Building surveyor instructed by Mr and Mrs J, gave evidence regarding the potential for the moisture ingress coming from an above ground source.

(b) Alan Gebbie, an experienced concrete repair and water proofing specialist gave evidence on the Krystol repair method, for which he is the approved applicator. He also was the developer of the leak repair system now certified by the Canadian manufacturer of Krystol.

[32] All the experts are well qualified and their behaviour on the stand demonstrated impartiality, shown by the fact that hypotheses were abandoned or adopted when appropriate. I was particularly impressed by the Geotechnical experts, who showed genuine curiosity as to the unsolved issue of the cause of the moisture ingress. I thank all the experts and Mr Frost for their assistance.

[33] As well as the experts, witnesses of fact gave evidence of their experiences and observations:

(a) Mr and Mrs J;

(b) Brent Ayton, a Project Manager employed by Holloway Buildings during the repair; and

(c) Stephen Spencer, a Director of Stake Consulting Ltd who has experience of the use of the Terrier grout system used for the void filling repairs, and who conducted an invasive test. Mr Spencer's experience and study would qualify him as an expert witness, however, as the director of a party to the litigation, he lacks the necessary independence to be able to provide opinion evidence. However, his knowledge of the Terrier grout provided relevant context to the structural expert's discussions and has been useful in my deliberations.

The GPR survey

[34] On 30 April 2021 Dr Eva Sutter conducted a GPR survey. GPR uses radar waves to image the subsurface. Changes in material produce reflective anomalies which may be interpreted by an experienced practitioner.

[35] Dr Sutter's survey shows the following relevant phenomena:

(a) the presence of grout below the slab extending down approximately to 300-400 mm;

(b) the water table was at approximately 2 m below ground level; and

(c) below the grout the scan showed the presence of water (the perched water) which was not present in other areas.

[36] The experts and the results of the destructive testing affirmed the accuracy of the GPR scan and the reliability of Dr Sutter's interpretations.

The destructive testing

[37] Two destructive tests have been performed in this case. Both explored the performance of the grout:

(a) The first was performed by Mr Clark on 8 June 2021. A 600 mm x 600 mm cut out was performed around and through the sawcut at the approximate location where the liquefaction ejecta was observed, and where moisture ingress has been observed (at A on figure 1). The cut out was conducted using a water-cooled concrete saw which produces a wet slurry. The cut sections of DPM and the slab were removed. The DPM appears from the photos to be intact. Beneath the slab the grout had cemented the tailing together to a depth of 300-400 mm. A concrete breaker was used to break this layer up. There were no obvious signs of liquefaction ejecta in the tailings. Beneath the grout and tailings, the photographs show damp earth.

(b) The second destructive test was conducted on 15 July 2021, by Mr Spencer. A 150 mm diamond core drill was used to cut out a grout injection point adjacent to the area of the cut-out. The grout core was then broken out of the surrounding concrete using a hammer. This sample largely confirmed the observations made at the cut-out and showed that the grout itself was dry and showed no signs of moisture entering the solidified grout.

[38] The other experts were critical of Mr Clark's findings of moisture beneath the tailings, as the method used was a water cooled saw and it was argued that the visible moisture came from the slurry. However, the breaker used to get through the tailing/grout layer does not use water, and the evidence (discussed at length below) is that the grout permeating the tailings forms a largely moisture resistant layer. The photos of the cut-out taken by Mr Clark and Mr Kennett show uniformly dark, damp soil, which appears to have been exposed to moisture for some time. This is consistent with the GPR survey finding of "perched" water.

The policy

[39] At the heart of any insurance dispute is the policy, the contract which defines the relationship between the insurer and homeowner. In this case the allegations are that the repairs are defective and do not meet the policy standard, and/or there was un-scoped earthquake damage. In turn the respondents argue that the repairs are not defective and IAG argues that some of the alleged damage is unrelated to the earthquakes.

[40] Insurance policies are governed by the normal rules of contractual interpretation. In the words of Tipping J in *Vector Gas Ltd v Bay of Plenty Energy Ltd*:[8]

> [The] ultimate objective in a contract interpretation dispute is to establish the meaning the parties intended the words to bear.

[41] Tipping J also set out that the interpretation of the words must include consideration of the circumstances in which the contract was made. The Supreme Court approved the approach taken by Lord Hoffman in *Investors Compensation Scheme v West Bromwich Building Society*.[9] This requires that the background circumstances of the contract are considered when interpreting its terms. In this instance the contract is a homeowner's insurance policy. The policy must be read to take account of, amongst other things:

(a) the relative imbalance in understanding and legal sophistication between the parties;

(b) the objective intention of the parties in offering and accepting insurance cover for a domestic dwelling; and

(c) that technical, legal or jargon terms and words may be understood by one side but not at all by the other.

[42] The home was insured under an ASB Home Insurance Policy, initially underwritten by Norwich, IAG's predecessor (the ASB policy).[10] There are two policy wordings and a dispute as to which had currency when the earthquakes occurred. This dispute was not aired before me.

[43] Both policies have the same insuring clause:

> You Are Insured for … Accidental and sudden loss of or damage to your Home.

[44] Both policies have the same indemnity clause:

> If following loss or damage … you restore your Home we will pay the cost of restoring it to a condition as nearly as possible equal to its condition when new using current materials and methods plus any extra costs that are necessary for the restoration to meet with the lawful requirements of Governments or Local Bodies.

[8] *Vector Gas Ltd v Bay of Plenty Energy Ltd* [2010] NZSC 5 at [19].
[9] *Investors Compensation Scheme v West Bromwich Building Society* [1998] 1 WLR 896 (HL) at 912–913.
[10] IAG purchased Norwich in 2001.

[45] Both policies contain a clause giving IAG the right to elect the form of the indemnity:

> [IAG] shall have the right to … restore, replace, or pay for any of your property.

[46] This election clause has a bearing on the analysis from *Sleight v Beckia* which is premised on the insured party having the choice of whether to repair or accept a payment.[11]

[47] The heart of both wordings is a promise to pay to reinstate damage to an '*as… when new*' standard. In the context of the ASB policy and in conjunction with the authorities on the meaning of '*as … when new'*, once the insurer has chosen to reinstate, it is obliged to pay the costs to restore damaged property to a condition which renders the fact of earthquake damage immaterial to its future function, and value.[12] The policy pays to reinstate to an '*as… when new*' condition, rather than simply to indemnify, so issues of betterment are irrelevant. The nature of the repair work required to meet the policy standard must include:

(a) restoration of functionality requiring considerations of whether a damaged element has a structural, functional, aesthetic or mixed purpose;[13]

(b) aesthetic equivalence to a similar standard as when the damaged element was new;[14]

(c) meeting health and safety requirements for the useful life of the damaged element, for example; structural components must last for at least 50 years and cladding for at least 15 years;

(d) consideration of the future saleability of the damaged property, which by implication requires that the reinstatement must enable the insured to meet standard real estate warranties for quality and compliance;[15] and

(e) restoring the damaged portions of the property to compliance with either the building regulations at the time it was built, or if required by the extent of the

[11] *Sleight v Beckia Holdings* [2020] NZHC 2851.
[12] *Parkin v Vero Insurance New Zealand Limited* [2015] NZHC 1675 at [117].
[13] At [120].
[14] *Sleight v Beckia Holdings,* above n 11, at [164].
[15] *Parkin v Vero,* above n 12, at [144]; and *Sleight v Beckia,* above n 11, at [165] - [168].

work or the nature of the building element being repaired, to current standard (discussed below).

