IN THE HIGH COURT OF NEW ZEALAND
WELLINGTON REGISTRY

I TE KŌTI MATUA O AOTEAROA
TE WHANGANUI-A-TARA ROHE

CIV-2015-485-594
[2021] NZHC 2077

BETWEEN	T J CRIDGE AND M A UNWIN Plaintiffs
AND	STUDORP LIMITED Defendant

CIV-2015-485-773

BETWEEN	K M FOWLER AND S WOODHEAD Plaintiffs
AND	STUDORP LIMITED Defendant
	JAMES HARDIE NEW ZEALAND LIMITED Second Defendant

Hearing:	17 August–11 December 2020 and 23 June 2021; further submissions received 28 July 2021
Counsel:	J A Farmer QC, R J B Fowler QC, D J S Parker, E S K Dalzell, J T Wollerman, D S Thorne, B M Lambert, D A Fry and D Viatos for Plaintiffs J E Hodder QC, B A Scott, J A McKay, E S Scorgie, T D Smith, J Y Moran, Z E Koo, S R Roberts, J P Papps, B J M McIntosh and O E Battell-Wallace for Defendants
Judgment:	11 August 2021

JUDGMENT OF SIMON FRANCE J

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INTRODUCTION

Overview

[1] In 2002 an overview group established by the Building Industry Association noted that in recent years moisture problems had become the single-most common reason for unsatisfactory building performance in New Zealand. The authors, in what has become known as the Hunn Report, identified a multiplicity of contributors to New Zealand's leaky building crisis and made various recommendations.[1] In 2004 a new Building Act was passed and in 2004/05 a new version emerged of E2/A51

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1 *Report of the Overview Group on the Weathertightness of Buildings to the Building Industry Authority* (Building Industry Authority, 31 August 2002) [*Hunn Report*].

(3rd ed). E2 is the external moisture clause of New Zealand's Building Code. This version represented a first regulatory push towards the use of cavities behind cladding;[2] in 2011 cavities became mandatory for all timber-framed houses.

[2] A major player in the New Zealand building industry is James Hardie, the defendant in this proceeding.[3] It manufactures and sells various cladding products for houses. It is an international company but the New Zealand operation is stand-alone, although obviously drawing on and flowing from the parent. Products may have different names domestically and some different features such as the colour of the sheets, but their physical essence is the same.

[3] From 1987 until 2005, James Hardie produced and marketed to the New Zealand building industry a sheet cladding called Harditex. It was a variant on an existing product called "New Hardiflex". That had been introduced in 1983 and was notable for being a fibre-cement product that was asbestos-free. Prior to this, asbestos was a key component in fibre-cement cladding, but emerging awareness of health risks necessitated alternatives be developed.

[4] The period through which Harditex was on the New Zealand market coincides, most certainly in its later stages, with New Zealand's leaky building crisis. At its most general, the question this case raises is what role, if any, Harditex played in the crisis.

[5] In this proceeding, owners of homes clad in Harditex sue James Hardie for selling what is said to be a cladding product not fit for purpose. That purpose was to provide a weathertight cladding for New Zealand residential homes, and the plaintiffs say it did not safely achieve this, with their homes suffering from moisture ingress and moisture-related damage as a result. The plaintiffs, alternatively called "the homeowners", are:

(a) four "lead" homeowners (the actual plaintiffs) involving two dwellings. Ms Fowler and Mr Woodhead are the respective owners of each half of a

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2 Cavities are a gap between the external cladding and the building wrap that encloses the timber framing. Their intended effect is to facilitate drainage and/or drying.

3 Once James Hardie New Zealand Ltd, it is now Studorp Ltd. I will refer to them as the defendant or James Hardie.

single duplex dwelling located in Karori, Wellington. Duplex means there are two separately titled dwellings attached to each other and sharing a common wall. The other plaintiffs are Ms Cridge and Mr Unwin, who own one-half of a similar dwelling in Island Bay, Wellington. The owner of the attached dwelling is not a participant in the proceeding;

(b) there are, then, 144 represented owners of 151 properties, all clad in Harditex, where the owners have "opted into" the proceeding. The proceeding is a class action, meaning these properties receive the benefits of any applicable findings, or accept the consequences, as regards James Hardie liability, for their properties if the litigation is unsuccessful. Of these, six represented homeowners' properties have been selected as "sample" properties and subject to destructive testing to analyse the extent of moisture damage and the causes of it.

[6] The homeowners' case involves a challenge to the suitability of the cladding, and of the method by which it had to be installed. The plaintiffs allege the composition of the cladding is inherently flawed, the system of installation was inherently flawed and, anyway, too difficult for builders to get right, and the information provided by James Hardie to assist with using its product was misleading and inadequate. James Hardie denies these claims. Concerning the eight properties that have been the subject of detailed analysis, it is common ground they are water damaged, and should not be.

[7] At a very general level, the competing positions are:

(a) for the plaintiffs, this was a bad product and a bad system which was unsuitable for New Zealand conditions and which required a level of building skill that was beyond the skill levels of a reasonably competent builder. It is said James Hardie did not do the necessary level of testing before releasing the product on the market, and provided inadequate information to consumers (including building practitioners) about how to safely build a house with this new product; and

(b) for the defendant, this new product was a relatively minor development in a decades-long system of sheet cladding generally, and fibre-cement cladding particularly, with which competent builders were very familiar. The sheets themselves are of an established proven composition, houses can and were built perfectly well with it, and such failures as have occurred reflect inadequate design of the house and bad workmanship in its building. The decline in New Zealand building skill standards throughout this period is well recognised, including in documents such as the Hunn Report.

Introductory comments

[8] There will understandably be interest in a case about a major product used to clad houses during the time from which emerged New Zealand's leaky home crisis. Anyone with exposure to the emotional and financial impact a leaky home can have on the people involved can only have the greatest sympathy for those caught up in such a situation. It is undoubtedly a miserable and stressful experience. It is important to emphasise, however, this proceeding is an adversarial case where the outcome reflects the Court's assessment of the evidence led by the parties. It is not a further inquiry into New Zealand's leaky home crisis, and the Court is not carrying out an inquisitorial role.

[9] There was a lot of evidence. The written briefs and their appendices amounted to more than 10,000 pages. The notes of oral evidence are more than 6,000 pages. The documentation is vast. The function of this judgment is not to report or narrate the evidence, but to reach an assessment based on it.

[10] The judgment addresses the numerous topics in a particular order. No doubt other structures were possible. What is important to understand is that the different areas and topics all impact on each other. The science is relevant to understanding the damage in the houses and the causes of that damage. What the damaged houses are revealing is relevant to assessing the merits of the competing views on the science. While therefore the judgment adopts an order for discussing topics, that sequence does not reflect a progressive unravelling of the answer. The interconnections are

recognised and were considered by me before any of the judgment was written. It is just that one cannot get all the different influences down on a single page. So when the building science is considered and resolved, that outcome is reached with an awareness of all the other evidence, and of conclusions already reached about what has happened to the houses.

What is Harditex?

[11] Harditex is a fibre-cement cladding that forms part of a weatherproofing system for a house.

[12] The traditional New Zealand cladding is weatherboards, which are wooden, bevelled and installed overlapping each other. This method creates drainage paths behind the weatherboards, thereby allowing any water getting in behind the weatherboard to drain away. Building wrap, placed between the timber framing and the weatherboard, provides a further barrier to liquid moisture reaching the framing. The primary barrier, however, is the painted weatherboard.

[13] Cladding in the form of sheets has been around as an alternative to weatherboards for quite some time. One such sheet option was fibre cement which is a mixture now of cement and cellulose fibres. Originally a key component of these sheets was asbestos but as the health risks associated with that became known, alternatives were developed. The Harditex formula used cellulose fibres extracted from *Pinus radiata*. Harditex was the second James Hardie version of an asbestos-free sheet, the first being New Hardiflex.

[14] The Harditex sheets are rectangular and roughly twice as high as they are wide, but sometimes taller. They are installed vertically, over a timber framing. That framing is wrapped in a breathable building wrap which is stapled to the timber framing. Over the top goes the Harditex sheet, again directly nailed to the frame but obviously with the wrap sandwiched in between. Each 2.4 x 1.2 m sheet has 63 nails, so there is a significant clamping effect between sheet and timber frame.

[15] Harditex is a "substrate". It must be coated. The jointing and coating systems seal some aspects of the sheet,[4] fill the gaps between sheets with a tape reinforced compound, and then coat the whole sheet with a flexible high quality acrylic coating. The flexibility is key because if the coating is too rigid it will crack with building movement.

[16] The coating process should cover all exposed parts of the sheet, including for example the bottom of the sheet. Fibre cement sheets absorb water so the texture coating is a vital cog in weatherproofing the house. Those familiar with a predominant style of these houses – Mediterranean look, often no eaves, sometimes parapets – may recall some have a flat finish and others have something more akin to a rough-cast finish. The rough cast is an aesthetic feature only. The coating system and products are the same in either case.

[17] It is a trial issue how much of a change Harditex represented, and this initial summary is not a comment on that. Essentially, however, Harditex was the existing New Hardiflex asbestos-free product but with bevelled edges. That is, at each side of the sheet the last few millimetres had a slope on them, thereby avoiding a straight edge finish.

[18] At the time Harditex was introduced, James Hardie's understanding of the market was that there was a desire for a completely flat finish to walls (the monolithic look). Whenever one sheet finishes and another starts (both usually nailed to the same upright timber piece – the stud), it is necessary for weathertightness reasons to fill the gap between them in some way. A popular early method was initially to cover the joins with battens, but that is not a flat look. So James Hardie developed these sheets with sloping edges that created a gap which when filled, with tape and compound, could be made flush to the surface of the sheet, preparatory to the application of the texture compound.

[19] Another feature developed by James Hardie were architectural shapes which were basically polystyrene shapes designed to be affixed to Harditex. This provided a wide range of architectural trim details for windows, arches, cornices and columns

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4 The systems varied.

at a fraction of the cost of constructing such shapes out of other materials. These features of the bevelled edges as a way of joining the sheets, together with accessories needed for some specific joint situations, plus the architectural polystyrene shapes, and completed with an acrylic coating, lead to the following proposition which is central to understanding the trial issues:

Harditex is both a cladding sheet and a system.

[20] James Hardie brochures themselves recognise both features, observing:

> The Harditex system is comprised of four basic components:
>
> Harditex sheets
>
> jointing systems
>
> architectural shapes
>
> coating systems.

[21] The homeowners' case takes aim at both the sheet and the system.

The purpose of a cladding system

[22] For present purposes the following two paragraphs from the defendant's submissions capture the task:[5]

> 295 The Building Code requires that the building prevent the penetration of water that could cause undue dampness or damage to building elements. That does not require the exclusion of all water from the assembly. It instead requires that water be managed to prevent undue dampness and damage.
>
> 296 That is a rate issue. When the rate of wetting exceeds the rate of drying, accumulation occurs. When the quantity of accumulated moisture exceeds the moisture storage capacity of a material or assembly, damage occurs.[6]

[23] Building philosophy is very much influenced by "the 4Ds", being deflection, drainage, drying and durability. These reflect the preceding paragraph – keep the water out (deflect it), drain out as much as you can of what is not deflected, and dry out the materials which have been exposed and have consequently absorbed some of

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5 Footnotes omitted.

6 This paragraph is sourced in a defence witness, Dr Lstiburek.

that moisture. Durability, in this context, relates primarily to the need to treat the framing timbers, but also the cladding itself.

The alleged defects

[24] The homeowners allege nine inherent defects in the sheet and system which can be described in these terms:

> Inherent defect one – The Harditex sheet is inherently moisture absorbent and will therefore absorb moisture and, when directly fixed to the timber framing, permits the transfer of moisture to adjacent building elements such as the underlay and the framing.
>
> Inherent defect two – The Harditex cladding system (which is direct fixed to the framing of the building) allows water ingress at various locations including at the base of sheets, at horizontal control joints, at penetrations including window junctions, at junctions with other building elements, through areas where cracking occurs and elsewhere.
>
> Inherent defect three –The Harditex cladding system does not adequately manage drainage and drying of any water that penetrates or accumulates within the Harditex cladding system and underlying areas. This is contrary to sound water management principles.
>
> Inherent defect four – The Harditex cladding system fails to adequately accommodate normal building movement (whether that arises due to thermal activity, effect of moisture, seismic activity, structural movement through wind pressure or through other normal and expected causes of building movement), which leads to cracking, water ingress and damage.
>
> Inherent defect five – The Harditex sheet is not durable. It absorbs moisture and is prone to damage from exposure to moisture, including swelling, rotting and decay.
>
> Inherent defect six – The Harditex 1991 Technical Information was inadequate and incapable of providing a cladding system which was fit for its purpose as a durable and weathertight exterior wall cladding system and able to meet appropriate standards and requirements for building.
>
> Inherent defect seven – The Harditex 1991 Technical Information fails to specify a method of installation of the Harditex cladding system which makes adequate allowance and contains sufficient tolerances for the typical conditions that exist on a building site, including climatic conditions, the skill and precision of a reasonable cladding installer and the tolerances to which buildings are constructed.
>
> Inherent defect eight – The Harditex 1991 Technical Information failed to provide details and specifications for important and commonly occurring details including face sealed window junctions, terminations of the horizontal control joints and exterior and interior corners.

> Inherent defect nine – The maintenance requirements for the Harditex cladding system were vague, and impractical or impossible to achieve.

[25] From this list it can first be noted that there are two allegations about the sheet itself, being defects one and five. Defect one is a claim that the sheet is inherently moisture absorbent. That this is so is common ground, and indeed is true of most building materials – for example, everyone knows wood absorbs moisture unless coated. Concrete is quite porous, as is brick. The exceptions are metal and glass. It remains unclear to me why this was pleaded as an inherent defect. It is an important background fact to many of the other claims, and explains, in the homeowners' assessment, a pathway for moisture transfer from sheet to timber framing, but of itself, the fact that a cladding in its natural (uncoated) state is moisture absorbent is not, and cannot be, an inherent defect. The real dispute around the issue is what happens to moisture stored within the Harditex sheet.

[26] The second alleged sheet defect is that found in defect five – the sheet is not durable because it is prone to damage from exposure to moisture. The damage takes the form of swelling, rotting and decay. These characteristics are disputed by James Hardie. For example, in its literature, James Hardie claims that Harditex will not rot. This is a claim that is not Harditex-specific but reflects James Hardie's view of the properties of fibre-cement products. The homeowners dispute this.

[27] Moving from sheet defects, a second group of alleged defects relates to the Harditex system. This concerns how the Harditex sheet is attached to the wall, and how it interacts with other building elements, such as windows. There are two broad claims – that the system lets water in behind the cladding, and then it does not adequately deal with that water. The relevant defects are two, three, four, and aspects of nine (maintenance).

[28] To explain some of these further by way of illustration, it is convenient to analyse a Harditex wall starting at the bottom. The Harditex system calls for the sheet to be affixed slightly off the bottom concrete foundation. This is achieved by building the framing with a slight overlap on the base so that an affixed sheet will have a gap between it and the concrete base. The bottom of the sheet, and the gap to the base, are both then to be coated. It is common ground that due to the absorbency of Harditex,

if the bottom edge closest to the ground is not coated, water is likely to be absorbed into the sheet. How much water and to what height up the sheet is disputed, but the idea of some absorption (called wicking) occurring with an uncoated bottom of sheet is accepted.

[29] Returning then to the claim about a defective system, the homeowners say it was too hard on a building site to coat the bottom of the sheet and most often this did not happen. It was too hard because applicators used spray guns that were too long to fit under the sheet. There was usually not enough clearance between the bottom of the sheet and the ground to allow this to happen. Further, any alternative means of application such as a brush were too erratic for the nature of the product and when dealing with a thin 7.5 mm wide surface. It is said the effect of no coating is either that the sheet degrades and becomes crumbly, or the moisture wicks up the board far enough to reach timber framing, where the rotting process starts.

[30] Moving from the base of the sheet, the homeowners focus on the joins between the sheets. The main concern is the sufficiency of the prescribed gap between the sheets. To understand this, it is necessary to understand that buildings will inevitably move. Further, in the case of timber frames, the timber will shrink. This is because when it is enclosed the timber will have a higher moisture content than its natural state. Over the first year or so of enclosure, this moisture will dry out until the framing reaches what is known as its moisture equilibrium. The moisture leaving the timber causes the timber to shrink in all directions – it gets shorter and narrower. If the timber shrinks, inevitably things nailed to it will move. For example, if two Harditex sheets are nailed to the same piece of wood which then itself shrinks, the sheets will move closer to each other because the piece of wood is smaller. The plaintiffs claim the prescribed gap to be left between sheets was too small to accommodate this inevitable movement. The sheets coming together force out the jointing compound so that the surface coating itself pouts out. This can and does lead to cracking through which moisture enters.

[31] Next in the area of systemic building flaws, wall penetrations are said to be a major example of poor advice from James Hardie on how to protect them. A common

example of a wall penetration is a window. It is submitted these are difficult to install in a weathertight manner, and the assistance given was insufficient.

[32] Finally, reference must be made to what is known as the "h-mould". The context is a two storey house, and the area under consideration is where the two storeys meet – the inter-floor area. The h-mould is a specifically designed accessory made of PVC. As its name suggests, it is shaped like an "h". The idea is the top sheet sits above the horizontal flat top of the "h" hook and the bottom sheet slots in underneath. The joint then needs sealing and coating. The homeowners say the h-mould was a flawed design that would inevitably allow in moisture to attack the uncoated back of the sheet, the wrap and ultimately the timbers.

[33] These system flaws, and others not yet mentioned in the judgment, are said to be the means by which the homeowners say the Harditex system allowed water to get in behind the cladding. The second key issue, and in a way the most important topic, is the ability of the system to handle that moisture. If, for example, it all drained away then there would not be a rotting problem in the framing.

[34] The homeowners say that the Harditex system could not cope adequately with moisture. This is based on two complementary streams of evidence – (i) what may be termed building science evidence which points out the flaws in the Harditex design that suggest it will inevitably fail, and (ii) the houses themselves which are said to present the evidence that these design flaws have materialised in damage. In addition to relying on the damage suffered by the houses, the homeowners' experts built a test wall which was meant to represent a whole wall of a Harditex system house built to James Hardie specifications. When subjected to water pressures, the test wall failed spectacularly, leaking as it were at every pore. The plaintiffs say this proves the correctness of their building science evidence, as do the houses which indisputably are suffering from moisture damage. It is a conceptually flawed and impractical system.

[35] Finally, there are the group of defects (six, seven and eight) that focus on the James Hardie Technical Literature (JHTIs). These brochures contain specific building assistance. They set out installation rules that must be followed and give details of what is and is not warranted by James Hardie. The JHTIs are alleged by the plaintiffs

to be incorrect in some of the instructions provided and deficient in a large number of areas where help was needed and not given. An issue relevant to the resolution of this dispute is the extent to which Harditex was novel. Obviously the more different it is, the less familiar with the technical requirements builders may be.

[36] A summary of the homeowners' case which captures its essence is set out in the closing submissions:

> 49. The Harditex System was a direct fixed system, using a sheet 7.5mm thick which had untested and unproven durability, and did not incorporate any provision for drainage or [drying]. It was an attempted face-sealed or barrier system, but fails to perform as a face-sealed or barrier system because the details provided cannot keep water out, and it is not a realistic expectation for a cladding system to keep all water out. This appears to be acknowledged by cl E2.3.2 of the Building Code, which only requires prevention of penetration of water that could cause undue dampness or damage: there is no requirement to prevent the penetration of all moisture. The Harditex System does not manage moisture or movement and is not durable.
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> 50. In addition the various editions of the JHTI were not adequate and did not provide sufficient installation details that would enable the product to be used in a way which produces a weathertight building.
>
> 51. When viewed as a whole, each of the inherent defects established by the plaintiffs come together to comprise a defective system which is not, and was never, fit for purpose.
>
> 52. This is at odds with the way in which James Hardie held out the Harditex product (in various versions of the JHTI) as being suitable, proven [1987 only], durable, and which will meet the building code. These statements were incorrect, false and misleading.
>
> 53. The combination of these various flaws in the Harditex system has resulted in significant damage at each of the lead and sample properties. There is no dispute between the parties as to the fact of damage: the issue lies in relation to the cause of the damage and whether this has been caused by the alleged inherent defects (or as the defendants contend, entirely as a result of workmanship).
>
> 54. The plaintiffs' evidence is that the damage at the lead and sample properties has been substantially caused or contributed to by the inherent defects.

Structure of the judgment

[37] The judgment first analyses the evidence in this order:

(a) the building science evidence, which includes consideration of the moisture management issue, the durability of the sheet, the ability to manage building movement, some specific alleged design flaws such as the h-mould, and the susceptibility of the system to mould;

(b) specific testing done for the case on model walls; and

(c) the evidence in relation to the damage suffered to houses owned by the plaintiffs, plus the six other sample houses selected by the plaintiffs to illustrate their case.

[38] The judgment then applies these conclusions to the law. The topics to be addressed there are the general issue of whether a manufacturer of residential cladding material owes a duty of care to the owner for the time being of the house. If so, the three areas where that duty is said to have been breached are in the manufacture of the sheet and the design of the system, in the adequacy of the literature that accompanied the product, and in James Hardie's alleged failure to react to a growing awareness of a problem with its product. The timing of this aspect is circa 2000, and it is alleged James Hardie breached its duty of care by failing to either withdraw the product or warn consumers of the established risks in using it. The final topic to be addressed are the plaintiffs' Fair Trading Act claims.

[39] Those two sections, the evidence and the law, will resolve the case. Not every trial issue requires resolution to reach that point. Following the Conclusion, an Appendix will note these unaddressed topics with at times a brief conclusory observation, but the judgment will already be long enough so as to tell against further exploration of the evidence or issues.

BUILDING SCIENCE

Introduction

[40] A core claim advanced by the homeowners is that the Harditex system is poorly designed. These flaws made it inevitable that Harditex system houses would fail,

which they have. It is this proposition that informs the label advanced by the homeowners – *inherent* defect one, *inherent* defect two and so on.

[41] There is a considerable body of building science to assist with analysing the correctness of this claim. Topics that arise include the size of gaps needed to allow water to drain, the absorption and drying rates of different materials including wood and fibre cement, predicted levels of water penetration into building envelopes, the properties of building wraps, the prospects of decay in various materials, the likely shrinkage rates of materials such as wood and the expected movement of a timber-framed house from various forces such as wind or shaking.

[42] The first section of the judgment is an analysis of the Harditex system by reference to this evidence and science. Its purpose is to assess the correctness of the homeowners' claim of an inherently flawed system.

Moisture management

[43] The moisture management topic considers whether a Harditex sheet nailed to a timber frame over building wrap is a design that can be expected to safely manage the expected amounts of water that will inevitably get behind the external cladding of a residential house. The key topics are whether the system has any capacity to drain away such water, what contribution, if any, the building wrap makes to drainage, and the capacity of the Harditex sheet to safely absorb this water. "Safely absorb" refers to the capacity of the sheet to store water which the sheet's mechanisms are then able to dry.

A face-sealed system?

[44] There was some trial focus on the type of moisture management system Harditex is. The homeowners claim it is a face-sealed system which is a system reliant on keeping out 100 per cent of the water that hits the exterior surface. A face-sealed system has no purpose-built capacity to drain away water that gets behind the cladding because none is meant to.

[45] The primary proponent of this claim was Mr Hazleden, a well-credentialled expert from Canada in the areas of building envelopes and weathertightness. He was

an important plaintiff witness in that his testimony was the primary (but not only) building science response to the defence experts – Drs Lstiburek and Straube. Those witnesses said Harditex was a concealed barrier system (the wrap being the concealed barrier) with capacity for drainage behind the external cladding.

[46] It is convenient at this early point to comment further on Drs Lstiburek and Straube who were key defendant witnesses. They are internationally recognised as experts in the area of the weathertightness of building envelopes. Dr Lstiburek has worked for 38 years as a forensic engineer in the area of building failures, with a speciality in "rain penetration, air burners, vapour burners, air quality, durability and construction technology". He is a consultant to numerous major manufacturers of building products. He has been called in to assist with all the major leaky home crises that occurred in North America.

[47] Dr Lstiburek is the author of numerous publications, some of which are award-winning. He himself has been the recipient of lifetime achievement awards from many relevant organisations. He has chaired standard drafting bodies and is a fellow of North America's leading organisation dealing with all aspects of building enclosures. My assessment, which I do not understand the plaintiffs to challenge, is that he is pre-eminent in the relevant fields.

[48] Dr Straube has 30 years of similar experience. He has been involved in projects throughout the world. His doctorate was in moisture control in enclosure walls and that has been his life work since. He also consults to major product manufacturers and to numerous government agencies. He is a building scientist and has undertaken extensive laboratory work. He has been involved in analysis of most types of building cladding and has long experience with computer modelling.

[49] The correct label for the system was not a topic I found particularly helpful. It will be an important question for a designer of a system since the moisture management system being adopted will obviously influence the design of the components of that system. Here, however, the Harditex system has been and gone, and the issue the homeowners advance is that it had inadequate moisture management capacity. If that is correct, it did not seem to matter whether it was an unsuccessful

face-sealed system or an unsuccessful concealed barrier system. Conversely, if it did manage moisture, whether that was through good planning or good fortune did not seem particularly to matter from a litigation viewpoint.

[50] To the extent an answer is needed, I do not consider Harditex was a face-sealed system, nor that it was intended to be or thought to be. By this I mean that no-one thought the system would keep out all rainwater, although the design of it is that it should do so as much as possible. That is true of every cladding system.

[51] It is important not to confuse the aim of keeping out rainwater with the proposition that there is no way of dealing with moisture if it does penetrate the cladding. All systems aim to keep out rain. Deflection is the first of the 4 "Ds", and the more you deflect, the less one needs to worry about the other Ds. If the proposition is that Harditex was intended to keep out all water with a consequence that the designers thought there was no need to think about what happened to moisture behind the cladding, the evidence does not support that.

[52] The reality is that Harditex could never be a face-sealed perfect barrier system. There are inevitably penetrations in the cladding, such as holes for windows, pipes and vents. The sheets are nailed, thereby creating at least 63 holes per sheet. A basic understanding of rain and moisture management would dismiss the idea it could ever be a 100 per cent barrier. Efforts to make it as deflective of water as possible therefore do not of themselves mean the system cannot deal with moisture that did get through.

Capacity to drain

[53] The first topic is drainage. Harditex has no intentional drainage paths. There is no cavity or other feature designed with the specific intention of draining away water that got behind the cladding. I agree with Mr Hazleden on this, although I do not understand the defendant to argue otherwise. Rather, through Dr Lstiburek and Dr Straube, James Hardie says there are nevertheless drainage paths which inevitably and always exist. They are the gaps that will exist between the back of the sheet and the front of the wrap.

[54] This is on its face a somewhat surprising proposition because, as has been discussed, the system requires the sheets to be tightly nailed to the framing. The wrap, a thin usually synthetic material, is compressed between the timber and the sheet. Drainage down its face might be thought unlikely.

[55] Dr Straube and Dr Lstiburek say that there is still enough of a gap. There are two aspects to this – the small gaps drainage theory, and the reality of a building. To take the latter first, it is noted that the clamping effect will not be uniform – across the surface of the wrap there is a large surface not held to the back of the sheet by a nail. It will be very near to it but not stuck to it, and this is where small gaps drainage comes in. Those small gaps which occur where the sheet is not tightly held to the frame are enough to allow drainage. Further, a timber frame is not uniform. Timber is never completely straight and building lines never perfectly exact. All codes allow for tolerances and these timber variations and tolerances create gaps. Finally, where the water does encounter a clamp, such as where it is nailed, by its very nature it works its way around the clamp, moving sideways until gravity again asserts itself and the water heads on down.[7]

[56] Inherent to this discussion, and a topic to which I will return, are the properties of a building wrap. By law all building wrap has long been required to be water resistant but vapour permeable. If there is a drainage path in the small gap, the water repellent nature of the wrap will encourage drainage.

[57] Mr Hazleden is critical of this theory for its lack of planning (ie not a designed feature), and its lack of predictability. He says a properly designed system should have an intentional drainage path, and one cannot know where these inconsistencies in the framing will occur. I do not understand the defence experts to disagree except to say the existence of the inconsistencies is predictable, just not where they will be within the frame. But it is certain they will exist, and therefore certain drainage will occur.

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7 This is not to say the clamping is irrelevant. It will certainly create an opportunity for water to pool at the clamp: see Mark R Bassett, Greg Overton and Steve McNeil "Water Management in Walls with Direct-fixed Claddings" (2015) 38 Journal of Building Physics 560 at 575.

[58] The small gaps literature is, in my view, convincing. Its most accessible exposition is a paper by Jonathan Smegal,[8] prepared for his Masters degree. I understand Dr Straube was the supervisor, and he later co-authored a further article with Mr Smegal.[9] The import of the research is that water can drain through gaps smaller than 1 mm.

[59] The plaintiffs seek to minimise this evidence and research by noting the links between the sources – Drs Straube and Lstiburek, and Mr Smegal. The independence of Drs Lstiburek and Straube is a topic which will be addressed later, but I note first that this is not the only literature on the topic. Dr Straube refers in his evidence to numerous articles and research reports which support and indeed establish the proposition.[10]

[60] It can be noted that two of the other plaintiff witnesses, Mr Lalas and Mr Wutzler, accepted that drainage in small gaps can occur. Mr Wutzler is not a witness who I consider has the requisite expertise in this area,[11] but I note the evidence as indicative of the soundness of the general proposition. Other research supports the evidence of the defendant's experts. For example, an experiment by Onysko and others examined a number of different direct-fixed claddings.[12] A general conclusion of the research was that:

> In most of the above cases some moisture appears to have migrated downward even though the siding should have been tightly clamped to the wall. In typical walls, there are discontinuities in the contact between siding and the wall, as well as between adjacent courses of siding.

[61] The main contest to the drainage theory came through Mr Hazleden. Although I accept his expertise and standing, there were issues with his evidence that cause me

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8 Jonathan Smegal "Drainage and Drying of Small Gaps in Wall Systems" (MASc Thesis, University of Waterloo, 2006).

9 John Straube and Jonathan Smegal "The Role of Small Gaps Behind Wall Claddings on Drainage and Drying" (paper presented at 11th Canadian Conference on Building Science and Technology, Banff, 2007).

10 See, for example, Timothy D Tonyan, Kevin W Moyer and William C Brown "Water Management and Moisture Transport in Direct-Applied and EIFS Wall Assemblies" (1999) 27 Journal of Testing and Solution 219; and William Brown, Peter Adams, Timothy Tonyan and James Ullett "Water Management in Exterior Wall Claddings" (1997) 21 Journal of Thermal Insulation and Building Envelopes 23.

11 I address Mr Wutzler's expertise at [77] and [93]–[94].

12 Donald Onysko, Constance Thivierge, Silvio Plescia and Barry Craig "Drainage and Retention of Water by Cladding Systems" (paper presented at Proceedings of BEST Conference, 2008) at 14.

to accord it lesser weight. Mr Hazleden's evidence was presented through the lens of a design assessment. This in turn brought into play two propositions – his belief it was a face-sealed system, and his design perspective that a system should have in-built overcapacity. Without rejecting it as irrelevant, whether the system is a good design or could be better is much less important from a litigation viewpoint than the issue of whether it can work, or, as the plaintiffs describe it, whether it is fit for purpose.

[62] The key aspect of Mr Hazleden's evidence on the moisture management capacity of Harditex was some modelling work he did. The purpose of the first model was to identify the likely level of water penetration of a Harditex wall in Wellington and in Auckland. A second model then calculated the likely drying capacity of those walls. For the purposes of these models, Mr Hazleden calculated what he believed were the standard weather patterns for these two districts. A sound system would have greater drying capacity than the expected wetting.[13] On Mr Hazleden's modelling, for Harditex in these environments the drying capacity was less than the likely wetting, meaning it was not fit for purpose.

[63] Dr Straube was very critical of Mr Hazleden's modelling. He first argued that it was an inappropriate model to use, and that there were many more suitable models commonly used for this exercise. Dr Straube then made a detailed critique of the assumptions and inputs underlying each of the wetting and drying models.

[64] It is necessary to spend some time on Mr Hazleden's response to these criticisms. First, and most importantly, he made no response to Dr Straube's critiques of the drying model, and in cross-examination he confirmed he was making none. The nature of Dr Straube's analysis was such as to mean the results achieved by Mr Hazleden could not be relied on. Mr Hazleden's lack of response means a Court can only infer Dr Straube's criticisms to be correct. This in turn removes one half of the equation. If the drying model cannot be relied on, then a conclusion that wetting exceeds drying must also be put to one side.

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[13] If one adopted the overcapacity theory, the drying would exceed the wetting by a considerable margin.

[65] Although that is enough to resolve the issue of what probative value to give this aspect of the evidence, it is appropriate to note what happened concerning the other half of the equation, the wetting model. In his evidence, Dr Straube had expressed the view the wetting model was more flawed in its assumptions than the drying model.

[66] Mr Hazleden's initial response to this was not to defend his wetting model, but rather to proffer a wholly different one which he said equally proved his point. This new model was ruled inadmissible.[14] However, when giving oral evidence Mr Hazleden did finally proffer a revised version of his original wetting model. This was intended to respond to Dr Straube's initial criticisms. It was provided to the defendant only the night before Mr Hazleden was cross-examined, but objection was not taken to its admissibility.

[67] The revised model was presented in a confusing and unhelpful way that at times was misleading. For example, it appeared that changes to the original model were highlighted in yellow. However, under cross-examination it emerged that there was in fact several more changes that were not highlighted. Further, there were aspects I consider unconvincing. For example, an issue with moisture management is assessing how much water which gets behind the cladding will ultimately reach the timber framing (and in what form – liquid or vapour). Mr Hazleden modelled on the basis that the amount of water behind the cladding that would penetrate the wrap and reach the timber was 50 per cent of all such water. This was a vastly greater figure than any other figure identified in the evidence. His rationale, which reflects an earlier point about assumptions influencing the evidence, was that there was no drainage in a Harditex wall so the water had to go somewhere.

[68] Overall, my conclusion is that Mr Hazleden's evidence on the moisture management capacity of the Harditex system did not merit weight.

[69] Turning to other evidence on the drainage capacity of the system, a topic of contention was the requirement of the Harditex system for there to be an "inseal" strip just above the base of the sheet along the inside. Its purpose was to limit water

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[14] *Cridge v Studorp Ltd* [2020] NZHC 2185.

splashing up behind the sheet from the ground. The plaintiffs submit it was an obstruction to the alleged drainage paths. Drs Straube and Lstiburek accept this but say water will get by it anyway. Of interest, the main building analyst for the plaintiffs, Mr Wutzler, says in his experience it was a detail "rarely ever used". My assessment of the evidence on this point is that the inseal, when present, would impede drainage but not block it.

[70] In discussing drainage, both parties point to the results of testing done specifically for the litigation. Each side commissioned testing companies to build a Harditex wall and subject it to various water tests. The methodologies and testing procedures were quite different, the outcomes hopelessly so, and I use the adjective advisedly. The structure designed by the plaintiffs failed so dramatically one would wonder that any Harditex house could remain standing. The one built for the defendant worked marvellously, and it is hard to believe a house ever failed. The judgment will need to tackle these tests and will do so. For now, I prefer to analyse the matters without significant reliance on either side's results. I do not dismiss the outcomes completely. Each provides support to their designer's case, and so inevitably one version will support to a certain degree the case I prefer, but other than occasional references to them, I will deal with them in a separate section.

[71] In similar vein to the last comment, whether the houses are examples of the Harditex system's inability to drain needs to be put aside for later consideration. There is no doubt that in these houses water has accumulated in sufficient quantities to cause damage. It is a fair inference that this means that water has not drained away, or has not done so quickly enough, to avoid the damage occurring. That is suggestive of a problem but whether it is a drainage problem turns in part on where the water is coming from and in what quantities.

[72] There is no absolute answer on how much moisture a system should be able to cope with. I do not understand anyone to suggest it should cope with anything nature and poor building can throw at it, but plainly it must be able to cope with expected, and probably a percentage of more than expected, moisture. In this regard, there is validity in the overcapacity point, but ultimately it is just another description for an undefined figure.

[73] Within building science, there are working assumptions as to the expected level of water ingress with a properly built house. The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) is described by Dr Lstiburek as the premier professional organisation in North America dealing with building enclosures. For its various modelling exercises, for this type of direct-fixed cladding system, ASHRAE assumes one per cent of water will penetrate the exterior cladding and then one per cent of that water will penetrate the wrap. This is not anything more than a modelling assumption but gives some insight into the necessary capacities of a system. It also illustrates the somewhat extreme nature of Mr Hazleden's assumption of 50 per cent penetrating the wrap.

[74] My conclusion on this topic is that Harditex has some drainage. It obviously is not as much drainage as there would be with a designed cavity (of whatever width) but drainage nevertheless happens. I am not aware of evidence that James Hardie relied on this drainage capacity as part of its planning, but on the other hand I accept the evidence of Drs Straube and Lstiburek that drainage is what has always happened with direct-fixed systems so long as the building wrap does not adhere to the surface of the cladding.[15] It may be that James Hardie knew or understood these systems drained without exactly recognising the underlying science but what matters for this litigation is that I accept drainage occurs.

[75] There were other witnesses who made general comments on the nature of the Harditex system, and its capacity to manage moisture. Prominent for the homeowners were Mr Sutherland and Mr Wutzler. Mr Sutherland is a very experienced architect who has held various positions within the architecture community in New Zealand. His evidence was the subject of a pre-trial challenge amongst other things for partiality, or the lack of detachment expected of an expert. I reserved final assessment but noted it was a challenge that had a reasonable basis.[16] I do not at this point need to comment further. Mr Sutherland's opinion on this was undoubtedly his view but was, like much of his evidence, more assertion than analysis. It did not cause me to differ from the analysis set out in these paragraphs.

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15 This is something that did happen with some stucco systems.

16 *Cridge v Studorp Ltd* [2020] NZHC 794.

The contribution of the building wrap to drainage

[76] Integral to the small drainage gap theory, and relevant also to the next topic of drying capacity, is the subject of building wraps. The homeowners submit that during the life of Harditex, kraft type building papers were more prevalent in New Zealand than the synthetic wraps now available. A kraft type wrap is tar impregnated cardboard. It is further submitted that these kraft type building papers were never designed for and cannot withstand prolonged wetting, particularly when in contact or clamped.

[77] The homeowners' evidence on this is scant. The only reference provided in the closing submissions is to statements made by Mr Wutzler. Mr Wutzler is a Wellington-based building surveyor with undoubted experience and expertise analysing houses affected by moisture issues. Mr Wutzler has 22 years' experience as a building surveyor and 15 years of that also as a remediation specialist. He has at various times been on the executive on the New Zealand Institute of Building Surveyors and is presently on the Executive of the Building Enclosure Council of New Zealand. He is a special advisor to the Building Practitioners Board which investigates complaints and contributed to a publication focusing on the correct methodology for diagnosing leaky buildings. He has had teaching roles and has presented to industry groups. He is a member of the relevant industry bodies. He is a principal of Helfen Ltd and an owner of Façade Testing New Zealand Ltd (FTNZ), an accredited testing facility which can test windows, curtain walls and building facade systems. FTNZ oversaw the project in which the homeowners constructed a model Harditex wall and tested it.