[48] I am guided by *Sleight.* Much of the discussion in *Sleight* is not relevant to the ASB policy in which IAG has the right to elect the form of indemnity. However, the analysis of the operation of an '*as… when new*' policy is authority for the proposition that an insurers policy obligation is no more and no less than to reinstate damaged property to a repaired condition. Gendall J found that neither a building contract, nor payments made to a builder for defective works, modified that underlying obligation.[16] This recognises the indemnity principle; it is not that the insurer has assumed a new liability or responsibility for the repairs, rather the obligation to indemnify cannot be met by defective work. The obligation to indemnify continues until remediation is properly completed, or the insured has agreed to an alternative indemnity, either by clearly assuming responsibility for remediation, or by clearly accepting an alternative form of settlement.

The Building Act, Building Code and guidance

[49] When discussing repairs to a building it is necessary to consider the Building Act 2004 (BA) and Building Code (the Code). These control how building work can be done and the policy makes compliance with building legislation an aspect of indemnity. In this case it is alleged that the repairs and proposed remediation do not comply with the requirements of the BA or the Code.

[50] Section 17 of the BA requires all new building work (including repair work) to comply with the Code, whether the work is repairing an existing structure or building a new one. This is subject to exceptions contained in the BA and any waiver or modification granted by the consenting territorial authority. These exemptions are necessary so that older building elements can be maintained without the need to be brought up to current Code requirements.[17] Section 42A allows for work listed in sch 1, cl(1) of the BA to be exempt from s 17. However, once the repairs or alterations are done the whole building must comply with the Code to the extent specified by s 42A (2):

(2) Subsection (1) is subject to the following conditions:

[16] *Sleight v Beckia,* above n 11, at [179] - [180].
[17] An example is the re-glazing of a sash window in a Victorian Villa, without the exemptions, a broken window would trigger the need to replace the whole window unit with double glazing.

(a) the building work complies with the building code to the extent required by this Act:

(b) after the building work is completed, the building,—

(i) if it complied with the building code immediately before the building work began, continues to comply with the building code; or

(ii) if it did not comply with the building code immediately before the building work began, continues to comply at least to the same extent as it did then comply

[51] The exemptions in cl 1 cannot be applied when a building element has failed to meet durability requirements.

[52] It is alleged that because of the moisture ingress the repairs have failed to meet the external moisture provisions at cl E2 of the Code, and that one of the proposed remediation strategies, the Krytol treatment, cannot be certified to meet the durability provisions at cl B1 of the Code (discussed below).

[53] Clause E2.3.3:

Walls, floors, and structural elements in contact with, or in close proximity to, the ground must not absorb or transmit moisture in quantities that could cause undue dampness, damage to *building elements*, or both.

[54] Clause B2.3.1:

Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the lesser of the *specified intended life* of the *building*, if stated, or:

(a) the life of the building, being not less than 50 years, if:

(i) those *building element* (including floors, walls, and fixings) provide structural stability to the *building*, or

(ii) those *building elements* are difficult to access or replace, or

(iii) failure of those *building elements* to comply with the *building code* would go undetected during both normal use and maintenance of the *building*.

[55] Certain building work must be carried out or supervised only by a Licensed Building Practitioner (LBP). Under cl 5 of the Building (Definition of Restricted Building Work) Order 2011, this includes:

(2) This clause applies to building work that is—

the construction or alteration of—

…

the external moisture-management system of a house or a small-to-medium apartment building; and

of a kind described in subclause (3) …

(3) The kinds of building work referred to in subclause (2)(b) are—…

(d) foundations work:

[56] It is disputed whether the repairs as scoped were suitable, or whether the extent of the damage should have triggered a rebuild. Mechanisms have been developed to aid decision making when considering how a damaged home should be remediated. These include:

(a) the rule of thumb referred to in *Rout v Tower/Southern Response* where if the estimated repair costs exceed 80% of the estimated rebuild cost there is a rebuttable presumption that the home in uneconomical to repair;[18] and

(b) presumptive guidelines issued by MBIE about appropriate repair strategies for particular damage.

[57] These rules and guidelines are rebuttable. The heart of decision making is expert advice. For foundations the relevant experts are structural and geotechnical engineers. However, the decisions do not occur in a vacuum. The building involved is a home, the wants and needs of the homeowner are important considerations. This was demonstrated by the change of repair strategy for the back slab from a re-level to a rebuild. However, an insurer is entitled to base the indemnity on a repair strategy which reasonably addresses the damage, even if the insured does not agree with the proposal.

WHAT EARTHQUAKE DAMAGE HAS OCCURRED?

What is "damage"?

[58] It is common ground that in the earthquakes the entire floor slab suffered from differential settlement and voiding. It is alleged that the damp proof membrane (DPM) was

[18] As if the two estimates are out by respectively +/-10% (a reasonable assumption) then the repair is uneconomic.

compromised allowing liquefaction ejecta to enter the home. It is also alleged that the replacement of the back-slab and grout repairs to the front slab have compromised the performance of these building elements, which is damage requiring remediation.

[59] The policy covers "[a]*ccidental and sudden loss of or damage to your home*". The question is whether the physical changes to the home alleged by Mr and Mrs J; the compromised DPM, the difference in foundation design performance between front and back, the loss of drainage through the tailings, and the moisture infiltrating the slab, are damage.

[60] In the insurance context damage is a change to insured property which diminishes the value of the property or impairs its utility. The indemnity principle means that the insured event must have a negative effect on an insured interest: some diminishment of the property's utility to the insured. The cases discussed below show there is no least or minimum diminution of the insured interest to be considered damage. This dovetails with the *de minimis* principal, where the condition of the property before the insured event has occurred may be such that the insured interest is not affected by the physical change.

[61] The leading case on damage is *Ranicar v Frigmobile.* Scallops meant for export were stored at an incorrect temperature, which meant they did not meet export regulations (diminishing their economic value) and causing enzymic changes. The Tasmanian Supreme Court stated:[19]

> In my view, the ordinary meaning, and therefore the meaning which I should prima facie give to the phrase "damage to" when used in relation to goods, is a physical alteration or change, not necessarily permanent or irreparable, which impairs the value or usefulness of the thing said to have been damaged. It follows that not every physical change to goods would amount to damage. What amounts to damage will depend upon the nature of the goods.

[62] *Ranicar* was followed in *Technology Holdings v IAG* where Woodhouse J explored the limits of the meaning of 'damage'. He concluded:[20]

> Something must happen to the property itself, followed by the impairment of value or usefulness, for damage to occur. That is the factor which excludes from cover cases of pure economic loss; cases where nothing happens to the property itself.

[19] *Ranicar v Frigmobile PTY* Ltd (1983) 1 ANZ Cases 60-525 at 78,000.
[20] *Technology Holdings Ltd v IAG New Zealand Ltd & Anor* (2009) 15 ANZ Insurance Cases 61-786 at 77,150.

[63] The inquiry is contextual; if insured property has a particular function, say a structural building element; required to meet the criteria of the building code but hidden from sight, then a water stain is not damage, but exposure to moisture which affects the structural performance or lifespan of the element would be damage. A similarly affected decorative feature would produce the opposite outcome.

Liquefaction ejecta

[64] It is disputed whether liquefaction ejecta had made its way to the top of the front slab and if so, whether this indicates damage. If this has occurred it indicates that the DPM was compromised, allowing the ingress of the liquefaction ejecta, and also presents a possible pathway for the moisture observed by Mr and Mrs J.

Evidence of ejecta

[65] Ejecta was noted:

(a) on 21 August 2014, by HFC in the construction join beneath the hallway to the north of the bathroom (On the C-D line on figure 1);

(b) by Mr Ayton after carpets were lifted, recorded in an email sent to Hawkins on 15 July 2015;

(c) on 23 July 2015, when the Hawkins Rebuild Solutions Manager sent a photo which shows a grey powdery substance beside the sawcut in the kitchen (A on figure 1);

(d) on 6 August 2015, in an email from Mrs J to IAG; and

(e) on 2 October 2017, Miyamoto reported "[t]*he saw cut has cracked through at two locations in the living room. Some fine sand particles were observed in the crack*" and a photo was taken showing the observed crack and debris.

[66] The photos were put to the experts on the stand. Apart from Mr Clark and Mr Raasch, who believed the particles observed are ejecta, the experts would not be drawn. It was suggested that the fine particles seen in the photos could be dust from either the destructive

tests conducted by Mr Clark and Mr Spencer, from the original construction possibly when the saw cuts were originally cut, or from the repairs to the front slab.

Conclusion on ejecta

[67] I find that the fine dust debris observed in the saw cut to the front slab is liquefaction ejecta. This finding is based on:

(a) The fact that there was ejecta clearly observed and recorded in the sawcut joint to the rear of the slab.

(b) The photo from the HFC report of 21 August 2014, which shows staining on the carpet underlay caused by the ejecta when the boil was wet. It is consistent that the sawcut in the front slab was also similarly affected, although with less ejecta reaching the surface of the slab.

(c) The observation of Mr Ayton, a project manager who had seen ejecta at other sites. I do not believe that a project manager who had more than 30 years in the building industry, working in earthquake repairs in Christchurch in 2015 would incorrectly identify liquefaction ejecta.

(d) The debris is unlikely to have been from when the home was first constructed. Saw cuts or shrinkage control joints are cut into concrete slabs while the concrete is "green", generally within 48 hours of the slab being poured. This occurs before framing is in place, and weeks or months before the building is enclosed. It is implausible that the dust from the cut, or general construction dust would have remained in place when the slab was exposed to wind and rain.

(e) Other dust and debris created during the process of framing, lining, plastering and carpeting the home. These steps produce sawdust, plaster dust (in large quantities) and other debris. The grey debris seen is not sawdust or plaster dust and is uncontaminated by either. For the debris seen to be from the original construction, it would require that the builders, plasterers and carpet layers cleaned up the other debris but left this debris untouched. This is highly unlikely.

(f) The debris is not from the repairs as it was observed when the carpets were lifted, prior to the repairs.

[68] The presence of the liquefaction ejecta indicates that there was a pathway through the substrate and slab, prior to the repairs. It indicates that the sawcut had cracked through to the base of the slab as observed by Miyamoto, and that the DPM beneath was in some way compromised. The nature of the DPM compromise is unknown. Observational testing on red zone properties has shown that polythene DPM can stretch to accommodate cracks of up to 30 mm without tearing or being compromised.[21] In this case the cracks in the front slab are less than 30 mm. When the destructive testing was carried out in this area the tradesman cut through the DPM and therefore the ability to observe what may have led to the ingress was lost. However, the DPM that was removed appears to be intact and uncompromised.

[69] While the exact mechanism by which the liquefaction ejecta made its way to the surface of the slab cannot be known, I am satisfied that the cause of the phenomena was earthquake related. While the ejecta itself is not damage, its presence indicates that the earthquake had compromised the slab, DPM and tailings. One purpose of the slab and tailings is to prevent moisture and debris from entering the home. This change to the slab, DPM and tailings is damage.

The garage slab

[70] There are two issues with the garage slab:

(a) Mr and Mrs J say that since the earthquakes the slab falls, and therefore water drains, into the home; and

(b) there is an unremedied crack in the southwest corner of the garage.

[71] The respondents say the garage slope is as built, and the crack is either not earthquake damage, or does not affect the utility of the garage slab and is therefore not damage.

[21] G J Beattie, Report to the Residential Engineering Advisory Group; condition of polythene DPM under cracks in concrete floor slabs, 8 August 2012.

[72] The floor slopes in the garage are captured in floor level surveys done pre and post repairs. The findings across the surveys vary, reflecting the accuracy of the instruments used. However, they all show a high spot in the approximate centre of the garage, which falls away by 12-14 mm to the southwest corner, by 6-10 mm to the south, by 8-14 mm in the southeast corner, by 4-8 mm to the northwest, by 8-10 mm to the north wall, 2-4 mm to the east, and sloping up by 2-4 mm to the north east. The maximum floor slope is towards the southwest and is 0.7%. I note this slope is in excess of MBIE guidelines, but the garage is not a habitable area.

[73] The issues with the floor slopes raised by Mr and Mrs J relates to an incident between the earthquakes and the repairs, when a car with snow on it was parked in the garage, and snowmelt ran to and beneath the east wall and soaked into skirtings, and the carpets in bedroom three. This necessitated the replacement of carpet smooth-edge which was affected by the water and was replaced during the repairs.

[74] The issue is whether the floor slopes are earthquake related. I note:

(a) the floor slopes roughly align with the ceiling and garage door jamb levels;

(b) the slopes follow the slopes for the rest of the home; away from the mid-point of the garage towards the rear of the home, where the most liquefiable soils are, and towards the south in the garage and adjacent bedroom three;

(c) the most recent levels could not be taken beneath the laundry sink at the east end of the garage and the levels taken earlier closer to the southeast corner indicate a greater drop;

(d) the water stained slab in bedroom three is at the southern wall, indicating that the water has flowed under the wall between the garage and bedroom three, and along the external wall;

(e) floor slopes in bedroom three show a drop of 10-12 mm to the south (4%), consistent with the adjacent area in the garage;

(f) there were repaired cracks in the garage, including the partially repaired tension crack; and

(g) photos taken by Miyamoto in 2017, show cracks to the perimeter footing at the southwest of the garage.