[78] Mr Wutzler has been used by the plaintiffs to provide evidence on a vast array of topics, the basis for some of which can only be experience and self-teaching. Mr Wutzler claims to have talked to many people within the building industry and to have learned from them. I will address the issue of his expertise more fully later,[17] but at this stage merely observe these caveats. I do not doubt his evidence about damage he has seen to building wraps.

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[17] See [92]–[94].

[79] The starting point is that any building wrap used in New Zealand has consistently been required to meet an unchanged regulatory standard. The homeowners query whether this regulatory threshold establishes a capacity to survive prolonged wetting but do not advance any research to support their doubts. Mr Wutzler says that he has seen these kraft type papers degrade, unlike the more modern synthetic wraps. He is supported in this by Dr Wakeling, a scientist and expert in mould analysis and timber decay who has over the years analysed many samples.

[80] Drs Straube and Lstiburek were more complimentary about the capacity of kraft type building wrap. Dr Straube noted that in North America it was very prevalent in the 1950s and 1960s but had been around much longer. Asked in cross-examination about prolonged wetting, his evidence was:

> A. So the building paper being in contact isn't a problem. I think the concern, not, it's certainly [not] desirable, the risk is how long do you keep it wet. Keep it wet for a week or two, you know, no biggy. Keep it wet for a month or two, probably not a problem. Keep it wet for two to five years, now you have a problem.

And again:

> Q. And building papers of that type are certainly not designed or meant to be kept subjected to prolonged moisture are they?
>
> A. Well they're not – we're describing a highly wet situation for two to five years. They're not designed for that but luckily that doesn't really happen very often and that's the reason why building papers have been used very successfully for, I don't know, 50 plus years. I mean obviously they go back even further than that.

[81] Dr Lstiburek, when asked, considered liquid water would need to be held against a kraft paper type wrap for over a year for it to fail.

[82] James Hardie also relies on a 2002 project undertaken by the Building Research Association of New Zealand (BRANZ) involving a bituminous building wrap which concluded such wraps appropriately resisted liquid water.[18] Likewise, a 2015 study also noted the resistance of building wraps to liquid moisture.[19]

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[18] BRANZ *Weathertightness of Selected Building Wraps* (Report T1070, 30 April 2002).

[19] Bassett, Overton and McNeil, above n 7. The study also observed that drainage was possible but that absorption into the uncoated back of the sheet would occur.

[83] In the end I doubt there is a contest here. A building wrap is required to resist water and does so. It is the case that some older versions of the wrap, the non-synthetic type, were more vulnerable to decay if subjected to prolonged wetting. How much wetting, and for how long, is not established by any science presented to the Court, but I accept the opinion evidence of Drs Straube and Lstiburek that it will need to have been for a long period of time, probably measured in years. This leads me to an assessment that the proposition that the Harditex system has some drainage capacity is made more likely by the longstanding New Zealand requirement for there to be used a water resistant building wrap.

[84] This conclusion as to the contributing role of the building wrap is arguably at odds with aspects of the current regulatory scheme. Within the Code there are methods prescribed by which a manufacturer can establish its product is compliant. These are termed Verification Methods, and one exists for the External Moisture standard. It is E2/VM1 and stipulates that to meet the requirements of the Code:[20]

> no water shall be transferred to the plane of the building wrap or splash onto the building wrap.

[85] This standard obviously involves no reliance at all on the water resistant qualities of the wrap, and indeed seems designed almost to protect it. It is somewhat unexpected given the longstanding requirement that wrap be water repellent. Dr Straube says there is no science underlying that standard and he is unaware of it being replicated in any other jurisdiction. Mr Hazleden agreed with both propositions. I am satisfied that whatever the reason for New Zealand adopting such a standard, it does not undermine the reality of a wrap's capabilities (and indeed its purpose).

[86] Finally, for clarity I observe that my conclusion about drainage capacity is not a suggestion that all the water will drain away. It is one route of getting the moisture out. As will be seen in the next section, some of the moisture will not drain but will absorb into the back of the fibre-cement sheet. Other of the moisture will no doubt find its way in liquid form into the timber frame through perforations in the wrap such

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[20] Ministry of Business, Innovation and Employment *Verification Methods E2/VM1, and Acceptable Solutions E2/AS1, E2/AS2, and E2/AS3 for New Zealand Building Code Clause E2 External Moisture* (3rd ed, 5 November 2020) at 24.

as those caused by the wrap staples and by the sheet nails. Also, if there are greater amounts of water than there should be, then the wrap may well eventually decay, especially the older paper-based wrap, which will further allow water to access the timber framing. The limit of this conclusion is that the building wrap can and does contribute to drainage.

Capacity to dry

[87] Drying addresses the capacity of the system to retain and expel any liquid that has found its way behind the cladding and has not drained away. This involves consideration of the ability of the timber framing and the Harditex sheet to dry. Concerning wood, there is very little dispute as to the science. Concerning the Harditex sheet, there may be a greater level of disagreement but again the picture is reasonably clear.

[88] For wood, the saturation level is at 28 per cent moisture content. At that level decay will start to occur unless the moisture content is brought down. Dr Wakeling testified that timber requires a 30 per cent moisture content for two to three weeks before it decays. Conversely, Mr Hazleden considered it might take as much as three months at that moisture level before decay occurs. Even accepting the shorter timeframe proffered by Dr Wakeling, the point to be taken is that decay is not immediate. Once decay has started, the process will continue until the moisture content drops. How far it needs drop to stop the decay process was the subject of mixed views, but two specialists in the topic suggest it will stop once moisture content drops back below 25 per cent.

[89] There are rules about the permissible moisture content of timber framing. Until 1999 the regulatory scheme allowed timber framing to be enclosed with a moisture content in the range of 18–24 per cent. However, from 1999, 18 per cent was the maximum permissible level. The timber framing, once enclosed by cladding, will then dry out until it reaches an equilibrium moisture content point of 12 per cent.

[90] The JHTI specified that Harditex should not be affixed to timber framing with a moisture content greater than 24 per cent. When the regulation changed in 1999 to require no greater than 18 per cent moisture content, James Hardie failed to update its

literature. So for a period there was a conflict between the JHTI which permitted 24 per cent and the regulation which mandated 18 per cent or less. Other than being an example of carelessness in the JHTI, the conflict was in my view a non-issue. The regulatory scheme prevails. Builders know that. There was no evidence to the contrary. The JHTI also said as much (in an admittedly contradictory way) in so far as it required that the timber framing must comply with the relevant standard, NZS 3604.

[91] Turning to the Harditex sheets, an uncoated sheet is absorbent. More of the water getting behind the cladding is likely to absorb into the sheet than it is to drain away.[21] As noted, the homeowners plead this absorbency as an inherent defect; the defendant counters that it is a good thing and an important aspect of the moisture management system. Water is safely absorbed in the Harditex sheet until it leaves as vapour.

[92] A key plaintiff witness on this topic was Mr Wutzler. As previously noted, he is a Wellington-based building surveyor and remediation specialist. He is a director and shareholder in Helfen Ltd which provides expert advice on issues concerning building failures, and manages remediation projects. He is undoubtedly very experienced in the area of assessing water damaged houses, and what is needed to fix them.

[93] Mr Wutzler's standing as an expert is not through formal qualifications. He has one trade certificate. He is not an experienced builder but he understands residential buildings, how they work, what the risk points are and where they fail. He is very experienced at looking at damaged houses. He has undoubtedly learned a lot, and he has no doubt read a lot in preparing his evidence for this case and others like it. Mr Wutzler's evidence covers a vast range of matters. Not only detailing what he has found in the houses, and what is needed to fix them, Mr Wutzler comments in detail on the mechanism of failure. He is probably the homeowners' main witness on these things. Mr Wutzler gives evidence, for example, on how water travels within

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[21] See for example Stephen McNeil and Michael Bassett "Moisture Recovery Rates for Walls in Temperate Climates" (paper presented at 11th Canadian Conference on Building Science and Technology, Banff, 2007).

the building enclosure, how it enters the Harditex sheet and system through various components, and what it does when in there. He interprets patterns on the back of Harditex sheets as disclosing water paths. Indeed, he comments on most aspects of the building science issues.

[94] The defendant makes a strong challenge to Mr Wutzler's expertise and capacity to give a significant proportion of his evidence. I also have considerable reservations about the scope of his evidence given his relatively narrow formal training and sparse building experience. When it comes to matters of building science, I regard Mr Wutzler's opinions as coming from a limited base. His views are vulnerable to competing evidence from truly qualified witnesses who have demonstrable expertise in these matters. Two such witnesses are Drs Straube and Lstiburek. There are no occasions where I consider Mr Wutzler understands the science better than them, and whenever there is a conflict I prefer by a margin the evidence of Drs Straube and Lstiburek. I accept Mr Wutzler's evidence about actual observations but if, for example, Drs Lstiburek and Straube say that his suggested mechanism for failure is scientifically not possible, I unhesitatingly accept their evidence.

[95] Generally on the topic of drying, it is clear that a ventilated system, which Harditex is not, works best. However, Dr Lstiburek pointed out there are many successful systems that have neither drainage nor ventilation. A solid masonry wall is one such example. Although there may be better systems than Harditex, the trial issue is whether the Harditex system has sufficient drying capacity.

[96] The evidence of Drs Straube and Lstiburek is that the moisture within the Harditex sheet can only leave as vapour. It will not leave as liquid moisture. The vapour can leave the sheet in either direction. This is determined by season – in summertime it will head inwards; in winter towards the exterior. Vapour leaves less effectively to the outside because of the inhibiting effect of the external acrylic coating. By contrast, the fibreglass insulation used in walls (such as Batts) is generally more vapour permeable than wrap, and so allows vapour to travel to the inside with little impediment. A character change from vapour to liquid moisture on contact with the interior gypsum board is possible and occasionally happens, but normally the moisture just diffuses through the gypsum to the inside as vapour.

[97] The primary contrary evidence from the homeowners on this drying capacity was that of Mr Hazleden, and I have previously explained why I do not accept his evidence. Accordingly, I accept the defendant's evidence that the Harditex system has a sufficient drying capacity. That is not to say it is a perfect system, nor that it could not have been improved. Rather, I reject the homeowners' case that from a building science viewpoint it is flawed.

[98] This conclusion has accorded considerable probative value to the evidence of Drs Lstiburek and Straube. However, there is other evidence supportive of this conclusion. There are, for example, computer models available that can predict or simulate the behaviour of materials within a building enclosure. Perhaps the most prominent of these is the WUFI system.[22] It predicts heat and moisture transport within and through a building envelope. WUFI analysis was undertaken in this case by Ms Hugens for the homeowners, and Drs Künzel and Straube for James Hardie. There is a degree of dispute between these witnesses over the outcome of the modelling in terms of whether the Harditex system creates a concerning potential for mould growth, but as regards the system's moisture management capacity there is largely agreement.

[99] Ms Hugens, the homeowners' expert, agrees any moisture that enters the building wall enclosure will not accumulate but rather will increase and decrease in volume. The rate at which it does this depends on the season, but moisture within the Harditex system will dry out. Ms Hugens also agrees the modelling shows there is no risk of condensate run-off developing or occurring within the walls. These conclusions mirror the science analysis of Drs Lstiburek and Straube.

[100] These results of a universally recognised computer modelling system reinforce the earlier evidence that the moisture balance of the Harditex system is fundamentally sound. If the wall is built properly with only expected levels of moisture penetration the system could cope with such moisture.

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[22] Wärme Und Feuchte Instationar.

Other systems

[101] I conclude the moisture balance analysis by briefly summarising the evidence of Drs Straube and Lstiburek on comparable systems. There were two aspects to this evidence – a description of comparable systems that similarly succeed, and an identification of the differences between the Harditex system and those systems that have led to leaky home crises elsewhere. This latter evidence is interesting, but not crucial to this case so will be dealt with briefly.

[102] Dr Lstiburek notes three systems that in his view are comparable to Harditex and which are recognised as having acceptable moisture management characteristics. The first he terms a three-coat stucco system which has been used for decades in New Zealand, Australia, Canada and the United States. Its drainage path was essentially the same as Harditex's. Dr Lstiburek then refers to two other common North American direct-fixed systems which use either a plywood sheet (T1-11) or now LP-Smartside. The latter is the primary system used by Clayton Homes which is described as the largest manufactured home builder in the United States. Similar to Harditex, both systems involve direct nailing the board over a wrap onto a timber framing.

[103] Mr Hazleden dismissed these comparisons as irrelevant, essentially because of climate differences. However, no evidence to support this alleged climate difference was proffered, and there seemed to be acceptance in cross-examination that some of the areas where these products were used were indeed comparable to New Zealand.

[104] The value of this comparative evidence, not to be overstated, is that it provides a cross-check of the core evidence about Harditex. It is a sound analytical approach to identify whether there are other successful examples of this type of system. Likewise, Dr Lstiburek provides by way of elimination evidence, an explanation of why failures have occurred elsewhere. His evidence shows that there are inherent features in the design of these failure systems – which occurred in Vancouver, Toronto, North Carolina, Minneapolis, Minnesota, Boston, and Seattle – which are not present in Harditex. Dr Lstiburek advises he has been involved with all those areas and in resolving the weathertightness problems. He accordingly speaks with a significant degree of direct knowledge of those systems.

[105] I accordingly regard the WUFI computer analysis, and the evidence about comparable systems, as supporting the earlier conclusions based primarily on the evidence of Drs Straube and Lstiburek about the adequate moisture management capability of Harditex.

Independence of Dr Lstiburek

[106] The homeowners submit that serious doubts exist about the admissibility of Dr Lstiburek's evidence, or the weight to be attributed to it, because of non-disclosure by him of his longstanding involvement with James Hardie. What follows may seem an overly long analysis of this challenge, but it is necessary and appropriate. First, Dr Lstiburek is an important witness on whom the Court places considerable reliance. Further, the independence challenge was in fact the homeowners' main challenge to Dr Lstiburek's evidence (as opposed to contesting the substance of it).

[107] I begin with Dr Lstiburek's written evidence and what was disclosed there about his relationship with James Hardie. Given the challenge, it is preferable to set out the paragraphs in full:

> First brief:
>
> 11. I have visited New Zealand in a professional capacity on five occasions and visited numerous building sites in Auckland. As well as advising James Hardie New Zealand (*James Hardie*) on weathertightness issues, during these visits I gave presentations on weathertightness and water management to BRANZ, the BIA, several territorial authorities and other participants in the building industry.
>
> 12. I was first engaged by James Hardie as an independent expert witness in relation to weathertightness issues in New Zealand in 2003, in relation to a claim in the Auckland High Court known as Burton Street (*BC No. 204299 & Ors v Approved Building Certifiers & Ors*: CP No 399/SD02). I first became familiar in detail with the opinions of Mr Wutzler and Mr Lalas in relation to the Harditex product in about 2010.
>
> 50. I have not visited the lead properties owned by the plaintiffs, or the other sample properties relied on by the plaintiffs. However, I have visited New Zealand five times in a professional capacity in relation to weathertightness issues. I visited numerous building sites in Auckland during those visits, including a large multi unit development clad in Harditex known as Burton Street and (in later visits) two other large multi unit complexes known as Eden Residential and Eden 2. I also spoke to a

large number of consultants and other stakeholders with an interest in the "leaky building" crisis which was unfolding in New Zealand.

And Reply brief:

86. In paragraph 99 of my first statement of evidence I mentioned that I demonstrated drainage over a building wrap over open wood stud framing in a simple experiment in Auckland in 2003.

87. That simple experiment was set up with my assistance on site by a former James Hardie employee, James Gleeson. At the time, Mr Gleeson was the Research and Development Manager for the Asia Pacific Region. I asked Mr Gleeson to construct a frame wall, install a building wrap over the frame wall and install a sheet. The simple idea was to add water at the top and collect it at the bottom. I was present when Mr Gleeson did a preliminary test that clearly showed drainage. I attach my photographs in Appendix A which show this preliminary test.

88. I was satisfied that the test, while basic, was useful and asked Mr Gleeson to do a more controlled series of tests. Those controlled tests were described in three Test Reports prepared by Mr Gleeson dated 24 February 2004 which were sent to me in February 2004. I attach these Reports in Appendix B which I only recently recalled had been sent to me. The three different tests referred to in the Test Reports varied the amount of water added. I also include in Appendix B a brief of evidence from Mr Gleeson which refers to the same tests which I understand was prepared for a case which settled in 2004 known as Burton Street (CP No 399/SD02).

89. I consider it appropriate to mention that I am aware of the three Test Reports and Mr Gleeson's brief of evidence in view of the fact that I am giving evidence about the closely related preliminary test I observed and assisted with and in view of the comments in my evidence on the recent testing undertaken by RDH.

90. I will not refer to the test results in any detail as I was not present when the final tests were conducted, but I can say that like the preliminary test sample which I observed directly, the tests clearly showed drainage and demonstrated the [significance] of the building wrap in that regard. The tests do not attempt to also demonstrate drying. I also comment that the results are consistent with the more recent and sophisticated tests conducted by RDH and referred to in the evidence of Mr Schumacher. In 2004 there was no accepted rate of water addition or test method.

91. The key point with the tests I refer to above is that all of the test sample assemblies drained.

[108] The homeowners submit this evidence significantly underplays what was in fact an extensive relationship, described by them as "a longstanding consultancy (including technical advisory)".

[109] It is first said Dr Lstiburek accepted in cross-examination that he should have included James Hardie in his list of building product manufacturer clients. In this regard Dr Lstiburek stated:

> I am a consultant to numerous manufacturers of building materials and products including Dupont, U.S. Gypsum, Georgia Pacific, Dow, Certainteed, Carrier, Fortifiber, Masco and Greenfiber, all of which are Fortune 500 companies.

When it was put to him James Hardie should also have been there, Dr Lstiburek said James Hardie was a minor, insignificant client over the last 20 years.[23] He also said he did not think his involvement with James Hardie was a secret to anyone in the case:

> I didn't think it was unknown that I had done work for James Hardie over many decades.

[110] Next it is submitted by the homeowners that in cross-examination Dr Lstiburek confirmed at trial a previously non-disclosed involvement in the Harditex Improvement Project. This was a project initiated by James Hardie in the late 1990s and was, as its name suggests, an examination of how Harditex could be improved and what its place was in a changing market. Dr Lstiburek elaborated that James Hardie had asked him many questions on building performance and he told them what things he thought were important, and what issues should be addressed.

[111] I observe there was no attempt to clarify with Dr Lstiburek the details of his involvement. Dr Lstiburek's first recorded visit to New Zealand was in 2003 when the Harditex Improvement Project was certainly coming to an end. The evidence does not support a submission Dr Lstiburek was involved in any meaningful way. Dr Lstiburek says that at the time of that visit, as well as James Hardie he talked to many people about these same issues, including territorial authorities.

[112] Next the homeowners submit:[24]

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[23] Concerning this topic, the Notes of Evidence record Dr Lstiburek as saying: "It's an error on my part, I apologise". Counsel for the defendant note their recollection is that the answer was in fact "If that's an error on my part …". Nothing particular turns on this, but I record that the defendant's recollection is my very clear recollection as well. The reality is that Dr Lstiburek did not think his past involvement with James Hardie was either noteworthy or unknown, and he made this plain.

[24] Footnotes omitted.

> Dr Lstiburek confirmed that he was involved with "James Hardie sponsored work" during this period. Dr Lstiburek confirmed that he had been "*very involved*" with Mr Gleeson of James Hardie on weathertightness matters. Dr Lstiburek stated that he had met with Mr Knox and Mr Gleeson of James Hardie "*on numerous occasions during my visits and I think 2003 onwards and so I was, not insignificant discussions with Mr Gleeson and Mr Knox over this time period."*

[113] Further analysis of this is required. A document was put to Dr Lstiburek in cross-examination that he had not previously seen. It was an internal James Hardie document, undated and without an identified author. It appeared to be, as suggested to Dr Lstiburek, a document from the early 2000s and was an overview of New Zealand's weathertightness issues and how James Hardie was being impacted by those issues. In a section of the document headed "Product Development – James Gleeson" the document records that there are key projects happening, one of which is the:

> JH sponsored work by Dr Joe Lstiburek of Building Sciences into weathertightness (that includes the construction of a test hut on our Penrose site as well as in other locations around the world).

Later, the document refers to Dr Lstiburek's "expert third party verification" of James Hardie's products.

[114] Two aspects of this document were explored with Dr Lstiburek. The first was the Penrose test hut mentioned in the extract. Dr Lstiburek said the document was "totally mistaken" and he did not have involvement in it. He recommended that Dr Straube and Mr Schumacher be used. He agreed, however, he was involved with Mr Gleeson in general weathertightness matters. This was from 2003 onwards. The paragraphs earlier set out from his written brief refer to working with Mr Gleeson. My assessment is that the document overstates Dr Lstiburek's role, and I accept his contrary evidence.

[115] Many other matters of a similar nature are raised by the homeowners. There is, for example, an internal document that observes that Dr Lstiburek's assistance with 2003 litigation (why he was visiting then) was also proving beneficial to product development. The same document comments that James Hardie could extract some marketing advantage from using Dr Lstiburek's name. It would demonstrate James Hardie's commitment to resolving current problems in New Zealand. I do not consider

the document, which sets out the thoughts of someone within James Hardie, demonstrates any unknown participation by Dr Lstiburek.

[116] Two other matters relied on by the homeowners merit some comment. The first is a claim that Dr Lstiburek was involved in a test hut project in Vancouver in which James Hardie was also involved. I am unsure if the point is that he was involved, or that it was not disclosed. Either way, it is necessary to set out Dr Lstiburek's evidence on this which was not really challenged and which I accept. Concerning this proposition, Dr Lstiburek advised:

(a) the purpose of the hut was to explore the reasons for the Vancouver condo crisis;

(b) it was a project of $150,000 between him and a Vancouver construction company. He personally contributed $70,000;

(c) there was no contract between him or his firm and James Hardie, and he received no money from James Hardie;

(d) some materials were supplied by James Hardie to the construction company which built the hut;

(e) Dr Lstiburek's firm provided some subsequent analysis of the results. It did not charge for this work; and

(f) James Hardie, along with other contributors, were noted on the report as a professional courtesy for supplying some material. Manufacturers who supported investigations into building failure should be acknowledged and encouraged, and that is what the report did. It was not a James Hardie initiative or project.

[117] The second matter on which comment is needed is the correct proposition that Dr Lstiburek's name and reputation have been used in James Hardie promotional material. The documents are two James Hardie brochures which promote its fibreboard products. Within those brochures Dr Lstiburek is quoted as praising the

qualities of fibre cement as a cladding material. The evidence is that the quote is a past statement of Dr Lstiburek's that is being re-used, rather than any comment he made specifically for the brochure. That said, Dr Lstiburek accepts he would have given his permission for James Hardie to use it. He says he has done the same thing for other cladding manufacturers and gives two examples. He does so when asked because he endorses fibre cement as a desirable cladding material from a weathertightness viewpoint. It is endorsement of a material not a specific product.

[118] As I understand the homeowners' overall submission, the challenge is more to Dr Lstiburek's independence than to the partiality of his evidence, but I will consider both. On independence, the homeowners cite this passage from *EXP v Barker* where the appellant had a professional connection to the expert witness:[25]

> [The Judge] considered that the witness had so compromised his approach that the decision to admit his evidence was finely balanced, and that the weight to be accorded to his views must be considerably diminished. In my view he was fully entitled to take that view. Indeed, had he decided to exclude [the expert's] evidence entirely, it would in my view have been a proper decision. Our adversarial system depends heavily on the independence of expert witnesses, on the primacy of their duty to the Court over any other loyalty or obligation, and on the rigour with which experts make known any associations or loyalties which might give rise to a conflict. [The expert] failed to do so here, despite an express direction to that effect. Indeed, the omission of mention of papers co-authored with [the appellant] points in the other direction.

And from the lower Court in the same case:[26]

> Failure to make early disclosure, particularly of an obvious conflict, also tends to raise a natural suspicion that the default was not inadvertent, and to reinforce the court's concern that the witness has, most exceptionally, become so compromised that the evidence must be altogether excluded.

[119] The matters which it is said Dr Lstiburek failed to disclose are his involvement in the Harditex Improvement Project, his advice to James Hardie on building matters and improvement, his involvement in the test hut, and that his work provided a basis to influence regulators and politicians on the strength of James Hardie's position.

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25 *EXP v Barker* [2017] EWCA Civ 63 at [51].
26 *EXP v Barker* [2015] EWHC 1289 at [58].

[120] Concerning influencing regulators, the basis for this proposition is another internal James Hardie document detailing that this is potentially how the unidentified author thinks Dr Lstiburek's work on the case could be used. It is instructive to cite from the evidence the relevant question and answer:

> Q. Go to the top of the next page. Just go back please to where we were at the bottom of the previous page. So there's a reference to you and to work you are doing on what they describe as their legal case and research projects and they raise the possibility of your work being communicated with regulators and elected politicians to demonstrate both the strength of James Hardie's position and their commitment to the solution, good corporate citizenry, et cetera and also to convince territorial authorities and insurance interests that direct fixed cladding remained a viable material. Now that's what it says. Do you agree that your role was to assist with those objectives in mind?
>
> A. Well this was never explained to me in this manner, but I was certainly helping them with legal matters and I was certainly helping them with trying to improve their products and reduce risk. And this is what I do with not just James Hardie but almost everybody.

There is no basis in this evidence to suggest Dr Lstiburek was engaged to help influence regulators and politicians, or that he knew this was how he was being used. The homeowners' reliance on it reflects, in my view, that there is a large degree of overstatement of the actual evidence.

[121] Although I consider there is little in this challenge to Dr Lstiburek's independence, it is important to put it in context. This is a case where numerous witnesses for both sides have past connections with the players in the litigation. They have either been instructed in litigation where James Hardie was the defendant or they have been instructed by James Hardie in its defence. A contact or past relationship, still always requiring to be considered, is far from an uncommon thing in this litigation. At least 10 witnesses have prior involvement.

[122] In relation to involvement with James Hardie New Zealand there was no material non-disclosure. Dr Lstiburek said he was here helping with a case, he said he was working with Mr Gleeson, and he said he had been to New Zealand five times. He further said that on his visits he met with various groups, including regulators, to talk about weathertightness issues. That he also talked to James Hardie about those topics seems a rather obvious proposition.

[123] I do consider Dr Lstiburek should have disclosed any relationship with James Hardie abroad, and that appearing in a promotional brochure is always a basis for concern in terms of independence and partiality. However, I note two caveats – Dr Lstiburek was endorsing fibre cement as a material rather than a specific James Hardie product and he advises that he has also done so for other manufacturers which he named. The quote used in the brochure was a previously available statement, and overall it is a benign example of endorsing a relevant building material.

[124] Finally, it is relevant to consider Dr Lstiburek's standing and reputation, and how he gave evidence. An insight into his reputation comes from that internal James Hardie document previously discussed. The unknown author thought the mere fact that Dr Lstiburek was involved would display to the world a commitment on James Hardie's part to weathertightness solutions. That reflects that Dr Lstiburek is a world leader in building envelopes and weathertightness.

[125] Dr Lstiburek was an excellent witness. He came across as an enthusiast for the science of building envelopes and what makes them work. His expertise was apparent, and he answered questions directly and fairly. He was not an advocate and did not seek to be one. It is fair to observe, and a careful subsequent review has not changed me on this, that he was not significantly challenged on the substance of his evidence. There was instead a considerable focus on these independence issues but thereafter a somewhat gentle exploration of some topics which did not in any way undermine the strength of his evidence, nor particularly seek to. I accordingly reject the homeowners' submission that his evidence should be given reduced weight.[27]

[126] I mentioned earlier that there were some similar criticisms made of Dr Straube, and observations about James Hardie's involvement in the small gaps research. The evidence did not, in my view, suggest any significant James Hardie involvement in

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[27] The parties approached me prior to the case with an agreed position concerning the obligation to put the case. The essential proposition, which I endorsed, was that to make the length of the proceeding manageable, counsel would be flexible as to how much contrary evidence needed to be put. It was a sensible suggestion and was followed. I mention this so it would not be thought I have overlooked it when commenting on the lack of challenge to Dr Lstiburek. There can be no dispute that his was pivotal evidence, and the lack of challenge to it was notable, at the time and still. I consider an inference that the substance of his evidence could not be seriously challenged is available and appropriate.

that research (perhaps not surprising since the homeowners' case is that James Hardie did not think about drainage). The closing submissions did not mount the same sort of sustained challenge to Dr Straube as was done in relation to Dr Lstiburek. I note for the record, however, my conclusion would have been the same. Drs Straube and Lstiburek have obviously worked closely over the years but this is apparent. Again Dr Straube was a very good witness who addressed questions appropriately, and whose command of the area was very apparent.

Conclusion

[127] My conclusion is that the Harditex system has not been shown to be conceptually flawed from a moisture management perspective. Rather, the way it manages moisture reflects well-established principles of moisture management. The contrary evidence was not convincing, and it is notable that current software modelling reaches the same conclusion. The evidence did not cause me to believe relevant James Hardie personnel understood all the mechanisms by which the moisture management was achieved,[28] but that it worked and had done so with sheet systems for a long time was understood.

[128] I accordingly reject the existence of inherent defects one and three.

Durability

[129] The second building science topic is durability. This is an inquiry into whether the Harditex sheet itself is fit for purpose. The homeowners' case is that it is susceptible to mould and decay, and that it breaks down. The regulatory context is that the sheet is required to perform its function for 15 years. However, if it is a bracing element of the house, which Harditex can be, it should last 50 years. Whether the sheet is used as a bracing element has nothing to do with its composition. It will be the same sheet either way, so that is the relevant figure.

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[28] I do not mean by this to diminish the technical expertise of those involved. I consider witnesses such as Mr Cottier to have an extensive understanding of the product, much in the same way as Dr Akers, a plaintiff witness involved in developing a similar European product.

[130] The topic of testing comes up in this section. Plainly when a new product is released on the market, it cannot have an established history of performance, let alone 50 years of such history. There are various methods used to accelerate the wear and tear a product can be expected to encounter so as to provide a reasonable basis on which to assess likely performance.

[131] The trial evidence discloses that on some occasions, in some places but particularly at the base of a sheet, a sheet has failed in that it can be easily broken off and at times appears almost to crumble. The parties are agreed this should not happen. As I understand it, depending on the extent of such damage and where it occurs, it is not necessarily a critical failure, but it would at least require replacement of the sheet. If, of course, the failure has exposed the underlying timber framing to moisture which has in turn started to decay, then it is a very significant issue.

[132] The homeowners say the state of these sheets discloses an inherent flaw with the product. James Hardie says they are isolated occurrences probably explicable by excessive liquid moisture. This easy summation of the issue masks some complex scientific evidence concerning the alleged mechanisms of failure. I have decided the best structure is to analyse the issues as presented by the homeowners in their closing submissions.

[133] The homeowners identify, through Dr Wakeling, two mechanisms either of which could explain why this sheet failure happens. Either would represent an inherent flaw in the composition of the sheet. The first alleged mechanism is that the wood fibre component is subject to fungal attack and decay. Put simply, the board rots from the inside because its cellulose comes from wood fibre. The second alleged failure mechanism is termed "differential movement", which is a nascent theory of Dr Wakeling's. It focuses on the relationship between the wood fibres and the cement matrix in which they sit.

[134] This section on durability has undergone a belated rewriting. In circumstances explained in the Appendix, further evidence was admitted by consent in June this year. An application to recall a witness was declined, but an opportunity for submissions on the new evidence – a collection of 33 internal James Hardie documents – was given.

[135] Although it is an unusual approach, on reviewing the draft I decided it would be best at this stage to leave my initial conclusions expressed as they were, even though they might have been modified in how they were expressed if I had had the new evidence. The discussion of the new evidence is addressed in an extra section under this topic of durability.

The composition of a Harditex sheet

[136] A Harditex sheet consists of:

(a) seven per cent cellulose fibres, which are fibres from *Pinus radiata* that have been through what is known as the kraft process. That process removes most of the lignin from the wood fibre;

(b) 28.5 per cent cement;

(c) 60.7 per cent silica (broadly speaking, sand);

(d) 3.5 per cent alumina trihydrate (an addition during early development to overcome cracking issues); and

(e) 0.3 per cent pigment (to colour the sheet pink).

[137] The kraft process referred to in (a) has been around since 1884. It is not necessary to detail it. It removes almost all of the lignin in the wood fibre. Lignin is a food source for decay fungi, as are some of the sugars and hemicellulose also removed by this kraft process.

[138] The cellulose fibres used in Harditex are converted (by the third party doing the kraft process) into sheets. These sheets are then further refined by James Hardie by a spinning process that separates the cellulose into individual fibres. These now individual fibres emerge with fine hair-like fibres on their surface which in turn improves bonding with the other materials when mixed together. All the sheet's materials are added together to form a slurry. This is made into very thin films which are then layered on top of each other. The number of layers determines the thickness

of the sheets (generally 7.5 mm but some 9 mm were made). The evidence describes the sheet as emerging from this process like a sheet of wet cardboard. Trimmed to size it is then left to pre-cure for several hours before autoclaving.

[139] Autoclaving is one of the two main processes used worldwide in relation to fibre cement. This involves subjecting the sheets to a controlled pressure cycle at around 180 degrees Celsius for eight hours or more. The process causes the calcium in the cement to react to the silica so as to form the cement matrix (calcium-silicate-hydrate – CSH). CSH exists in different forms or phases. The autoclaving process produces a crystalline form called Tobermite which is a stronger form and contributes, James Hardie says, to the durability of the board. The cellulose fibres bond chemically to the Tobermite, which is why it is called a fibre-cement sheet.

Fungal decay as a failure mechanism

(i) A discussion of the trial evidence and the original closing submissions

[140] There is a significant dispute here between the experts over whether fibre cement is susceptible to fungal decay. James Hardie says it is not because the high alkalinity of the cement matrix prevents it. Dr Wakeling contends otherwise and says he has seen decay within fibre cement on numerous occasions. He is supported in this by another plaintiff witness, Ms Burnie, who produced photos of slides said to depict such decay happening. Dr Wakeling agrees that it is the correct interpretation of the slides. The defendant experts disagree.

[141] Dr Wakeling, whose evidence is subject to sustained challenge by the defendant, is an expert in the biodeterioration of wood. He says he specialises in the decay of timbers in buildings and other wooden structures caused by fungi and other biodeteriogens. This has led to him analysing and providing advice in the leaky home context. Dr Wakeling advises that he has, in this context, examined samples of cladding and other materials.

[142] Of Harditex, Dr Wakeling says he has analysed several thousand Harditex samples, and a similar number of samples of "proximal building materials" by which

is meant, as I understand it, the building wrap and the timber framing.[29] He concludes "with a very high level of confidence" that the Harditex cladding system lacks the minimum performance criteria required by the Building Code. He then gives a very broadly expressed opinion that the move from asbestos to:

> … the highly perishable and dimensionally unstable wood fibre, was an irrecoverable step to widespread systemic failure, a failure I have now recorded in thousands of Harditex samples across hundreds of buildings which are representative of thousands more buildings.

[143] The essence of Dr Wakeling's evidence is that, notwithstanding the kraft process, the cellulose fibres remain wood fibres and are to be analysed from that viewpoint. The removal of the lignin, which is a protective layer over the fibres, makes the fibres more vulnerable.[30] The Harditex sheet is absorbent so the vulnerable fibres will be exposed to moisture and become wet; therefore decay is inevitable and predictable.

[144] The key disagreement concerns the impact of the cement component on the refined wood fibre. The cement mix is highly alkaline, and alkalinity at a certain level prevents rot fungi from surviving. While it is agreed that the high (pH) level of the mix will decline over time, it is argued by the defendant that it does not get to the level which would allow rot fungi to survive. It is this quality that underlies the James Hardie claim that Harditex "never rots or decays". It is a statement about fibre cement generally. The corollary of this is that if something causes the alkalinity to drop too low, the fungi can survive. This is the position of both James Hardie's experts and Dr Akers. If, for example, the cement matrix breaks down with a resultant decline in pH levels, then the protection against fungi attacking the cellulose is lost.

[145] Dr Wakeling disputes that the pH level will stay that high, but also advances the proposition that the wood fibres form an interconnecting network within the

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[29] Dr Wakeling during his evidence made various claims involving figures such as thousands. The defendant in its closing has analysed these claims to demonstrate the exaggerated nature of them. I accept the defendant's analysis – the point was obvious when the evidence was being given. It does not require further comment.

[30] In their closing submissions, the plaintiffs state that a defendant expert, Dr Spiers, agreed with this "more vulnerable" comment – NOE 5840/5. This is to take an answer out of context. Dr Spiers agreed the fibre if left exposed would be more vulnerable "if it hadn't been subject to boiling and alkalinity … it's not that susceptible at all."

cement matrix. This network allows the fungi to migrate from fibre to fibre without engaging with the cement matrix. Dr Wakeling says he has seen decay fungi within Harditex on hundreds of occasions. He, however, produced no imagery of this for others to observe and comment on. When queried on this, Dr Wakeling's answer in part was that you need a lot of experience to recognise what it is that he is recognising in these samples.

[146] Dr Wakeling at one point advanced the proposition that Harditex should be classified as a wood product. He then referenced New Zealand standards applicable to wood products with a view to showing how Harditex was non-compliant with those Standards. NZS 3640:2003 applies to round and sawn timber. NZS 3602:2003 applies to wood-based products, being products made primarily from wood or wood fibres. It was a surprising and not credible proposition that these Standards apply to fibre cement. Dr Wakeling's analysis seemed premised on the idea that fibre cement contained "wood" without sufficient recognition of the process to which the wood fibres had been subject. I accept this kraft process may not mean the fibres lack all the properties of wood, but the approach taken by Dr Wakeling was not helpful.

[147] This leads to a more general assessment of Dr Wakeling's evidence. I have noted the evidence is subject to strong attack, and I observe I agree with most of the criticisms. It is necessary to consider them in some detail as Dr Wakeling's evidence was central to the plaintiffs' claimed inherent defect five.

[148] There is a body of published literature that supports James Hardie's position that fibre cement is at very low or no risk of fungal decay.[31] In advancing his contrary thesis, Dr Wakeling in his initial brief made no reference to any of this literature, or indeed to any literature supportive or otherwise of his evidence. This is itself surprising in an area such as this, but Dr Wakeling's style was to assert.

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[31] See for example W R Sharman and B P Vautier "Accelerated durability testing of autoclaved woodfire-reinforced cement-sheet composites" (1986) 3 Durability of Building Materials 255 at 273; and Marcia Shirakawa, Edson Aihara, Cleber Dias, Christine Gaylarde and Vanderley John "Fungal Colonization on Fiber Cement Exposed to the Elements in a Tropical Climate" (paper presented to 11th International Conference on Durability of Building Materials and Components, Istanbul, May 2008).