[75] I find that the garage slopes are caused by the earthquakes. Mr Finn and Mr Kennett pointed out that the slopes were within construction tolerance and thought they were not earthquake related. I cannot agree. The slopes to the southeast and southwest corners are at the upper limits of construction tolerances. The garage door lintel and the ceiling slopes also trend in the same direction. Framing, doors and ceilings are generally installed level after the slab is poured so, had the slab been laid with these slopes, the garage door lintel and ceiling, would be unlikely to follow the same trend. The tension crack and crack to the perimeter are consistent with earthquake related settlement of the garage slab and footings to the south.

[76] As the tension crack was only partially repaired, and that repair appears to have opened up, this will also need to be remediated. The southern section of the garage slab was grout injected so it is implicated in the remediation of the moisture ingress issues discussed below.

[77] The issues experienced show that the differential settlement of the garage slab is damage. Any water or snow on a vehicle will drain to walls and cause damage. This is a loss of utility, which affects the insured interest and must be remedied to satisfy IAG's duty to indemnify.

THE REPAIRS

[78] The CES events caused differential settlement of the back slab and voiding to the front slab. The differential settlement was addressed by replacing the perimeter foundation and back slab. The voiding caused by round tailings shaking down away from the underside of the slab was addressed through the injection of Reid Terrier grout to fill the void.

[79] It is alleged that the repairs are defective, and do not meet the policy standard as:

(a) replacing the back slab and perimeter while leaving the front slab in situ has left the home with a non-conforming foundation system, as the back and front will perform differently;

(b) the grout is acting as a conduit for moisture to infiltrate to the surface of the slab; and

(c) the penetration of the grout into the tailings has reduced the ability of the tailings to perform the function of allowing moisture to drain away from the slab.

[80] I must decide whether the form of repair was a reasonable response to the damage, and whether the repair was properly carried out.

The foundation

[81] It is alleged that replacing the foundations to the rear of the home and the repairing the front slab means that the home now has two foundation "systems" and is in some way compromised.

[82] It is common to hear foundations described as a system. However, it is important to understand the purpose of a foundation is to support the structure which its supports. This requires the foundation to resist gravity loads from the weight of the structure, lateral loads from the braced elements of the structure and seismic loads from earthquakes. If the soil is poor the foundation must spread those loads in such a way that the structure can resist the loads. Additionally, components of the foundation may have a dual purpose, such as the floor slab, which is both a floor surface and carries some loads. In this case the foundations are a mixture of perimeter strip footings and slab. To the rear of the home differential settlement led to the perimeter and footings being replaced. Changes to requirements of foundations for poor soils, meant that the replacement foundations are stronger, with more reinforcing and so can bridge poor soils better than the original foundation design.

[83] It is argued that the difference between the foundations to the front and back of the home means there is now a difference in performance, and this does not meet the policy requirements. The actual performance of the home's original foundations under earthquake conditions show that this is an overly simplistic view. The home had a "single" as opposed to "mixed" foundation system, an NZS3604 combination of strip footing and cast in slab, which was partially reinforced. Despite being a "single" system, the difference in subsoil profile meant that the front of the home performed differently to the back of the home, where there was significant settlement. In effect the arrangement as it currently stands, with a stiffer more

deeply bedded slab and footings at the rear, is better suited to the ground conditions than the original.

[84] The policy requires repairs to bring the foundation to an a "when new" condition as a base level. The BA and Code considerations form part of these considerations. The evidence before me is that the performance of the foundation, as a whole, has been improved by the increased strength and resistance to liquefaction of the foundations to the rear of the home.

[85] I caution that my comments here are only relevant to the performance of the rear slab in conjunction with the front slab. Evidence of whether the rear-slab replacement was constructed in a compliant fashion is not before me.

The grout

[86] The grout was installed by Stake Consulting Ltd. The injection process involves drilling 25 mm holes into which liquid grout was injected under a pressure of 3 to 4 bar. The operator pumps until refusal, which indicates that the voids have been filled. The Reid Terrier grout used is designed to:

(a) be thixotropic, that is to flow only under pressure;

(b) to set quickly, once pumping pressure is stopped;

(c) to not slump when setting;

(d) to be hydrophilic (water loving) due to the presence of bentonite clay in the grout; and

(e) to be dense and lack porosity, due to the injection method, and as the bentonite swells when in the presence of moisture.

[87] It is important to this decision to understand the properties of the sodium bentonite used in the grout. Bentonite is a volcanically formed clay, which swells when wetted. This swelling contributes to the thixotropic nature of the grout when being injected and means that the porosity of the grout reduces in the presence of water (or other liquids) reducing capillary

effects within the grout itself. As the grout is denser and less porous than the surrounding floor slab, it is unlikely that the moisture is rising through the grout, or in the interstices between the slab and the grout. The photos of the moisture ingress show the effect of the bentonite, where the surface moisture has been absorbed by the bentonite at the edges of the plugs, leaving a darkened ring around the centre of the plug which is dry and light in colour. This may be compared with the concrete in the slab itself which is more porous and less dense than the Terrier grout.

Was the grout injection an appropriate response to the damage?

[88] Reviewing the floor levels, the front slab was less affected by floor slope issues than the rear of the home, but for the corner in the garage which is discussed above.[22] This is consistent with the known difference in ground conditions between the front and back of the home. The damage to the front slab requiring remediation was the voiding. While the grout injection was intended to remedy the voiding rather than the pathway of the liquefaction ejecta, it could be expected to also deal with that issue. I find that the grout repair was a reasonable response to the damage to the front slab.

[89] It is alleged that the grout injection was not properly carried out and the cured grout is acting as a pathway for moisture to rise to the surface of the slab. I am not persuaded that this is the case due to the nature and composition of the grout itself and due to the observed performance of the grout in the destructive testing. The grout has performed as expected, in that is it has filled the void between the slab and tailings.

The extent of the grout injection

[90] There is uncertainty about the extent of the areas which were grout injected. Mr and Mrs J believe that the bathroom and toilet were part of the area injected, as the tiles were removed when the repairs were carried out. Against this there is a site plan which was annexed to the Stake Consulting Ltd quote which states in red letters “do not drill in tiled areas”. There are no other construction documents which clarify the situation.

[91] I note:

[22] The floor slope surveys conducted after the repairs show the front slab similar slopes to the newly laid slab at the rear of the home. Both are within construction tolerances.

(a) The join between the front-slab and the rear of the home runs through the tiled part of the bathroom. The bathroom tiles were cracked by the earthquake induced movement of the slab.

(b) Comparing the photos before during and after the repairs, the original tiles were replaced, in both the bathroom and toilet.

(c) The "do not drill" notation is in the hallway, although the hallway was carpeted.

(d) The rear slab replacement and grout injection both occurred in September 2015.

(e) The bathroom and toilet sit within the u-shaped area identified as suffering from voiding (see figure 1).

[92] From these observations I conclude that when the grout injection occurred the bathroom and toilet were not tiled. These areas sat within the area identified as having voids. I find it more likely than not that the bathroom and toilet were within the areas where grout injection occurred.

WERE THE REPAIRS DEFECTIVE?

Installation of the grout

[93] I have found that the grout was correctly scoped, but it is alleged that the installation method for the grout was defective. This involves drilling through the slab and DPM and injecting the grout below the DPM. In doing so the DPM is compromised and it was argued that it was no longer functioning as it should. On the stand the experts advised that in an ideal situation the grout would be injected above the DPM, however, in practice this is very difficult, if not impossible, to achieve. They advised further that the DPM is a moisture barrier, not waterproofing or tanking, and often has taped joins or holes caused when it is walked on prior to pouring the slab. The destructive testing shows that the grout has in effect solidified and capped the tailings, and, given the dense non-porous nature of the grout, it is in effect acting as a DPM in the areas near the injection points. I find that the grout injection was properly performed in this respect.

[94] There are, however, unintended consequences of the grout injection which require consideration: the grout has infiltrated the tailings, and it has changed the consistency of the slab, by inserting columns of denser material with different thermal properties into the previously uniform concrete of the slab.

[95] Mr Brown argued that the grout infiltration of the tailings is a defect, as it stops the tailings from allowing water to drain away from the slab. Mr Cuff argued that the tailings are not intended to act as a drainage substrate, therefore the infiltration does not affect the utility of the slab, I prefer the first argument. The technical documents for the NZS3604 slab refer to the drainage capacity of graded fill. The loss of the drainage does represent a material change to the slab's amenity. In most cases this loss of drainage would not be an issue, however, the ground conditions and drainage at this site are unusual and the loss must be remedied, which is discussed below.

[96] The consistency of the slab has been changed by the grout injections. The grout is significantly denser than the native concrete of the slab. The slab is a large, homogenous mass, which is subject to heating and expansion. The change in density between the grout columns and the slab means the columns are acting as foci for stresses when the slab expands and contracts due to thermal changes. This causes the cracking referred to by Mr Spencer and Mr Finn. I find that, on the balance of probabilities, thermal cracking has occurred around the grout plugs, although not to the plugs themselves. This is not a defect in the grout and under normal conditions would not be problematic. However, it has a bearing on the ingress of the moisture discussed below.

[97] I caution my findings here are not that the grout injection has failed, was not properly specified, or has not performed as it should. It has performed in a manner entirely consistent with its technical specifications.

The moisture ingress

[98] Since the repairs have been completed there have been the instances of moisture permeating to the surface of the slab at the grout injection holes and a saw cut. This was observed by Mr and Mrs J in October 2017, October 2018, on or around May 2019, and on 2 January 2021. On the latter two occasions, photos captured the signs of moisture. No photos were available for the 2017 and 2018 events, however, the presence of moisture was reported

to Miyamoto and mentioned in their report of 2 October 2017. In her oral evidence Mrs J also described the concrete as feeling damp when touched.

[99] The moisture ingress has not been seen by any of the experts. Unfortunately, and no criticism is meant by this, the exact locations of the moisture ingress (apart from the saw cut instance) were not recorded. The respondents criticised the photo evidence, with arguments made that the darkened patches were simply differences in colour between the grout and the concrete of the slab. This is true of some of the photos. However, others clearly show moisture, and one appears to show water. The earlier of the photos, taken by Mrs J in 2017, show darkened patches around several grout plugs. While these do not show obvious moisture, these moisture 'haloes' are consistent with what the expected behaviour of the bentonite-based grout. The later photos show a mixture of more pronounced moisture haloes, and clearly damp concrete around the grout cores. There are 15 photos taken in 2021 of core holes and one of moisture at a saw cut. Of the 15 photos, 14 show damp patches, the other shows darkened grout which cannot be distinguished from other photos of grout cores taken when the slab was dry. Some photos show white patches which may be efflorescence.[23]

[100] The source of the moisture is a mystery. The structural engineers during conciliation suspected pressure was an element so a Geotech report was prepared by Mr Giannakogiorgos and Dr Sutter's GPR survey was conducted to see if a spring had arisen under the slab. No spring was found, but the perched water was detected.

[101] The respondents noted that the experts had not witnessed the moisture despite attending the site during record high rainfall events. They also say that the moisture seen beside the saw cut is particularly problematic as it would require water to fill the sawcut, which they say is impossible. Under cross-examination Mr Cuff asked Mr and Mrs J whether water had been poured on the slab. They denied this. I found Mr and Mrs J to be credible witnesses. I found their evidence of the moisture ingress was consistent with their previous observations and note that they reported the phenomena to Miyamoto as far back as 2017. I also note that the experts spent only a limited time in the home, whereas Mr and Mrs J visit the home frequently to maintain the gardens. The frequency of their visits means it is simply more likely that they would have observed the phenomena rather than anyone else. This leaves me to conclude that

[23] When moisture draws salts to the surface of concrete or masonry.

some other effect is causing the moisture to be present on the slab. I am left with a difficult question, how has the moisture got to where it has been observed?

[102] I asked the parties if I must find a cause for the presence of the moisture and it was the view of the respondents that I must. I disagree, I do not need to find the precise mechanism by which the phenomenon occurs. Rather, the important finding is that the probable mechanism or mechanisms are likely related to either the effects of the earthquakes, the repairs, or both. It has been confirmed that there is water beneath the grout. To get to the surface of the slab there must be a route through the tailings and grout to the underside of the slab, and from there to the surface.

[103] Capillary action occurs where water bonds to two adjacent surfaces and is drawn upwards by surface tension. The surfaces may be plane surfaces or small irregular gaps in a porous material. How far the water can be drawn upwards depends on the size of the gap between the surfaces and how hydrophobic or hydrophilic the materials are. An example is when a kitchen towel "sucks" water off a flat surface. Standard concrete is porous and can draw moisture up for some distance. Small cracks in concrete act as conduits for capillary effects. Mr Spencer referred to this as "wicking".

[104] Terrier grout is denser and less porous than standard concrete. The inclusion of the bentonite makes the grout more hydrophilic, which disrupts surface tension and lessens the capillary effects of the grout. This was demonstrated in testing of the product by Opus consultants. The moisture is not being drawn up by, or through the grout.

[105] The presence of ejecta debris in a confined area presents pathways for water to be drawn up by capillary action. BRANZ conducted testing in 2014, which showed that liquefaction ejecta in tailings created pathways for capillary action to lift water by up to 500 mm over time.

[106] I observe that:

(a) The location of the moisture ingress is the area where the liquefaction ejecta was seen.

(b) There is water remaining under the tailings/grout following heavy rain (the perched water shown in the GPR), and area remains damp (seen in the destructive testing).

(c) Water has been seen ponding on paving against the perimeter at several points.

(d) Mr J, a keen gardener, spoke of the soils in the being saturated at times. He referred to plants dying due to having waterlogged roots, where previously they were fine.