[149] When challenged in cross-examination about this initial lack of supporting material, Dr Wakeling said he did not dream that anyone would contest the proposition that perishable kraft pulp fibre would not decay. This was also surprising. The case context, of course, is not about perishable kraft pulp fibres in some suspended state, but about such fibres within the cement matrix of a fibre cement board. If it was not appreciated that this was contested, Dr Wakeling knew insufficient about the case to be giving evidence.

[150] Dr Wakeling produced a second brief, which was a response to the literature relied on by the defendant's experts:

> Q. But you'd agree you don't refer to any literature in your first brief of evidence. You only refer to literature in the second brief because the evidence of the defendants' witnesses that say there's literature and you didn't respond to that, agreed?
>
> A. Well, that was partly because the – it seemed to be suggested that a perishable draft pulp fibre would not decay which to me was such a surprise, *I was then forced to produce work from other people to say that it did, …*

[151] Dr Wakeling's use of the literature to which he refers has become a second focus of challenge. The papers he refers to as supportive of his theories stand for the opposite proposition to that which he advances.[32] Some extracts will make the point. The emphasis is mine.

[152] In a paper by Parameswaran and Bröker[33] the authors examined the micromorphology of cement bonded insulation boards and wood-cement blocks which had been in use for 25 years. They also considered a wood-cement composite that had been in the ground for 30 years. The authors observed:

> The first two samples showed no structural changes in the wood tissue. The sample taken from the ground, on the other hand, showed colonization by fungal hyphae of the outermost 2-3 mm: the wood cells were degraded, showing decay patterns resembling soft rot and white rot. The inner sections of this sample were, however, completely free from fungal hyphae and showed

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32 In making this statement I am not overlooking the plaintiffs' closing submissions on these articles. The plaintiffs seek to support Dr Wakeling's interpretation. Counsel's reading of the papers is not how I read them. I consider their import plain.

33 N Parameswaran and F W Bröker "Micromorphological investigations on wood-cement composites after long-term use" (1979) 33 Holzforschung 97. The paper is in German. The defendant produced a certified translation.

> no sign of degradation. *This suggests that cement composite is not prone to extensive changes in the micromorphology even after years of use.*

[153] A second publication by Goodell and others similarly found no decay. The authors observed:[34]

> Because the decay test did not show significant weight losses, it is likely the decay observed with microscopy was at a very early stage of development. Whether significant decay (i.e., weight loss) would be obtained by extending the duration of the decay – a very severe decay test – is unknown. *Given the results observed in this test, it is likely that only wood regions exposed in surface regions to the fungi will be accessible for fungal attack.* An earlier study by Parameswaran and Bröker (12) examined a single sample of wood-cement composite that had been buried under soil during construction of a building. Similar to that observed in our soil-block study, surface degradation of the wood in this sample was observed but the interior remained free of fungal attack.

[154] Likewise, Huang and Cooper note:[35]

> *Wood-cement composites are known to be highly resistant to decay due to the encapsulation of wood particles and the high pH environment in the composite* (8.22). Conventional measures of decay resistance have been difficult to interpret because when the composites are exposed to decay fungi in a standard laboratory test, carbon dioxide produced by fungi may be absorbed by the cement resulting in weight increases that confound expected weight losses from the wood decay (8). Wang and Takahashi (22) evaluated the loss in internal bond (IB) strength of wood-cement particle-board and concluded that strength loss was minimal.

[155] I have selected these extracts to enable focus on two aspects – the general conclusion of each, and the hint of a caveat in each. There is no doubt that each article provides strong support for James Hardie's case. They each assert the core proposition of resistance to decay due to the high pH and do so in relation to materials which are not fibre cement, but are similar to it. The differences between these products and fibre cement only increase fibre cement's inherent protection from rot compared to the materials considered in these articles. Dr Wakeling's use or description of these articles was misleading and inaccurate and caused me to significantly doubt the value I could place on his expert evidence alongside his attempt to classify fibre cement as a wood product.

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[34] B Goodell, G Daniel, J Lieu, L Mott and R Frank "Decay Resistance and Microscopic Analysis of Wood-Cement Composites" (1997) 67 Forest Products Journal 75 at 79. Note how the authors have interpreted the Parameswaran article.

[35] Chen Huang and Paul A Cooper "Cement-Bonded Particleboards Using CCA-Treated Wood Removed from Service" (2000) 50 Forest Products Journal 49 at 50.

[156] I refer to a caveat out of fairness to Dr Wakeling. The passages I chose all have an aspect supportive of his position. An example is the Parameswaran passage which does record penetration to the "outermost 2–3 mm". This is plainly penetration beyond the surface. As I understand it, Dr Wakeling saw in each article an aspect of the research which, when all put together, provided some support for his theory. That is in itself an available methodology but only, in my view, if one makes that methodology clear. That was not done here. If I have correctly understood Dr Wakeling's approach, that understanding has only come about as a consequence of cross-examination. Further, if one is doing this, it nevertheless remains necessary for an expert to acknowledge and to confront properly the obvious contrary central thesis of the research referred to. That was never done.

[157] Other matters concerning Dr Wakeling's methodology also arose. Dr Wakeling was requested to analyse samples provided to him by the homeowners' representatives. What he did could be described as destructive testing. Dr Wakeling says what was left after his testing would not be of use to anyone but this cannot be otherwise known because Dr Wakeling destroyed all the remnants. Dr Wakeling advises that is his normal practice and he expected the other party to have possessed a sample taken from an immediately adjacent spot.

[158] The defendant's experts were critical of this and said it was not their practice nor common. That is also the Court's experience and I would expect a person experienced in litigation as Dr Wakeling says he is would at least have checked before disposing of sample material.

[159] This aspect of depriving the other party of an opportunity to review arose more clearly in relation to Dr Wakeling's evidence about what he has seen and can see when reviewing slides. Although claiming to have viewed decay on countless occasions,[36] no supporting evidence was produced. When challenged on this, the response, and I consider this a fair summary, was that it was too time consuming to produce quality slides and the litigation was not worth that effort. However, he was working on a paper to be published in the future which would have such images.

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[36] In hundreds of samples, but not in any of the samples submitted to him from houses in this case.

[160] The form in which evidence is presented to the Court is ultimately a choice to be made by Dr Wakeling and those instructing him, but the outcome is that there is no support provided by Dr Wakeling for his evidence, nor has he chosen to subject his analysis to peer scrutiny. Its value is correspondingly diminished. I wish to emphasise this is not any formal critique of the expertise of Dr Wakeling, the scientist. I am alert to the potential for him ultimately to be proved correct, possibly solely by his own publication. It is, however, very much a critique of Dr Wakeling as an expert witness in this case. The methodology underlying his evidence, and his understanding of the expectations on an expert were not satisfactory. It significantly undermined the probative value I am willing to attach to his evidence.

[161] It is necessary to conclude this aspect by reference to the style of evidence. It is an extension of that to which I have already referred. The tendency was to assert without providing any support, and when challenged to claim that what he was saying was so fundamental he thought there was no need to offer any support for it. This was said notwithstanding a bevy of experts on the other side proffering a contrary view. Likewise, suggesting that he is the only one in New Zealand with the experience to see what he observed in the slides, but again without providing opportunity for others to assess his opinion, also demonstrates the difficulties with his approach.

[162] Before concluding, I note that these challenges to Dr Wakeling's evidence were well-flagged and were addressed in the defendant's closing. Correspondingly therefore the plaintiffs undertook a defence of his evidence in their submissions. I record that before setting out my conclusions on the evidence, I had regard to these submissions but I do not wish to prolong this section by outlining them in detail. I have spent the time I have on the topic because Dr Wakeling was an important witness for the homeowners and, as with Dr Lstiburek, it is important to articulate the reasons why evidence is accepted or rejected, or accorded high or low probative value.

[163] The plaintiffs relied in their original closing submissions on four other matters said to point to the capacity of fibre-cement sheeting to decay:

(a) a James Hardie test sometime prior to 1996;

(b) reports received by James Hardie from a New Zealand laboratory, Biodet, that refer to mould on and within the sheet;

(c) reports of mould growth on painted Hardiplank; and

(d) patents registered in the United States in which, in narrative sections, James Hardie appear to acknowledge this very risk.

[164] The pre-1996 test was during trial referred to as the Allunga Tully test. What was available were seven pages of a fuller document which pointed to James Hardie testing in extreme conditions on a fibre-cement sheet, possibly Harditex. Since the hearing the full document from which the page was taken has become available. It is confirmed the product was Harditex. This full document is part of the new evidence which is discussed shortly. I first address, however, the other three matters on which the homeowners relied.

[165] The Biodet reports related to two properties in Auckland. The first report suggested fungi penetration on a Harditex sheet to 3 mm. The report concluded the back of the sheet had been very damp for a period of time. The second report recorded growth on a sheet indicative of a 20 per cent moisture content for at least three to six months.

[166] The reports were put to the defendant experts but the exchanges did not produce helpful evidence from my viewpoint. The most that can be said is that the first report is evidence of a fungi penetration beyond the surface but does not otherwise advance matters. As I understand it, the issue is not the capacity to penetrate but to survive once having done so.

[167] The third topic does not require consideration. It is accepted mould can grow on an uncoated surface, and indeed in certain circumstances on a coated one.

[168] The fourth issue is patents held in the USA by James Hardie. The patents contain statements at odds with James Hardie's case position. For example:

> However, cellulose fiber cement materials can have performance drawbacks such as lower resistance to water induced damages, higher water permeability, and higher water migration ability (also known as wicking) compared to asbestos cement composite materials. These drawbacks are largely due to the presence of water conducting channels and voids in the cellulose fiber lumens and cell walls. The pore spaces in the cellulose fibers can become filled with water when the material is submerged or exposed to rain/condensation for an extended period of time. The porosity of cellulose fibers facilitates water transportation throughout the composite materials and can affect the long-term durability and performance of the material in certain environments. As such, conventional cellulose fibers can cause the material to have a higher saturated mass, poor wet to dry dimensional stability, lower saturated strength, and decreased resistance to water damage.

[169] There is little to be said here. They are statements by James Hardie (an international section thereof) which are at odds with its present case. The evidence, for reasons given, has satisfied me the present case is correct but it cannot be denied the statements exist. The plaintiffs say the new evidence strengthens the proposition that what is said in the patent application reflects James Hardie's knowledge.

[170] The decision not to accord much weight to Dr Wakeling's evidence undermines the plaintiffs' case on this topic. That said, it is important not to focus solely on Dr Wakeling's evidence. In my view, the overall evidence suggests the defendant's propositions about rot reflect the present scientific understanding.

[171] First, and not needing further detailed rehearsal, the published literature supports the proposition that fibre cement is not subject to fungal decay, or at least the risk is so low as not to be a factor. Further, no-one referred to any published literature claiming the opposite proposition as its conclusion.[37] This is significant. Science, like many disciplines, develops not only through research but through the publication of that research which can then be built on, or critiqued. I consider the absence of any published literature (at least to which I have been referred) which supports the homeowners' core proposition is telling.

[172] Second, a panel of experts on fibre cement which included the plaintiffs' own expert, Dr Akers, agreed at an experts' conference that fibre cement was not subject to decay. Their agreed position was:

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[37] The patents are an exception but they are not studies, just statements.

- Surface colonization by microorganisms (mould growth) is possible in both technologies (as well other materials), depending on the microclimate.

- There is no evidence that the microorganisms will penetrate in the cement matrix to destroy (feed on) cellulose fibres.

- After the matrix has been leached to a point that fibres are exposed, biological degradation of the fibres is possible.

[173] The point made there by the experts, about the cement matrix leaching, can be noted to be the preferred explanation of the defendant's experts on why on occasion Harditex sheets have lost their strength. The experts agree excessive exposure to water can cause the cement matrix to leach, and this effect is increased if the water is acidic. The second bullet point represents the experts, including a homeowners' expert, agreeing with James Hardie about durability.

[174] Third, the only other evidence of decay occurring within a sheet was some slides produced by another defence expert, Ms Burnie, a microbiologist with an expertise in building material analysis. Her original brief concerned analysis of fungi and mould on the surface of some Harditex samples and did not address this topic. However, in her reply brief she engaged with the issue of decay within a Harditex sheet. Ms Burnie supports Dr Wakeling's conclusion. She produced slides that were said to be evidence of such decay. The defendant's experts differed, saying either the images were unclear or noting that if there were mould hyphae present, they were plainly stressed, indicating that the high alkalinity of the sheet was having the expected effect.

[175] This conflict in what could be seen on the slides is not one the Court can resolve. It is clear it needs an experienced eye aware of what is being looked at. For this reason, I prefer to base my assessment on the overall preponderance of the evidence.[38]

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[38] I do not dismiss Ms Burnie's evidence or expertise but weigh it in the mix. That said, there was an example in her evidence of not understanding the proper role of an expert. Ms Burnie said in her reply evidence that there was literature supporting her and Dr Wakeling's position. This came as a surprise, and would be important given, for example, the judgment's earlier observation there is none that was relied on. It transpires the "article" cited by Ms Burnie was an in-house publication of a Minneapolis-based building consultancy. It is not peer reviewed or in any sense authoritative. Ms Burnie had only found it the night she was preparing her reply evidence as a result of a web search. She was unaware of any of the contrary published literature this judgment has referred to. I consider this aspect of her evidence was capable of misleading the Court and

[176] Fourth, the defendant proffers a viable alternative explanation for the damage seen to some sheets. I put it no higher than that because it, likewise, seems generally unsupported by literature. It does, however, have the endorsement of the experts' conference including Dr Akers who is very experienced with fibre cement manufacture.

[177] Central to the defendant's proposition that fibre cement will not rot is the overall alkalinity of the sheet. A fibre-cement board will start with a pH level of around 12.0 but this will reduce over time due to a process known as carbonisation. How low the pH will go, and whether it will reach levels facilitative of fungal decay, was a point in dispute.

[178] The general consensus of the defendant's experts, and of some of the published literature, was that a sheet would normally only reduce to a pH level of around 8.0 to 9.0. This would be too high for the fungi to operate. This evidence is consistent with the extracts earlier cited from the published literature which note alkalinity to be the primary barrier to decay.

[179] However, Dr Spiers, a defence expert, noted he had recorded readings in samples as low as 6.8 and 7.0.[39] The plaintiffs submit that the evidence shows that the pH level can alter, especially when acidic water enters the cement matrix thereby decreasing the alkalinity. However, the isolated low pH reading could also be consistent with the leaching theory where, once the cement matrix breaks down, the possibility for decay obviously increases.

[180] For the purposes of the litigation, a conclusion is only needed on the plaintiffs' fungal decay proposition. I recognise that on occasions Harditex sheets, or at least part of them, lose their strength, and at the extreme become crumbly. On the basis of the evidence, and supported by the current state of published literature to which I have been referred, I am satisfied that this loss of strength is not due to fungal decay. It has

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represented an incorrect approach to the role of an expert that to some extent diminished the value of her evidence.

[39] Conversely, in other aged Harditex samples he found a pH level of around 9.5.

not been shown that the sheet is prone to rot, and the preponderance of scientific evidence says the opposite.

(ii) A discussion of the post-trial evidence

[181] The new evidence consists of a collection of internal James Hardie documents. They are:

(a) the full suite of documents concerning an exposure test on uncoated Harditex at a site in Queensland (called the Allunga Tully documents). An extract from one of the documents had been available at trial;

(b) a series of what are called research and development reports;

(c) a compendium document, drafted it seems in 1996, which seeks to bring together knowledge held within James Hardie about fibre cement durability. It collates a history of post-asbestos testing and outcomes;

(d) a series of reports on mould issues; and

(e) a collection of documents on various topics such as coating systems and recessed edges.

[182] The homeowners consider the documentation significant and advance eight propositions based on them:[40]

> 1. The sole 'Allunga' document available at trial relating to testing undertaken on Harditex by James Hardie at its Allunga, Tully test site was an incomplete 10-page document. That document recorded alarming property degradation of Harditex on natural exposure at the Allunga Mould Growth Test Site.
>
> 2. The defendants have withdrawn their closing submission questioning the provenance of the document available at hearing and accepted that Harditex was subject to the Allunga testing. This followed their recent discovery of a bundle of documents relating to testing at Allunga and associated documents (the Allunga documents). The provenance of the Allunga document could hardly be doubted as a James Hardie internal document.

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[40] Footnotes omitted.

3. The Allunga documents contain highly relevant and probative information confirming that Harditex had no track record of performance or 'proven durability'; it degraded as a result of microbiological attack and the defendants knew (or at the very last ought to have known) that Harditex was an unproven product which was subject to significant ongoing durability problems since its release to the New Zealand market in 1987. The documents are entirely consistent with and corroborate the plaintiffs' case and undermine the entire factual basis for the defendants' position.

4. By way of overview, the Allunga documents discussed below establish:

   (1) James Hardie cellulose reinforced fibre cement had no proven track-record of performance. Harditex was an experimental and untested product when it was released to New Zealand in 1987. Harditex never had proven durability;

   (2) Harditex is highly susceptible to mould growth and microbiological attack of the cellulose within the sheet causing degradation. Harditex is not immune to water or rot;

   (3) The Allunga testing was undertaken by James Hardie to assess the durability of asbestos-free fibre cement (including Harditex). The results are applicable to New Zealand and other aeras where Harditex was intended for use and are not limited to tropical conditions. The results are particularly relevant to New Zealand which James Hardie knew to be a high mould growth area;

   (4) James Hardie knew that the durability of Harditex was not established, including that: the addition of alumina did not resolve issues with carbonation, moisture movement and cracking; and Harditex and other autoclaved asbestos-free fibre cement products degrade as a result of fungal decay;

   (5) The uncertain effect of the addition of alumina in resolving issues with sheet cracking, and problems with mould growth causing degradation of fibre cement, were critical issues of focus for James Hardie Research & Development (R&D) which were of increasing concern and never addressed or resolved with respect to Harditex in New Zealand. James Hardie knew Harditex never had a 50-year durability lifespan;

   (6) James Hardie R&D held an extensive library of internal research which was kept confidential and was not released to the wider scientific community. From the recent disclosure it is apparent that the research and knowledge of microbiological attack entirely contradicts the limited "published literature" cited by the defendants' experts, corroborates the plaintiffs' expert evidence and explains the James Hardie patent for fibre cement using biocide treated cellulose fibres to protect against bio-decay of the fibres;

   (7) The information held within James Hardie R&D was accessible and available to the defendants, and the defendants relied on testing undertaken by James Hardie R&D for its claims regarding

> the durability of Harditex. If the defendants did not rely on the knowledge of R&D, they had no basis to assert the durability of Harditex and have failed to carry out any relevant testing. That was negligent;
>
> (8) The documents show the unreliability of the evidence given by Mr Cottier, who suggested trouble-free usage following the addition of alumina trihydrate to the formula. Likewise, the inability of Mr Cottier or Mr Kuizenga to recall detail regarding Allunga or other microbiological tests is questionable given the clear significance and knowledge of microbiological attack causing degradation that is apparent from the Allunga documents.

[183] Of these topics two merit particular consideration – the Allunga Tully testing and what it says about microbiological attack of the cellulose fibres; and the claims concerning the success or otherwise of adding alumina to the composition of the sheet.

[184] I begin with an observation that is also in part a conclusion. The plaintiffs' submissions brought into clearer focus for me what I see as a fundamental flaw in their case – a lack of evidence. There are for example, as can be seen, strong submissions made on what messages can be taken from the results of the Allunga Tully testing, but there is no expert witness saying any of it. The Allunga Tully testing involved placing an uncoated sheet of Harditex outside at a 45 degree angle in the harshest of environments – one of the hottest and wettest places in Australia. After seven years the uncoated sheet lost half of its cellulose content, which the documents suggest is a concern.

[185] But the question remains – of what relevance is that outcome to the use of a coated Harditex sheet on a house in New Zealand? This is not in my view a question to be answered by submission. It needed evidence from someone able to explain its significance, but none was proffered. The plaintiffs' witnesses included Dr Akers who was undoubtedly an expert and indeed the durability of fibre cement is his core expertise. His essential endorsement of James Hardie's autoclaved fibre cement has been noted, including his agreement that:

> There is no evidence that the micro organisms will penetrate in the cement matrix to destroy (feed on) cellulose fibres.
>
> After the matrix has been leached to a point that the fibres are exposed, biological deterioration of the fibres is possible.

[186] In the absence of further evidence from Dr Akers or a different expert, in my view the Court cannot itself read the results of a test such as Allunga Tully and conclude it overrides the agreed views of the experts, and the current state of the literature.

[187] Given these observations I am unsure how much detail needs to be given of this test. James Hardie sent a collection of its products for exposure testing at this site. As it appears it is a pretty simple test – the sheet is left outside on a frame at a pre-set angle. It is uncoated and completely exposed to the elements. Analysis of how it was affected in this environment was undertaken at six months, one year, two years, five years and seven years.

[188] In relation to Harditex, mould started to appear quite quickly, but otherwise at the 12-month stage the assessment was that the product was displaying good tolerance. The mould had consisted of a 100 per cent thin film coverage. The same was so after two years except the mould had thickened and the surface under the mould had consequently softened. It had lost some flexural strength.

[189] The five-year report caused concern in relation to the loss of cellulose material. It was estimated it had lost 25 per cent of its cellulose and predicted that the same rate of loss would continue, meaning 50 per cent after 10 years. After seven years the assessment was the test showed:

(a) high carbonation;

(b) severe physical performance reductions;

(c) poor physical appearance; and

(d) cellulose degradation.

[190] James Hardie's position, which I accept, is to question the relevance to the trial issue of how it will perform in service in New Zealand and to note the absence of evidence about this. James Hardie also makes a legitimate point that the test results may be considered within the context of all the trial evidence. There is a danger

otherwise of viewing it as the only testing. For example, BRANZ conducted a series of weathering tests on New Hardiflex that suggested it would have appropriate durability. The trial evidence was that the exposures conditions matter, with Dr John suggesting an average increase of 10 degrees in the climate can double reaction rates.

[191] The other aspect of the Allunga Tully report that needs comment is the homeowners' claim that the results show the product is subject to fungal attack. In the absence of evidence I do not accept that, at least if the claim is that it shows a healthy sheet can be subject to microbiological attack. There is no analysis apparent in the reports of what process had happened to the sheets and whether, for example, the cement matrix had collapsed which would expose the cellulose to such an attack. On this issue I do not regard the fresh evidence as advancing matters.

[192] It can be noted in conclusion on this that the James Hardie document discussing the Allunga Tully results concluded:

> Products subject to the Allunga environment should have protective coatings (paint etc) applied as soon as possible after installation to help prevent the severe losses in product performance.

I do not cite this to minimise the plaintiffs' case but rather to illustrate the need for context and the need to not view these things in isolation. No doubt there is much in the study that those who are expert in product development would see as helpful or instructive, but objectively it was not viewed internally as some crisis. It is a conclusion that also reinforces the earlier observation that linking the study to the performance of the product in service needed evidence.

[193] The other matter identified for fuller discussion was the topic of alumina trihydrate. This was the product added in 1980 (it was thought) to address issues of cracking and shrinkage due to carbonation. Mr Cottier had provided the date (from memory) and had claimed it solved issues that had emerged when the product was first trialled in Western Australia. The homeowners say that new documents show it was first added only in 1984 and there were still issues subsequently. By 1987 James Hardie could not be satisfied it had solved issues with carbonation, moisture movement, cracking and shrinkage. It was still experimenting with alumina. All this is reflected in the compendium document which in 1996 noted:

> There is no definitive proof that Alumina improves the durability sufficiently to cover the up to 50 years warranted long term survival.

This and the Allunga Tully testing led to the wider submission based on the documents that Harditex was "an experimental and unproven product" when it was released on the market in 1987.

[194] Carbonation is a common chemical reaction that can affect the properties of the sheet. It can cause the sheet to shrink, and to crack. It was not a trial issue and not linked by the plaintiffs to any alleged defects, or house-specific problems. Alumina trihydrate was regarded by James Hardie as an important development. The agreed statement of the experts, again including Dr Akers and again not modified subsequently by evidence, is that:

> We agree that the addition of alumina trihydrate resolved the issues relating to carbonation induced cracking shrinkage.

[195] The compendium document provides a basis for a submission that in 1996 James Hardie was still assessing the effectiveness of different amounts of alumina. Dr Akers in his brief had noted that the amount can be varied depending on the purpose of the particular fibre-cement product. As an example, ceiling boards have less than wall cladding.

[196] It is not of any obvious significance in itself that James Hardie was analysing the effectiveness of different amounts near the time of release of Harditex. There is no evidence to say this sort of product development is indicative of some issue. There was never Harditex sold in New Zealand without alumina added, and my understanding of the evidence is that the formula did not in fact change during its time on the market here. On the specific topic of alumina, there is no basis to go behind the experts' agreed statement.

[197] Concerning the wider proposition of an unproven product, there is in my view little that is particularly new or significant. Asbestos-free fibre cement started in 1981. That is as far back as it goes, and so when Harditex was released six years later that is the extent of its in-service history. There had, however, been a number of tests done, including accelerated ageing that led entities such as BRANZ to consider it would

have appropriate durability. The judgment elsewhere concludes the testing was sufficient.

[198] Turning to the compendium document on which reliance is placed, it is a summary by the author of various documents held by James Hardie. It is therefore that person's assessment of other people's documents. It describes itself as a draft. It brings together various issues known to James Hardie about its products over the then 15 year life of asbestos-free fibre cement. The Allunga Tully information initially available at trial in fact comes from this document rather than the original Allunga Tully reports.

[199] The document is 41 pages long and covers a broad range of topics, many of which have no relevance to trial issues. Aspects of it are technical suggesting the author has expertise but it is not always clear what is original comment and what is sourced in other documents. No conclusion is offered which leaves somewhat unclear its purpose. At the start the purpose is described as creating:

> a stepping stone to a shared document summarising important fibre cement durability developments or understanding …

However, its intended audience is unclear. My impression is that considerable technical expertise is needed to understand it or find it useful, but that is as far as it goes.

[200] I have formed the view it is not a document that needs further detailing. In the absence of tested evidence about the implications of any of its contents, I do not consider it merits the Court seeking to draw conclusions from what is a collation of information which does not itself proffer any conclusion.

[201] Without unduly prolonging this topic of the new evidence, I address finally the question of James Hardie knowledge. On the individual level, the evidence did not cause me to doubt Mr Cottier, a witness who impressed me. That he misremembered the exact date for when alumina was introduced some 30 years ago seems inconsequential. His evidence on its effectiveness mirrored the experts' panel

assessment. (He was not part of that panel.) In relation to the other documents it is very unclear which of them he may have seen or not.

[202] On the issue of corporate knowledge, there are statements by individuals that appear to acknowledge microbiological attack as a reality. However, those statements are usually general and do not engage with the trial topics. For example, does the maker of the statement think that can happen in a healthy sheet with high alkalinity, and if not what has happened to the sheet to allow it? They are not statements that lead me to doubt the current view of the literature concerning this topic, nor to think that James Hardie knew the literature to be wrong but nevertheless publicly and often asserted the opposite, and indeed sold the product on that basis – namely, that it does not rot.

[203] The discussion to date has not dealt with all of the points made by the plaintiffs or even most of them. It has addressed the most important ones. It is not necessary to analyse the material further because the answer will normally be the same I gave at the outset. There is simply an absence of the evidence that would be necessary for the Court to draw the type of conclusions the plaintiffs claim. Repeating that viewpoint on numerous occasions will not assist.

[204] Looking at the documents for their face value, I consider the plaintiffs overstate the conclusions to be drawn. I gave one example with the conclusion the paper drew from the Allunga Tully research; namely, if you are going to use Harditex in such an environment, paint it. More generally, I acknowledge there is material in the documents that the plaintiffs would like to have had at trial, and to have had the opportunity to put it to witnesses. But it was not available and nothing can change that.

[205] For these reasons the new material did not change my assessment of fungal decay, durability, or James Hardie knowledge.

Differential movement as a failure mechanism

[206] Differential movement is a hypothesis advanced by Dr Wakeling. I do not intend to dwell on this aspect of the case. He fairly made it clear it is a hypothesis and

nothing more at this point. It was him trying to explain why in his view sheets fail as often as he has seen. Initially he suggested that differential movement was the primary failure mechanism. However, in oral evidence it became his secondary mechanism behind decay.

[207] The theory is that, in response to moisture entering the sheet, the cellulose fibres and the cement matrix react differently. In relation to this theory it is, as I understand it, agreed by all experts that the cellulose fibres will react more than the cement matrix to the moisture. The fibres will expand over their diameter but minimally along their length. This differential movement between the two components creates a stress on the connection between the fibre and the cement matrix. That connection will eventually break and as this breaking of the bond is repeated, the sheet's strength breaks down.

[208] Various witnesses were cross-examined on this theory. I preferred the analysis of Dr John, who was able to cite published literature to support his propositions that it was flawed. Dr John's expertise on the issue, comparative to that of Dr Wakeling, was queried by the plaintiffs. Dr John is a Professor of Building Materials at the University of San Paolo. His tertiary qualifications, including his doctorate, are in the relevant areas. He has been researching and writing on the topic of the durability of cellulose fibre cement since 2000. Ranking experts is seldom a rewarding exercise. My assessment is that his specialty is probably more specifically directed at this topic than is Dr Wakeling's, but the reality is they are both qualified albeit they perhaps come to the topic through different routes.

[209] I preferred Dr John's methodology and the fact that he pointed to literature in support. However, for reasons already given, it is not necessary for me to do more than conclude Dr Wakeling's proposition has not been established on the evidence.

Flexural testing

[210] Flexural testing is a method by which the strength of Harditex sheets can be tested. A collection of 10 Harditex samples taken from the eight properties were given to Dr Jia to undertake such testing to see if the sheets had retained the level of strength required by the Building Code.

[211] Dr Jia is a specialist in construction materials which was also the subject of his doctorate. His research as a student was on a project which explored alternative methods to autoclaving. He is experienced in the area of cement-based materials. He is well published and has presented at conferences.

[212] The samples were provided to him by Mr Wutzler's company Helfen Ltd. They were grouped by Helfen into three categories of condition – good, fair and bad. Dr Jia's assessment was the flexural strength decreased in conformity with Helfen's assessment. The weakest samples were those labelled bad by Helfen, and so on.

[213] Dr Jia reported his results with this introduction:

> 10 samples were tested for flexural strength in accordance with AS/NZS 2908.2:1992, being the first standard that would have applied to testing of Harditex. This test involves assessing flexural strength in accordance with the procedure set out in AS/NZS 2908.2:1992. The test procedure is set out in AS 2908.2:1992 which is attached and marked YJ-2. I do not repeat the test procedure here.

[214] The table which followed allocated a flexural strength measured in megapascals to each of the Helfen samples. Dr Jia concluded the average MPa for the categories was 16.86 (for the good), 14.23 (for the fair) and 8.69 (for the bad). These conclusions had two implications – it appeared to endorse the soundness of Helfen's visual observations of the quality of sheets[41] and it provided relative assessments of whether the boards met the necessary strength requirement. However, on this latter aspect, Dr Jia, having analysed the relevant Standard, concluded he could not determine whether the samples tested met the required level of strength.

[215] The defendant's expert, Dr John, identified a number of areas in which he said Dr Jia had not in fact applied the Standard's methodology as he had claimed. These included adopting a displacement rate significantly lower than those required by the Standard; not detailing nor accounting for the direction of the test sample (the sheet is significantly stronger in one direction (longitude) than the other (traverse)); and not ensuring the sheet had the required moisture levels before conducting testing.

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[41] This in turn would add strength to Mr Wutzler's evidence and opinion on what he was observing at the eight houses.

[216] When challenged, Dr Jia accepted these points and essentially acknowledged he had been unable to fully comply with the Standards. Of itself that is not a concern in that one can ultimately test in whatever way considered helpful and then defend it. What is, with respect, not acceptable in an expert is to mislead by asserting compliance when that has, apparently knowingly, not been done. This, in my view, is poor practice at a level which means the evidence should be put to one side. I do not think weight should be accorded to the evidence of an expert witness who has misled the Court in this way in relation to his core evidence. I understand of course that it is a situation where the witness has not properly understood the responsibilities that come with the role (despite all these witnesses stating the Code of Conduct had been read and complied with). I also understand that Dr Jia was not seeking to disguise matters. He readily acknowledged Dr John's points, without, it seemed to me, any concern on his part that it was a significant matter. It would, though, be placing insufficient weight on the requirements of the Code for the Court not to respond to this level of non-compliance.

[217] There were two other aspects concerning Dr Jia's evidence where issues arose. First, Dr Jia cited some papers in support of his evidence. Mr Hodder QC took him to those papers, and to specific paragraphs within them. It was surprising when Dr Jia advised the Court he had not read those paragraphs because he only reads the synopsis and the conclusion. As a practice that is an understandable approach. Lawyers are familiar with reading headnotes to cases to get a sufficient understanding of what they stand for. However, to have relied on the articles in evidence without having read them is a further illustration of a lack of understanding of the role of an expert witness.

[218] Second, during his evidence Dr Jia ventured the opinion that James Hardie was probably not doing the autoclaving of its sheets properly. I initially thought this had only emerged in oral evidence, but reviewing his written evidence I can see it is hinted at in the brief. As best I understand the sequence, following this claim being made by Dr Jia in evidence, information was then provided to Dr Jia by James Hardie which allayed his concerns. It is surprising that an expert would make such a claim without first getting the necessary information. Dr Jia may well have been right but the caveat is that James Hardie is a worldwide manufacturer of autoclaved fibre-cement products and has been doing so for more than 40 years. I would expect an expert to explore this

properly rather than make what seemed to me a casual assertion or proposition. It was another factor which did not give me confidence in the evidence.

[219] All this aside, James Hardie submits that Dr Jia's work, properly analysed, in fact supports its case. Dr John obtained Dr Jia's raw data. His subsequent re-analysis of that data led him to conclude that:

> within the weakest sheets there was evidence of significant ongoing contribution to strength by the cellulose fibres, but a breakdown of the cement matrix.

The defendant submits this is further evidence supporting its degradation theory, and evidence contrary to Dr Wakeling's decay theory. If decay of the fibres was the cause of a loss of strength, they would not be still contributing.

[220] Dr John concluded his further analysis with the opinion that, properly assessed, all the samples tested by Dr Jia meet the requirements of the Standard. I am not aware of any evidence contradicting this.

Conclusion

[221] The plaintiffs have not established inherent defect five. This conclusion reflects two factors. First, the opinion of the defendant's experts is consistent with the current scientific understanding of the underlying issues. Second, the contrary view was presented by expert witnesses concerning whom there were significant issues with the manner in which their evidence was presented. These issues led me to devalue the probative value to their evidence. It is important to observe, however, that the defendant's evidence was sounder in any event. On the topic of decay, it was supported by current literature and the Court was pointed to no contrary literature. On the question of ongoing strength, Dr John's analysis countered, successfully, the propositions advanced by Dr Jia.

Capacity to cope with normal building movement

[222] The next building science topic is alleged inherent defect four. The homeowners say that the rules James Hardie imposed for how the sheets were to be nailed to the timber framing were flawed. Not enough gap was allowed between the

sheets. As the building moved, the sheets came too close together, forcing the coating within the gap outwards. This in turn causes pouting, which is an aesthetic issue; but pouting if not addressed will lead to cracking of the coating which can allow water ingress. Movement is said to also cause cracking elsewhere, for example, at corners and along the bottom of the h-mould.

[223] The pleading identified several sources of this building movement – seismic activity, thermal activity, wind, and the timber frame shrinking. The last of these topics, timber frame shrinkage, was the primary focus of the evidence, and the sole focus of the homeowners' written closing. The underlying building science dispute concerns the extent to which a timber frame will shrink. This in turn will dictate how much of a gap between the sheets should have been mandated to cope with this shrinkage.

[224] To recap the issue, at the time cladding is nailed to the timber frame, the timber framing will have a particular level of moisture content. What that level is will depend on the type of timber, and the circumstances that existed before the cladding was nailed. If, for example, the timber has been exposed to significant rain not long before cladding, the moisture content will be higher. If, however, the rain was a few weeks earlier, the timber is likely to have dried considerably. Another variable is the type of timber used; if it is "kiln-dried" timber, the moisture content will be much lower. Once the house is clad, the timber will dry out from that point until it reaches its equilibrium moisture content (EMC). As the timber dries, it shrinks three-dimensionally, meaning the width, depth and length of the timber all decrease in size.

[225] Translating that process to a house –

(a) shrinkage of an upright timber stud. The sides of two cladding sheets (right-hand side of one sheet, left-hand side of the other) will be nailed to the one stud. There will be a gap between those sheets. If the width of the timber on which they are nailed narrows, the sheets will inevitably move closer together;

(b) shrinkage of a horizontal timber plate. This is the piece of timber running across the bottom of a wall. Sheets are nailed to its side. If the length of this piece of wood shortens, then the sheets nailed to it will move closer to each other.

[226] The JHTI requirements were that for the upright studs, the gap between sheets had to be 1–2 mm. For a period this was amended to 2–3 mm before being changed back. For horizontal joins (between two floors), the prescribed gap was 9 mm. The homeowners contend these gaps are insufficient, and it represents an inherent flaw. James Hardie's experts say it is enough. The issue matters for the Harditex system more than some because of the jointing system which relies on the exterior coating to fill the gap. If there were, for example as under some systems, a batten over the joins, it would not matter. All the activity would happen underneath the batten.

[227] There are limits to the value of any general discussion. The extent to which a house will be affected by shrinkage is very much case-specific. It depends on the moisture content on the various pieces of wood that make up the frame. It has already been noted that the rules concerning moisture content changed. Also, through the 1990s the use of drier kiln-dried timber increased. This timber shrinks less. These variables mean linking a general theory of likely building movement to what has happened on a particular house is at best uncertain. It is very unlikely, for example, that years later anyone would know what the initial moisture content was.

[228] A second theoretical aspect of this topic is that, in this case, cracking was not the alleged primary source of water ingress for any of the houses. Yet another theoretical dimension, related to the last, is that there is little evidence in the case to suggest cracking when it occurs is a major water ingress concern, as opposed to an aesthetic one. Certainly cracks can let in water, but there would need to be quite a number of cracks unattended for a considerable time to pose a real risk. Even a rudimentary level of maintenance should eliminate the concern before moisture became a problem. None of this is to say a crack cannot be a problem, just that the evidence in the case does not suggest they have resulted in significant moisture ingress concern.

[229] The primary witness on timber shrinkage and building movement for the homeowners was Mr Hadley. He is an experienced civil and structural engineer with 25 years' experience in the design, management and construction of buildings. Mr Hadley took what he called a first principles approach, which meant undertaking the task as if he had been asked by a manufacturer, at the development stage, what tolerances should be allowed for. It is a criticism made of James Hardie that there is no evidence this type of exercise was ever done.

[230] Mr Hadley analysed different wall lengths, and assumed initial moisture contents of 18 per cent, 24 per cent and 29 per cent. His conclusion was that JHTI requirements were flawed; the gap tolerances were insufficient for the expected shrinkage.

[231] James Hardie presented contrary evidence from Dr Buchanan, formerly the holder of a Chair in Engineering at the University of Canterbury. His particular expertise is in timber design and he had edited since its inception the Timber Design Guide which is a comprehensive publication for architects, engineers and builders. Dr Buchanan also has private practice experience and was the chair of the advisory committee that wrote and produced the most recent Timber Structures Standard.

[232] Dr Buchanan took issue with four aspects of Mr Hadley's work. The first concerned what was the correct base moisture level. Mr Hadley argued for 24 per cent as that was both the James Hardie limit, and for many years the upper limit allowed by the Regulations. Dr Buchanan produced a list of reasons why in his view it was too high. The debate in part reflected the different starting points. Mr Hadley was presenting a model he considered appropriate for a manufacturer which is launching a product. A measure of tolerance would therefore be appropriate. Dr Buchanan was analysing from his understanding of existing conditions. Whilst I see the strength in Dr Buchanan's points, given the JHTI and the regulatory scheme applicable for much of Harditex's life allowed a 24 per cent moisture content, I consider Mr Hadley's was a reasonable assumption.

[233] The second issue was whether Mr Hadley was correct to include a shrinkage component because of thermal movement. Mr Hadley assumed there had occurred a

20 degree Celsius change in temperature which in turn would cause thermal movement. There was no dispute between the witnesses that the impact of this would be small in terms of shrinkage – a fraction of a millimetre – but Dr Buchanan disagreed it was appropriate to include it at all. For a change of that dimension to occur, the timber would have had to be in, say, 30 degree heat for several weeks prior to enclosure and then within the frame decline to a temperature of 10 degrees. Dr Buchanan thought that was highly unlikely. The matter does not particularly need resolution given the minimal impact, but I preferred Dr Buchanan's reasoning.

[234] The third area of dispute was methodology. First, in terms of raw calculations, Dr Buchanan said Mr Hadley had erred in his horizontal shrinkage figures by including a width (traverse) decrease as well as length. Mr Hadley appeared to agree with this challenge and did some recalculations, but this aspect of his evidence was confusing. The adjustments seemed to not give effect to the logic of the change, and Mr Hadley was reluctant to accept what appeared to me to be obvious consequences of the adjustment.

[235] The next point of methodology dispute concerned how a two-storey house will reflect the vertical shrinkage. There was agreement on the amount of shrinkage but Mr Hadley placed all the impact on the timbers at the midpoint of the house. Dr Buchanan said this was wrong and the shrinkage will occur half at each end of the timber. Therefore, the midpoint of the house will experience half of the shrinkage of the bottom storey and half of the shrinkage of the top. Mr Hadley disagreed. If Dr Buchanan was correct as to how the shrinkage would manifest, the tolerances allowed for by James Hardie were sufficient.

[236] I preferred the evidence of Dr Buchanan who was a good witness and who is an expert in these matters. That is not in any way to dismiss Mr Hadley who prepared a clear brief and was generally a sound witness. He is no doubt an experienced and very competent practitioner, but Dr Buchanan has held a Chair in the area, has taught this material at tertiary level and is the editor of a leading text in the area. I saw in the evidence and his presentation of it no reason not to accept what he said.

[237] I also, in this respect, agreed with Dr Buchanan's third challenge which was that it was unrealistic and incorrect for Mr Hadley's model to be based on a stand-alone wall, unconnected to any other component of the house. Dr Buchanan was of the view that this would exaggerate shrinkage by ignoring the constraints those connections to other members place on shrinkage. Mr Hadley contended it was appropriate for a first principles approach. Even if that were so, it is not helpful in terms of the trial issues. Walls do not stand apart and it cannot prove a claimed flaw to not have regard to the reality. A wall will always be connected to another. The extent to which a model recognises that will influence the value of the consequent analysis to the trial issues.

[238] These conclusions, which are that Dr Buchanan was correct that the gaps were sufficient, are further supported by the general evidence. If Mr Hadley's calculations were correct, coating failure should be inevitable and regular since the basic sheet layout was flawed. However, there is no evidence that this occurred other than at a specific subdivision (Clemmows) which was something of a test project, for warranty purposes, between James Hardie and others.

[239] The evidence did leave me satisfied that at the higher end of moisture contents, the system tolerances were very tight. It may be, given this conclusion but also the absence of any evidence of general failure, that Dr Buchanan's reasons why an assumption of a 24 per cent moisture content was too high were correct. He noted research that suggest an average mean moisture content figure in winter of 21.4 per cent and in summer of 16.9 per cent. He also noted the increasing prevalence through the 1990s of kiln-dried timber which had a much lower moisture content. If the moisture content were generally lower than the assumed 24 per cent, the amount of shrinkage would have been less, hence the absence of evidence of a general problem.

[240] At this point I do return to what I see as the theoretical aspect of this. There is no evidence of the widespread failure that would result from an inherent defect of the type claimed. It is possible that some houses might have suffered a pouting issue if the enclosed moisture content level has been above the authorised level. From 1999

on, it would need to have been a significant example of non-compliance to present shrinkage of the amount required to be a problem.

[241] It is unnecessary to traverse in any detail James Hardie's other responses on this topic. Generally, it relies on the whole design process to illustrate its awareness of the topic of building movement and the need to accommodate it. An example is the need for relief joints at specific lengths, the sole purpose for which is to address this issue.

[242] As noted, the pleadings mentioned other sources of movement which are not in dispute as a potential source. As I understand it, they were raised as part of the general thesis that this was a poorly thought out product concerning which James Hardie did insufficient testing before releasing it on the market. That general topic will be addressed later, but, within the confines of defect four, I do not understand these other factors to be significant contributors. As noted, the closing submissions on this defect do not address them.

[243] The evidence does not establish inherent defect four.

Mould

[244] Harditex samples from some of the case houses had mould on them. This is probably not surprising in that each of the houses is acknowledged to have moisture ingress issues. The existence of the mould led to evidence about its significance. This evidence raised two issues:

(a) is a Harditex system house conceptually prone to, or at risk of, mould issues; and

(b) what are the known health risks associated with mould?

The susceptibility of Harditex houses to mould

[245] The evidence on this topic comes from the WUFI modelling discussed earlier in relation to moisture management. Amongst its other capacities, the WUFI software

can predict the relative humidity rates likely to exist within a wall cavity. Ms Hugens, who completed a WUFI analysis on behalf of the homeowners, identified a relative humidity (RH) percentage that would be a concern. Ms Hugens' opinion was that, at that percentage/relative humidity level, mould growth would occur all year round, and that this would have a cumulative effect year on year. In other words, the amount of mould would just keep increasing. The defendant's experts obtained different results, a situation reflective of different inputs.

[246] As earlier noted, Ms Hugens first conducted an initial moisture balance exercise, the outcome of which, in agreement with the defendant's experts, suggests the Harditex system does not display moisture balance concerns.[42] Ms Hugens then put these results through what is known as a WUFI Bio programme. She explains this to be a system designed to assess the risks of mould growth where there are elevated moisture readings. Ms Hugens explained the WUFI Bio programme can consider the mould risks in a particular building element. It records its results by a simple colour coding – green (fine), orange (caution), and red (mould growth inevitable).

[247] Ms Hugens has 26 years' experience in New Zealand and Australia as a consulting structural engineer. She identifies her particular expertise as being in thermal bridge free construction,[43] air tightness detailing, low embodied energy building materials, structural durability and indoor environmental health. She "has experience" in the preparation of WUFI simulations and lists projects in which she has been involved.

[248] The defendant's experts were Drs Straube and Künzel. Dr Straube's qualifications have previously been discussed. Dr Künzel, since 1994, has been the Head of the Department for Hygrothermics at Fraunhofer Institute of Building Physics. The department specialises in analysing the dynamic heat and moisture behaviour of building materials and components, and whole building complexes. He has chaired the German National Standard Committee on Moisture Control and the European Committee for Standardisation Working Group on Hygrothermal

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42 At [98]–[99].

43 Thermal bridges facilitate heat transfer so can impact negatively on the efficiency of a building.

Performance of Building Components. Dr Künzel developed the WUFI software programme as part of his PhD thesis.

[249] Dr Künzel replicated Ms Hugens' tests using the exact same inputs and obtained the same results. However, there are aspects of what she did with which he disagrees. Concerning the initial WUFI analysis, Dr Künzel disputed several inputs. However, he and Ms Hugens are agreed that the only one that made a significant difference was the coating input. Ms Hugens had used an acrylic polymer modified cement stucco sourced from the database of Northern American coatings. Both Drs Künzel and Straube said this was an error as it is not an acrylic coating of the type used in New Zealand. As I understand it, Ms Hugens accepted this point.

[250] However, disagreement then arose between her and Dr Künzel as to the alternative he chose. Ms Hugens said it was not a product typically available in the Harditex era in New Zealand. I note that as regards this dispute, although the WUFI expertise plainly lies with Dr Künzel, it is not really a dispute that turns on that expertise as much as an understanding of the attributes of the coatings used in New Zealand at the time.

[251] Ms Hugens relied on a 2000 BRANZ Report in which that organisation had tested several Harditex sheets with different coatings.[44] Being 2000, I accept it is a reasonable basis on which to determine the attributes of coatings available during the period Harditex was on the market. Ms Hugens considered the data from this paper about coatings favoured her position, but a reply brief from Dr Straube was, in my view, decisive.

[252] Dr Straube was of the view that Ms Hugens was misunderstanding the terminology being used by BRANZ in the Report. The detail of this does not need repeating but the analysis satisfied me he was correct. It was a topic clearly within Dr Straube's expertise. The focus was on the water vapour flow resistance component of the BRANZ coatings. The analysis indicated that the coating chosen by Dr Künzel was much closer to that used in the BRANZ testing.

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[44] BRANZ *Water Permeability Test of 8 Harditex Systems* (MTR 1245, 31 March 2000).

[253] Dr Künzel's analysis, using this different coating, indicated to him there were no mould issues with the Harditex system.

[254] The WUFI Bio test conducted by Ms Hugens was challenged in several ways. First, in terms of inputs, this test uses and builds on the initial basic WUFI analysis. An error concerning the coating will necessarily affect the Bio results also. Second, Dr Künzel explains it was anyway the wrong test to use. WUFI Bio does not factor in seasonal changes. This defect, in his opinion, explains why Ms Hugens' analysis concluded that mould would just keep accumulating year on year; the test assumes a constant environment rather than one affected by fluctuating seasonal impacts.[45] WUFI Bio is best used for testing interior surfaces than building enclosures near the exterior of a house and therefore impacted by climate.

[255] Dr Künzel said the correct test to use was the WUFI VTT programme. When this was done, no issues emerged such that Dr Künzel concluded:

> there is no negligible risk of mould growth at the interface between the glass fibre insulation and the building wrap.

[256] The interface referred to in this conclusion is the inside face of the wrap where it meets the timber framing. I note for completeness that Dr Künzel disagreed with Ms Hugens' interpretation of her own test results, considering they also did not disclose concerning outcomes. It is not necessary to explore that further. I accept the revised combined analysis of Dr Künzel and Dr Straube, and accordingly conclude there is no inherent mould growth risk in the Harditex system.

The risks and dangers of mould

[257] For completeness, I record that evidence was heard from several witnesses about the health risks of mould. The main witnesses were Dr Shorter and Mr Prezant. Both were experts in their area and gave clear evidence within their expertise. There was a degree of consensus but also areas of disagreement. The disagreements included the capacity of mould to travel from a wall cavity to the occupied spaces of a house, and the proven health risks associated with mould and mould odour.

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[45] Mould on paths is an example of mould coming and going depending on the season.

[258] It is not necessary at this stage to attempt a resolution of these matters given my conclusion on the preceding topic. I understand there would be agreement that:

(a) there is a link between dampness and adverse health effects but the exact mechanism is not yet established; and

(b) there is evidence suggestive of a link between mould and adverse health effects but the causal link has not yet been established. This is the current assessment of the World Health Organisation.

[259] On the issue of pathways, Mr Prezant did not deny the potential for transfer from the interior of a wall to an occupied space, but considered the likelihood of it happening, and in what quantities, was not yet established by current research. He considered this was due to the many variables within the occupied space and the adjacent wall cavity that would influence the capacity of fungal particulates to migrate.

[260] Dr Shorter considers the potential risks to occupants of wall cavities that contain mould are well established in the literature. She also considered more emphasis should be given to the presence of mould odours and its implications – "mould odour has been strongly associated" with health effects in various research pieces.[46]

[261] I note finally on this point, given its presence on some samples, that both Dr Wakeling and Dr Shorter agreed that no direct link had yet been established between Stachybotrys and adverse human health consequences. Dr Shorter notes research on animals has identified some effects that make a link to adverse consequences in humans "plausible" but puts it no higher than that.

[262] It would be necessary to return to this issue if James Hardie were held to be responsible for some of the damage reported in the plaintiffs' houses but for now the topic can be left. The homeowners have not established mould potential is an inherent

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[46] Dr Shorter refers in her evidence to M Jaakkola, R Quansah, T Hugg, S Heikkinen and J Jaakkola "Association of indoor dampness and molds with rhinitis risk: A systematic review and meta-analysis" (2013) 132 Journal of Allergy and Clinical Immunology 1099; and J Mendell and K Kumagai "Observation-based metrics for residential dampness and mold with dose-response relationships to health: a review" (2017) 27 Indoor Air 506.

flaw in the Harditex system. That is not to deny it has been found in the houses; just that on the evidence, it is not an expected consequence of using the Harditex system.

Further alleged vulnerabilities

[263] This section addresses a number of further alleged vulnerabilities:

(a) the h-mould;

(b) the base of sheet detail;

(c) external corners; and

(d) windows.

H-mould

[264] The h-mould is a specifically built PVC mould. The use of a specifically designed accessory to join two sheets is not novel. A similar accessory was used from 1983 for the New Hardiflex system. Mr Longman notes that prior to that, plastic joiners had long been used for vertical joins, but that metal "z" moulds had been traditionally used for horizontal joins.

[265] The h-mould looks like this:[47]

[47] In its original form it is off-white and not so dirty.

[266] Descriptions and illustrations in technical literature of how to build a specific item are commonly called “details”. The first JHTI detail for an h-mould was in the 1991 version:[48]

[48] Mr Longman notes the 1988 and 1989 JHTIs, which were not just for Harditex but covered many products, included h-mould details for Hardiflex, as did an earlier 1983 Hardiflex-specific JHTI.

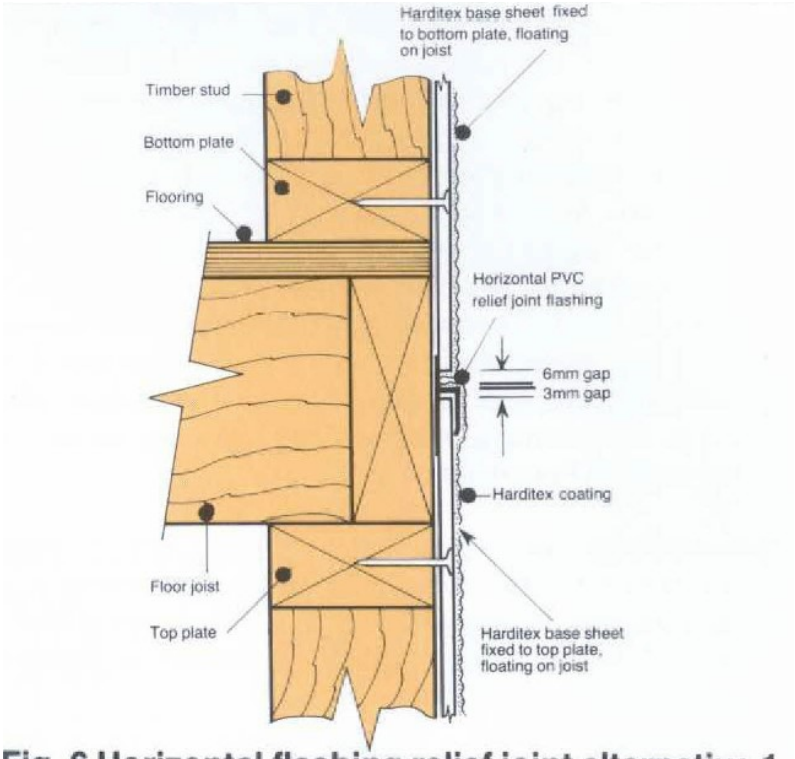

Fig. 6 Horizontal flashing relief joint alternative 1

[267] In this detail, the Harditex sheets are on the right of the diagram next to the timber. The h-mould is halfway down, sitting on what is known as the mid-floor joist. It is the black outline in the middle of the Harditex sheets. For terminology purposes:

(a) the upright piece of the h-mould which sits hard against the joist will be called the "vertical part";

(b) the part of the h-mould that forms the "h" will be called the hook. The horizontal surface of the hook is flat, not sloping; the very bottom of the downward face of the hook has a slight inward curve.

[268] The matters to note for present purposes are:

(a) the bottom sheet fits into the hook, with a 3 mm gap to be left between the underside of the hook and the top of the sheet;

(b) the top sheet sits above the hook, with a 6 mm gap to be left between the bottom of the sheet and the flat surface of the hook;

(c) the back unsealed face of the sheets sits against the vertical part. The vertical part is 55 mm high in total with the hook occurring 30 mm down. So, allowing for the prescribed gaps, 24 mm of the bottom of the top sheet, and 22 mm of the top of the bottom sheet will sit against the vertical part;[49]

(d) as can be seen in the diagram, the sheet nails do not go into the joist, but into the plates above and below the joist. This is what makes it a movement control joint. As the joist shrinks, as it will, the impact on the sheets (and therefore the wall assembly) is ameliorated because the sheets are not nailed to it; and

(e) in addition to the backs of the sheet which are never coated, the top of the bottom sheet will be covered by the hook so the exterior coating cannot get at that part of it.

[269] The plaintiffs, relying primarily on the evidence of Mr Wutzler, identify several flaws. Mr Wutzler is generally supported by Mr Lalas. The other witnesses who comment on the h-mould are Mr Hazleden and Mr Sutherland.

[270] The issues identified by the homeowners are:

(a) concerning the design of the h-mould, the vertical part should be longer and the horizontal surface of the hook should be sloped not flat. It is noted that the h-mould for Harditex's successor (Monotek) includes both these modifications. The height of the vertical part affects the ability of any water which has got in between the sheet and mould to work its way up and over the top of the vertical part of the mould. When water does this it will meet both the wrap, and the uncoated back of the sheet. Obviously the longer the vertical part, the harder it is for water to work its way up over it. The flat surface is said to encourage water to pond, rather than flow off as it would if sloped;

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[49] These figures make no allowance for the thickness of the hook so may be a millimetre or so out.

(b) concerning the manufacture of the h-mould, it came in 3 m lengths. Walls are often longer. Two pieces needed therefore to be joined on the joist. It is said this could not be done in a satisfactory way;

(c) concerning installation of the sheets, the 6 mm gap between the bottom of the top sheet and the surface of the flat part of the hook is said to be insufficient. It was too hard to get the exterior coating properly into the gap and particularly onto the bottom edge of the sheet that sits above the flat part of the hook;

(d) the coating within this gap, and the coating covering the point where the curved bottom of the hook met the sheet, both had a tendency to crack; and

(e) the h-mould distorts when subject to temperature differentials.

[271] Some of these topics inevitably overlap with past discussions. To the extent that water encounters uncoated Harditex, the sheet will absorb some or much of that water. The previous conclusion is that the sheet should cope with that and adequately dry unless these flaws mean excess water will get in.

[272] A building science issue which arises is what happens to the water which gets between the back of the top sheet and the vertical part of the mould. It is common ground some water will be held there. It does so by two mechanisms. First, surface tension holds the water against the surface of the sheet. However, as Dr Straube explains, with constant rain it will only be the last drop held there as subsequent rain otherwise washes preceding rain off. But some rain will cling to the bottom, and the design also means some will sit in the 6 mm coated gap. Second, the gap between the back of the sheet and the front of the vertical part of the mould is very narrow and this facilitates capillarity. Capillarity will pull water into the gap; the narrower the gap the more powerful the capillarity forces work. Third, Dr Lstiburek explains that capillarity pulls water into pores but cannot expel it. Some other process is needed. I do not understand this to be disputed, but if it is, I accept Dr Lstiburek's expertise.

[273] There are then two options for expelling this water that is sitting between sheet and h-mould – absorption into the sheet, or wind-driven force driving the liquid from the gap and up over the top of the vertical part, where it will enter the building enclosure. I pause here to repeat an earlier observation that the higher the vertical part the more difficult it is for that to happen. So a taller vertical part to the h-mould would be better, and again I understand it to be common ground that the current Monotek design of 70 mm is better. The issue is whether the Harditex predecessor was flawed.

[274] Dr Lstiburek calculates that the wind forces needed to drive the water from the gap into the building enclosure would occur, on average in Wellington, once every five years for a one-hour period.[50] In Dr Lstiburek's opinion this is too infrequent an event to merit focus. He also considers none of the water ingress mechanisms, if the join is properly formed, could deliver sufficient water to test the drying capacities (ie the vapour diffusion properties) of the sheet to a level where it could not cope. He notes that if on rare occasions liquid water does get up over the vertical part, the wrap will reject it in that form (other than where the wrap is damaged or there are penetrations). The water will therefore disperse and either drain or absorb.

[275] Reviewing the competing evidence, I note Mr Lalas contends for a lower degree of wind being needed – approximately half that assessed by Dr Lstiburek. The evidence does not allow me to fully understand his differing calculation, but even if it were as he says, it is still not likely to be of sufficient regularity to force sufficient quantities of water into the building enclosure to represent a flaw. Further support for the homeowners' case is taken from Mr Sutherland, but his evidence was that he had seen "instances" where water has gone over or under the h-mould. He seems, however, to link this to being a product of a crack in the coating. As such it does not advance the claim that the h-mould is inherently flawed.

[276] Overall, I again prefer the evidence of Dr Lstiburek with respect to how moisture will behave. The defendant also has other witnesses, such as Mr Longman an experienced building surveyor whose evidence sits against that of Mr Wutzler's,

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[50] It is recognised that this calculation does not factor in wind forces around the building which, depending on the building design, may increase or decrease the winds' effect at a particular moment but it is illustrative of the situation needed for wind to have this effect.

but for this particular aspect I consider following the science is the correct analytical route. The rest of the evidence is opinions or interpretations of what people have seen.[51] I accordingly do not accept it is an inherent flaw that some water will get between the sheet and the mould and I accept Dr Lstiburek's evidence as to how much and what will happen to it.

[277] The next issue, namely adequacy of a 6 mm gap between the bottom of the top storey sheet and h-mould for coating purposes, is really just a matter of competing opinions. My own observation of the exhibits prepared by Mr Wutzler for the case[52] is that they seem to have coating adequately applied in the gap. It is easy to see there are susceptibilities to cracking – within the open joint between the bottom of the top sheet and the top of the hook, and also along the line at the bottom of the hook where it meets the bottom storey sheet. This is, however, where maintenance comes in. I cannot see any difficulty here with the capacity to maintain. If the spot was covered once, it can surely be covered again or painted over.

[278] Mr Moginie, not a texture coater but a person from within that industry, gave evidence that 150 mm was the necessary gap to allow for adequate coating of a bottom edge. Mr Moginie is experienced in the exterior coating domain, and was a technical manager for Fosroc, one of the main coating systems. Mr Moginie also agrees with Mr Longman, however, that a brush can be used instead of the gun applicator.

[279] More generally, and related to these points, the evidence does not satisfy me that the h-mould cannot be properly installed or coated. If it is properly installed, there is no reason why sufficient water should enter through it, even if there is some cracking, to pose a hazard. There may well be examples at the lead and sample properties of building wrap degradation and timber decay around the point of an h-mould, and this will need considering, but given the building science it is very hard to contemplate it can be the design of the h-mould that has caused it. The evidence can be recalled, for example, about the length of time the building wrap must be exposed to constant liquid water before it will decay. It does not rain constantly or

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51 As I have done previously, I acknowledge these opinions are informed by an understanding of the science. But it is in my view a general understanding, albeit maybe to a good level. It must yield to the clear eminent expertise of someone like Dr Lstiburek.

52 Exhibits 9A, 9B and 9C.

anything like it; and the coated exterior surface anyway repels most of that water. It is also difficult to imagine a crack would let in sufficient moisture to cause a major issue, especially if the wall is even minimally maintained.

[280] The other major topic raised here is the alleged difficulty of sealing a join between two lengths of h-mould. It seemed that everyone accepts it is not an easy join to seal. This is because the width of the end of the h-mould is only about 1 mm. That is not much of a surface to adhere to the equivalent end of another piece. However, some of the experienced builders said it could be done. To my unskilled and untrained eye it seemed a case of immersing the ends in sealant; I use the word "immersing" advisedly because it seemed to be thought by everyone that a thin bead of sealant was not the answer.

[281] This was a topic on which I accept I may not have quite grasped the issue. It seems generally accepted that care is needed with sealant as a waterproofing device, especially if it is exposed to the elements. It breaks down under UV light and generally has a shelf life. This latter point feeds into the homeowners' challenge to the ability to maintain the system. Once the sealed join is covered by the exterior coating, how can it be maintained? The answer is plainly that it cannot. A query that can be raised, however, is that as long as it is covered by the external coating and that is maintained, does it matter? In other words, although clearly it is a potential vulnerability, it seems to need some other failure mechanism to turn latent into a reality. And it will only be a single point on some walls; why water would ingress exactly there if the coating covers it properly is not apparent to me on the evidence.

[282] There was, as with all the topics, a lot more evidence about h-moulds but none of it impacts on these core conclusions. Reviewing the homeowners' closing submissions, the preceding discussion addresses the key matters raised. I therefore address the balance of the topics only briefly.

[283] An aspect of the homeowners' evidence and submissions on this topic was in part defensive in the sense that when problems with the h-mould are pointed to on the lead and sample properties, James Hardie notes the extent to which there is a non-compliance with the JHTI. Some of that will be addressed later, but a point made

here by the homeowners is that their evidence suggests that the h-mould's location on the inter-storey join does not affect the watertightness of the joint. I accept that is so, but with one qualification. It is a movement control joint so non-compliance removes one mechanism by which the building was to be compatible with movement. Movement, amongst other things, causes cracking so, as indeed Mr Wutzler observed on numerous occasions, these things are interconnected.

[284] The defendant presented considerable evidence to counter that of the homeowners which included the fact that the h-mould was part of the system which had BRANZ approval, and that it was a detail consistent with other cladding product manufacturers. Mr Longman analyses the technical brochures concerning several alternative products – ETERPAN, CSR, Duratex and Primebase. His opinion is that the JHTI was either as comprehensive as or plainly more so than the other manufacturers, and he notes CSR also had a BRANZ approval certificate which covered its very similar h-mould. I accept this analysis.[53]

[285] Further in this regard, two BRANZ publications are supportive of the h-mould concept. In 1993 BRANZ first published a House Building Guide, the 1996 version of which showed an h-mould.[54] Then in 2001 BRANZ produced a Good Texture-Coated Fibre-Cement Practice Guide.[55] The Guide recommended as one of the join options a PVC horizontal flashing. It was noted sealant should not be used if directly exposed to the weather (which as noted will not be the case once the wall is coated).

[286] Overall, my conclusion concerning the h-mould is that, while it could have been improved in the way that is now seen with the Monotek version, there is no reason why, if installed as directed, it should not have worked, and the evidence did not satisfy me it could not be done properly.

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53 The systems are by no means identical. CSR used a "z" mould. Duratex provided no detail, although Mr Longman says in his experience PVC h-mould jointers were commonly used with Duratex.

54 BRANZ *House Building Guide* (July 1996) at 189.

55 BRANZ *Good Texture-Coated Fibre-Cement Practice Guide* (Wellington, April 2001). It is a criticism of James Hardie by the homeowners that James Hardie declined to assist with this publication, believing there was a threat to its intellectual property.

Base of sheet

[287] It is convenient to summarise this challenge with two extracts from the plaintiffs' materials. First, the Fowler statement of claim:[56]

> The Harditex sheets are inherently moisture absorbent such that the sheets themselves will readily absorb and accumulate moisture and can transfer this moisture to other building elements including the underlying framing timbers. The absorbent nature of this fibre cement is particularly relevant at the bottom edges of sheets where water clings to the bottom edge of the sheet under surface tension which promotes water ingress via absorption. This water can also be absorbed by the inside face of the base of the sheet. The defect is particularly relevant at the base of the north, east and west elevations of the property where the Harditex sheets have absorbed and transferred moisture to adjacent building elements such as the building underlay and underlying framing timbers to which they are directly fixed;

Second, the closing submissions:

> 99. The plaintiffs' evidence is that failure at the base of sheet occurs where water which runs down the face of the sheets to the base clings to the bottom edge under surface tension, and from there it can enter the wall assembly either by capillary action or being absorbed through the base of the sheet or the rear of the sheet. Once the water is absorbed by the sheet it can travel through the sheet and where the sheet is in contact with the underlay:
>
> (a) The water can either be absorbed through the underlay (in the case of Kraft paper); or
>
> (b) Can access the framing through fixing holes or other holes in the underlay (in the case of both Kraft paper and synthetic papers).

[288] There is no dispute that water running down the face of the sheet can be held against the sheet, including the bottom of it, by surface tension. If that bottom of the sheet is not sealed and coated, then the established absorbency of the sheet will take the water up into the sheet. The evidence suggests there would need to be a lot of water before this was an issue, but theoretically, and depending on the climate and rain pattern, one could envisage a situation of continual wetting sufficient to overwhelm the drying capacity. At the extreme, it would break down the cement matrix. But all this is unlikely. I also accept Dr Straube's point it will only be the last drops of each rain event that linger to be absorbed.

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[56] Fowler, fourth amended statement of claim, at [36](a).

[289] I am unsure exactly what is the import of the closing submissions in terms of water pathways but repeat the earlier conclusion that I am satisfied water once absorbed can only exit the sheet in vapour form. I do not therefore understand the proposition, if that is what it is, that water will be absorbed through the kraft paper. I accept depending, on the relative temperatures, it may exit inwards through the building wrap in vapour form, but it will definitely be in vapour form if the source of the moisture is the sheet.

[290] The real issue arising from the evidence is the practicality of coating the bottom edge. I can say immediately in my view the evidence shows it can be difficult, because an applicator gun will often be unable to be used. Brushing will therefore be required.

[291] More generally, care and effort are definitely required. The evidence in this case would not give any confidence that all applicators at the time would take that care or put in that effort, or even appreciate the importance of it. If not coated, the bottom of the sheet is exposed, and will become a moisture pathway.

[292] Concerning how much moisture will get into the building enclosure at the bottom of the sheet, at many of the properties the uncoated back of the sheets showed a moisture staining pattern at the base which was like the outline of the tops of rolling hills, or the tops of waves. It is agreed this pattern is evidence of moisture having been there. The parties are at odds as to whether that pattern reflected water wicking up within the sheet from the base or water coming down from above. I will consider that topic later but observe for now that the existence of a staining pattern reflective of water having come and gone would seem to favour Dr Lstiburek's evidence – under normal conditions the sheet will dry out.

[293] The prescribed detail for this base of sheet area is:

(a) the bottom of the sheet should hang down past the bottom plate, which is the bottom piece of wood, by at least 50 mm;

(b) the bottom of the sheet should be above the ground. The JHTI rules have been an inconsistent mess. Original iterations of the JHTI required the

sheet to sit at least 20 mm above the ground after landscaping had been done. In 1995, it became 50 mm but the BRANZ appraisal of that same year said it should be 100 mm above hard surfaces and 175 mm above unpaved ground. A different detail within the 1995 JHTI said 100 mm and 150 mm respectively. In 1996, it seems to be 100 mm and 225 mm, and then in 1998, 100 mm across the board. However, again within these documents, other inconsistencies can be found;

(c) where it is a concrete slab house, there was to be a gap between the back of the sheet, and the concrete slab (the capillary gap). For all JHTIs until the last one in 1998, the required gap was 2–3 mm. In 1998, this became 6 mm. It can be noted that throughout the whole period the applicable building standard, NZS 3604, required a gap of 6 mm, so all JHTIs prior to 1998 were inconsistent with the Standard;

(d) this prescribed gap between the slab and the back of the sheet was to be bridged by a strip of inseal placed 5 mm above the bottom of the sheet; and

(e) the JHTI required the coating to cover the bottom of the sheet and go across the inseal to the slab.

[294] The overall theory of the detail, as I understand it, is that the overhang below the plate, the inseal strip and the ground clearance protect the bottom timber plate from water. The coating on the face and the bottom protects the sheet.

[295] The primary challenges are:

(a) the sheet should have had a drip edge to promote water drainage;

(b) the capillary gap prior to 1998 was inadequate and from 1998 only just so;

(c) the inseal would not work to prevent water splashing but did inhibit drainage. It was impractical to install and Mr Wutzler's evidence is that he has rarely seen it used;

(d) the ground clearance details were very inconsistent; and

(e) it was too hard to coat the bottom of the sheet.

[296] Of these, several were raised by the plaintiffs more to respond to an aspect of the defendant's case, than as an assertion of a problem. For example, the defendant often points to non-compliance with the ground clearance requirements when responding to an allegation of base of sheet damage. In response, the plaintiffs highlight the inconsistency of James Hardie's treatment of the ground clearance requirement so as to make its case that such non-compliance was not a reason for the damage.

[297] The only issue that really matters here is the ability or otherwise to coat the bottom of the sheet. Of the other topics, the experts disagree on whether the sheet as is operates as a drip edge or whether some specific design was needed to achieve that. A designed drip edge seems not to have been a feature of any rectangular cladding sheet at the time. The inseal would no doubt, if effective, be an extra safeguard against water getting up, but its efficacy can certainly be debated. But undoubtedly it would be a flaw if the sheet cannot be coated on its exposed bottom edge, and it is to that issue that attention turns.

[298] The homeowners' criticisms of this aspect include:

(a) the JHTI never placed significance on the need to coat, or maintain the bottom edge;

(b) there is considerable evidence from both sides that it is difficult to coat it; and

(c) Mr Wutzler's experience is that the coating will be uneven and will degrade over time, an issue reflective of the difficulty of initial application.

[299] I accept all these points, and as noted earlier accept that coating the bottom edge is a difficult task for the applicator. The evidence does not satisfy me, however, that that makes the design wrong.

[300] It seems fundamental to coat exposed surfaces of an absorbent exterior cladding, whatever the cladding. No special knowledge needs to be imparted, or should need to be imparted, concerning this. It is clear that whether an applicator gun can be used to coat the bottom depends on the particular site. For example, photographs emerged during trial of the Woodhouse Avenue property (the property of Ms Fowler and Mr Woodhead) that suggest there would have been ample clearance to coat the bottom with an applicator gun. There will undoubtedly be other properties where there is not sufficient clearance. Where that is so, a brush would have to be used, but I do not accept it is a flaw that a product manufacturer requires a builder or whoever is responsible for the exterior to ensure the surfaces are coated.

[301] There must be options. For example, the Good Practice Guide issued by BRANZ suggests sealing the bottom of the sheets while they are on the pallet.[57] That does not seem unduly burdensome. Ultimately it is not for the Court to determine what the best method is. What is clear on the evidence is that it must be done, and while there will often be difficulty and it will need endeavour, it can be done. It seems to me, as with many of these things, it just needs a little thought and planning and probably time. I accept also that brushing may not be as effective as an applicator gun, but it is a longstanding way of coating surfaces.

[302] I therefore proceed on this topic on the basis that the JHTI required the bottom of the sheet to be sealed and coated and this should have happened. Analysis of whether the base of sheet detail is inherently flawed starts with that conclusion.

[303] Looking next at the issue of the capillary gap between sheet and slab, I agree that the JHTIs prior to 1998 were flawed. The gap should have been bigger. If the aim is to prevent capillarity, then it was not good methodology to require this small a gap. Dr Lstiburek confirms capillary action does not operate once the gap is 6 mm or more. This was the requirement of NZS 3604.[58] The homeowners also cite the initial 2–3 mm capillary gap requirement as an example of the unworkability of the Harditex

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57 BRANZ, above n 55, at [4.12.2].

58 Dr Straube considered 2–3 mm would achieve the purpose, and that a much smaller gap was needed before a real issue would arise. Given the NZS 3604 Standard sets it at 6 mm, I consider the correct assessment is to conclude the JHTI figure was incorrect. I accept though that it was a large enough gap to limit the worst effects of capillary action.

system. It is said it was unrealistic to expect a builder could achieve that sort of gap around the whole building with what are inevitably imperfect lines in the slab and in timbers. The defendant does not disagree but notes there is no evidence in the lead or sample houses, or elsewhere, of anyone trying to construct to that narrow margin.

[304] On that issue, it seems clear that any builder, recognising an inconsistency between a minimum requirement in a New Zealand Standard and that stipulated in product technical information, should apply the Standard. It is the regulation governing the building of the house, and there is no capacity for a manufacturer to lower minimum requirements. Accordingly, the JHTI flaw, while very poor, should not have been material. No doubt, however, on occasions it nevertheless induced error.

[305] The inseal strip issue was somewhat a moving event. It seemed at times to be argued by the homeowners that it would not prevent splash-up but would prevent drainage; on the other hand, James Hardie claimed the opposite – it prevents splash-up but not drainage. The homeowners further submit the recommended inseal size was incorrect in order to achieve a seal, but then Mr Wutzler said in his experience no-one used the inseal anyway. James Hardie says it was not a detail concerning which complaints were much received.

[306] Overall, perhaps reflecting all this, it is not an issue on which I have a firm view. The evidence shows competing opinions within James Hardie about its utility and the homeowners seem to say it was conceptually flawed but not particularly important. I do not regard it as a significant topic.

[307] Likewise with ground clearance. The JHTI details are a clear example of a lack of attention to detail within the JHTIs. There are inconsistencies within a particular JHTI, let alone changes across iterations without any obvious basis for the change. It is difficult to discern one JHTI that properly reflects the requirements in this regard of NZS 3604.

[308] All that said, there does not appear to be a situation where the amount prescribed by the JHTI at any given time would be a real source of risk. The amounts could and should have been more, but putting the sheets too close to the ground would

be contrary to NZS 3604, to the JHTI and to the Good Practice Guide.[59] I agree with the homeowners that assuming a basic level of clearance is achieved, it is hard to accept a failure to have more mattered given James Hardie's apparent indifference (as reflected by the JHTI inconsistencies) to the issue.

[309] In conclusion, I accept there are difficulties in meeting the requirement, and that aspects of the technical information suggest a lack of care about consistency and about compliance with NZS 3604. However, in terms of weathertightness, it was always clear the base of the sheet should be sealed and coated, and there is no reason why that could not be done. Sound building experience should have ensured sufficient ground clearance such as to not be a significant issue whatever height was chosen.

Exterior corners

[310] Identifying exterior corners as a separate flaw comes from the defendant's submissions rather than the plaintiffs'; but it is nonetheless a convenient heading for drawing together some topics.

[311] An exterior corner is a corner exposed to the elements, and what one usually thinks of when talking about the corner of a house. The contrast is an interior corner which occurs, for example, where there is an inward bay in a wall. Interior corners tend to be more protected from the elements. The issues which arise are whether the detailing within the JHTI was sufficient and workable for:

(a) joining two walls; and

(b) ending an h-mould at a corner (or joining them at that point).