(e) The area of the moisture ingress is adjacent to the patio area, a test bore by the patio (at B on figure 1) showed readings of water being 300 mm-450 mm below ground level (bgl) between 25 April and 14 May 2021 (the water table at the home is 2m bgl).

(f) The gardens affected by the changes in water levels are also adjacent to the patio.

(g) Mr Spencer confirmed that the grout does not form a waterproof barrier, it is designed to resist water vapour rising. The grout injection is a blind process; there is no way for the operator to know where the grout has gone apart from when refusal occurs, which indicates the targeted void area has been filled.

(h) As I understand it from Mr Spencer's evidence, the sawcut goes beneath the walls and extends to the perimeter foundation.

(i) Thermal expansion has led to fine cracking of the slab around the grout plugs, particularly in areas adjacent to the patio and the full height glass doors and windows which form something of a suntrap.

(j) There is liquefaction ejecta present in the saw cut crack.

[107] I conclude that the moisture coming to the surface of the slab has occurred because of changes to the slab and tailings as a consequence of the earthquakes and/or the repairs. There has been a complex change in the drainage profile at the site caused by the earthquakes. This had led to the presence of water beneath the affected slab area after rain. The water levels

observed by Mr Giannakogiorgos at the test pits after rain (as opposed to the water table) is high enough for water to be within the tailings. Through an occult mechanism, possibly linked to the pathway by which the liquefaction ejecta made its way into the sawcut, moisture is coming to the underside of the slab. Once there, the grout prevents the moisture draining away from the underside of the slab. Capillary action then draws the moisture through the small cracks around the grout plugs, and through the ejecta in the sawcut to the surface of the slab.

[108] That the moisture ingress only happens occasionally is not relevant to considerations of whether the moisture ingress means the slab is non-complaint, or whether the repairs do not meet the '*as… when new'* standard. Moisture ingress has occurred at least four times. Had the home been carpeted the ingress would have damaged carpets. The moisture ingress must be remediated for the repairs to meet both the requirements of the Code and the policy.

[109] I conclude that the repairs, while not defective, have either not addressed the pathway for the ejecta and moisture, or have caused consequential damage, by creating a pathway for moisture, and reducing the drainage capacity of the tailings. My findings are not a criticism of the work, however, in this situation a number of unusual circumstances are combining to cause the problem and it must be addressed.

REMEDIATION

Remediating the slab

[110] There are three proposed solutions to the moisture ingress: replace the slab with a TC2 waffle slab, break out and recast the slab in the affected areas, or treat the slab to resist moisture ingress.

[111] Identifying the 'correct' remediation is a question of fact, viewed through the requirement that the remediation restores the insured property, so the damage becomes irrelevant. The remediation must restore the insured interest affected and in doing so indemnify the insured. Provided a solution provides the indemnity set out in the policy, which includes BA and Code compliance, the insurer is not bound to pursue a more comprehensive or expensive option.

[112] Replacing the slab would require that the footings and slab are replaced in their entirety with a TC2 waffle slab, as has been done to the rear of the home. This would involve the same process of demolition as was carried out to the rear of the home. As the slab would be upgraded to a TC2 it avoids the potential bracing issues referred to below.

[113] Breaking out the slab would involve removing the slab, tailings and grout in the affected area and replacing with a new TC2 compliant slab, tied into the existing perimeter, any remaining front slab, and the replaced rear slab. If the entire slab is replaced this may cause an issue with bracing, as the original bracing schedule appears to show an area where bracing loads are taken by wall framing at the wall between the bathroom and toilet and are transferred to the slab.

[114] The slab treatment proposals involve the use of Krystol, a silica based crystalline concrete waterproofing treatment. The treatment is applied as a solution to wetted concrete, it then follows the moisture and as the solution dries, forms impermeable silica crystals in the pores and crack in the concrete. Any moisture which does affect the slab leads to the growth of more crystals, so any new cracks due to thermal issues or shrinkage will self-heal.

[115] Mr Gebbie gave evidence on the application of the Krystol treatment. He is a licenced applicator and developed the proposed methodology. The process involves drilling out the grout cores to 40 mm and then using Krystol Repair Grout to fill the holes. The surrounding slab is scarified using a grinder, wetted, and then Krystol T1 is applied to the surface of the wetted slab. The silica in the KRG and T1 then 'follows' the water and, as the concrete dries, silica crystals form in the pores, cracks and interstices of the concrete. In effect the slab becomes highly moisture resistant. The treated concrete is self-sealing, in that if any fine cracks occur, any moisture moving through the crack will bring silica crystals with it which will then seal the crack.

[116] Both slab replacement options involve significant enabling works and demolition. The first option has the potential to push the costs of repair to greater than the costs to rebuild the home. The Krystol option has the least intrusive effect, with only the removal and re-installation of skirting boards being necessary.

Is Krystol a current method?

[117] Mr Brown argued that the proposed Krystol repair method does not meet the policy requirement that repairs are carried out using current methods and materials. In *Young v Tower* Gendall J considered whether a proposed repair strategy; the use of cable winches to pull the damaged home back into alignment, was a "*construction method commonly used at the time of loss or damage*" as required by the Tower policy.[24]

[118] Referring to *Turvey Trustee v Southern Response* his Honour pointed out that the requirement for commonly used methods protects both the insurer and homeowner:[25]

> I add to Dobson J's observation that the contractual requirement to use construction methods "commonly used at the time of loss or damage" not only saves money for the insurer but must also be designed to minimise the risk of uncertainties in adopting a novel or revolutionary construction method never or rarely tried or tested before.

[119] He found that the method proposed was not acceptable in terms of the policy:[26]

> It must follow, in my view, that this aspect of the defendant's repair strategy can only be considered as novel and largely untried. Is it in common use, is it a "usual, ordinary, easily got or frequently used" strategy on steep hill-side residential sites? The answer must be no. Although since the Canterbury earthquake sequence, many other repair strategies for foundations especially became regularly used, this was not one of them. Certainly at this point on all the evidence before me it appears it has not been a construction method commonly used on sites of this kind in Christchurch or other parts of New Zealand… The real purpose of that "commonly used" requirement, in the defendant's standard form insurance policy, must be not only to limit costs to the insurer of being required in a repair to use expensive historic materials (or outdated construction methods) (such as was addressed in the Turvey decision) but also to provide a measure of protection for insureds that their residential home, often their most valuable and distinctive asset, is not to be put at risk by an unusual or untried construction repair method which might not work at the time or later, with all that entails.

[120] Here the ASB policy requires the use of "*current materials and methods*". Mr Brown argues that the meaning of 'current' brings the ASB policy into line with the wider principle from *Young*, which is to protect insured parties from risky, unproven repair methods. This analysis is based on dictionary definitions of the adjective 'current' which include:

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[24] *Young v Tower Insurance Limited* [2016] NZHC 2956.
[25] *Turvey Trustee Ltd v Southern Response Earthquake Services* [2012] NZHC 3344; and *Young v Tower,* above n 24, at [69].
[26] *Young v Tower,* above n 24, at [78].