[312] External corners are obviously risk points. Whatever the cladding, there will be a join that needs weatherproofing. Obviously, conceptually this is as it has always been with a building.

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[59] BRANZ, above n 55, at [2.10].

[313] Reviewing Mr Wutzler's evidence on this, the main concern seemed to be with the termination of the h-mould or with where h-moulds met at a corner. At a corner the JHTI allowed for either filling the gap with a jointing compound or using a PVC designed mould placed over the corner. Mr Wutzler says his experience is that the latter was more common. He is critical that no detail satisfactorily explained how to handle the PVC h-mould meeting the PVC corner mould.

[314] This topic reflects an ongoing point of difference between the parties, and in particular Mr Wutzler for the plaintiffs and Mr Longman for the defendant. It is the extent to which the JHTI needed to explain sound building practice. For example on the topic of h-moulds meeting, Mr Longman says the obvious thing is that you mitre a joint (cut the ends on an angle so they fit together). Mr Wutzler observes this is not suggested anywhere in the JHTI. I will discuss this point of difference in more detail later but note the absence in the JHTI of any explanation of what Mr Longman says is a basic building skill is a constant point raised by the plaintiffs.

[315] The external corners, like everything else, should be and will be coated. The issue as Mr Wutzler sees it is that the joining system, be it with jointing compound or sealant, is not robust enough to allow the joints to cope with movement. Cracks will result, and will let in moisture which causes the damage he has seen. The James Hardie witnesses dispute the inability to cope with movement. Mr Longman accepts the detail improved in the 1995 JHTI and subsequently when a proprietary PVC corner mould was stipulated, but remains of the view that the prior detail worked.

[316] This issue can otherwise be left until the houses are considered. If it is a problem it should be apparent, although much of the same context will exist – how much moisture would anyway get in, and whether it would exceed the capacity to drain and dry it.

Windows

[317] Along with the h-mould, the difficulties encountered with installing windows were the key focus of the plaintiffs in relation to the alleged inherent defect two – "being that the system allows water ingress at various locations". The inclusion of

windows within this defect implicitly assumes they are part of the Harditex system which is something denied by James Hardie.

[318] By way of background, at issue are what are called face-fixed or flushed-fixed windows, which are just regular windows. They are windows that sit flush on the wall (as opposed to being recessed in). James Hardie first addressed this feature in its 1995 JHTI where it provided a detail for a head flashing above the window, and instructions for joints and sill flashings. The head flashing is the metal strip one sees above windows that protrudes out from the wall and acts like an awning or eave, only it is just a few millimetres wide. In 1998, details for sill (underneath the window) and jamb (side of window) flashings were added.

[319] The homeowners raise two issues or criticisms:

(a) joinery/cladding junctions are a critical weathertightness component of a building, and details should have been provided from the outset;

(b) but not the details that were eventually provided because they were inadequate and flawed.

[320] I address first the general question of whether it was James Hardie's responsibility to provide these details at all.[60] In support of their argument that it was, the homeowners note:

(a) every penetration, including windows, in monolithic cladding is a potential water ingress point, so manufacturer literature should provide details as to how to install it properly;

(b) Harditex was "an absorbent cladding material with no provision for drainage and drying" so it was more important they be provided;

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[60] This topic is returned to later when the adequacy of the JHTIs is considered as a discrete topic. However, they were presented as part of inherent defect two and it is convenient to consider all aspects of the topic in the one place.

(c) Harditex was an Alternative Solution under the Code, which means more detail should have been provided;

(d) the need for these details was ultimately recognised by James Hardie and they were provided, which shows they should have been there in the first place; and

(e) In 2002, James Hardie paired with a window manufacturer to provide window flashings designed for its latest cladding, Monotek. This is evidence of a manufacturer recognising or assuming responsibility for the cladding window interface, a responsibility that the homeowners say has always existed but was not recognised by James Hardie.

[321] In support of these propositions the homeowners rely on statements by Messrs Wutzler, Lalas and Sutherland. I accept the latter's experience in New Zealand as an architect and his involvement in technical literature. Mr Sutherland's evidence on the point, though, as with much of his evidence, tends to be assertion rather than containing reasoning as to why the views are held.

[322] Relevant to this, there is no evidence that any other manufacturer provided this sort of detail. The homeowners called two witnesses, Mr Glover and Mr Baines, who were experienced in the window industry. The whole of their evidence left me satisfied that there was quite a shift in the late part of the 1990s through to the 2000s. It seemed to me that prior to that there was compartmentalisation of tasks – manufacturers produced the claddings, window manufacturers produced the windows, and builders joined these components. Mr Glover accepted, for example, that his company, a prominent aluminium window manufacturer, did not produce flashings other than head flashing as anything approaching a standard item until the late 1990s.

[323] Care is needed, I consider, when a defendant such as James Hardie initially responds to a challenge about its product by urging the Court to look at the context and the times. The primary focus must be on what the manufacturer did, not whether others were as bad. However, here I consider there is legitimacy in the point. There has been a significant change and what a cladding manufacturer does now in relation

to the interface of its cladding with windows is very different from what any manufacturer did for most of the life of Harditex.

[324] The James Hardie evidence was that the shift in approach – in 1995 when a head flashing detail was first provided, and then in 1998 when jamb and sill details were added – was a response to growing awareness that errors were being made, and growing awareness that assumptions as to building knowledge may be, or indeed were, wrong. It seems that head flashings were not being even used on some buildings,[61] let alone the idea of jamb and sill flashings.

[325] The evidence seemed consistent that at the time Harditex was released, a manufacturer did not assume responsibility for providing details on how to deal with penetrations generally, and windows specifically. I accept the James Hardie evidence that it started to engage with the topic as it received evidence of poor practice and therefore failures. There is no evidence to suggest its approach was different from any other manufacturer.

[326] A relevant inquiry is whether there was anything different about Harditex that necessitated a different approach. In closing submissions the homeowners emphasise it was an absorbent cladding "with no provision for drainage or drying". These matters have been addressed and the conclusion of the judgment is that the latter part of the statement is incorrect. The homeowners also refer to Harditex being an Alternative Solution,[62] which is correct but that status does not mean that the manufacturer of the cladding must in its technical literature explain to builders how to build homes. The reasonable expectation must be that the manufacturer's literature deals with the new features of a product that require new building skills or tasks.

[327] Harditex is a rectangular cladding sheet, the style of which had been around a long time. Its primary changes were (arguably) its composition and (certainly) its recessed edges. Neither of these matters impacts at all on windows and I accept the

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61 I recall but cannot locate a witness observing they had seen unused head flashings discarded on a building site.

62 An Alternative Solution is a design which requires specific consent each time. Most cladding systems, other than timber and stucco, were Alternative Solutions.

defendant's position that it was not negligent in failing to tell builders how to build windows in a house.

[328] Mr Longman made the points just noted in his evidence, to which Mr Wutzler replied:[63]

> Mr Longman's primary response to my criticism of the lack of details in any of the Harditex JHTI for face fixed window/cladding junctions until 1995 is that flashing of doors and windows is "*basic building practice*", that a competent builder "*would know*" how to detail them and that builders also had access to various generic guidance in BRANZ publications and a James Hardie telephone helpline. Mr Knox repeats similar themes, stating at paragraph 1324.1 that the face fixed window details in the JHTI were "*standard trade practice*" and notes they were similar to "*equivalent details for stucco walls*". Mr Knox's comments fail to take into account the fact that Harditex was an Alternative Solution incorporating an absorbent, non-durable sheet encapsulated in a coating which effectively entraps any moisture which penetrates the board. These details differ from other sheet cladding systems such as plywood painted in a thin paint system through which moisture could more easily diffuse. In this situation, I am of the opinion that the protection of the window/cladding junctions within Harditex required more than an assumption that builders knew how to detail the areas and should have been the subject of specific detail and testing.

[329] I am satisfied this captures the essence of the homeowners' case on the aspect and for the reasons given, I do not accept it. It is premised on Mr Wutzler's opinion that the sheet is in itself a deficient cladding option, which in turn means greater care and initiatives were needed than either were the industry norm or were done by anyone. If the premise is not established, and it has not been, the force of the balance of the proposition diminishes.

[330] The second aspect of the windows topic is the adequacy of the instructions or details that were given in 1995 and subsequently. Some of the material is very technical. It is sufficient for this judgment to capture the key aspects at a general level. On these technical issues there were competing views which are difficult for a fact finder without building expertise to resolve. Some conclusions are, however, possible.

[331] A key focus was the safe construction of the head flashing. As noted, it is the sill above the window. One can imagine a single sheet with a square cut in it into

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63 Footnotes omitted.

which a window will be inserted.[64] A head flashing has to be placed at the top edge of the hole immediately above the window. The flashing will have an upstand that has to go up beneath the cladding. That upstand should have the building paper over it, between the metal upstand of the flashing and the back of the sheet, so it is important to position the flashing correctly. If the cladding and building paper have been installed first, it is not easy to slide the flashing upstand in between them without damaging or bunching up the building wrap. If the sheet has already been nailed hard, it is not possible. Further, the flashing has to be, and is, wider than the window so there will be an extended notch cut at each side.

[332] The issues the homeowners raise, all of which focus either on the capacity of the window penetration to let water in or its alleged incapacity to drain, are:

(a) there was inadequate direction as to how to seal the notches properly. This included insufficient instruction as to the type of sealant to be used. The sealant will eventually fail either through exposure to UV light, or through stress from building movement. If coated, this failure will not be evident and cannot be fixed. Sealant is not a satisfactory weatherproofing mechanism;

(b) it was not until the 1998 JHTI that builders were told to lap the building paper over the upright stand of the flashing. There was never sufficient instruction how to do this;

(c) connected with these, the installation sequencing is unclear, and in particular whether to put the window in before the flashing. It seems common ground the best approach is probably to put the flashing in place before or at the same time as the cladding, with the window last. This enables the building paper to be properly positioned. However, the homeowners say it is an impractical sequencing because it requires the flashings to be onsite prior to the windows arriving and this does not happen;

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64 This is not how a window will be built but it suffices as an example for present purposes.

(d) the JHTI required a 75 mm upstand for the head flashing at a time when the industry standard was 40 mm; and

(e) there was an inconsistency in the technical literature about whether the back of the sheet immediately above the window should be first sealed. For a while there was a requirement for sealing the bottom 200 mm of the sheet above the window but this changed to putting a strip of inseal on the back of the sheet so the inseal sat between the sheet and the face of the upstand. This altered requirement is said to be impractical and an impediment to drainage.

[333] James Hardie witnesses provided responses. It is clear that this aspect of building, namely fitting the windows, is a difficult task, but for reasons already discussed there is nothing new about it and there were several sources of information to assist. Witnesses were taken to BRANZ bulletins, and window manufacturers' technical information on how to do it, although, again, any level of detail did not emerge in the manufacturers' literature until around 2000 and beyond.

[334] It is not for the Court to determine the best method of the available options for the sequencing of installing a window. One witness said, and I suspect it is correct, that experienced builders develop their own technique and stick to it. The focus of the homeowners' evidence, and this is not a criticism, was to critique the methodology suggested by James Hardie. The evidence, however, did not in my view establish there was an obviously better way that James Hardie ignored. It is just a difficult task in the building of a house.

[335] My conclusion on this is that windows, like all penetrations, present an area of risk. They are a technically difficult component of the process of building a house, and no doubt some builders are better at it than others. There seem to be different ways of doing it and knowledge about the best way to do it has improved. For example, there is now agreement that the answer with the building paper is to do what is called double lapping (building paper under and over upstand), but in the 1990s that was apparently not a common practice.

[336] The evidence did not establish that this difficulty with windows was an issue new to or different with Harditex than has always existed.

[337] I conclude on this by mentioning other topics simply for completeness. There was criticism that James Hardie's window details did not provide for an air seal. This was a counsel of perfection at best, and on some views, not shown to be a necessarily desirable or a necessary thing. The cross-examination of Mr Glover, who along with Mr Wutzler advanced the point, led me to conclude there was nothing in the point as a criticism of what James Hardie was doing at the time.

[338] In similar vein, the lack of attention by James Hardie to jamb and sill flashings is not a criticism that merits weight. By that I mean it is no doubt correct these things all assist but they were not a feature of construction at the time, at least to the extent it could be said James Hardie was negligent in its treatment of them or lack thereof.

[339] For these reasons it has not been shown that James Hardie was negligent in the way it dealt with windows. The evidence does not satisfy me that there was an obligation on James Hardie to do more than it did, and I am influenced in this by the absence of any evidence that anyone else did more. Further, there is nothing unique about Harditex when it comes to windows, so it was reasonable to rely on general building skills to deal with them.

Conclusion

[340] Various topics have been considered. Some are in effect the claimed inherent defect; others are a component of a wider alleged defect. The conclusions have not been favourable for the homeowners but that is where the evidence points, and quite clearly so.

[341] The homeowners' starting point of absorbency as an inherent defect is quite significant. The evidence has satisfied me that rather than a defect, it is an advantage. It is a mechanism by which water that penetrates the exterior cladding can be safely stored and then removed (through drying in vapour form).

[342] The only basis on which it might have been a defect is if the sheet could not in fact cope with expected levels of moisture. This was where the issue concerning decay came in. The plaintiffs had a difficult task here in that there was a significant body of published literature that said fibre cement was not prone to decay. Further, the plaintiffs' own fibre cement expert agreed with the defendant's experts that fibre cement is not prone to decay. I will not repeat comments already made but just note at this stage that I consider the contrary evidence of the homeowners on this topic was presented in a deficient way.

[343] Generally as regards the evidence underlying this section of the judgment, the cumulative package of evidence about the nature and properties of Harditex presented by James Hardie was superior, and notably so. Its experts were at least as well credentialled, but usually more so. The scope of their evidence was as a rule more confined to their expertise; they were not asked to, and did not, stray beyond that expertise. The methodology was sounder. The end result was the assessment of the evidence which I have set out in the preceding paragraphs.

[344] My conclusion is that it has not been shown Harditex was a conceptually flawed product.

TESTING

[345] The judgment now leaves the building science and turns to the various tests undertaken by both parties to prove their propositions. The building science conclusions will, however, inevitably come across to this and to succeeding sections and inform conclusions.

[346] There are three tests to consider:

(a) the Helfen test, a homeowner test involving a Harditex wall, said to have been built in accordance with the JHTI, and subjected to an AS/NZS 4284 test, which is a building facade test that assesses water penetration and air infiltration.

(b) the RDH test, the defendant's test involving a less complex Harditex wall also said to have been constructed in accordance with the JHTI and subjected to a series of specifically designed tests; and

(c) a prolonged duration test conducted by the homeowners which subjected a piece of Harditex to applied water to test its absorbency.

[347] The key tests were the Helfen and RDH tests. Whilst a party may obtain its evidence as it wishes, this was a very unhelpful exercise from the Court's viewpoint. Separate walls, conceptually different in their design, to which were applied different tests. Both sides say the other built their wall wrongly; both sides criticise the utility and execution of the other's tests; both claim success; and both agree their results cannot both be right.

The Helfen test

The testing process

[348] The homeowners' testing approach was to use the AS/NZS 4284 test. Previously not approved for residential dwellings, since the time cavities became a regulatory requirement it is an available methodology for a residential wall. It is a matter of dispute between the parties but I consider there is no doubt that the original purpose of this test was to test curtain walls on commercial buildings. These generally are walls such as glass and aluminium which are intended to keep out all moisture.[65] The test sprays the specimen wall with measured quantities of water at both constant and then cyclic (increasing and decreasing) pressures.

[349] The choice of test is significant. It reflects the homeowners' case that the Harditex system was a face-sealed system designed to keep all water out with no capacity to drain and dry. Consistent with this, the definition of failure in the Helfen test protocol was any water getting behind the external cladding. This is a standard

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[65] There is evidence I will touch on later from two witnesses involved in the development of the predecessor to the 4284 test, SIROWET, that it could always be adapted to low-rise residential buildings. Regardless, I am satisfied the common understanding as to its use was that it was designed for large commercial buildings.

failure definition for these tests, and rightly so for curtain walls, the purpose of which is to keep out all water.

[350] I state at the outset that I consider the utility of the exercise has been diminished by it being premised on what I have concluded is a mistaken premise. Namely, that the Harditex system has no capacity to drain and dry. This by no means removes all utility but it is a significant initial caveat. Dr Straube's evidence that it was the wrong test (evidence itself premised on the contrary theory that Harditex does drain and dry) was compelling.

[351] The wall was built by independent builders who were given written instructions that originated within Helfen Ltd, which is Mr Wutzler's business. The basic idea was to build it in accordance with the JHTIs, but also sound building practice. It sought to include every feature relevant to the plaintiffs' case so there were four windows installed using different building methods, a bay was created, and different sealing plans were used. On this aspect, I consider it unfortunate Mr Wutzler was involved. As will be discussed, the line of authority within Helfen Ltd concerning the construction process was very murky. My assessment, however, is that it was much influenced by Mr Wutzler, and his views on the JHTIs and what they required. The builder assigned to the task was not left to his own devices to construct the wall in accordance with his assessment of the JHTI and sound building practice as should have been the case.

[352] The test specifications were designed by Mr Lalas. He is an experienced facade engineer, and undoubtedly has expertise in relation to curtain walls. He has accordingly had a long involvement with 4284 testing. Mr Lalas' test specification was peer-reviewed by Mr Bennie, who also undoubtedly has expertise in the area. He agreed Mr Lalas' specification reflected 4284. Dr Straube also believed it was a sound 4284 test. To relate this to my comments in the preceding paragraph, there are two phases: building a wall reflective of the JHTI, and then subjecting it to a properly designed test. The comments about confusion in Helfen Ltd apply to the first phase. The comment about the soundness of the test protocol in terms of compliance with AS/NZS 4284 address the second phase.

[353] The actual testing was carried out by FTNZ, a New Zealand testing facility with international accreditation. Mr Wutzler is an owner but says he was not involved for independence reasons in the actual testing.[66]

[354] The results of the testing were a spectacular fail for the wall: The summary of the test results was that:

(a) for windows, water penetration occurred at the initial no pressure test and carried on getting worse as pressures increased;

(b) at h-moulds water penetration again occurred at zero static pressure, at 225 pa applied constantly and also during the cyclic tests; and

(c) at the exterior corners, at 225 pa during the cyclic testing phase.

In brief, water started entering the building enclosure at virtually no pressure and increased markedly as the wind pressure was increased such that by the highest points it was flooding in. It found its way behind the building wrap onto the timber framing. Mr Wutzler believes this confirms his view that all Harditex houses will fail. At the end of his evidence I put to him what seemed an obvious question – were the results not too bad to be true? Mr Wutzler and the homeowners say not; James Hardie contends otherwise.

[355] The wall was also subjected to a seismic test which caused cracking at internal corners, above windows and at steel joints, all resulting in pouting.

Issues

(a) Construction of the wall

[356] Looking at the construction process, I agree with the defendant that there is confusion about what was done and why. Evidence was heard from Mr Wutzler, Ms Hohaia (the primary Helfen supervisor) and Mr Cuneen who was the builder.

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[66] Some hesitancy in being sure of the relationships comes, in part, from the fact that it was Mr Wutzler who in evidence reported on and interpreted the results of FTNZ's work. The main FTNZ tester, Mr Scott, gave evidence but not about the results.

[357] To comment first on the choice of Mr Cuneen, he had little experience with Harditex. For myself, I do not see that as particularly mattering if he was an experienced builder. The defendant's theory of the case is that Harditex is not particularly innovative or special; it just needs competence, so particular experience with Harditex would not be crucial. Experience in building with cladding sheets of whatever composition would, however, have been a sensible qualification.

[358] Mr Cuneen lacked the appropriate general building experience. He is not a licensed building practitioner and therefore not himself permitted to clad buildings, although he can do so under supervision. His experience at installing windows was limited to probably "half a dozen" times before this exercise. I do not say for a moment he lacks competence, but to the extent this exercise is meant to also assist with the issue of buildability, he was not the appropriate choice for this test.

[359] The evidence about the instructions Mr Cuneen was given was, across the relevant witnesses, inconsistent and confusing. There is no value in trying to unravel it. Mr Cuneen did his best, relying primarily on what he called "JHTI books". He was required to refer matters of uncertainty to Helfen personnel, who no doubt are knowledgeable but none of whom are or have been registered builders.

[360] The key driver of the wall design, and its method of construction, seems to have been Mr Wutzler's desire to test all the theories. For example, there were instructions to seal some joints and not others. Likewise, it was a very complex wall incorporating every available building feature. This does not per se matter, but once water enters, working out where it has come from becomes difficult through to impossible depending on the quantities. Water of course obeys gravity but otherwise finds its own pathway so where it is seen does not necessarily reflect the point of ingress.[67]

[361] All this said, it does not appear there are major concerns with the ultimate construction. The point of the previous discussion is to explain my assessment that the exercise has no value in terms of the buildability topic.

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[67] Anyone who has experienced a leaky roof, or a leak in a car, will attest to this.

(b) Specifications

[362] I have touched already on the failure definition of no water past the cladding . It is not a relevant standard for assessing a direct-fixed Harditex system which has drainage and drying capacity.

[363] Turning next to the air pressures component of the test (that is, the forces applied to replicate wind), the specifications were:

(a) Static (or constant) pressures – 0 pascals, 225 pa and 330 pa;

(b) Cyclic pressures – 150 rising to 300 pa; then 300 rising to 600 pa; and finally 340 rising to 680 pa.

[364] Mr Lalas assessed 330 pa as representative of a "very high" wind zone as defined in NZS 4211, the standard for windows. The defendant submits Mr Lalas is misreading the documents which require that level of wind only in the context of bracing requirements. I am not in a position to resolve this but the evidence satisfied me the pressures chosen were representative of either the worst conditions likely to be experienced rarely, or of a level higher than that. Dr Straube gave evidence, for example, that the lowest static wind pressure level (225 pa)[68] was something that would be experienced on a Wellington hillside for five to 10 minutes once every five years.

[365] The purpose of tests such as 4284 is to stress a system and thereby identify its failure point, if any. The pressure levels stipulated by Mr Lalas do that. This is not a criticism, just something that puts all this in context for the actual litigation. Failure at an extreme level means, at best, a house may struggle at that extreme.[69] It does not mean all or any houses will fail whenever there is rain. On Dr Straube's analysis, the levels stipulated are several times greater than the peak hourly rainfall rate he found in an analysis of six years of data for Wellington and Auckland. Likewise, using published data, the worst hour-long period of wind/rain expected on a 50-year cycle is

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68 Other than 0 pa.

69 "May" is appropriate as there will be factors such as the site's exposure which will always influence the pressures and the likely failure point.

two times less than the 4284 pressures. These matters reflect the different purposes of tests. A test designed to expose the extreme failure point may be less instructive as to the likely causes of problems being discovered in houses not being exposed to those stresses.

[366] The next contest in relation to the specifications is pressure differential. The pressure in a wall cavity will reduce from the outside cladding to the inside. The more that pressure is taken by the inside lining, such as the gypsum board, the less pressure there is at the outside cladding. Less pressure lessens the load on the outside wall and therefore the risk of rainwater penetration.

[367] The Helfen test replaced the usual internal lining (gypsum board) with perspex (to allow viewing). Holes of a 6 mm diameter were also drilled to mimic penetrations that occur in a wall assembly – power points in the gypsum and holes in the timber framing for wiring and piping. James Hardie's witnesses say the effect of these changes was to greatly reduce the pressure at the inside wall, sometimes to as low as zero. A defendant witness (Mr Schumacher)[70] measured the range in pressure at this inside wall as between 0 pa and 20 pa. This is significantly lower than would normally be expected. Mr Schumacher says the effect of this low pressure at the inside lining is to double the pressure at the external cladding – an apparent 225 pa on the outside wall, when there is such a low pressure on the inside lining, makes the 225 pa the equivalent of 450 pa. The homeowners' response to this in closing submissions is:

(a) to emphasise Mr Schumacher's lack of experience with New Zealand construction;

(b) to note that the importance of the interior lining was never emphasised in the JHTI;

(c) to note there are areas in a New Zealand home which do not have internal lining (for example, waste pipe penetrations) that therefore will have this zero pressure; and

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[70] Mr Schumacher is the person who oversaw the equivalent James Hardie exercises. He is a principal of RDH.

(d) the internal gypsum lining is not and is not intended to be airtight.

[368] The response is not persuasive. To take the last two points, if accepted they point to a contest with the Straube/Schumacher calculations concerning the impact of the design on the internal pressures, but no contrary evidence is provided. Further, the defendant's calculations are taken in part from a New Zealand BRANZ paper which estimated that the airtightness contribution of the internal lining in a traditional wall assembly would be as much as 83 per cent.[71] This supports the key point of the defendant's thesis which is that the interior lining takes a lot of the pressure. Constructing a test where that pressure is so significantly reduced on the internal lining is a flaw.

[369] As for the criticism of Mr Schumacher's experience, his evidence on this point does not appear country-specific. It is no doubt the case that other countries such as Canada will have different assemblies including internal vapour barriers, but the calculation methodology will be the same. And the source of his data was New Zealand papers. The plaintiffs' final point, which notes the lack of emphasis on the role of the internal lining in the JHTI, does not merit weight. The topic is the effect of a lining on the internal air pressure and therefore the value to be attached to the test. It is not about a JHTI (which in any event no doubt assumed a New Zealand home would generally have an internal lining).

[370] The evidence satisfies me that the utility of the H test has been significantly reduced by the test wall not having typical pressures at the internal lining.

(c) Design features

[371] Three design features need consideration – the use of sealant, the method of installing the head flashing, and the observation portholes.

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[71] See M R Bassett *Air Flow Resistances in Timber Frame Walls* (BRANZ, Study Report No 80, 1988). The authors conclude the interior linings determine the air infiltration rate through walls. See also R C Bishop and M R Bassett *Weathertightness of Domestic Claddings* (BRANZ, Study Report No 22, 1990).

[372] To take the third of these, the Helfen test included seven observation viewports situated in the timber framing opposite an h-mould. This enabled observers to view the back of the Harditex sheet, and therefore the inside of the assembly. However, they were not sealed and for each of them the building wrap was removed for the size of the face of the viewing port. Mr Schumacher said this affected the validity of any results about the system because a key component was compromised. When asked about it, Dr Straube replied:

> my view … is that if you cut a large hole in a membrane [the building wrap] that's supposed to keep water out, it won't keep water out. That's my view.

[373] I can simply observe there is no answer to this criticism. It is surprising it happened but perhaps not so much if one returns to the idea that Harditex is a face-sealed system. Cutting holes in the building wrap and not sealing the penetrations is less important if moisture management and pathways are not the focus, and failure is defined as any water at the back of the cladding. I accept the defendant's evidence that this feature further undermines the value of the exercise.[72]

[374] Before leaving this aspect, I refer to one further submission of the homeowners' closing submissions. When responding to James Hardie's criticisms of the test, the plaintiffs submitted:

> Mr Wutzler explained that having done the test multiple times the results were the same.

[375] There are several instances in Mr Wutzler's evidence of comments like this. I decline to place weight on them. The circumstances and details of those tests are not in evidence and it is not evidence that can be allowed in under the label of qualifying a witness. Unsupported references to other tests are not admissible and I ignore them.

[376] The second topic is sealant. The evidence demonstrates the same lack of clarity as to what the builder of the wall was required to do. That confusion was exacerbated by the absence of any definitive records of what was done and the uncertain

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[72] Mr Wutzler's evidence was that he did not observe water entering by this means. I do not doubt that is his assessment but as a test its integrity in this aspect has been compromised. Further at the higher pressures Mr Wutzler agreed it was very difficult to know where the water was coming from.

recollections of Ms Hohaia and Mr Cuneen. There is simply no sound record of what was sealed and by whom.

[377] In closing submissions the homeowners rely on Ms Hohaia's evidence that some sealant was applied after the sheets were installed. Mr Cuneen, however, said his instructions were to leave sealing to the coating applicator and that is what happened. The plaintiffs say this was normally done in the field, referring to a passage of evidence from Mr Wutzler:

> A. Well, often it's done by the texture coater, and the sheets are already applied. So the only part of the end that's exposed is this little bit here.
>
> Q. Why do you say it is done by the texture coater?
>
> A. Because on the hundreds of thousands of buildings (sic) I look at that's who normally applies it, and it's probably the most appropriate person to apply it.
>
> Q. Good trade practice would be for the builder to install the sealant as the h-mould is being fitted, correct?
>
> A. No, not necessarily. I think there's multiple interpretations …

[378] No builder to my recollection supported this, and others described how they, the builder, would do the sealing. On other occasions Mr Wutzler seemed to accept it was good practice for the builder to do it and that seems obvious as it is easier to do when, for example, the h-mould is being fitted in the first place.

[379] When sealant was or was not used on the test frame was influenced by Mr Wutzler and his belief that the JHTIs were deficient in not telling builders to seal joins. This meant he wanted some joins unsealed to reflect the unsoundness in the JHTI. The silence in the JHTI was because it assumed builders knew joins need sealing. This was a reasonable assumption. Instructions to the test wall builder not to seal some joins were another flaw.

[380] Sealant issues in relation to this construction also arise with the area around the head flashings, and in particular whether some of the extended notches have been sealed. From photographs it is difficult to discern there being any sealant at all in some of these places. I do not understand there to be disagreement that there should

be. Mr Wutzler would dispute the sealant's value, but I am sure he would support the use of it.

[381] The third issue is the installation of the head flashing. I have touched on the topic before, and the debates that exist about the best way to do it. It is clear that Mr Cuneen put the upper sheets on first and at least firmly tacked them, if not indeed nailing them all the way. Getting the upstand of the flashing underneath the hard nailed sheet was therefore very difficult. On one occasion a chisel was used to lever in the flashing and it was damaged. It is inevitable in these situations that the plane of the building wrap was disturbed. It probably ended up bunched at the top and not covering the upstand, or alternatively the upstand was in front of the wrap rather than covered by it. It is very unlikely it remained in its correct position. This is very relevant to whether water will properly drain away.

Conclusion

[382] My assessment is that the test was not done well enough to make it reliable evidence for establishing the plaintiffs' case. I do not purport to have an answer for every penetration of water occurring especially at the very low static pressure levels (nor is it the Court's function).[73] My assessment is whether in the end the methodology and the implementation allow the Court to give the exercise weight, and how much.

[383] My primary reasons for not regarding it as reliable enough to establish or significantly assist the plaintiffs' case are:

(a) the flawed premise of the test which was that Harditex is a face-sealed system with no water management capacity;

(b) the limited value for the litigation of testing upper end pressures as a pointer to a general system deficit;

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[73] James Hardie links the 0 pa leaks to specific design flaws. It is suggested, for example, that the sites of water ingress matched unsealed aspects of the model – a nail hole or a viewing port. It is not necessary to resolve these.

(c) the related fact that those upper end pressures are much higher than expected weather conditions in New Zealand;

(d) the absence of an appropriate pressure level at the internal lining which significantly exacerbates those already high pressures on the external walls;

(e) the inadequate use of sealant which is a necessary and legitimate aspect of weathertightness, and the use of which is required by good building practice;

(f) the unsealed viewports and the corresponding cuts in the building wrap membrane; and

(g) the building paper concerns around the head flashings.

[384] Lesser concerns I would add are:

(a) the general inexperience and unsuitability for this particular exercise of the builder; and

(b) the very confused instruction system and recordkeeping of what was done (not the fault of the builder).

The RDH test

The testing process

[385] RDH[74] is the name of the Canadian company which carried out the testing for James Hardie. The main person overseeing the exercise was Mr Schumacher although Dr Straube was closely involved, designing the air pressures and water spray rates in much the same way as Mr Lalas did for the Helfen test.

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[74] RDH Building Science (Inc). It has nine offices across North America. It does not hold the same international accreditation as FTNZ which did the Helfen test.

[386] The concept of the RDH test was different in that a single wall of two storeys with windows and an h-mould was constructed. Tests were then designed and implemented, separately but sequentially, in order to answer six questions that were understood to underpin the plaintiffs' case:

1 Can liquid water pass through a coated sheet?

2 Does a building wrap resist rainwater penetrating into the wood framing cavity, even at significant water and wind pressure rates, and does the whole system (ie cladding added over the wrap) resist rainwater penetration into the wood framing cavity?

3 Does the system drain and dry?

4 During heavy rain does the rainwater overtop the h-mould vertical upstand; and, if so, does that water reach the timber?

5 Do windows installed with flashing details common to the 1990s work to limit rain penetration?

6 Does the base of sheet detail provide sufficient drainage to manage water draining from above?

[387] The water spray rate was the same as used in the Helfen test, both being the figure specified in AS/NZS 4284.

[388] The wind pressure rates varied according to the tests. Where the issue was draining, the air pressure was nil. (tests one, three and six). In test two, which was a rainwater penetration test, pressures varied between 75 pa (which Dr Straube says represents a moderately frequent example of severe rain and wind) through to 300 pa. Concerning the testing of whether water would overtop the vertical part of the h-mould, the pressures ranged from 150 pa to 1200 pa. Finally for the window test the air pressures were those specified in the relevant window standard NZS 4211.

[389] Recalling the earlier discussion about pressure differences within the assembly and the role of the internal lining, the pressure differential was maintained at 50 per cent for each lining, being the halfway point of the range identified by Bishop and Bassett in their BRANZ article.[75]

Results

[390] Test one. This seemed an unnecessary test based on a misunderstanding of the plaintiffs' case. It showed that water would not penetrate a coated sheet where there was not a join or a crack. This is not contested. It is, in effect, a testing of the deflection requirement of Mr Hazleden's "four Ds". It is unnecessary to consider this test further.

[391] Test two. There were two stages. First, the timber frame was covered only by wrap and subjected to wetting events, and then cladding was put over the wrap and the same thing done again. With the wrap only,[76] some water was seen to penetrate through staple penetrations. The frame retained 5 kg of moisture from the 7400 kg sprayed over the course of four hours. With the cladding in place there was no visible penetration, but a moisture retention of 2.5 kg. The rates of penetration represent 0.07 percent and then 0.03 percent and compare favourably to the ASHRAE default assumption of one per cent discussed earlier.[77]

[392] Test three. This was the test designed to test drainage capacity and drying ability. Water was inserted at the top of the frame between the back of the sheet and the wrap. For the drainage part of the test, the internal lining was perspex to allow observation of water movement.[78] The bulk of the water exited at the h-mould point halfway down. Recalling the building paper is lapped over the h-mould upstand, the water went down the back of the sheet and then followed the path of the wrap. This meant it exited to the exterior at the h-mould and then travelled down the exterior face. 29.1 kg of water was introduced. 25.6 kg exited by the method discussed. 3.6 kg was

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75 Bishop and Bassett, above n 71; and Bassett, above n 71.

76 This is really just a test of building wrap capacities. It is of some utility but the reality is that for a long time building wraps have been required to have the capacities demonstrated by the test. It keeps water out unless there are holes in it, which there will be where staples and nails penetrate.

77 As noted earlier, ASHRAE assumes one per cent through cladding, and one per cent of that through wrap. This suggests the latter figure over-estimates the amount that will get through a sound wrap.

78 The difference here from Helfen is that the enclosure was pressure controlled.

retained either on the face of the wrap or the external face of the sheet or absorbed into the back of the sheet.

[393] The exercise was then repeated to assess the capacity of the system to dry the retained water. Because the focus was drying, the perspex was replaced by a standard gypsum board lining.[79] The same water quantities were introduced, and a very similar drainage rate/retention amount balance was achieved. Eighty-four hours of "moderate solar heating" was then applied. The effect was that the retained moisture dried out.

[394] Test four. This test applied pressure-driven water to the face of a wall with an h-mould constructed in it. The test used a range of pressures from 150 proposes wavered pa to 1200 pa. The pressure differential was varied from the default 50:50 (internal:external) through to 0:100 (internal:external). The result was that water did not overtop the h-mould at any pressure. Dr Straube admitted he was surprised how well the h-mould worked, but considered the explanation was that the gaps inherent in a real-world assembly impact on pressure differential sufficiently to produce this outcome.

[395] Test five. This tested the penetration of rainwater at windows. There were two windows – one installed with the "Harditex system" and one using weatherboards. The windows worked. The dispute about the test is the extent to which the design of the windows was representative of the time Harditex was on the market, but that is not a challenge that undermines the proposition that windows can be installed properly.

[396] Test six. This was the base of wall test. The window design used was that recommended in the 1998 JHTI, with inseal applied. The water was inserted between the back of sheet and the wrap. This test also reflected a misunderstanding of the homeowners' main complaint about the base of sheet. Mr Wutzler says the issue is the face of the sheet and water gathering at the unsealed bottom. The test, if accepted, showed the inseal feature did not prevent drainage.

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[79] This is because vapour can penetrate these linings (but not perspex).

Criticism

[397] The homeowners make some general criticisms. Taking the substantive ones, they are that it is an inadequate exercise because the tests were not done on a full wall assembly with windows, h-mould and corners all on the one elevation. This criticism taps into an ongoing dispute between the parties as to whether there exists a proper testing system for this type of wall assembly. That aside, however, it is a point to note. To the extent to which the presence of other features on the wall may impact the operation of the feature being tested, this RDH test does not capture that.

[398] The other general points made can be listed but do not need analysis. The homeowners say RDH should have done a 4284 test,[80] the homeowners' experts should have been given more notice of when the testing was happening,[81] reflecting their lack of familiarity with the product RDH had to construct a trial wall, something which was not disclosed,[82] and the RDH builders had no experience with New Zealand building.[83]

[399] I turn now to the criticisms of each test. I observe that the primary source of the criticisms is Mr Wutzler which, again, brings his experience into focus. I do not need to dwell further than I have on my doubts as to the basis on which he can give these opinions, but I note one relevant further aspect. Mr Wutzler owns FTNZ, the testing facility used by the homeowners for their tests. When asked about this, Mr Wutzler said he did not do this testing and that it was important he did not:

> [FTNZ] is an IANZ accredited facility and has very strict protocols. Its audited.

[400] This of course makes sense but, again, calls into question the basis on which Mr Wutzler presents the results of the homeowners' test and critiques the RDH processes and testing methodologies.[84] Mr Wutzler says he observes a lot of FTNZ work but it could be argued, even expected perhaps, that Mr Scott, the main person at

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80 As discussed, James Hardie says, and I agree, this is the wrong test.

81 On the material I have seen, more notice could have been given.

82 Obviously it eventually came to be known. For the purposes of the assessing the value of the testing it did not seem to me to be particularly relevant.

83 This is correct.

84 I do not include in this reservation Mr Wutzler's observation of the construction of the rig.

FTNZ who does the testing, and who is in effect Mr Schumacher's equivalent, is better placed to give this commentary. Testing is his expertise.[85]

[401] Tests two and three.[86] The plaintiffs criticise the frame used for both tests two and three. It is suggested a lack of precision in building has created drainage pathways which would not normally exist. The proposition gains strength from the optics – at one point the top sheet juts out from the h-mould in a very noticeable way. Dr Straube and Mr Schumacher both agreed that this would not be tolerated on an actual house, and would need redoing, but explained why it was left for the purposes of the test.

[402] I have wavered somewhat in my views on this. It is clear the frame is not perfect; the answer of the James Hardie experts is that nor are houses and all the deviations identified by the homeowners nevertheless fall within allowable building code or JHTI tolerances. Mr Wutzler disputes this and cites examples where the deviation is greater than the allowed tolerance. Whether that is correct seems to turn in part on the measuring methodology. To explain, Mr Wutzler had an experienced Canadian builder take measurements for him. However, he was dissatisfied with that person's initial methodology so sent him back again to take further measurements doing it a different way. The defendant notes the different outcomes obtained by the Canadian builder on each of his visits, submitting the first which was more favourable to RDH were valid. It submits Mr Wutzler's method gives no value to the fact that the sheets, when nailed, will conform to the frame. The consequence is that gaps which may seem likely to exist if just the frame is measured do not eventuate when the sheets are nailed on.

[403] I consider a case can be made either way, but in the end have concluded that if the purpose was to construct a wall built in accordance with the JHTI, then it should have been constructed more precisely. There were errors that should not have occurred – for example, a line of nailing was completely missed.

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85 It can also be noted that, correctly, it was not Helfen Ltd who provided the technical specifications. Mr Lalas did that.

86 As noted, there is insufficient dispute concerning test one for it to merit further consideration.

[404] To counter the point about water draining out where the sheet sits noticeably out from the h-mould, the defendant notes that the drainage through the h-mould occurred across the whole width of the sheet and was noticeable even where it sits tight on the frame as it should. I agree with this.[87] It was matters like this that nearly persuaded me to accept the test three outcomes, but in the end I consider that if demonstrating drainage was the purpose, the sheets should have sat properly all the way. It is accepted no-one would allow the house to be finished that way, so the test sample should not be.

[405] Overall, there are too many occasions where the defendant was forced to, and generally did, produce reasonable arguments as to why defects or omissions did not invalidate the results. The better course would have been not to have these defects. For this reason I did not place weight on the outcomes of tests 2 and 3 (acknowledging, however, as I must that those results do reflect the conclusions I have otherwise reached on the building science analysis).[88] I also observe the primary defect which related to potential drainage capacity should not affect the validity of the drying results which do tend to reflect the evidence of Drs Lstiburek and Straube about the drying capacities of fibre cement in this type of building enclosure.

[406] Test four – the h-mould walls. The homeowners criticise the construction. For example, in some the top sheet sat between 9 and 11 mm above the h-mould rather than the stipulated 6 mm. There was originally a criticism of the sheets used but this appears not to be pursued.[89] Finally, sealant was applied between the bottom plate and the plywood flooring. This would not occur in a house but was done by RDH to enable them to control air pressures for the purposes of the test. Dr Straube explained where it would impact, and where it would not.[90] The primary effect would be at the interior lining, not the h-mould in the external wall. Dr Straube later explained the RDH methodology was to control air with a flow control device so issues such as sealants or screws are neutralised. This evidence seemed not to be challenged but if it is, I note

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87 There was a video taken of the water draining.

88 Reviewing the judgment prior to release, I acknowledge this aspect continued to trouble me. There is a reasonable case to say these tests were sound and capable of proving James Hardie's case. However, the judgment by a narrow margin adheres to the conclusions expressed.

89 It was incorrectly understood by the homeowners that factory-sealed Monotek was used.

90 NOE 5376/20 and also 5608/13.

I accept it, essentially for the same reasons as previously. I accept Dr Straube's expertise and understanding of these matters.

[407] It was not apparent to me that the increased gap between the bottom of the sheet and the h-mould made any operative difference to the test outcome.[91] I am satisfied the results of test four are sound. The results confirm the building science that water may trap between the upstand and the sheet but in normal circumstances, even with high winds, will not be expelled over the top of the upstand. It will of course absorb into the sheet.

[408] Test five – the windows test. It seems it has to be accepted that if nothing else, the test shows that windows and particularly head flashings can be properly installed in a weathertight way. The homeowners note several attempts were needed to get it right but again this is consistent with it being one of the more exacting tasks in a build. The homeowners' primary challenge was the proposition this is not how windows were installed in the 1990s. I am not sure the trial evidence as a whole establishes that to be so (as opposed to it just not being installed properly on houses where the windows have failed), but even if it did, the question would surely be why not. As noted, the answer to that, whatever it may be, does not seem to me to be Harditex-specific.

[409] Test six. As noted earlier, the parties were somewhat at cross-purposes here. The test focused on the back of the sheets whereas the homeowners' focus on the front and bottom of the sheet. Again, as with tests two and three, there was non-compliant nailing (which, if relevant, would affect drainage). Further, the inseal was placed at the bottom of the sheet, rather than 5 mm up. This might help with coating the inseal, but otherwise seemed not particularly relevant.

[410] The plaintiffs assert Mr Wutzler's evidence challenging the design of this test was unchallenged. This is not exactly so in that some responses or clarifications were elicited in evidence-in-chief of defendant witnesses, so it was not so much challenging Mr Wutzler as explaining a concern he had raised.

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[91] When this topic arose at trial, the reason advanced for allowing a bigger gap was to better facilitate coating.

[411] Overall, my assessment was that test six stood up, although I accept there are aspects which provide a basis for challenge.

Conclusion

[412] I conclude by recording a general submission on behalf of the homeowners that conceptually the organisational structure of the RDH testing is not acceptable. They were tests wholly designed and implemented within RDH, and the results were not peer-reviewed. The RDH testing facility is not accredited to an independent body. It is also alleged insufficient data was provided to the plaintiffs to allow the test to be repeated or properly reviewed.

[413] To the extent the evidence enables me to comment on the last aspect, I disagree. At least in my assessment the evidence does not establish the criticism. As for lack of peer review that is so. I would not have expected peer review, but agree it has not happened. I do not accept the structural arrangements for RDH are materially different from that of the Helfen test structure. There the test was designed by Mr Wutzler and his company, Helfen Ltd. The specifications were provided by Mr Lalas, in the same way as Dr Straube. The test was done by a company owned by Mr Wutzler and the results reported by him. On the evidence before me, suggestions of better independence within the Helfen test structure are not made out.

Prolonged duration test

[414] Mr Wutzler obtained a piece of used Harditex from a house owned by one of the persons who has joined the class action. The condition of the sheet was not checked other than by means of a visual inspection which assessed it as in good condition.

[415] The test protocol was designed by Mr Wutzler and Mr Lalas. It placed a 1 m square of coated Harditex in a chamber on a typical house frame and subjected it to combinations of water and drying. There was debate about the cycle but I understand Dr Straube's analysis to be accepted. If not accepted, in my view it is correct. The cycle was a repeating six-hour cycle involving:

(a) an hour of wetting at 125 pa;

(b) two hours of wind (no rain) at 125 pa; and

(c) three hours of drying with no air pressure.

This was carried out in a sealed container.

[416] The observations relied on by the homeowners are:

(a) staining patterns became visible on the back of the sheet. This is said to be consistent with moisture absorption with more occurring at the base;

(b) mould growth on the back of the sheet;

(c) mouldy building wrap, with crinkling (indicating moisture) at the bottom;

(d) the coating on the base of the sheet was delaminating;

(e) concerning the timber framing, elevated moisture readings and mould growth; and

(f) generally the base was in much poorer condition with elevated moisture readings at the bottom.

[417] The closing submissions of the homeowners submit the test provides "useful information" that the sheets are absorbent, that moisture can transfer from the sheet to the underlying building paper and framing; and that regardless of how well the base of the sheet is coated, it will fail.

[418] This might be thought to be a relatively modest set of claims taken by the homeowners from the test outcomes. There is good reason for that. It was not, on my assessment of the evidence, a sound test. I am conscious that my observations here largely reflect the criticisms made of the test by James Hardie, but that is because I accept them.

[419] There was confusion within the homeowners' witnesses over the protocol for the test, and who set what are termed the "environmental overloads" that the test rig was subjected to. Ultimately it does not matter as the real issue is whether those loads were sound, but the uncertainty between Mr Lalas and Mr Wutzler was plain. Mr Scott, who carried out the test at FTNZ, said he had nothing to do with it.

[420] Dr Straube had two primary criticisms – the environmental load was much more extreme than any house would be subjected to and the specimen was never given a proper opportunity to dry. Dr Straube's evidence was that the design parameters were incorrect because there was a fundamental misunderstanding of what was being done. Rather than testing water penetration, the protocol as designed was in effect an extreme humidity vapour test that would have produced the same outcomes with timber weatherboard or stucco cladding. The primary mechanism actually tested was water adsorption via vapour diffusion, rather than water absorption. Adsorption is the process by which water *vapour* is taken up and held by a porous material from the surrounding air; absorption is the process of drawing *liquid* water into porous materials by capillary suction forces.

[421] Dr Straube calculates that the sheet was exposed to very high relative humidity for well over a thousand hours.[92] Dr Straube conducted his own analysis of the data, which was not subsequently challenged. It showed repeated cycling with relative humidity at 90 per cent for three hours and then 70 per cent for three hours. The latter figure varied between 60 and 70 per cent but was repeated through 500 continuous cycles. In Dr Straube's assessment, the average vapour pressure difference, which is the force driving water vapour from the air into the sheet (adsorption), was 567 pa. On his calculations of available New Zealand data, the likely real-world rate would on average be 92 pa.

[422] I accept the criticisms identified by Dr Straube. It greatly diminishes the probative value to be taken from this test.

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[92] It can be recalled when discussing mould that Ms Hugens' concern from her WUFI analysis was the levels of relative humidity that her modelling predicted: see above at [245]. It seems common ground that high sustained relative humidity will encourage mould.

Conclusion

[423] When analysing the building science, I had put to one side each party's reliance on the testing they undertook for the case. This was because, given the purpose, neither had been executed to a standard which meant the Court could wholly rely on it. There were aspects of the defendant's test that were sound, and reflective of the building science, but the key tests for the defendant, tests two and three, were let down by the construction of the wall. Likewise, I assessed the Helfen test as being flawed in fundamental ways. I consider the Prolonged Duration Test was misconceived and unhelpful. Overall, there are aspects of the defendant's test which legitimately reinforce the conclusions otherwise reached in the judgment – particularly drying capacity, ability to insert windows safely, and the h-mould design.

HOUSES

Introduction

[424] This section considers the evidence presented about what has gone wrong with eight houses and why. From the homeowners' perspective, the reason for considering specific houses is that the houses are built with Harditex sheets, they suffer from moisture-related damage and therefore they are examples of the inherent defects at work. The contest to this proposition that is advanced by James Hardie comes down to two key questions:

(a) given the departures from the system, is it fair to call any of the eight houses a Harditex system house; and

(b) can the moisture-related damage be linked to an alleged inherent flaw rather than the more obvious cause, as James Hardie sees it, of poor building?

[425] How the judgment deals with this evidence has been influenced by several factors. First, there is far too much evidence to attempt any overview. In relation solely to the damage and its causes, so therefore ignoring evidence about what is

needed to fix the houses, I estimate the evidence-in-chief to be nearly 2,000 pages.[93] To that figure can then be added the reports of all the analysis done on samples taken from the houses, numerous volumes of photos, and weeks of cross-examination.[94] For example, in relation to the Bay Lair property there were 900 pages of photographs, and a document booklet of 230 pages.

[426] The next factor influencing how I deal with all this is the nature of this evidence. The damage that each house has suffered is fact evidence and is largely undisputed. However, the evidence about the causes of that damage is opinion evidence, almost all of which is reconstructed after the event, and consists of interpretation of where the moisture has come from.

[427] The deconstruction work[95] was all done after the event. No-one has seen the water entering, and in some cases (such as with stained but now dry sheets) the water ingress may have been some time ago. Further, the purpose of the work was not only the normal one of ascertaining what remediation was required. There was also the purpose of advancing the plaintiffs' case in the sense of fitting the damage into one of the inherent defects advanced. This in my view influenced the methodology. It is also common ground that with all the houses there are building mistakes. There is a dispute over the extent and significance of those mistakes, but that there are some, and in reality plenty of mistakes, is beyond question. And, finally, as will be seen, there is no evidence at all from anyone involved in the builds, be they designer or builder.

[428] As I listened to this opinion evidence from both sides, it became clear that it was far from an exact science leading to conclusions in which one could have a high level of confidence. In part this reflects the reality of moisture which finds its own paths, and is dictated by gravity so tends not to remain where it started. Further, very little if any of the opinion evidence was underpinned by, or reflective of, scientific

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93 The main contributors are: Mr Wutzler (450 pages), Ms Johnson (981 pages), and Mr Sylvia, who analysed only two properties (nearly 200 pages). There are further building witnesses and also scientific witness who did the analysis of samples and give evidence speaking to their analyses.

94 The evidence lasted 14 weeks. Most evidence-in-chief was taken as read or briefly summarised. Around 80 per cent of the evidence is likely to be cross-examination.

95 Deconstruction work refers to the process followed by Mr Wutzler and Ms Johnson. It involves taking numerous cut-outs from the cladding, photographing what is revealed, and taking samples for analysis.

literature. There were, for example, debates about the message to be taken from staining patterns on the back of the sheet. Everyone had an opinion, but the Court was not referred to any research underpinning the opinion.

[429] This context explains why the judgment started with the building science. There are significant limitations in the deconstruction and cause analysis. By contrast, the analysis of moisture activity within building envelopes, and its drivers, is well established. Sophisticated modelling programmes exist, as does a significant body of research. The Harditex system was able to be analysed through the lens of that established body of science. It was a sounder anchor than this opinion evidence.

[430] How the judgment deals with this house-specific evidence is also necessarily affected by the stage at which it is discussed. My structure, and no doubt others were possible, has led me to a point where I have not been satisfied, on the evidence available, that the alleged inherent flaws that have thus far been analysed exist.[96] It would not now be sensible to write up this house-specific evidence as if those conclusions had not been reached.

[431] The aim of this section, therefore, is to explain the damage and the competing theories as to cause, but not in a way that is reflective of the quantity of evidence. There is too much, and a lot of it consists largely of these competing analyses neither of which can be certainly proved. I preferred on a general level the evidence of some witnesses to others, but quite plainly those witnesses will not always be right on everything, and the other witnesses always wrong. That is not the nature of the beast.

[432] Further, the witnesses inevitably have underlying views about the soundness of the Harditex system that must have influenced their analysis. This is not to criticise these witnesses for that, just to state what I think is the obvious:

(a) if you think the h-mould is essentially sound, then it is natural to look for other causes of nearby water damage; and

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[96] The ones omitted to date are the adequacy of the JHTI and, more generally, buildability.

(b) if you think the h-mould is a flawed design, then it is natural to see nearby moisture damage as evidence of that.

[433] The eight houses, their location, and their date of construction are:

(a)	Bay Lair, Wellington	(1992)
(b)	Woodhouse, Wellington	(1996)
(c)	San Vito, Kāpiti Coast	(1997)
(d)	Ambassador, Tauranga	(1996)
(e)	Carnelian, Auckland	(1996)
(f)	Golf, Auckland	(1996)
(g)	Portsmouth, Auckland	(1996)
(h)	Esplanade, Kāpiti Coast	(1996)

[434] The first two houses are the "lead houses" in that they are the properties of the two sets of plaintiffs – Ms Cridge and Mr Unwin, and Ms Fowler and Mr Woodhead respectively. The other six houses are the "sample houses". They were proffered by the plaintiffs because they are said to reflect particular defects.

[435] The choice of the houses was that of the plaintiffs. As I understand the evidence, Mr Wutzler looked at all the properties associated with the 146 claimants,[97] and these eight were selected. The timing and notification of those selections obviously influenced the access the defendant could have. There are issues over this I will address later.

[436] Mr Wutzler analysed each house for evidence of moisture-related damage. As noted, this involved doing "cut-outs" of the Harditex sheets to expose the back of the sheet, and the underlying building wrap and timber framing. Various analyses were then done. For example, samples were sent to Dr Jia and to Dr Wakeling for analysis of strength and fungal decay respectively, and also for the presence of mould.

[437] Mr Wutzler's evidence-in-chief was the means by which the detail of the damage alleged, and of which inherent flaw the damage was said to be symptomatic, was provided to the defendant. At some point thereafter, the defendant was given access.

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[97] The plaintiffs represent two claimants with 144 others in the class action.

[438] The primary expert for the defendant was Ms Johnson. She was assisted in her work by an experienced builder Mr Kennerley, but also at times analysis was undertaken by Mr Sylvia and Mr Longman. Specialists in remediation of houses representing both parties have also visited the sites. As I noted, at least from the defendant's viewpoint, this process was not always smooth or desirable and there are complaints as to lack of access.

[439] The provision of the defendant's evidence on the houses sparked a substantial quantity of reply evidence which at times tested the concept of reply. However, the process to a certain extent made this inevitable – just as the defendant did not know the homeowners theory about a property until Mr Wutzler's evidence was provided, so the homeowners did not know how James Hardie analysed the property until they received Ms Johnson's evidence, and the evidence of others such as Mr Sylvia. It is also a fact, however, that on the face of his original evidence Mr Wutzler did not seem to have considered the damage to the house as a whole, or to have overtly considered whether there was a primary overarching problem contributing to all location-specific damage. His approach seemed to be to go directly to a "problem location" such as an h-mould and start from there. Consequently, when the defendant's experts often came back with a whole-of-house analysis, there was a need for Mr Wutzler to consider this theory, as well as the specific challenges to his location analysis. Hence the length of the reply evidence.

[440] There was a site visit by the Court to the two lead properties. Amongst other things this exercise brought home the intrusive nature of this deconstruction exercise, and the impact on the houses. One in particular, on some walls, looked almost like a patchwork quilt, with so many now covered cut-outs. I make this observation to acknowledge that although there are 146 claimants, it would be incorrect to assume each of these properties were freely available to Mr Wutzler and the plaintiffs for use as an example. Many would not be willing to endure the process. That said, the claim is the plaintiffs' and they must stand by the evidence that is presented, and the inferences to be fairly drawn. The fair inference is that these houses are the best available to demonstrate the alleged inherent flaws.

[441] Turning to the structure of the pleading, in relation to the two lead properties, the inherent defects are pleaded, and also where those defects are said to be manifesting on these two houses. Also acknowledged for each property is a list of building defects. These are reasonably extensive. On Bay Lair, for example, there is acknowledged, amongst others, to be a lack of capillary gaps, inadequate provision for movement, incorrect placement of the h-mould, inappropriate sheet lay-out, and inadequate protection of the base of sheet edges .

[442] Concerning witnesses, the main homeowners' witness on the houses and the causes of damage is Mr Wutzler. I have previously discussed his qualifications and experience.[98] He is experienced in remediation and as qualified as the equivalent witnesses for the defendant. All their evidence on causes, when not building related, is vulnerable to competing opinion sourced in research.

[443] The homeowners also rely on Mr Peryer and Mr Proffitt. Mr Peryer has been a registered master builder since 1988 and has a firm which employs 30–40 builders. The firm undertakes both public and private sector work, with a recent preponderance of work remediating school buildings. Mr Proffitt is a registered building surveyor and remediation specialist dating back to 2003. He has an advanced trade certificate in carpentry and was both an employed and self-employed builder. He has subsequently been a construction manager, before the present focus as a building surveyor and remediation specialist.

[444] For the plaintiffs, Ms Johnson is a registered building surveyor with 32 years' experience in the building industry. She has been a member of, and at various times on the boards of, relevant industry groups. She has performed various teaching roles and was on a working group developing standards for qualifications for building officials. She has written or co-authored a number of papers in the relevant areas. Mr Longman is a life member and past president of the New Zealand Institute of Building Surveyors. He was the BRANZ accredited advisor for the Hawke's Bay region for 10 years. There are a number of qualifications and positions held going back to 1968 that attest to his experience within the New Zealand building industry

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98 At [92]–[94].

and his capacity to give evidence about building practices. Mr Sylvia is a building surveyor and qualified carpenter who has worked in the industry since 1995. He is experienced in commercial and residential construction. He is very familiar with working with sheet cladding but has more limited experience with Harditex itself. Mr Donnan is an architectural drafter with 20 years' previous experience in carpentry, including extensive work building Harditex homes.

[445] I turn to the houses.

Bay Lair

The damage

[446] The subject property is a single building, two-dwelling duplex, only one half of which is involved in the litigation.

[447] The pleaded damage is:

(a) elevated moisture content in framing;

(b) decay in some framing;

(c) degradation of Harditex sheets at the bottom, and decay of wood fibres in the sheets;

(d) degradation of building wrap;

(e) degradation of particle board floor in places;

(f) mould growth on various building elements;

(g) corrosion of fixings; and

(h) cracking to texture coatings and sheet joints.

[448] It will be helpful if, for one of the houses, the judgment sets out how the evidence was presented. For each property Mr Wutzler produced a photo of the house with locations noted on it, and a description/record of what is said to be the issue at that location. The location is superimposed on the photo accompanied by a dialogue box containing a description of the findings at the location. For Bay Lair there are 36 boxes. I set out in detail the content of the dialogue boxes for most of the locations.

> **Location 01**[99]
> Photographs: 4-8
> Deteriorated cladding and wrap. Cladding was brittle.
> MC 22 – 40%+ across most timbers after testing.
> Beagle Report 1 – 16.7.2015
> Sample 12 – Stud (left – below flashing)
> Framing – "No decay but dense fungal growths, paper wrap had traces of rot and low numbers of spores of Stachybotrys."
> Sample 14 – Joist (left – above flashing)
> Advanced soft rot across the depth. Low numbers of spores of Stachybotrys.
> Sample 15 – Joist – (right – above flashing) "Pockets of early to advanced soft rot across much of the depth. Low numbers of spores of Stachybotrys."
> Sample 17 – Building Wrap "Pockets of advanced soft rot in wood fibres and growths of Stachybotrys."
>
> **Location 02**
> Photographs: 9-13
> Prolific mould growth in area.
> MC – 40%+ in timbers after testing
> Beagle Report 2 – 14.9.2015
> Sample 5 – Stud (below flashing) "Pockets of early to advanced soft rot and suspected incipient brown rot"
> Sample 6 Boundary joist (above flashing) "Traces of soft rot in the outer 1mm"
> Sample 18 – Corner Stud (Below flashing) "advanced soft rot throughout. Low numbers of spores of Stachybotrys."
> Sample 21 – Building Wrap "Pockets of soft rot in wood fibres and growths of Stachybotrys."
>
> **Location 03**
> Photographs: 14
> MC – 22% in east timber
> MC – 40%+ in northern timber
> Beagle Report 1 – 16.07.2015
> Sample 7 – Bottom Plate "Advanced soft rot across the depth. Low numbers of spores of Stachybotrys.
> Sample 8 – North Boundary Joist "No established decay micromorphology. Dense fungal growths."
> Sample 9 – East Boundary Joist "No established decay micromorphology. Dense fungal growths."

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[99] MC is moisture content of the timber framing in that location. Beagle Report refers to the company doing the analysis of samples sent. The samples were numbered and the results are then noted.

Location 04
Photographs: 15
MC – 22% in bottom plate after testing.
Beagle Report 1 – 16.7.20
Sample 10 "No established decay in micromorphology and no incipient brown rot detected. Dense fungal growths."

Location 05
Photographs: 16-18
Dye absorption to the bottom of top fibre cement sheet
Mould growths on reverse of fibre cement
MC – 40% in left after testing
MC – 32% in right after testing
Beagle Report 1 – 16.7.2015
Sample 01 – Top plate (left – below flashing) "Pockets of advanced soft rot across the depth in latewood, Low numbers of spores of Stachybotrys."
Sample 02 – Joist (left – above flashing) "Framing – traces of soft rot across the outer 1mm.
Paper – Pockets of soft rot in wood fibres and low numbers of spores of Stachybotrys."
Sample 03 – Stud – (Right – below flashing) "Framing – traces of soft rot across the outer 1mm."
Sample 04 – Joist (right – above flashing) "Framing – Pockets of early to advanced soft rot and suspected incipient brown rot.
Paper wrap – Pockets of soft rot in wood fibres and growths of Stachybotrys."
Sample 19 – Building wrap – right hand side – above flashing "Pockets of soft rot in wood fibres and growths of Stachybotrys"
Sample 20 – Building wrap – left hand side – above flashing "Pockets of soft rot in wood fibres and growths of Stachybotrys"

Location 06
Photographs: 19
Wrap is degraded
Crack in fibre cement cladding down sheet join above
Fibre cement was friable on removal
MC – 40%+ in bottom plate
Beagle Report 1 – 16.7.2015
Sample 16 – Bottom plate "Mixed advanced soft rot and white rot throughout. Low numbers of spores of Stachybotrys.

Location 07
Photographs: 20
Timber visibly decayed in area.
MC – 18% in timbers.
Beagle Report 1
Sample 11 – Corner Stud "Advanced insect borer damage. Brown rot also."
Sample 22 – Building Wrap "Pockets of soft rot in wood fibres and growths of Stachybotrys."

Location 08
MC – 22%, 24% in boundary joist.

Location 09
MC – 16 % and 18% in trimmer stud

Location 11
Photographs: 21-23
Dye absorption to the back of fibre cement – appears friable/brittle on removal
MC – 36% in stud and 22% in soft bottom plate after testing

Location 12
Photographs: 40
Fibre cement appeared stained, friable and brittle on removal.
Building wrap had beads of moisture on it and was degraded.
MC – 32% in trimmer stud, 20% in second trimmer stud

Crack in cladding emanating from corner of joinery unit. Fibre cement appeared stained, friable and brittle on removal. Building wrap had beads of moisture on it and appeared degraded.
MC – 32% in trimmer stud, 20% in second trimmer stud

Location 13
Photographs: 41
Wrap is degraded behind the wall and moisture evidence.
MC – 40% in bottom plate, 28% in boundary joist, 32% in stud, 22% directly below joinery unit after testing.

Location 14
MC – 18 %

Location 15
Photographs: 24-25
Dye absorption at base of sheet
Wrap wrinkled and degraded
Fibre cement was brittle on removal and stained
MC – 40%+ in bottom plate after testing

Location 16
MC – 24% in trimmer stud, 20% in second trimmer

Location 17
MC – 22% in trimmer stud, 20% in second stud

Location 18
Wrap was degraded and wet when cladding removed.
Fibre cement stained on the reverse under corner junction and slightly brittle on removal.
MC – 23% in framing timbers

Location 19
Internal
Water damage to timber reveal

Location 21
MC – 32% in bottom plate and stud.

Location 22
Photographs: 26
MC – 32% in bottom plate left hand side of post
40% in bottom plate right hand side

2% in post

Location 23
MC – 22% in framing timbers in soffit

Location 26
Photographs: 27-28
Dye absorption up the base of top sheet
MC – 40% in stud below flashing
Beagle Report 2 – 14.0.2015
Sample 24 – top plate – pockets of advanced soft rot across depth. Stachybotrys.
Sample 25 – Fibre cement – traces of moulds and yeast – no decay
Sample 26 – Boundary joist – pockets of advanced soft rot across depth. Stachybotrys.
Sample 27 – Building wrap – Advanced soft rot in wood fibres. Stachybotrys.

Location 27
Photographs: 29
Corrosion to metal angle installed at two sides of glass blocks.
MC – 32% in dwang
24% in Stud/post
Staining to back of fibre cement sheet on other side of party wall

Location 28
Photographs: 30
Corrosion to metal angle at change in plane
MC – 22% in top plate

Location 30
Slight degradation of building wrap

Location 31
Photographs: 31
Degradation to building Wrap
MC – 28% in bottom plate after testing
Mould growths on the reverse of fibre cement cladding
Beagle Report 2 – 14.9.2015
Sample 28 – No decay of bottom plate but dense fungal growths.
Sample 29 – Building wrap – traces of soft rot in wood fibres. Stachybotrys.
Fibre cement – Traces of soft rot in wood fibres. Stachybotrys.

Location 2019/1[100]
Friable, brittle and mouldy fibre cement.

Location 2019/2
Slight staining to fibre cement.
Beagle Report 3 – 30.4.2019
Sample 67 – Fibre cement – prolific fungal growths but no fungal decay.

Location 2019/3

[100] The single location numbers were Mr Wutzler's original cut-out and samplings. Location numbers which include a year – for example, 2019/1 – were samplings done more recently by one or other of the parties.

Photographs: 32-33
Fibre cement stained, mouldy and friable.
MC: 32-40% in bottom plate, 32-36% in joist and 25% in bearer.

Location 2019/4
Photograph: 34
Fibre cement stained, friable and brittle. Bearer under-packer decayed with Stachybotrys present.
MC: 24-34% in joist, 29% in bearer.
Beagle Report 3 – 30.4.2019
Sample 68 – timber A – "Dense fungal growths"

Location 2019/5
Photographs: 35
Fibre cement mouldy and very friable.
MC: 20.5% in sill timbers.
Beagle Report 3 – 30.4.2019
Sample 71 – Fibre Cement – "Pockets of soft rot – fibre cement very friable. Growths of Stachybotrys"

Location 2019/6
Photographs: 36
MC: 28% in Joist. 23% in Timber. Fibre cement stained and mouldy.
Beagle Report 3 – 30.4.2019
Sample 72 – Timber to which H-mould affixed – "Pockets of advanced soft rot, low number of spores of Stachybotrys"
Sample 73 – Fibre Cement – "Well established rot within 10-560mm of the bottom edge including fixing holes… Low numbers of spores of Stachybotrys"
Sample 74 – Building Paper "advanced soft rot pockets. Growths of Stachybotrys"

Location 2019/7
Photograph: 37
Stained, mouldy and friable fibre cement. Visible decay of building paper, corner stud, and adjacent stud.

Location 2019/8
Photographs: 38-39
Rear face of fibre cement was stained and very friable at jamb/sill junction.
MC – 22% in timbers
Beagle Report 3 – 30.4.2019
Sample 75 -fibre cement- "fungal soft rot and loss of structural integrity".
Sample 76 – timber: "Dense fungal growths".
Sample 77 – Plasterboard – "soft rot pockets. Growths of Stachybotrys".

Location 2019/9
Beagle Report 3 – 30.4.2019
sample 78 – Pockets of [soft] rot – fibre cement very friable. Stachybotrys.

[449] The overall content of these boxes captures the condition of the house. While not every aspect of the narrative is agreed, the bulk of it is. The remediation, as it is

with all the houses,[101] is to remove the cladding, replace any timbers which are damaged and reclad it.

History

[450] The house was built 28 years ago. No evidence was called from anyone with a connection to the house prior to the current owners, Ms Cridge and Mr Unwin, who bought it in January 2006. Accordingly, everything prior to that is based on such records as are available.

[451] The house was seemingly built by a person who can be described as a designer/builder. The house was transferred in a very short time to the builder's son who onsold it to someone who owned it for 13 years before that person sold it to Ms Cridge and Mr Unwin. The builder's experience with designing and building is not known.

[452] The building consent was for 6 mm Hardiflex (not Harditex), "plastered to specs" and it was contemplated there would be a timber covered batten or approved PVC moulding. At the time of consent in mid-1992, Harditex had been on the market for four and a half years, yet Hardiflex was specified for but then not used.

[453] Ms Johnson describes the plans and specifications as very rudimentary by today's standards but not uncommon for the times. Her view, which I do not understand to be disputed, is that the brief specifications reflect the approach that then prevailed with timber-framed houses, which was that it was left to the builder to construct the house in accordance with NZS 3604: 1990.

[454] The house is located in a "very high" wind zone, a matter demonstrated on the day of the site visit. It is built over three levels with the garage at the lower level immediately off the road. There are short flights of stairs to each level. The section goes downhill from the road frontage to the back so when you look at the back of the house, some of the back wall is the same height as a two-storey house. However,

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[101] With the exception of San Vito which was pulled down many years ago.

beneath the top level, which is the occupied space, there is just a dug-out basement. There is a mirror image house on the other side of a dividing wall.

A Harditex house?

[455] Throughout the trial the defendant put to the plaintiffs' witnesses that the departures from the JHTIs on these houses meant that it could not be called a Harditex house, and it was a flaw in their evidence to assume it was. It was not a line of questioning the Court encouraged as it really is a question of labels. When does non-compliance become such as to say it is not a Harditex system house? It seemed to me ultimately a pointless debate. However, what underlies the question is a valid issue for the judgment to consider. It is that, given all the departures from the JHTI, how much value can one attach to the property and its issues as an example of a Harditex house in action, and something that is meant to illustrate inherent flaws in a Harditex system house.

[456] The non-compliance features identified by James Hardie fell into two groups – things required to be done by the JHTI which were not, and things required by the JHTI which had been done but badly. To take the Bay Lair omissions, vertical relief joints were required and not used.[102] A horizontal control joint was required but absent on the north wall as the joist seems not to be kiln dried.[103] Inseal tape and galvanised angles were required for corners and not used.

[457] Moving from omissions to alleged poor compliance with the JHTI, a general introductory comment is needed. Many of the requirements of the JHTI, such as the requirement for a capillary gap at the base of the sheet, can also be found in a regulatory document such as NZS 3604. It is also a requirement that would be recognised as sound building practice independent of either the JHTI or the standard. This means that some building defects could be seen as non-compliance with any of these sources.

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102 The trial evidence suggests this omission is common; it is not a structural joint.

103 The h-mould is a movement joint. Using kiln-dried timber significantly reduces movement, which means an h-mould was not always required. That said, some method of joining the sheets was needed, and the h-mould accessory was sometimes used to fulfil this role even though not serving as a movement control joint.

[458] For Bay Lair, there are some aspects that can be identified primarily as non-compliance with the JHTI. The h-mould construction at this address is submitted to be so non-compliant as to suggest (and in this I agree with the defendant) that the builder cannot have been trying to comply with the JHTI. Further, the sheet layout was poor. There are rules about where to place the sheets, and particularly about where sheets should end in relation to penetrations like windows and doors. These were not followed. Compliance with the need for a capillary gap at the base of the sheet was erratic and there are numerous examples of the bottom of the sheet not being sealed and coated, or if it had been, then very poorly.

[459] It is the extent of the omissions and non-compliance that underpins the defendant's submission it is not a Harditex system house. One of the difficulties I had with the argument is that the JHTI required compliance with NZS 3604, which brings into Harditex system the whole regulatory scheme on timber framing. Any non-compliance with that could not be sufficient to make it not a Harditex system house, and so one inevitably progresses to a debate about how much non-compliance is needed. The better approach is to recognise that the scale and nature of building deficits may well impact on the inferences that can be drawn from that property about whether the Harditex system was sound.

The problems

[460] The defendant in its closing submission has grouped the locations relied on by the plaintiffs by reference to the inherent defects they are said to represent. That provides a convenient starting point for analysis. These locations were:[104]

(a) h-mould: locations 1, 2, 3, 5, 26 and 2019/6;

(b) base of sheet: 3, 6, 11, 15, 31 and 2019/3, 4 and 6;

(c) windows: 7, and 2019/5 and 8;

(d) boundary fence: 21, 22, 27 and 28.

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[104] Recalling these locations are the ones detailed above.

[461] The boundary fence is a wall at the back of the houses that separates the decks between the two houses. It is unrelated to the structural dividing wall between the two houses. I do not consider it is relevant to the case and so do not address it further.

[462] The defendant notes that there are a number of locations, all described in the dialogue boxes previously set out, which are not relied upon at all as indicative of the inherent defects, without explanation as to why not. The defendant invites an inference they are therefore accepted by the plaintiffs to be solely the product of poor building. As regards windows, for example, there are eight such locations where analysis was done, and damage exists, but which are not said to be illustrative of an inherent defect.

(a) The h-mould

[463] The h-mould is situated on the rear wall where the vertical height of the wall is at its greatest. It is undoubtedly a spot calling for an h-mould. Looking at the condition of the building envelope under the h-mould, there was evidence of water staining, damaged wrap, some timber decay, very high moisture content in most of the related timbers, and mould. It is clear water has been present in significant quantities above and below the h-mould, along its whole length.

[464] There are several errors in the installation of the h-mould which can be discussed, but a better initial focus is the area above the h-mould. The timbers have extremely high moisture content along its length (40 per cent, 32 per cent, 40 per cent, 28 per cent, 23 per cent, 40+ per cent). These readings are regularly found up to 200 mm above the top of the h-mould, and in one place 400 mm above. How did sufficient water get to those points, in sufficient quantities and with sufficient regularity to prevent drying and to have this effect? The relevant inherent defect theory suggests the water seeps through cracks in the coating or has lodged between h-mould and sheet and then either been driven up into the enclosure by wind or has absorbed into the sheet and then transferred from there.

[465] It is here that the building science intervenes to say that is unlikely, or even, as Dr Straube suggests, is not scientifically possible. Dr Lstiburek and Dr Straube have explained, as previously discussed, the very rare wind events that could achieve the

force necessary to blow liquid water out of the capillary gap and up over the upstand. Those wind/rain events are sufficiently rare that they could not, in my view, account for the quantities of water that have plainly been present here. The alternative inherent defect option is for the water to have been absorbed into the sheets and wicked its way up that way. However, it would only emerge from the sheet as vapour, and all of Dr Lstiburek, Dr Straube and Mr Lalas agree it will not anyway wick that far up within the sheet.

[466] As well as the timber moisture content, there is evidence of staining on the back of the sheets consistent with the sheets wetting and drying. The staining often ends in a "top of a hill range profile" earlier noted. There are peaks and dips. The issue again becomes how did water get to that spot. For Mr Wutzler and the plaintiffs the answer is as he says – it gets in through the deficient h-mould and works its way up. For the defendant the explanation must be it is coming down, as water does, from somewhere above, and enough of it is being held there to cause this damage.

[467] On this particular house, in the spot of the h-mould, there was other evidence that, in my view, supported the defendant's theory. There was some very fine debris (like fine sawdust) patterned onto the building wrap. It seems clear it is debris created when a power point was installed above. The position and pattern of the debris suggested it had washed down. Mr Wutzler's contrary view was that it must have fallen there when he disturbed the cladding sheets by removing them. This seemed speculative and unlikely when the pattern pointed obviously to the remnants having been washed down.

[468] Commenting on the construction of the h-mould itself, it is located on the wrong piece of timber (the bottom plate of the upper level rather than the joist), a join in its length is not sealed at all and it ends at each end of the wall without apparently being sealed off in a satisfactory manner. As for the incorrect positioning of the h-mould, I accept Mr Wutzler's position that this is generally not relevant to weathertightness, at least directly. However, it is an error that both points to the quality of the building work, and which removes one aspect of the system designed to assist with movement.

[469] The defendant's experts contend there are other aspects of the construction of the h-mould that have facilitated moisture movement once it has arrived at this location from above. They note what is said to be misaligned framing, the fact that the h-mould is on a slope and the fact it has been clamped to the timbers by nailing (it is meant to float).

[470] In summary, it is clear that there is a lot of water damage on the inter-storey timbers. However, given the apparent amount of wetting and the relevant building science, I consider it unlikely the h-mould was the source of this moisture ingress.