(a) "*generally accepted… a popular trend or tendency*";[27]

(b) "[i]*deas and customs that are current are generally accepted and used by most people*";[28] and

(c) "*generally accepted, used, practiced or prevalent at the moment*".[29]

[121] I am not persuaded that *Young* creates a broad principle about what building methods may, or may not, be used to repair damage in the context of residential insurance. Deciding whether the words used in the ASB policy create the same obligation on IAG as Tower bore in *Young* turns on the particular words of the policy.

[122] In this case the phrase requiring interpretation is:

> [IAG] will pay the cost of restoring [the home] to a condition as nearly as possible equal to its condition when new using current materials and methods.

[123] The keys words in the phrase are "*current materials and methods*". Mr Carter argues that in *Fitzgerald v IAG* the same phrase was applied as "*modern materials and methods are to be used*".[30] I agree with this interpretation. The context is that the words are used to define IAG's liability to indemnify Mr and Mrs J under a homeowner's policy. The language used is plain English and there are no defined terms or terms of art used in the phrase which add a gloss to the meaning of the words used.

[124] I note:

(a) the phrase uses the word "*current*" which has a temporal effect, tying the standard of repair to a condition at a point in time;

(b) the dictionary definitions for "current" cited by Mr Brown also include; "*belonging to the present*", "*happening, being used, or being done at the present*

[27] "Chamber 21st Century Dictionary" Chambers <www.chambers.co.uk>.
[28] "Current" Collins <collinsdictionary.com>.
[29] "Current" Merriam-Webster since 1828 <merriam-webster.com>.
[30] *Fitzgerald v IAG New Zealand Limited* [2018] NZHC 3447 at [29].

time", "*of the immediate present",* "*happening, being used, or being done at the present time*", and "*happening or existing now"*:[31] and

(c) The policy also uses the word '*current*' to refer to the "*current Sum Insured*" on several instances, to "*current* [bank] *fees*" and, for completeness, as a technical electrical term.

[125] The word "*current"* is used consistently in the policy as a temporal term which matches the definitions referred to at (b) above. I find that the phrase "*current materials and methods*" used in the policy is a temporal term. It refers to the use of materials and methods in use at the relevant time. It cannot be interpreted as materials and methods "*in common use*", a term which requires temporal currency *and* widespread use. This means that this aspect of the indemnity clause cannot be interpreted as protecting against unproven methods or materials in the same way as the Tower policy did in *Young.* There is a protection against unproven methods and materials in the Building Code's requirements for future performance. As was discussed in *E v IAG* future performance is assessed based on testing or past performance of a product or method.[32] Unproven methods will not meet these criteria.

[126] The evidence is that Krystol has been used in Christchurch for other residential properties, and to prevent moisture ingress into concrete slabs. It has been used in New Zealand since 1983, and Mr Gebbie has used it in Christchurch since 1995. Mr Gebbie gave evidence that he has used the same methodology proposed here for repairs to other domestic dwellings. I find that the Krystol treatment is a current method and meets this policy requirement.

Does Krystol meet Code requirements?

[127] There was criticism that the Krystol treatment does not meet Building Code requirements and has not been approved in New Zealand. The Krystol Repair Grout (KRG) and T1 applications proposed have not been tested or certified by BRANZ. However, BRANZ have approved another Krystol product, KIM, which is added to bulk concrete during construction to produce a waterproof structure. Mr Gebbie's evidence and the technical documents indicate that the Krystol products all use the same silica crystalline technology. The

[31] Chamber, above n 28; Collins, above n 29; and Merriam-Webster, above n 30.
[32] *E v IAG* CEIT0013-2019 (15 December 2021) at [142].

importer of Krystol has certified that T1 meets the durability criteria of the Code. Mr Gebbie supplied copies of documents which showed that independent tests in Canada, Malaysia, India and the United States had confirmed the water-resistant qualities of T1. This also applies to the suggested use of another Krystol product Krytonite swelling waterstop, a swelling grout which also uses the crystalline technology, to seal the construction joins and the areas where invasive tests were conducted.

[128] External certification is only one route for an alternative repair solution to certify compliance with the performance criteria of the BA and Code.[33] An LBP, or Chartered Professional Engineer can issuing a PS4 Producer Statement, which certifies compliance. However, Mr Brown pointed out that Mr Gebbie is not an LBP, and cannot issue a PS4. Mr Gebbie gave evidence the type of work he does is specialised waterproofing repair work of a type which does not fit into the recognised categories in the LBP scheme. This and the requirement that the repairs are supervised by an LBP can be dealt with by:

(a) having the instructing engineer do the design work and issue a PS1;

(b) Mr Gebbie, will perform the work, supervised by the instructing engineer, and will issue a PS3; and

(c) the instructing engineer will conduct a construction review and issue a PS4.

[129] Mr Kennett, Mr Finn, and Mr Day indicated that they would be prepared to act as the instructing engineer should this be necessary.

[130] There was criticism of the use of Krystol due to the slab thickness, maintenance requirements and that the manufacturers do not provide a warranty. My observations regarding these criticisms are:

(a) The literature referred to by Mr Brown required that the slab thickness is 150 mm and conformed with NZS 3101 or NZS3106 norms. The front slab is 100 mm thick and was constructed prior to those norms being in place. However, these requirements are specific to the KIM admixture, rather than the K1 and

[33] As opposed to a method set out in the Code or relevant New Zealand Standard.

KRG products. The K1 literature refers to the product being unsuitable for "structures with unstable, moving cracks or joints". Here there is no evidence of instability or settlement occurring. Looking at the literature, the type of remediation proposed is what these products are designed for.

(b) The maintenance listed in the supplier's literature is for regular inspections, which Mr Brown says would be onerous as the area is carpeted. However, I note that the this follows a section which states "*No maintenance is required to preserve the waterproofing performance of concrete treated with the Krystol Waterproofing System provided that significant building movement or cracking does not occur*". As above there is no evidence of significant movement or cracking. Further fine cracking, as seen at the grout injection sites, will self-heal in Krystol treated concrete.

(c) The issue of a manufacturer's warranty is of minimal, if any, relevance. The BA implies warranties that work will be carried out properly, competently and in keeping with consent requirements, whether new or existing.[34] The contractor warrants that they are qualified, have relied on professional skill and judgment to achieve compliance, and that the materials used are suitable and are installed according to industry and manufacturer's requirements. The warranties last for 10 years from the date of the breach.[35] If a product fails the first ports of call are the New Zealand based applicator and supplier, not the Canadian manufacturer.

[131] I conclude that the Krystol method is a satisfactory solution to the issue of the moisture ingress. It is the least disruptive proposal in terms of demolition or enabling works. By effectively making the slab moisture resistant, and along with the drainage works, the method will restore the utility of the slab which has been negatively affected by the earthquake damage and repairs.

[34] Building Act 2004, s 362I.
[35] At s 393.