(b) Window

[471] A notable feature of this house was a large mitred corner window. In other words, the window was on two walls with a glass join forming the external corner where they met. It is common ground that this is inherently a risky building feature and one not well executed here. There is a lot of damage to the timber framing below this window all the way to the ground. It is plain it has been leaking for a long time. Out of this mess, Mr Wutzler appeared initially to suggest there nevertheless could be found three illustrations of inherent flaws.[105] The locations were below the external mitre glass join, and on either side of the window where it meets the wall cladding. However, in reply evidence it appeared that Mr Wutzler no longer relied on these, but instead maintained the extensive damage to the framing below the window is a sign that the system cannot manage water that gets behind the cladding.

[472] The window is poorly designed and executed. It is plain it has leaked for a long time and significant water damage has been caused. Mr Wutzler's reliance on timber damage below it as a sign of a system unable to cope with water was surprising. It cannot credibly be suggested the system should be designed to manage this, and there was no evidence to suggest the outcome would be different with any other cladding. It was not a cladding-specific problem. Mr Wutzler may have had in mind that a cavity system would manage it. I do not know if that is what he meant but I considered this aspect of his evidence far from compelling.

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105 The locations were 7, 2019/5 and 2019/8.

(c) Base of sheet

[473] Eight base of sheet cut-outs (out of 11) are relied on. Five come from the rear of the house where there is the h-mould and three from elsewhere.

[474] Considering first the issues with the timber framing near the locations relied on, and looking at the rear wall, at location 15 there is a moisture content of 40 per cent in the bottom plate, and a similar reading at location 6 further along the same wall, where there was also evidence of rot. Further along the wall to an area below the mitre window (location 11), there were readings of 36 per cent and 22 per cent in the "soft bottom plate". A further location, 2019/7, is immediately below the corner of the mitre window where there is extensive decay all the way down.

[475] Building deficits acknowledged by Mr Wutzler were that, in some places, there was no capillary gap, the sheet did not overhang the bottom plate by the required amount, no inseal was used and there was a lack of coating to the bottom edges. It is contended nevertheless that the moisture content along the base reflects the inherent flaws.

[476] To these building issues, Ms Johnson would add an error in the framing that means the bearer is set back from the foundation, thereby creating a lip on which water can pool. This is relevant if it is accepted water may be coming down from somewhere above. There is also in places an error in the installation of the damp proof course (a layer of waterproof material designed to prevent moisture movement from the ground into the home) which would provide a moisture pathway from the concrete foundation.

[477] The fifth bottom of sheet location relied on this back wall is location 3 which is at the end furthest from the mitre window, and is at the corner of the wall where it meets decking and stairs. In addition to the missing inseal at the base of the sheet, an inseal up the vertical length of the corner was also not used although required by the JHTI.[106] The defendant notes that the highest moisture content recording is furthest up the framing. This is submitted to point to moisture coming from above, a point Mr Lalas accepted had potential validity. The defendant submits, and I have accepted,

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[106] Mr Wutzler is of the view the inseal would not have made a difference.

the science would suggest there is no plausible theory to explain these results if the source of the water is the base of the sheet. It makes no scientific sense why the moisture content reading would increase and be highest further up the stud.

[478] As regards all these locations, the defendant complains about a shifting position in relation to whether the plaintiffs were saying the base of the sheet had been texture coated or not. I agree at times it is unclear whether it was being claimed they were coated and have subsequently delaminated, or if it is being acknowledged it was not coated. The pleading, on balance, suggests the latter, although my impression from the evidence is that Mr Wutzler believes it was coated, perhaps not well, and has subsequently failed. If the latter, it certainly has not been maintained as required.[107]

[479] I tend to the view that generally the base looks like it has not been coated, but can see the spots that Mr Wutzler highlights which could be traces of old coating. What can be said, though, is that to the extent these cut-outs are meant to demonstrate a base of sheet flaw, the value of the evidence is significantly diminished by a clear lack of compliance with the coating obligations.

[480] The remaining base of sheet locations do not raise different issues from those already discussed. Leaving to one side the issue of where else the water might come from, the reality is that the base of sheet detailing on this building so departs from the JHTI requirements that the results cannot support a conclusion that the base of sheet detail is inherently flawed. This building does not test its soundness or otherwise.

An alternative water source?

[481] The defendant claims the house has a defective rainwater system which causes the gutterings to overflow, discharging water into the building enclosure. It is fair to say it was a keenly contested theory. However, it is common ground that the Klass fascia gutter system used on the house is recognised as a relatively high-risk system, and that the recognised risk is exactly that which the defendant experts identify. It is a system where an internal gutter is hidden behind a fascia to give clean lines. As I

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[107] Mr Unwin is a painter by trade. He painted the house in 2009. He did not paint the undersides of the sheets, even in spots where that was not difficult.

understand it, an issue with the system was that the angle of the internal gutter was often downwards from the outside in, thereby directly flowing into the building cavity.

[482] The defendant's theory of a guttering issue starts with an analysis of Council records which it said disclose dampness issues quite early on.[108] In 1994, the owner of 2A Bay Lair wrote saying:

> The outer framework under the house is very wet, *there is evidence of water running down the building paper, and there is mildew developing on the concrete floor of the garage, in line with the outside wall*.

The Council replied that it had inspected the property and recommended the addition of a downpipe as there might be a build-up in the concealed gutter, stating that "A high water mark indicates this could be the cause of the problem." The evidence then suggests alterations were made over time to the guttering to redirect the flow of water across the roof. Mr Sylvia's analysis was that the house's system today still has insufficient downpipe capacity. Ms Cridge also confirmed there had been water flowing down the inside of her sliding lounge doors. Indeed, it was moisture that caused Ms Cridge to contact Helfen Ltd and Mr Wutzler, and she confirms she mentioned this lounge water issue then.

[483] The theory of James Hardie's experts is that the water down the lounge window event is something that happens elsewhere unobserved, including in the rear wall. It is caused by the gutter overflowing. If the gutter theory is correct, one might expect evidence of flooding inside the ceiling cavity. Numerous photos, taken by Mr Wutzler before this was known to be an issue, were pored over and opinions expressed. It is clear that in some places there was debris within the roof cavity such as twigs, but again no agreement on how it got there. Some say from the gutters overflowing; Mr Wutzler would say wind. The issue was one on which informed persons could disagree, and reinforced my assessment of all the house-specific evidence. The gutter theory was a contestable theory not resolved by the evidence, and largely just competing opinions. The opinion on the source of the debris, for example, inevitably reflected the witness' core theory because no-one can definitively say how the debris got there.

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[108] The first correspondence is about two years after construction.

[484] At this point it is necessary to divert to an issue concerning the available evidence. In closing submissions the homeowners observe:

> Ms Johnson acknowledged both in her evidence and on cross examination that she had undertaken no investigations to confirm this [gutter] theory.

The statement is correct. Why Ms Johnson had not done so needs consideration.

[485] The access allowed to the defendant's experts to inspect and analyse properties was a constant issue during the trial. It often arose the same way. Counsel for the homeowners in cross-examination advanced the proposition there was every opportunity to check things out if wanted. The witnesses would usually respond it was difficult, or it was plain to them it was not encouraged. There was then a counter that formal requests could have been made but were not, and the witness replied that from their viewpoint the situation was difficult.

[486] To illustrate, Ms Johnson was asked about the absence of a flood test of the gutterings to support her theory. She said she had been invited to attend the property on the one day when Mr Wutzler would be there with scaffolding:

> I was informed that Mr Wutzler would take responsibility for the scaffold and that we could observe what Mr Wutzler was doing.

And then:

> Q. And you did not request to undertake a flood test of your own in the gutter region, did you?
>
> A. Mr Wutzler did a flood test near that location – sorry, Mr Wutzler put a hose into the gutter from that location 23 and directed the water down towards the downpipe which is on the west elevation. I observed that Mr Wutzler's ladder wasn't high enough for us to get a very good look at what was going on, so I used the ladder of my carpenter so we could get higher to look at it. And then Mr Wutzler – so the downpipe wasn't blocked. The water was put into the gutter in a way it would operate if it was raining. Mr Wutzler asked someone to turn the hose off and then we were whisked away from the site. So Mr Wutzler kept saying: "We've got to go, we've got to go", banged on the window where Sarah was allowing Mr Sylvia and Mr Donnan to look inside, banging on the window saying "We've got to go, we've got to go", and we were rushed off the site.

[487] When it was suggested she could have asked subsequently, Ms Johnson observed:

> Every time I asked for something, there was a counter argument back again.

[488] This was a common refrain. I formed the view that whatever arrangements counsel may have thought were in place, on the ground Mr Wutzler was obstructive of access for the defence witnesses. This assessment was reinforced by an incident that occurred later in Auckland at a site when Mr Wutzler told Ms Johnson no further access was possible for anyone. However, he then returned the next day for a significant time and took samples and photos. There was a conflict over this but I preferred the recollection of Ms Johnson and consider Mr Wutzler's conduct at the time was misleading.

[489] My conclusion is that the homeowners' repeated submission that the defendant had as much access as it wanted comes with a significant caveat, namely that the united sense of those who might have initiated such requests was that they were discouraged, and that such requests would not be granted or would result in a contest. Mr Wutzler was the source of that commonly held view.

[490] Returning to the gutter theory, the homeowners provided counter points to each of the matters on which the defendant witnesses had relied. Most responses posit reasonable alternative analyses. However, I consider it is significant that a concern about water was being raised by the initial owners soon after construction, and that the response of the council who had inspected the property was to point to the gutters. It is also significant that the "gutter theory" is consistent with a well-recognised weakness in the style of guttering used. These are objective independent facts that give considerable credence to the defendant's theory. The lack of high moisture content readings at the top of the house was a pointer against it, but not a particularly strong one given the reality that water will go down, if it can, and there is generally good drying in a roof space. I accept a flood test was not done but make the obvious point it was not done by either party.

Conclusion

[491] The most significant damage consistent with the inherent flaws initially appeared to be the damage to the inter-storey timbers that occurred around the h-mould. There is also damage to the ground floor bottom plate that is without doubt a sign of water ingress into the building envelope, and so links potentially to the base of sheet detail. Some of the base of sheet has become damaged in a way consistent with the cement matrix breaking down. But only in some spots.

[492] In terms of what the house might say about buildability, there is no evidence about the capacity or experience of the builder. It is known, though, that they were a developer/builder who did a poor job at building with fundamental errors apparent (such as capillary gaps, wrong framing leading to inadequate nailing of sheets, incorrect sheet layout, and inadequate roof water removal capacity) and with numerous departures from the JHTI. I accept the defendant's submission that the nature and scale of these cast genuine doubts on whether the builder had a JHTI, or if so knew how to apply it. The base of sheet detailing is too poor to use as a basis for an assessment of whether that detail works. It would be a generous approach to the homeowners' case not to draw the same conclusion about a wrongly placed, inadequately sealed h-mould.

[493] There is moisture present in framing timbers at heights inconsistent with the theories underlying the alleged inherent defects. This is accompanied by objective evidence of water having come down inside the building envelope, and a credible theory as to where the water is coming from. It is relevant to that credibility that the flaw being identified by the defendant's expert is the exact flaw for which that style of guttering is known, and that a concern with water was first raised with the Council only two years after the house was built. The Council suggested a change to the downpipes, having inspected the guttering and noting an issue.

[494] The house has not been shown to have damage resulting in whole or in part from an inherent flaw with the Harditex system.

Woodhouse

[495] The detailed discussion of Bay Lair illustrates the process that was followed for all the houses; in particular how the relevant damage was identified, how the plaintiffs' experts linked that damage to one or more of the alleged inherent defects, and how the defendant and its experts responded. It is not necessary to repeat the exercise in the same detail for the rest of the houses.

[496] Woodhouse is the second lead property. It is again a duplex similar to Bay Lair but with both units involved in the litigation. It is a two-storey building separated in the middle by an internal party wall. The two units are structurally separate. Because the section slopes downwards across its road frontage, the left-hand unit is higher than the right-hand unit. This means, for example, that as you look at them from the street, the h-mould on the left-hand unit is about one metre higher than its equivalent on the right-hand unit. This emphasises they are separate units – the inter-storey framing (ie the framing that separates the top and bottom floors of each unit) does not itself connect in any way with the inter-storey framing of the other unit.

[497] The building has various damage issues but generally not to the extent found at Bay Lair. Ms Fowler was the first and only owner of her half, having seen the house during construction and arranging to buy it. Mr Woodhead, on the other hand, only bought his house in 2015 and three weeks later, after talking to Ms Fowler, joined the litigation.

[498] There are two general topics needing to be addressed regarding this property, namely an issue with cracking/building movement, and the damage apparent at the base of some sheets.

[499] The two key experts are Mr Hadley for the homeowners and Mr Smith for the defendant. Mr Hadley's experience has been set out previously.[109] Mr Smith has 52 years' experience as a structural engineer. He was for 38 years a director, and is now a consultant, to Spencer Homes Ltd, a firm of civil and structural engineers. He

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109 At [229].

is a member of the relevant associations, and was a member of advisory groups following the Christchurch earthquake. He was an advisor to the Royal Commission.

Cracking/building movement

[500] This property has suffered issues with cracking to the exterior coating from early on. The first 10 years were covered by a warranty, used often by Ms Fowler and which saw the builder/developer return to repair the coating. The related inherent flaw relied on by the plaintiffs is the building movement claim.

[501] The defendant counters by claiming there are fundamental structural issues which together have led to a situation where the building moves more than it should. A key focus is the adequacy of the bracing, a topic on which competing evidence was called. Mr Smith identified six interconnected structural flaws which he said were responsible for an overall structural movement defect. Having reviewed the evidence and the homeowners' closing submissions, I accept James Hardie's proposition that the homeowners' reply evidence from Mr Hadley only really contests one of these six contributors, the adequacy of the bracing.

[502] Concerning bracing, the building was not constructed, from a bracing viewpoint, in accordance with the consent plans. The difference between the experts is that Mr Hadley contends the as-built version, when all components are considered, nevertheless provides adequate bracing. Mr Smith says that bracing cannot be assessed in the manner Mr Hadley does, and that if one is looking at the as-built rather than the concept, the better guide is the actual performance of the building which has been flawed from the outset.

[503] Mr Hadley's evidence as to adequacy of the bracing had two aspects. He considered the top storey adequate as built. As for the bottom storey, he accepted that if the two halves were considered individually, each was deficient. However, if considered together, he was of the view they met the requirements. Mr Smith says they are not designed to, and do not work, as a single dwelling, and so the "one building" analysis is not valid. On this aspect I consider Mr Smith's evidence was to be preferred. They are structurally two separate halves. It did not seem to me correct to address bracing on a whole of building basis.

[504] As earlier noted, bracing was but one of six interconnected structural flaws, which Mr Smith said meant the building was subject to excessive movement. The others were that the timber framing did not comply with NZS 3604:1999; the sheets were incorrectly installed; there were missing vertical control joints; and the horizontal control joint was incorrectly installed.

[505] It is relevant that these cracking issues started early and have continued on throughout the whole life of the building, notwithstanding repairs. The defendant's focus on the structural integrity of the building, rather than anything to do with Harditex, as the source of the issues is not a theory being imposed at the end, but one that reflects the in-service history of the building.

Base of sheet

[506] The second general topic is the base of the sheet condition. There are several locations along the ground floor base where the board is damaged, and there are elevated moisture readings in the bottom plate (generally a moisture content reading in the mid-20 per cent range).

[507] As with Bay Lair, there was a dispute between the witnesses as to whether texture coating had ever been applied to the bottom edge. In this context uncertainty arose about which coating system had been used, who had applied it, and how well it had been done. Mr Wutzler and Mr Moginie (a former technical director of Fosroc) suggested that based on colour it was a former Fosroc product, but they could not be sure. Mr Moginie did, however, say the application of the coating was "very poor" and he would not have expected any authorised Fosroc applicator to give a warranty in relation to that quality of work. It can be observed no coating warranty was ever located concerning the house. It was a poor coating job.

[508] Relevant to this uncertainty, I note the identity of the builder/developer is known. Generally I do not place too much weight on the omission of witnesses, preferring to focus on the evidence there is. Here, however, it is of some relevance that the builder was not called to clarify the issue, or to comment on any other aspect of the building. It was this builder who came back repeatedly to repair the cracks.

Assessment of Woodhouse

[509] The evidence satisfied me that the deficiencies in this building were such that care was again needed before any reliance was placed on the house as evidence of fundamental defects. There are clear building defects associated with each location that the homeowners rely on as illustrations of an inherent flaw. The most significant features are:

(a) the sheet layout is non-compliant in obvious ways and particularly in relation to several windows and across the gap between the two houses;

(b) I accept Mr Smith's evidence on the structural deficiencies and his proposition that together they contribute to an unstable house in the sense of one which moves much more than it should. Cracks, and moisture issues related to those cracks are reflective of this rather than any alleged inherent flaw;

(c) generally there were poor building skills displayed around penetrations with some not sealed by any method; and

(d) the coating, whatever it is, is a "very poor" job, to accept Mr Moginie's description, and has not been properly applied if at all to the base of the sheets. Photographs emerged during the trial that show in almost all areas there was ample ground clearance at the time of construction to enable proper application to the bottom of sheets and this just was not done. Again, this undermines the value one can attach to the house as evidence of a base of sheet flaw.

[510] Reviewing the homeowners' closing submissions, some further comments are necessary. On the topic of the bracing, the homeowners submit Mr Smith's approach too narrowly focuses:[110]

> on whether the bracing has been constructed in accordance with the bracing requirements of the 1998 JHTI. Mr Smith did not account for other factors which *may provide bracing support*.

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110 Emphasis added.

[511] This submission is, I consider, quite telling. It reflects a constant battle for the homeowners which is to try and offset so many basic building deficiencies in order to prove there are other causes of the problems being experienced. Here the basic bracing requirements have not been complied with in a house that manifests damage consistent with building movement. A witness is critiqued for focusing on the non-compliance. The homeowners' task in the face of such regular and fundamental non-compliance was a hard one, especially when the building science is also against them. If the science had suggested these conceptual flaws existed, one might more readily view the problems as the homeowners contend. However, here, for example, in response to the question why this is happening, the homeowners must first contend with the fact that their illustrative faulty Harditex system house does not in fact follow the required Harditex system bracing requirements. This is not minor. Bracing is about handling movement, excessive movement causes cracks, and cracks have been a constant issue for this house.

[512] Another extract from the closing submissions could be used to make the same point:

> The defendants also focussed on the sheet layout at the property. The plaintiffs accept there are several examples of incorrect sheet layout, predominantly on three elevations the properties whereby vertical sheet junctions have been formed in line with window jambs. Many of these sheet joints have cracked although it is relevant to note that there is also sheet joint cracking at locations which are not impacted by incorrect sheet layout.

[513] Again, the homeowners are first required to acknowledge that there are several examples of incorrect sheet layout, which is recognised as a potential source of cracking. The sheet layout flaws are very basic ones of incorrectly lining up sheet endings with window jambs.

[514] These are but two examples but they do illustrate the nature of the task the homeowners had, namely the need to sufficiently "disentangle" (to use the defendant's term) these building flaws from the accompanying damage in order to be able to show that damage to the house is a sign of the inherent flaw in action.

[515] Concerning Woodhouse, there are other disputes I do not consider it necessary to detail. For completeness I note them to be an issue as to whether failing metal straps

on the exterior corner have deformed or been badly installed, the fact that the concrete foundation had plaster applied to it and the consequence of that,[111] the location of the inseal (which was in fact used here), whether the windows show signs of water ingress,[112] and the significance of the plaintiffs not relying on this building's h-mould as an example of the inherent flaw.[113]

San Vito

[516] San Vito was built in 1997. It was demolished in 2018. The timing of events has limited the analysis opportunity –

(a) Mr Wutzler first visited, as part of his survey of all the houses, in January 2018;

(b) Mr Wutzler, accompanied by Ms Johnson, returned on 18 October 2018 to do invasive or destructive testing, and a Helfen employee returned on 23 October; and

(c) the house was nominated as a sample property in November 2018 by which time it had been demolished.

[517] I make no further comment on the sequence other than to observe its truncated nature, and the destruction of the house, means that, in my view, there has been limited opportunity to properly analyse matters. Its value as a sample house is thereby reduced. The fact that greater deconstruction than normal was possible on 18 October, because the house was being demolished, does not affect the fact that it was a very tight timeframe allowing no opportunity, in reality, for reflection or further analysis. On all these houses it has to be recalled the defendant only knew the detailed claims as to damage once Mr Wutzler's brief was received, and often did not have the knowledge or assurance the house was being relied upon for the litigation until after the initial defendant visit.

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111 The defendant's witnesses say it created a lip that acted as a reservoir to hold water in place at the base.

112 Described in the homeowners' closing as "more subtle" ingress than at other properties.

113 The homeowners say the focus was elsewhere; the defendant notes that several cut-outs were nevertheless made along the h-mould but are not relied on.

[518] I have commented already about the access dispute, and the differing perceptions of what happened and why. I set out, to further illustrate the matter, an extract from Ms Johnson's evidence on San Vito.[114] As noted, I generally accept her recollection of events, and also her assessment of them, reinforced as it was by other witnesses on several occasions:

> 3 Mr Wutzler says he attended site visits at the property on 20 January, 18 October and 23 October 2018. I was not invited to attend the initial site visit. The schedule for the subsequent inspection changed several times during September and October, however, a confirmed date was established during mid-October and I attended the site visit on 18 October when Mr Wutzler carried out destructive testing.
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> 4 I was advised by email that the plaintiffs' experts were intending to return to the site following the 18 October 2018 inspection to collect further cladding and timber samples. I was invited to observe this removal, but did not attend on 23 October.
>
> 5 Mr Wutzler says that I was also advised that I could undertake a further site visit to this area of destructive testing at any time. I do not recall that open invitation but do know that, at the time he says the offer was made and while attending site on 18 October 2018, I did not know that this property would later be included as a sample property in these proceedings. By the time that I knew that it was being nominated as a sample property (in late November 2018), the property had been demolished.
>
> 6 At the time of my visit the property was unoccupied, but the owner came to site once or twice during the day and spoke with Mr Wutzler. Mr Wutzler explained to me that the owner was not in the best of health and that he would not introduce me to him. This seemed a kind suggestion.
>
> 7 I was not aware that the property had been vacated for some time before the 18 October 2018 visit until I read this in Mr Wutzler's Schedule 3. There was no power or water to the site and I had assumed that this was because demolition was to occur in the very near future, rather than because the house had been left unoccupied over the winter. I note that from my inspection of the property I do not think that the condition of the interior of the house supported Mr Wutzler's comment that the condition of the house was "*such that the house could not be occupied.*"

[519] San Vito had a number of high-risk features, in particular parapets, no eaves and areas of flat butynol roofing. About 80 locations were inspected but only 18 are relied on. Mr Wutzler says that does not mean the other 62 may not have been relevant or not had an issue; it is just that discretion was being exercised in the number of areas

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[114] Footnotes omitted.

detailed and relied on. The defendant suggests a different inference should be taken, namely that the features were working as they should, or that damage was due to a cause other than an inherent defect.

[520] The main damage is around the windows and at the base of sheet. It seems, however, the house was actually chosen because it used the polystyrene plant-ons and was said to illustrate the issues with those. However, they do not otherwise feature in the evidence.[115]

[521] There was a significant division of views on the quality of the build at San Vito. Reviewing the material, the divergence is perhaps strongest in relation to the significance of agreed building non-compliance, rather than whether such non-compliance had happened. The defendant, as its evidence did on all the properties, emphasised departures from the JHTI and the relevant Code. The homeowners, primarily through Mr Wutzler, tended to minimise the significance of non-compliance in terms of its potential to impact on weathertightness.

[522] Mr Wutzler's evidence on this particular property, particularly the cross-examination, reinforced for me a view that building standards at the time were often not good. Mr Wutzler tended to regard non-compliance as not significant because it was common non-compliance. This is not, in my view, a correct approach. The Hunn Report similarly notes the decline in building standards during this period, but that Report does not diminish the significance of non-compliance to the leaky building crisis. [116]

[523] San Vito was representative of a poor build and I reject the homeowners' contention to the contrary. There were revealed to be a litany of errors including incorrect framing and bracing, misaligned framing, poor sheet layout, sheet joints with literally no support at all under them, missing relief joints, incorrectly configured h-mould, missing capillary gaps, poor ground clearance, and poor window detailing.

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115 Mr Wutzler's summary of issues in his original schedule relating to San Vito does not focus on these as an issue (sch 3, at [18]–[19]). They are mentioned only briefly in his later summary of issues at [120(c)].

116 *Hunn Report*, above n 1, at 16 and 35.

[524] The defendant suggests, and it can be put no higher than that, that the roof and parapets were a likely source of moisture. One dye test conducted by Mr Wutzler supported this, but he described it as an anomaly.

[525] There is no doubt that under the windows, wherever the framing was exposed prior to demolition, there was significant damage. As to cause, the parties disagree on the significance of gaps that existed between the window sill and the plant-on underneath it. I observe that where that gap was present it seemed an obvious contributor, but more generally there is no doubt the construction of the windows has led to much of the damage. That much is probably common ground. It is whether the issues are reflective of an inherent flaw or specific (but not necessarily uncommon) building flaws that is the real issue.

[526] In my view, resolution on San Vito can only be found by reference back to one's view of the broader picture. Based on the preceding analysis of the science, and the fact that there are numerous windows in this litigation that have not failed in this way, I would side with the defendant's analysis of San Vito representing site-specific issues. I recognise this is ultimately circular, or perhaps a bootstrap-type argument, but that point was always going to be reached in the analysis. Determining cause after the event is not a certain science, and so recourse to fundamental perceptions is inevitable.

[527] Here, Ms Johnson's evidence satisfies me water may have been coming from elsewhere, and there was obvious bad workmanship around the windows. The base of sheet locations do not raise new issues.

Ambassador

[528] This was an unsatisfactory sample property. It is a motel complex consisting of three buildings, only one of which was in issue. The particular building in issue was built in 1996 and was already being reclad at the time of engagement with the litigation. The relevant sequence is:

(a) Mr Wutzler visited on 3 and 4 August 2018;

(b) Ms Johnson was invited to visit on 26 and 27 February 2019 by which time recladding had started; and

(c) In August 2019, so after the recladding was done, the building was nominated as a sample property.

[529] The plaintiffs appear to rely on Ambassador for problems around an h-mould along one wall and as an example of the inability of the system to handle moisture that does get in. There are also examples of windows as a source of moisture ingress.

[530] A notable feature is the significant departure of the as-built from the approved plans. For example, the plan called for a specially designed h-mould; this was not done. This is therefore another situation where reference can be made to the absence of evidence from those involved.

[531] Ms Johnson is of the view that the primary source of moisture ingress is the failure of the waterproof membrane used on the balconies. As I understand it, the homeowners do not disagree this was an issue but point to other damage which they say cannot be related to this issue. However, there are again a litany of other building defects, and particularly around the windows some failings which are very likely to allow moisture ingress. These include the absence of jamb and sill flashings in circumstances where the plans called for them, inadequate flashings, a lack of sealant and poor coating.

[532] I consider it is relevant that there is a significant, and unexplained by the evidence, departure from the consented plans. I am aware from other evidence that departures from the consent plans are not uncommon, although the expectation is that the departures will be properly recorded, noted to an Inspector, and ultimately approved by an amended consent. The evidence does not disclose any of that having happened here.

Carnelian

[533] Carnelian was built in 2002, and the current owners purchased it in 2005. It had changed hands three times before then. Ms Johnson described access difficulties

that were the subject of disputed evidence between her and Mr Wutzler. I preferred Ms Johnson's recollection of events, while accepting Mr Wutzler may have believed a different message was being conveyed. The end result was limited access to another house where recladding had already started. The homeowners rely on it as demonstrating base of sheet issues, and window/cladding junction issues.

[534] The defendant raises building issues and non-compliance issues, noting also there is a mixture of claddings used. It is common ground that there is a movement issue, the cause of which has not been identified by the case evidence. Ms Johnson considers there is more movement occurring than Mr Wutzler accepts, but both agree something is happening. There has also been significant moisture ingress from an incorrectly constructed deck and balustrade. If a formal conclusion is necessary, I again confirm I accept Ms Johnson's assessment that it is poorly built. Even if Mr Wutzler were correct that many of these building deficits are not uncommon, it would not divert me from the label.

Golf Road

[535] Enough has perhaps been said about access but concerning this property the defendant's experts were not able to visit it at all. Mr Wutzler made his usual visits but by the time Ms Johnson and Mr Longman travelled to Auckland to look at it, in November 2019, it had been sold and entry was declined.

[536] It should not, in my view, have been used as a sample property and it is unclear to me how the Court could fairly place reliance on the analysis of only one party.

The Esplanade

[537] This house is relied on as disclosing the three standard defects; namely, base of sheet, h-mould and window/cladding junctions. Of this property, the homeowners' closing submissions begin:[117]

> 434. On cross examination Mr Wutzler was taken through a copy of a pre-sale report obtained by the owners in 2017 which referred to various high risk features and poor detailing, with which Mr Wutzler mostly

[117] Footnotes omitted.

> concurred. The house was constructed some 24 years ago and should be viewed in that context. Many features which are now recognised to be high risk were not considered to be high risk at the time of construction.
>
> 435. This is supported by the comments in the pre-sale report which commented under a heading of "design detailing" that this was "standard practice for era of construction" and that "original detailing will required upgrade".
>
> 436. Mr Wutzler agreed in cross examination that many of the details, particular on the front elevation and the details relating to the upper storey deck, were poor and it was also unclear if some of the unusual detailing was original (including for example the termination of the h-mould in the middle of the front elevation). However, as Mr Wutzler explained in cross examination this was one reason why he confined his destructive testing to the rear part of the house.

[538] The difficulty previously highlighted is again on display. Mr Wutzler has confined himself to the rear of the property, where he considers inherent flaws are evidenced, because the rest of the house is too badly built to be used. Ms Johnson and Mr Sylvia query whether a qualified builder actually built the property. A letter is on the Council file from a neighbour who is a builder, and who had priced the building job for the owner on a labour-only basis. His quote was accepted but then the neighbour decided not to do the job. The circumstances caused him to write to the Council, noting:

> What worries me most is the owners scant knowledge of building practices and scant regard to adhering to Council building requirements. He seems a law unto himself who will not listen to advice …
>
> I have declined the work because when discussing extra requirements for very high wind area he again didn't want to know …

[539] It is of this property Ms Johnson observes the cladding is very poorly installed and

> I question whether its installation was undertaken by a qualified carpenter.

[540] Care is obviously needed before much weight is placed on a letter of this type on the Council file, but in the absence of any information about the construction, it is legitimate to consider it, especially when significant problems are acknowledged by experts from both sides. Of the h-mould, Ms Johnson contends none of the JHTI requirements have been complied with and it has been nailed through (not floating);

the base of sheets are not coated, and the head flashings are wrongly installed. I also note, and accept, Mr Sylvia's evidence concerning the implications of the incorrect installation of the damp proof membrane.

[541] I do not accept that a building of this quality can be used to provide proof of the inherent flaws. The need for the plaintiffs' expert to focus on only one part of the house is telling, and inevitably undermines the legitimate value that can be taken from it. The little that is known of the history when that is considered in light of the analysis by Mr Sylvia and Ms Johnson, is significant.

Portsmouth

[542] The homeowners rely on this property for proof of the base of sheet flaw, as evidence of cracking and its effect, and for difficulties with the joinery/cladding junctions. When Ms Johnson attended, along with Mr Longman and Mr Kennerley, they were denied the opportunity to do any destructive testing, or to go inside the house. It is somewhat surprising, therefore, that the plaintiffs' closing says the defendant's competing analysis has not been investigated fully.

[543] Of this particular property, while not resiling from my initial comments that there was no general pattern of deliberate non-disclosure, it was an occasion where I was troubled by the lack of disclosure by Mr Wutzler of his dealings with the owners. Mr Wutzler was also loose with his initial language in relation to the issue of whether the house had a Code of Compliance. His initial evidence was that a copy of it was not on the file provided to him, but in fact one has never been issued and at some point Mr Wutzler seems to have known that.

[544] There is little to be gained in dwelling on another property concerning which there is limited in-service knowledge, where there are plain building issues, and where the property does not have a Code of Compliance. It is another poor vehicle through which to demonstrate inherent flaws.

Conclusions

[545] At the risk of repetition, some general observations can be made.

[546] Looking at all these houses, one can only be struck by the poor building practices that they evidence. Recognition of these deficits does not reside solely in the defendant. Mr Wutzler's evidence is replete with similar acknowledgments, although, as discussed, he would attribute less or little significance to them from a weathertightness viewpoint.

[547] Reference can be made to the Hunn Report. It was an important historical document in terms of the impetus for change it generated. It identified many contributing causes to the leaky home crisis, and any reference to one of those causes must come with a caveat that there were many, and no sectors of the industry were seen as blameless. The following fairly captures the essence of the Report: [118]

> The Overview Group believes there is potential for a major systemic breakdown across the industry. While buildings have always leaked, traditional building methods have had a greater degree of redundancy in their design – 'belt-and-braces' – and have coped by providing reasonable protection and by dealing with water penetration when it occurs – even if inadvertently. A confluence of factors has now made the systemic problem manifest. In summary, these include:
>
> - Changes in responsibilities and relationships of designers and builders
> - Town planning criteria relating to plot ratio and yard distances that inadvertently lead to particular building solutions or contribute to the choice of building style
> - Lack of professional and trade skills and good judgements. There has been widespread comment about an identifiable decline in the levels of skills in most trades on site
> - Changes in on-site structures and responsibilities (sub-trades)
> - Imperatives of cost and speed (cutting corners)
> - Emphasis among product manufacturers on product rather than building system
> - Lack of effective supervision/inspection practices
> - Lack of detail, prescription, performance criteria, and guidance in the Approved Documents (both the Acceptable Solution and the Verification Method) regarding weathertightness compared to other aspects such as structural integrity.
> - Lack of designer and constructor attention to achieving weathertightness performance compared to other aspects such as structural integrity

[548] As can be seen just from the bullet points there is a potential value in the conclusions for both parties to this litigation. Concerning building trade practice, it is noted:[119]

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118 *Hunn Report*, above n 1, at 16.
119 At 35.

> At the trade level, the Overview Group became aware that there is a perception throughout the industry that skill levels on site are declining. The evidence for this is related not only to the weathertightness problem itself but more generally to workmanship practices and the on-site working environment. Reasons ascribed to this perceived decline include problems with the apprenticeship system, a lack of skilled workers, the predominance of labour-only contracts, the lack of regulation of standards, and of quality assurance and accountability across the industry.

and later:[120]

> In the comments made to us not only was concern expressed about an identifiable decline in the levels of skills in various trades on site and the variable application of trade skills and good judgements, but there were also some observations about changes in:
>
> - on-site structures and responsibilities (sub-trades)
> - responsibilities and relationships of designers and builders
> - the application of professional skills and good judgements
>
> The advent of labour-only contracts has changed the responsibilities of the main contractor and sub-trades. There is now a proliferation of sub-trades on-site from traditional carpenters and plumbers to specialist cladders and coating applicators, to labourers. Some product manufacturers are becoming more careful about who they employ or allow to be employed to install their product. Some companies offer relatively extensive education programmes before licensing approved installers or applicators. Some insist that only applicators who have completed their specific courses successfully may install or apply their product, otherwise their product guarantees are invalid. However, on-site supervision of how one element of the building relates with another sequentially or otherwise is apparently no longer seen as a paramount responsibility of the main contractor, project manager or architect. One specialist sub-trade may work alongside another with little or no knowledge of how their product operates (or does not operate) in relation to another.

[549] The detailed analysis of the lead and sample houses has had on the Court the opposite effect from that sought by the homeowners. Rather than point to the inherently flawed nature of one of the materials used in construction, the analysis has confirmed that indeed there was a decline in building skills. If more evidence were available it might provide an explanation, but on what is before the Court it has to be queried why there were so many departures from good practice, and how such departures passed inspection. Many of these departures disclosed a fundamental lack of understanding as well as flaws in implementation. That is exactly what the Hunn

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120 At 37.

Report notes with specialists working beside each other with no understanding of the relationship of one to the other.[121]

[550] It is also noticeable, at least on the evidence before the Court, how often it was unclear what had happened during construction and why, including who had built the property, and why there were such immediate departures from consented plans. Cladding type was changed without acknowledgment, core features were omitted without comment. The consequence, from my viewpoint, is that it was not possible to sensibly isolate spots on houses and say, on any significant level, that they reflected an inherent flaw. I accept the defendant's evidence that other explanations, almost always at least as likely, exist. The industry context at the time lends weight to that proposition. The homeowners' evidence did not establish that the houses were examples of the inherent flaws in action.

BUILDABILITY

Introduction

[551] This is not of itself a pleaded inherent flaw but brings together under one label all or part of three alleged flaws –

(a) defect seven, being the Harditex system did not contain sufficient tolerance for normal building conditions;

(b) defect six, which is that the JHTI was defective in its content; and

(c) defect eight, which is that the JHTI lacked detail it should have had.

[552] The plaintiffs' pleading captures it best:[122]

> The Harditex Cladding System was a proprietary sheet cladding system, designed by James Hardie specifically for textured exterior finishes. James Hardie was in a position to know and understand the most suitable method of

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121 It must be borne in mind that litigation like this deals with damaged houses. As the Hunn Report said, houses could be and were being built properly. The importance of houses to New Zealanders, and the terrible impacts of a leaky house, understandably require attention and analysis, but it is important to recognise there were sound builders building sound properties.

122 Cridge, third amended statement of claim, sch 1, at [21(e)–(f)].

> installing the cladding system it had designed and should therefore have provided clear and unambiguous instructions for the installation of the elements of the cladding system. In particular James Hardie should have provided clear instructions on the method of installation of common (and high risk) elements such as face fixed joinery and corner detailing at the horizontal control joint. A proprietary cladding system which lacks clear instructions for an installer is not fit for purpose.

[553] In terms of buildability it will be helpful to first briefly address some research on building defects that relates to the relevant period.

[554] In December 2000 the Unitec Institute of Technology produced a report in which 287 pre-purchase reports were analysed for what they said about building defects.[123] The source of the inspection reports was the firm associated with Mr O'Sullivan, a witness for the homeowners.

[555] By way of background the report notes the growth in forms of cladding other than timber weatherboards that occurred in the 1990s. Taking stucco, fibre cement and EIFS[124] together, in the 1970–1980 period they represented six to nine per cent of new builds. This figure rose to 38 per cent in the 1990s.[125] Obviously the growth in such materials was significant and rapid.

[556] The Report found that, when looking at all identified building defects, fibre cement was less represented than other major materials.[126] However, when the Report created a subset of moisture-related defects, the percentages altered:[127]

(a) stucco – 41 per cent;

(b) fibre cement – 22 per cent; and

(c) timber – 23 per cent.

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123 UNITEC Institute of Technology School of Architecture *Auckland House Cladding Survey: A Report for the Building Industry Authority* (Wellington, December 2000).