The extent of the Krystol remediation

[132] There was discussion of the extent of the front slab which requires treatment with Krystol. Mr Gebbie spoke of treating the entire home, including the new rear slab. This was based on moisture readings of the slab he took at the rear of the home. The reading was 13, on a meter which has a range of 0 and 17 as "low". However, the reading was higher than Mr Gebbie expected at that location. This issue is complicated by the fact that the home is generally closed up and therefore not ventilated, and that Mr Gebbie is not a building surveyor with expertise in interpreting the significance of such a reading.

[133] There is no evidence of moisture infiltrating the new rear slab. The rear slab was constructed with new substrate and DPM. Given that the slab and DPM are new, and the new slab concrete is uniform in density, the cracking seen at the grout cores cannot have occurred and any moisture below the slab will be dealt with by the DPM. The front slab and rear slab are connected by a mechanically rigid joint.

[134] In those areas where the front slab was not subject to voiding, and so were not grout injected, such as beneath the kitchen, there is no pathway for moisture to rise and none has been reported. I cannot find that the Krystol treatment is justified for the rear slab or the un-grouted areas of the front slab.

[135] However, the rest of the front slab, including the garage needs to be treated with Krystol. This, along with the perimeter drainage, discussed below, is the "belt and braces" approach recommended by the engineers.

Drainage

[136] It was suggested by Mr Raasch, Mr Giannakogiorgos, and Mr de Vocht, and was agreed to by the other experts, that remediation must include drainage works around the perimeter of the foundations to prevent water from making its way beneath the slab. This will involve a cut-off drain 500-700 mm deep around the entire perimeter of the house, as suggested by Mr Raasch and Mr Giannakogiorgos. Due to the silty, often waterlogged soils, this should also include a silt trap at the street kerb, as suggested by Mr de Vocht.

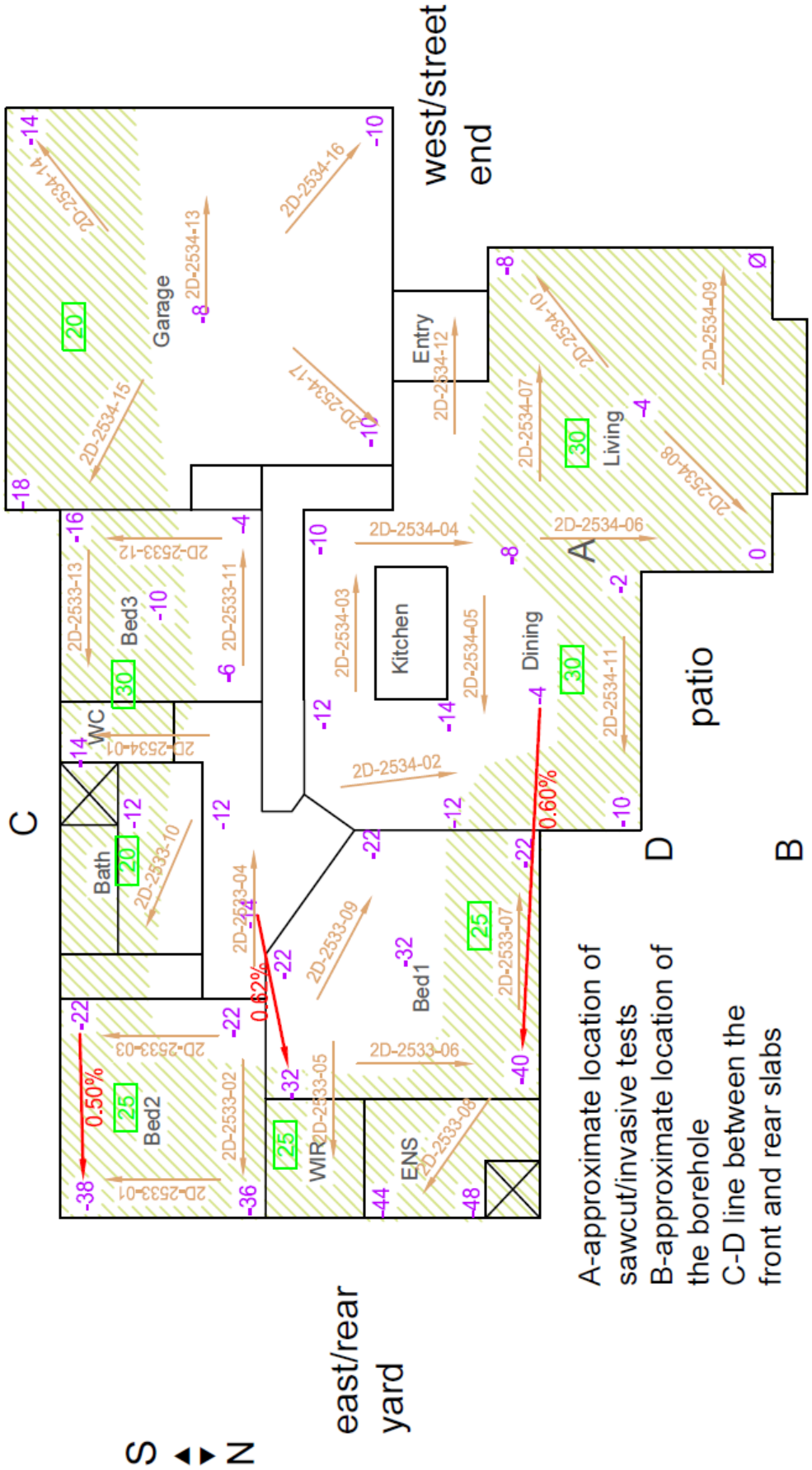
[137] The drain will remediate the loss of drainage capacity of the tailings, as well as reducing the chance of water getting under the home. In evidence Mr Finn pointed out that the mechanism by which moisture is infiltrating the slab cannot be narrowed down to a singular cause, this justified the "belt and braces" approach of Krystol treatment and drainage.

The garage floor slopes

[138] As well as being treated with Krystol, the floor slopes in the garage must be addressed. The proposal is to grind the garage slab to fall towards the garage door. There were concerns that the grinding will reduce the concrete cover for the reinforcing in the slab, however, Mr Clark used a scanner when he and Mr de Vocht conducted their survey, and this showed the reinforcing was embedded 79 mm into the 100 mm slab. Given this the grinding will not reduce the cover in a significant way. The tension crack in the south of the garage will need to be properly remediated.

C D Boys
Chair
Canterbury Earthquakes Insurance Tribunal

FIGURE 1


west/street end
east/rear yard
S
N
C
D
A
B
Garage
Entry
Living
Kitchen
Dining
patio
Bed3
Bed2
Bed1
Bath
WC
WIR
ENS
2D-2534-16
2D-2534-14
2D-2534-13
2D-2534-15
2D-2534-17
2D-2534-12
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2D-2534-06
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2D-2533-04
2D-2533-09
2D-2533-07
2D-2533-03
2D-2533-02
2D-2533-01
2D-2533-05
2D-2533-06
2D-2533-08
0.50%
0.62%
0.60%
A-approximate location of sawcut/invasive tests
B-approximate location of the borehole
C-D line between the front and rear slabs