124 Exterior Insulation and Finish Systems, being a system of plaster and paint over a polystyrene substrate.

125. UNITEC Institute of Technology School of Architecture, above n 123, at 13.

126 Fibre cement accounted for only 14.5 per cent of identified defects compared to timber weatherboards, which accounted for 40 per cent, and stucco, which accounted for 27 per cent.

127 UNITEC Institute of Technology School of Architecture, above n 123, at 22.

[557] For stucco and fibre cement, about a third of the total building defects in relation to each had moisture implications. The percentage figure was lower for weatherboards.[128]

[558] A second piece of research was one undertaken by MBIE entitled *Data on Residential Weathertightness Failures*. It represents an analysis of claims brought to the Weathertight Homes Resolution Service. This was not officially published and was made available as a draft under the Official Information Act.[129] I do not recall it being relied upon by the parties, although in the material before the Court; however, some of its data is of background relevance.

[559] As at mid-2014, 9912 dwellings had been the subject of claims.[130] Of these, 28 per cent were single dwellings, 30 per cent were apartment complexes, and 42 per cent were other complexes.[131] This latter group includes duplexes and complexes of stand-alone dwellings, both of which could involve dwellings relevant to the present litigation.

[560] Of all the claims filed, 89 per cent of the dwellings had monolithic cladding. Of these, 45 per cent of claims concerned fibre cement, 28 per cent EIFS and 20 per cent stucco. The building consent figures do not break down the cladding type build rates, but fibre cement is very likely to represent much more than half of those three types of houses. The 89 per cent figure speaks for itself in terms of where the leaky building crisis manifested itself.

Difficulties in building – general evidence

[561] I recognise there are some difficulties for the homeowners in leading evidence of the problems in working with a product not now on the market for more than 15 years. Further, those who did build Harditex houses are not likely to come forward

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128 At 22–24.

129 Andrea Knox and Lisa Star *Data on Residential Weathertightness Failures* (MBIE, 16 February 2015) (obtained under Official Information Act 1982 request to MBIE).

130 Claims must be lodged within 10 years of build date. Obviously not all houses that are the subject of leaks are the subject of claims so it cannot be suggested the figures necessarily reflect the problem.

131 Andrea Knox and Lisa Star, above n 129, at 3.

and give evidence that they found they could not safely build with Harditex, but did so anyway.

[562] A consequence of this is that the plaintiff witnesses who did give evidence of the difficulties did not themselves say they could not build a safe Harditex house. Rather, it was said that it was hard, and required care and skill. As a list of qualities needed for a builder, care and skill would not strike most lay people as particularly unexpected.

[563] Mr Proffitt and Mr Peryer were important plaintiff witnesses on this topic of buildability. Mr Proffitt completed his apprenticeship in 1977 and then worked as a carpenter for about 13 years. Then for a similar time, for different entities, he performed a role that could be described as project managing construction. This seems to have covered all types of building, but many of them were larger scale enterprises. In 2003 Mr Proffitt entered into the building surveyor field, and then in 2010 added remediation work to his portfolio.

[564] In terms of Harditex, Mr Proffitt built one house with it. I infer he built it successfully; he does not say otherwise. His primary contact with Harditex seems to have been first as a project manager for a company that used Harditex as one of its cladding options, and then his work as building surveyor and remediation expert. As project manager, the scale of his engagement with Harditex emerged in oral evidence as much greater than had been apparent from his written brief. Mr Proffitt spoke of involvement in as many as 50 Harditex buildings, not all of which would have been domestic dwellings. It seems he was a resource for site builders on how to do things, and also had the role of inspector, correcting building errors when he saw them.

[565] Mr Proffitt's evidence-in-chief is a powerful statement for the homeowners as to the buildability of Harditex, or its lack thereof. Mr Proffitt gives his own lengthy list of problems with Harditex, a considerable few of which are not mirrored in the pleadings. Overall though the following best captures his evidence-in-chief:

> Prior to my work as a building surveyor and remediation specialist, I gained significant experience building with Harditex, particularly in the late 1990's and early 2000's while I was with Primesite. During this time, I learned that, despite our best efforts, we had more weathertightness failures related to

> Harditex cladding than any other cladding. Much of the detailing of the Harditex system was critical to the weathertightness of the building, however good detailing was difficult to achieve on an everyday basis in on-site conditions while guidance on a number of critical details were completely absent, for example saddle flashings to parapets and balustrades, cladding to roof clearances and joinery flashings other than a head flashing. Other details were introduced via the manufacturers technical literature as problems became apparent, though this always seemed to be done in an ad hoc fashion, with no major review of the information provided to the industry until the introduction of the Monotek product and a drained cavity cladding system in the early 2000s.

[566] It is fair to observe, however, that a quite different context emerged during cross-examination. Mr Proffitt has a very bleak view of the skills of the building industry at the relevant time. The following is not just picking up on a bad moment, but is fairly reflective of his evidence:

> Q. The essence of your position is that James Hardie needed to provide a set of training wheels for everyone, not only experienced people but unexperienced people, bad builders, everyone, it needed a manual for everyone?
>
> A. Yes, or restrict who could put it up. And I think that last point is very important, in my view at least.
>
> Q. So in terms of exactly who these poor builders are, so your evidence is pretty scathing. You say pretty bluntly that most of the profession wasn't up to it, correct?
>
> A. Yes.
>
> Q. Not just a few bad eggs but most of it?
>
> A. Yes.
>
> Q. The vast majority?
>
> A. More than 50%.
>
> Q. And you say, in paragraph 40(d) of your reply brief.
>
> A. Can I just go back, that 50%, I mean I have no basis for arriving at that, just to …
>
> Q. No, no, I understand, it's just an intuitive feel?
>
> A. Yes.

[567] In that extract can be seen not only his assessment of building standards, but an explanation for much of Mr Proffitt's evidence. Given those standards, he believes more should have been done to reduce the risk. The JHTI should have contained basic

building information including statements on fundamental topics such as that penetrations should always be sealed.

[568] Other relevant evidence included that, in his experience as a project manager, head flashings could be brought onto a site ahead of windows to enable pre-installation; and if the JHTI lacked details, he believed the architect or designer should have provided them for the builder. I also infer from his evidence that he believes the product is buildable by a competent builder, albeit it is not easy. However, because the product was generally available to be purchased by anyone, all those potential builders should have been catered for in the JHTI.

[569] Mr Proffitt was not asked by counsel or the Court to comment on what now in hindsight seems an obvious follow-up; if many of the builders were so bad, would more information have been of assistance? Would it have even been read, and would the builders have been able to follow it?

[570] Finally, I observe Mr Proffitt confirmed that throughout the period a common building model was a project manager and labour-only builders. I observe of this that labour-only should not be equated with "not competent"; many no doubt were good builders, but obviously many were not. Mr Proffitt's main concerns were with "spec builders" who built a large quantity of these houses. Spec builders are people generally not in-trade as a builder but who undertake construction of a dwelling for themselves, often with an intention of on-selling.

[571] Mr Peryer owns a building firm which employs 30–40 builders, many of whom have been with him a long time. He founded the business in 1989, so very much at the time Harditex was introduced onto the market. However, his first experience working with Harditex was not until 2002, when building an administration block for a school.

[572] Mr Peryer's brief, and his oral evidence, showed him to have a dim view of Harditex as a product. This seemed to primarily relate to Harditex's alleged inability to deal with moisture. Mr Peryer's view was that it was a face-sealed system and that when water got behind it, it attacked the timber.

[573] There were difficulties with Mr Peryer's evidence. The basis for his evidence was often unclear. For example, having stated his first contact with Harditex was on a school building in 2002, the brief talks of difficulties working with early versions of the JHTI. For example:

> There was no requirement to seal or prime the bottom edge or the back of the Harditex sheets. The 1996 details for the head flashing called for some sheet seal on the back of the sheet above the head flashings but not the 1998 details. It was difficult to keep up with the various changes to the JHTI. Any unsealed cladding would delaminate over time from moisture penetrating the edges especially around cut edges.

[574] Mr Peryer did not actually have experience working with either the 1996 or 1998 JHTI. Nor has he had to deal with changes, because the last JHTI was published four years before his first engagement with Harditex. It never changed during Mr Peryer's time working with the product. Mr Peryer was asked about this and advised he had downloaded the earlier JHTIs so as to be able to comment on them. He could not explain why he had done this, but confirmed that comments, for example, on the difficulties of working with Harditex in the 1990s were just recounting what others had told him. The unsatisfactory nature of this is clear, and the weight to be accorded what is largely unacknowledged hearsay evidence is accordingly significantly diminished.

[575] Some of the evidence in this case, including that from Mr Peryer and Mr Holmes who is also connected with a large firm, makes plain that there are builders who firmly believe Harditex was a bad product. However, in litigation it is necessary to be clear about the basis for the belief, and allow it to be tested. Where testing has been possible, on many occasions significant caveats such as the hearsay component of Mr Peryer's evidence have emerged.

[576] As another example, it was not apparent from his written evidence that Mr Peryer had built a Harditex house for himself. This emerged in cross-examination and so accordingly there was no evidence about it.[132] Should one infer, therefore, as the defendant suggests, that Mr Peryer experienced no problems building his Harditex house, or since?

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[132] My sense at the hearing was that plaintiffs' counsel was also unaware of this. I omitted to check this point.

[577] I make these observations not as a criticism of Mr Peryer but to confront an underlying theme that many in the industry think Harditex a poor product.[133] It would be wrong not to acknowledge it, but also not to respond in the way I have with a fact noted at the start of the judgment. This is litigation and a Court must act on admissible reliable evidence.

[578] Other witnesses who gave buildability evidence for the homeowners included Mr Wutzler, Mr Lalas, Mr Cuneen (who built the test frame), Mr Holmes, Mr Williams and Mr Sutherland.

[579] I have commented on Mr Wutzler's experience previously. In terms of buildability issues, although Mr Wutzler is experienced in the industry generally, he has limited experience as a tradesman builder, and little experience in building with Harditex. Mr Sutherland is an experienced and respected architect. His evidence is primarily directed at the JHTIs.

[580] Mr Lalas is a facade engineer who provides evidence on most aspects of the plaintiffs' case. This includes a very long commentary on the contents of the JHTIs, and opinions on the Harditex system and on the alleged inherent flaws. I have concerns in relation to his evidence that require some development.

[581] He is an experienced facade engineer. My assessment is that experience related primarily to weathertightness, load capacity and general engineering soundness of the facades of commercial buildings. In this he was appropriately an expert. I do not by that suggest that an understanding of the underlying science and principles that must accompany such expertise cannot translate to knowledge about other building envelopes. But his is very much an expertise in commercial or large building facades.

[582] More generally, Mr Lalas was not an expert witness on whom reliance should be placed. There were too many aspects where his evidence was based on errors, and on careless misreadings of material; much of his evidence (which in total was more

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[133] I am conscious in this regard of some internal James Hardie documents that register concern that Harditex has become equated with, and is used to describe, all fibre-cement products. It was, however, the predominant one in the market, although that market share diminished from the late 1990s.

than 400 pages) was outside his expertise; there was incorrect use of publications, and he made allegations of impropriety about witnesses for the other side that were unfounded and can only be explained by the lack of objectivity that permeated his evidence.

[583] To take the latter first, as has been discussed, RDH built the James Hardie model wall and conducted various tests. The outcomes of those tests were that, consistent with the evidence of Drs Straube and Lstiburek, the system drained. As part of his criticisms of the RDH work, Mr Lalas made and adhered to what I can only describe as the extraordinary proposition that RDH had deliberately built in a non-disclosed batten to in effect create a cavity. There was simply no basis for this proposition and it indicated, as did other aspects of his evidence, a lack of understanding of the role of an expert.

[584] This was not the first occasion where Mr Lalas had done this. In his original evidence he accused RDH of misusing the results of a third party research report in order to achieve the most favourable results. This allegation was withdrawn at the beginning of his oral evidence because Mr Lalas realised it was in fact he who was misreading the research. It is of course one thing to interpret a publication different to other witnesses. It is quite another, without any basis, to allege improper motives in the other party's claimed misreading. This is another example of a lack of balance and objectivity that was a concern. These concerns were apparent throughout the evidence.[134]

[585] The matter on which I have just commented, the misreading of the research paper, was one of numerous examples where Mr Lalas misread or misunderstood the material he was critiquing. The nature and number of the errors diminished the confidence a Court could have in him as an expert witness.

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[134] Aligned with this, Mr Lalas, who had a consultancy as a facade engineer until 2010, advised the Court that since then his main work had been on this type of litigation. He still did some facade consultancy. As I understand it, much of the recent work involved James Hardie although exactly how much is not clear. Further, I acknowledge some of the buildings, such as large apartment buildings, would be much more within his expertise. There is a concern when an expert has largely engaged in this type of work for the past 10 years. It is not of itself a matter on which I would necessarily place weight, but it does gain some greater relevancy given my assessment of a prevalent lack of objectivity.

[586] Another matter on which Mr Lalas gave evidence was the issue of whether James Hardie should have undertaken a SIROWET test as part of its product development. SIROWET is the predecessor to the 4284 test used by FTNZ when testing the Helfen model wall. Although undoubtedly a topic within his expertise, I consider Mr Lalas' approach to the matter again reflected an inappropriate commitment to his side of the case. One of the issues around this test is whether it was designed for residential houses, or just commercial buildings. I accept opinions might differ, but to me it is clear that all the written text suggests the latter is true. To give but one example, the current version of the relevant New Zealand external moisture standard observes of this test:[135]

> The weathertightness test of AS/NZS 4284 is modified for generic domestic-oriented cladding *because it was developed primarily for testing specific, non-absorptive facades and curtain wall systems on high-rise commercial buildings*.

[587] Mr Lalas was not willing to accept that comment reflected the clear tone of the writings. Eventually he may have done so, but his rigidity was not a helpful approach. Generally his evidence reflected an inflexibility inappropriate for an expert witness. Mr Lalas' thesis on the use of the test was that there was general industry awareness of its availability and suitability. In support he referred to two documents. One was a draft BRANZ letter from 1998 (more than 10 years after Harditex's release to the market). The draft letter does suggest the authors (BRANZ employees) were alert to the possibility. I accept therefore it provided support for his thesis but its obvious limits (its age and that it was a draft) were not acknowledged.

[588] Mr Lalas also referred the Court to what he termed a publication, informing the industry of the applicability of SIROWET to residential buildings. However, this was incorrect. It was not a publication, but seemingly a paper presented to a conference. Mr Lalas could not identify where or when it was presented, nor tell the Court how it could be obtained. Mr Lalas was also significantly in error as to the date of the paper. This aspect of his evidence should not be overstated; standing alone it would only go to the particular point and would not cause me to have doubts about the overall probative value of the evidence. But it again involved misstatement (as to its

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135 Ministry of Business, Innovation and Employment, above n 20, at 21.

availability) and carelessness (as to the date of the paper which was very significant to its relevance).

[589] Another factor in my assessment of a lack of probative value of Mr Lalas' evidence is that much of the evidence falls outside the scope of his expertise. Mr Lalas purports to offer a commentary on the JHTIs and their adequacy. He has no or insufficient experience in residential construction to allow him to do this. His lack of knowledge of building science and technique was exposed on numerous occasions in cross-examination. Mr Lalas does not accept this lack of expertise but I consider it is irrefutable, and for that reason alone would set aside the bulk of his evidence. I need to stress this is not just a paper critique, matching his experience and qualifications to the content of his evidence. In my view, it was apparent from his oral evidence on many aspects concerning residential construction that Mr Lalas was not qualified to be giving evidence on these things as an expert. He appeared often to not understand the issue he was giving evidence about. For all these reasons I have given his evidence little weight.

[590] Mr Williams works for Mr Peryer, and has done so since 2003. Prior to that he worked at a large building supplier, where his responsibilities included pricing from plans, then as a representative on the road and then running a manufacturing plant. He joined Mr Peryer's firm as a contract manager. His experience is with "the supply of building products and with management of building projects". He can accordingly speak on his experience with how Harditex was sold and his relationships with and knowledge of James Hardie representatives and their approach. Mr Williams says his first experience with Harditex was in 2000 when the firm was recladding a school block. Following that he supervised the construction of several Harditex clad properties, including one where 300–400m^2 of Harditex was installed.

[591] The balance of Mr Williams' evidence was somewhat unusual in that it closely mirrored, with a significant portion of identical text, the evidence of Mr Peryer. It became clear they had collaborated on their evidence. This was a somewhat unusual approach. The collaboration related as much to the opinion evidence as the underlying factual basis. It is of course permissible and not wholly uncommon for a second expert to confirm they agree with the first. It can add independent weight to an opinion.

Usually, however, I suggest the approach would and should be to indicate when that is happening, rather than to produce apparently independent briefs which in fact have much common jointly prepared content.

[592] Mr Williams joined Mr Peryer's firm not as a builder, and does not have any experience in that capacity. He has not physically himself installed Harditex, and generally has not worked on the tools. I accept his factual evidence as to what he has seen, and that he holds similar views to Mr Peryer. They are not, however, views based on relevant knowledge or experience. In saying this I do not discount management experience – something relevant to Mr Peryer, Mr Holmes and Mr Proffitt. But those other witnesses had a background as a builder before turning to management. I did not find Mr Williams' evidence of assistance, and do not consider him qualified to comment on buildability.

[593] Mr Holmes runs a substantial construction company. He first assisted his father in his company, Holmes Construction, when he was a child and started work in the building industry at the age of 17. He spent seven years learning the trade before leaving for a while but then returning as a project manager for Fletcher Construction. Those seven years are his "on the tools" experience. As a project manager Mr Holmes is plainly skilled and very experienced. His evidence is that the experience has taught him the importance of using quality people not only as site managers and forepersons, but in the sub-trades. Mr Holmes returned to Holmes Construction in 1986.

[594] Mr Holmes advises the nature of his business changed from 1991, as it "stopped being traditional builders" and moved more to project managing, and site managers. Mr Holmes developed a practice of having specialist suppliers such as James Hardie attending building sites to confirm products were being used properly. This reflects Mr Holmes' general view that from the 1990s the range of different products that emerged required different detailing than the products that had been the focus in polytechnic courses, and also were different from the inherent knowledge built up in the industry in relation to more traditional products.

[595] Mr Holmes details his experience, and by that he means the firm's, in dealing with Harditex:

(a) The first development was Courtenay Apartments. James Hardie was not involved. After nine years, three decks needed re-laying due to a failure of the membranes. This work caused other inspections, and water ingress was found on one level. The problem was identified as being with the window/cladding junction. These were fixed. The building is 22 years old. Mr Holmes describes the texture coating used as "the saviour of the building" which I apprehend is, to the extent known, in good condition;

(b) The next development was Palm Grove Apartments. Mr Holmes says as far as he was concerned there were no issues during installation.

(c) The next large development was Stadium Gardens. Mr Holmes says that James Hardie representatives were often on site.

[596] For non-Wellington readers of this judgment, it is appropriate to note the last project was not successful in that the building suffered significant moisture damage issues which were the subject of high-profile litigation. The proceeding, more typical of its type in that it involved a large number of defendants, settled.

[597] Mr Holmes adds that the company has used Harditex on a number of smaller residential apartments and on a newer apartment block, Kate Sheppard. That building is undergoing work due to earthquake damage. Mr Holmes notes that in his opinion the performance of the cladding has improved due to the requirement for a cavity, "air sealing at the property" and treated timber.

[598] Of Harditex and its use, Mr Holmes observed:

> 68. We understood that BRANZ had tested Harditex with various coating systems and that they had provided appraisal certificates for the product. We assumed that the tests carried out by BRANZ were robust, but later found out that the tests carried out only tested the durability of the coatings and that no water tests were conducted on any junctions or control joints, or the system as a whole. We also assumed that James Hardie had tested the product to ensure that it would perform.
>
> 69. However, I did see a construction risk around how the product was handled and installed. To be fair that risk was recognised as much by Paul Meo and Brent Pitkethley as me, and I totally agreed with their

> approach. The Harditex specification was not written in overly technical terms, but it was a system that not just anyone could put up. We would not just want unskilled labour or hammer hands to put it up. They would need to be properly supervised and trained, in order to pay attention to details such as the fixing spacings, framing substrate and back seals, which needed to be done properly and in the right order.
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> 70. The specificity of the details around the placement and construction of the expansion and control joints, the sheet layout, nailing centres, placement of inseal tape and head flashing details meant that careful attention was required when installing the product. Harditex could only have been installed properly by competent people, if these details were to be adhered to.
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> 71. The tolerances of 1-2mm required in the JHTI are virtually impossible to achieve on any project which uses concrete slabs and timber framed structures. By contrast, the accepted tolerance for concrete use is ±3mm over a length of 3m.

[599] Although not having been involved in the original construction of any single-level buildings, Mr Holmes says recladding work the firm is doing suggests to him that the concerns he has with Harditex on large buildings exist with the smaller home as well.

[600] Mr Holmes filed a reply brief which picked up on various topics. Responding to suggestions of the desirability of a different sequencing approach to head flashing than that initially advanced by him, Mr Holmes agreed that the suggestion of the defendant experts was technically correct but difficult to achieve. Amongst other things he notes, as witnesses such as Mr Wutzler do, that flashings usually arrive with the windows. By contrast, and perhaps illustrating the reality of different approaches and experiences, Mr Proffitt, who was doing this work through the 1990s, said that his firm always had the flashings custom built specifically with a 75 mm upstand (as required by JHTI), and generally could get them delivered when wanted.

[601] Relevant to the issues in this case, and bearing in mind the litigation's focus is on residential properties, Mr Holmes' response on the proposition that Harditex as a cladding was just an incremental development, was:

> I agree that sheet products have been used for years. The difference with Harditex was that it was introduced as a product that was suitable for complex multi-level houses and commercial buildings and it was textured to have a monolithic appearance. The impression given and stated was the combination

> of Harditex sheets and an approved texture coating was sufficient to provide a weathertight home. Prior to the introduction of Harditex, sheet products were used largely on single level houses with soffit overhangs. The joints were usually covered with a weather grooved batten.

[602] The evidence does not, in my view, suggest that different building issues emerged with Harditex over and above previously available cladding sheets. The other hesitation I have with Mr Holmes' evidence was that it was not always clear that Mr Holmes had focused on the difference, for JHTI purposes, between the multi-storey complexes concerning which his building projects[136] have involved, and the target of the JHTI which is a residential timber frame dwelling of not more than two storeys. Some of his criticisms of the JHTI appeared to ignore this limitation.

[603] On behalf of James Hardie, evidence was called from Messrs Longman, Sylvia, Donnan and Kennerley. Comments were made by others such as Ms Johnson who is familiar in the industry in the same way but no more than Mr Wutzler, from an experienced architect, Mr Pynenburg, and from Mr Knox who is a senior research and development manager. With some of these witnesses, and meaning no disrespect, their evidence can be paired against equivalent evidence from the homeowners. For example, Mr Wutzler and Ms Johnson have similar backgrounds, and the same can be said – at a broad level – of Mr Proffitt and Mr Longman, and of Mr Sutherland and Mr Pynenburg. It is not easy to discern, however, in the homeowners' case evidence comparable to the defendant's builder witnesses Messrs Sylvia, Donnan and Kennerley. I start with these latter three.

[604] Mr Donnan has an architectural design business but also 20 years' experience in residential carpentry. His recollection is he has built about 16 Harditex-clad homes. Ten were in the same complex, and six subsequently were for a prominent building company. This work occurred in the late 1990s and early 2000s. After 2010 he took up a role with the Earthquake Commission assessing damaged properties.

[605] Mr Donnan comments generally on the building industry and the skills required for a builder. It was his experience in the 1990s and 2000s there was a mixture of good builders, and builders with inadequate skills. The latter needed more

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136 I am not referring here to recladding and remediation work.

supervision than they often received. Documentation had a lot less detail, and more was expected of builders. It was not uncommon for plans just to instruct a builder to build in accordance with NZS 3604 and with manufacturer's specifications. Mr Donnan says he personally used the JHTIs. He does not today recall the detail but nor does he recall struggling with them. He believes they were comparable to the technical literature of other producers.

[606] Concerning cladding, Mr Donnan has worked with Harditex, weatherboards (both bevel back and rusticated), linea weatherboards, stucco, and brick veneer. He has done a small amount of work with EIFS.

[607] Of Harditex, he found it not materially more complex than other products, but it required precision, albeit not in his view a precision beyond a competent builder. He considered particular accuracy was needed with the base of sheet to ensure a visually straight edge, and with the notching for the head flashing because that remained visible after coating. As an example of comparable difficulty with, say, weatherboards, Mr Donnan notes that splay joints require a high level of precision because they will be visible. In the 1990s pre-cut scribers were not available so had to be cut on site. His opinion is that each cladding has areas of difficulty and areas requiring precision.

[608] Other features recalled by Mr Donnan were the weight of a Harditex sheet and the h-mould. The weight was something also referred to by Mr Holmes and it seems clear it is a feature best solved by using two people.[137] The h-mould was made more difficult to install by being made of PVC rather than a more rigid metal but otherwise was not unduly difficult. Finally he agrees, as do all witnesses, that allowing 35 mm timber studs was poor in that it made fixing sheets more difficult. It could, in his view, be done, but the tolerances in a 45 mm stud were much to be preferred.

[609] In cross-examination Mr Donnan confirmed his periods working on Harditex were with other builders so he has not himself built all components of a Harditex

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[137] As another example of different approaches and recollections, Mr Proffitt saw the advantage of Harditex as being the speed with which it could be installed. He considered this one of the risk factors as people then took less time and care.

house. He had not, for example, built a two-storey Harditex house, so has not constructed an h-mould. This was another example of overstated or inaccurate original evidence as noted to have occurred with some of the homeowners' witnesses.

[610] Mr Sylvia is a qualified carpenter who has been in the industry since 1995. In his original evidence he described himself as experienced in working with sheet cladding, but as only having worked with Harditex on a few occasions. He has 20 years' experience in residential and commercial construction, has built new homes, but the majority of his career has been with older villas and bungalows. Mr Sylvia gave evidence on various topics, but this section focuses on his evidence in relation to buildability.

[611] Mr Sylvia details on his experience with various cladding sheets including Harditex, Titanboard, HardieBacker, Shadowclad and profiled metal cladding. In his opinion the first few products all involve specific framing set-outs, and careful detailing in many locations including at the base of sheet and windows.

[612] Setting out the propositions to which Mr Sylvia thought he was responding provides a convenient context for his evidence:[138]

> Mr Proffitt explains that Harditex had details that were very difficult to detail on site or had to be produced on the fly by the builder. He states that the details included in the JHTI were significantly more difficult to achieve, or less tolerant of poor workmanship or design detailing than the details provided by other cladding systems on the market. Mr Holmes states Harditex was so different to anything he had built with previously and very different from any other traditional building methods, although he accepts that he did not have any background in installing sheet style products. I assume that the plaintiffs' experts are saying this to explain why so many workmanship defects exist at the test properties.

[613] In Mr Sylvia's opinion these concerns, which I agree are reasonably summarised by him, are overstated. His essential thesis is Harditex is a sheet cladding and therefore involves many of the same issues as other sheets. The flush jointing was a new feature but otherwise it was similar to other sheet claddings that had been around and continued to be.

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138 Footnotes omitted.

[614] Mr Sylvia agrees that some cladding systems such as bevel back weatherboards and brick veneer are more tolerant of workmanship error, but notes they are far from immune to it. In his earthquake assessment work he came across many examples of houses clad in those materials suffering from substantial water damage. Other than these, Mr Sylvia's opinion is the other systems are equally vulnerable to poor workmanship, and he lists as examples vertical shiplap, stucco, rusticated weatherboard, board and batten, and Shadowclad.

[615] Concerning specific details of the Harditex system, Mr Sylvia gives examples of similar requirements in other systems. On h-moulds, for example, he regards it as both relatively simple, and similar to the Z flashing for plywood sheets at the inter-storey join.[139] The vertical movement joints are little different from express joints in other cladding systems and the base of sheet detail is the same (other than the need for an inseal strip). Mr Sylvia notes, as the judgment earlier has, that matters such as a capillary gap are an integral part of NZS 3604, regardless of the cladding type. Finally, he observes that in his opinion the head flashings requirements are the same as for any sheet.[140]

[616] A focus of cross-examination was with the extent of Mr Sylvia's actual experience with Harditex. It emerges it was limited to three houses and he was involved in aspects of building them relatively early in his carpentry/building career. However, concerning his opinion that cladding sheets present similar issues whatever the particular cladding, my assessment was that Mr Sylvia's opinion withstood challenge. He generally was a witness who impressed me.

[617] Mr Kennerley is a builder who started as an apprentice in 1987. He has worked in the construction industry in England, Canada and New Zealand. He has been a self-employed carpenter in New Zealand since 1993, as a sole trader and then owner of a construction business.

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139 In a report written for James Hardie on a project known as Clemmows, Mr O'Sullivan also described the h-mould as a simple construction.

140 Picking up on an earlier comment in the judgment, I obviously was aware of the evidence when earlier observing that the evidence had not convinced me anything had changed as regards penetrations: see above at [335]–[336].

[618] Mr Kennerley has had a lot of experience with fibre cement, including Harditex, primarily in the context of alterations and renovations. Earlier in his career he worked on new builds, including Harditex townhouses in Wellington. As with Mr Sylvia, he has worked with other James Hardie sheets such as Titanboard, Monotek, Villaboard and Hardiflex.

[619] Mr Kennerley says he has found Harditex no more difficult to work with than any other sheet cladding. He considers that it was a buildable product if the technical literature and good building practice were followed. In his renovation work he has not come upon Harditex that had lost strength. Where moisture issues are present, his experience is that building errors can be seen.[141]

[620] Pressed in cross-examination for detail, Mr Kennerley estimated as an apprentice he worked on around 10–12 Harditex houses. This was in the early days of Harditex. Later, all in the context of renovation, he worked on another six to seven houses. As with Mr Sylvia, Mr Kennerley was a sound witness who, in my view, displayed a comfortable familiarity with "on the tools" building craft. It is clear he both followed details but also adapted them as he thought best.[142] Mr Kennerley was a regular user of inseal at the base of sheet and described different methods of installing windows and head flashings. His preferred style was to put the window and head flashing in before fitting sheets from either side which met above the window. However, the method depended on the location.

[621] As will be clear, I found the general evidence on buildability proffered by the defendant to be more convincing, and comfortably so.

Difficulties in building – evidence about specific areas and coating issues

[622] In this section I consider further the topics of incorrect details, omitted details, the incompatibility of the JHTI requirements with normal New Zealand building conditions and, briefly and on the Court's initiative, coatings.

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141 Mr Kennerley was the builder assisting Ms Johnson at several sites. His other evidence covers his observations from those occasions.

142 An example was altering the sizes of the inseal and also using sealant. He also sealed the bottom back of sheets.

[623] Evidence was led concerning the alleged incorrectness or unworkability of numerous details:

(a) windows – installing head flashings including sequence, safe notching, proper lapping of building paper, inseal, jambs and sills;

(b) sheet layout – including the adequacy of the permitted for a while smaller 35 mm stud;

(c) base of sheet – including the capillary gap, the need for inseal and the difficulties of coating;

(d) control joints, both horizontal and vertical; and

(e) corners – including external and internal, and ending or joining h-moulds.

[624] There was very little direct evidence from builders that the details did not work or could not be made to work. The builders called by the defendants said they worked. The plaintiffs' witnesses who gave contrary evidence either had not themselves sought to work with the JHTI on a project or in some cases had built a Harditex home for themselves and did not give evidence about experiencing problems. Some witnesses who had supervised the work of others gave evidence of those builders experiencing difficulty and I accept that is undoubtedly so, in the sense that some of the tasks were difficult.

[625] The judgment will neither set out the arguments concerning specific details, nor seek to resolve them. However, comment can be made of some of the major ones.

[626] The evidence satisfied me the best sequence is to install a head flashing before putting the sheets up. This requires the flashing to be on site before the window (or for the windows to be there earlier than normal.) The evidence equally satisfied me this could be done, and without much difficulty if there was planning and they were ordered. But I accept many would not have done this and so would have resorted to

more difficult installation methods which carried risks such as disturbing the building paper.

[627] I accept Mr Wutzler comments on the difficulty of forming the corners, although moisture issues seemed much less prevalent with corners than windows. It also appears that for a period there was a mismatch between the prescribed accessory for forming the corner, and its availability. I also observe that corners occur on all buildings, and there was nothing particularly unusual in this regard with a Harditex sheet.

[628] Difficulties with some other details were overstated or not established. Inseal was an example of both. I was not satisfied on the evidence that meeting this requirement was difficult, although I accept Mr Wutzler's evidence it was often ignored.

[629] I reached a similar conclusion about the h-mould and the capillary gap. Concerning the h-mould, there was little evidence that it was difficult to construct in accordance with the JHTI. Indeed, the primary focus of the homeowners was not that it was hard to build but that it did not work. I also consider Mr Wutzler overstated the sealing difficulties in relation to the h-mould. Builders such as Mr Sylvia seemed little troubled by the need both to apply sealant and to do so adequately. I accept the subsequent joins would not last from a waterproofing viewpoint if they were then left as exposed sealant joints, but that was not what was to happen. They would be coated.

[630] I have commented on the capillary gap. Its treatment in the JHTI was inconsistent and poor, and for the first 10 years conflicted with the standard set out in NZS 3604. NZS 3604, which was easier to comply with, should have been recognised as prevailing. Strict compliance with the JHTI would increase the risks because the gap would be narrower.

[631] Beyond these general comments, there is no value to the judgment or the parties in dwelling on the specifics. My conclusion on the buildability topic will reflect a preference for the building evidence of the defendant's witnesses. That does not mean, of course, they will be correct on everything. I also note that while there

was criticism of the adequacy or difficulty of many details, there was very little evidence provided by the plaintiffs of alternative or better details that should have been used.

[632] Concerning omitted details, the answer to the dispute depends on the target audience. The omissions identified by the plaintiffs largely concern features that are not new to Harditex but were common to sheet cladding. In some cases they were details that were basic to good building. This topic is addressed under the Negligence part.[143]

[633] This other aspect of the homeowners' case is the proposition that what was required to build a sound Harditex house was impractical given normal New Zealand building conditions. This is the sixth inherent flaw pleaded in the Cridge proceeding as:

> The Harditex JHTI up to and including the Harditex July 1991 Technical Information failed to specify a method of installation of the Harditex cladding system which makes adequate allowance and tolerances for the typical conditions that exist on a building site including climatic conditions, the skill and precision of a reasonable cladding installer and the tolerances to which buildings are constructed.

[634] In closing submissions the proposition is put this way:[144]

> 602. A cladding system should be designed so that it can be used and installed in real world building conditions. The plaintiffs' evidence establishes that Harditex was not able to be used and installed in real world building conditions, and did not have appropriate building tolerances built in such that it could tolerate any level of occasional poor workmanship or minor deviations from the JHTI.
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> 603. It cannot be right that only when perfection is achieved that a system like this for general widespread use will perform. People and materials are not perfect and system design must recognise this.
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> 604. In addition, the JHTI generally requires a high level of millimetre perfect precision, and in many cases provides absolute values rather than a range in which the detail could be achieved. For example, providing for the Inseal to be placed 5mm above the base of the sheet. These absolute values are relied on by the defendants when assessing whether a detail has been constructed in compliance with the JHTI,

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143 At [690].
144 Footnotes omitted.

without any consideration of whether the detail can be complied with consistently.

[635] This reflects paragraphs from Mr Proffitt's written brief:

> 64. A cladding system should be designed so that it can be built and used in real world conditions. Based on the details that are included the JHTI and my experience in supervising the installation of Harditex on a number of properties, it was very difficult for Harditex to be appropriately used in real world conditions. Many builders struggled to comply with the details included in the JHTI, in particular those outlined above.
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> …
>
> 66. The details included in the JHTI were significantly more difficult to achieve, or less tolerant of poor workmanship or design detailing than the details provided by other cladding systems on the market. The obvious system that is more fault tolerant is weatherboard cladding, especially bevel-backed weatherboard.

[636] Beyond these statements it is difficult to discern what James Hardie was meant to have done and did not do. It may be that these are in effect a general statement that Harditex is not a suitable product and system but otherwise the specific evidence about their significance is elusive.

[637] Reviewing Mr Wutzler's primary evidence, there are references to the weather, and the implications if timber framing and cladding sheets get wet. He also refers in a similar context to problems if the concrete slab and particle board flooring get wet. These are all undoubtedly issues if the product gets wet, but they are also situations governed by NZS 3604, the JHTI, and good building practice. There are rules as to moisture content. It may be that compliance was difficult at times because of the weather, the reality of exposed building sites, and the manner and timing of the delivery of products. What has not been made clear is what James Hardie was meant to do in this regard and did not.

[638] A second topic of alleged impracticability were some of the measurement requirements in the JHTI, with the prominent ones being the 2–3 mm capillary gap, the 35 mm stud which meant achieving nailing requirements was difficult, and the sheet gap of 6 mm above the h-mould. I agree the first two were difficult. I have commented previously on the capillary gap, and a 35 mm stud made the nailing task

much harder than it was with the subsequently required 45 mm stud. I am less convinced by the third matter. There was no evidence to say it was easier to position a sheet, say, 10 mm above the h-mould than the required 6 mm.

[639] Of these measurement points, two comments can be made. The JHTI, as did NZS 3604, allowed identified tolerances, and there is little evidence that not meeting those JHTI standards caused damage. A wider capillary gap would be a good thing; and a larger gap between sheet and h-mould has not been identified as an issue. It would shorten the height of the upstand of the h-mould, and so therefore increase (as the homeowners would have it) the risk of water being blown over, but otherwise it seems of little moment. I accept the 35 mm stud made it more likely some sheets were not nailed as tightly as they should be.

[640] A final topic requiring some comment is the issue of the texture coating. The case is notable for no direct evidence from a texture coater. I accept that many of the witnesses would, in the context of their work, speak to coaters and develop knowledge of the systems,[145] but it is nevertheless a feature that there is no direct evidence from a texture coater saying what the issues were. The closest to such an expert was Mr Moginie who was a technical director for a coating manufacturer, Fosroc. His evidence was that his company had little difficulty with Harditex.

[641] The importance of texture coating to the "Harditex system" is plain. The sheets need to be sealed and coated in all places where they are exposed to the elements. There are inherent risks in the system. An example is that unless first sealed by the builder, some aspects of the sheet will inevitably be covered over by a board without having any prior treatment. If a defect then occurs in that area, the untreated raw part of the absorbent sheet is vulnerable. As the science analysis showed, it would still require a considerable period of water exposure to be troublesome to the board but

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[145] That said, when inquiry was made of witnesses, the basis on which they commented on coating difficulties was unclear. The day-to-day work of many witnesses would not obviously bring them into contact with coaters. Surveyors, for example, and those doing pre-purchase inspection reports or engaging in remediation work all came along after the build, often by many years. I accept that a repair and remediation process could involve contact with coaters, but otherwise consider those involved in actual building in the relevant period were most likely in the best position to recount what is in this case all second-hand evidence.

there are examples in the case where damage has happened to an uncoated portion of sheet.

[642] The evidence suggests James Hardie was uncertain as to what approach to take to texture coating. It was consistent in noting in its JHTI that the coating applicator was a third party and that their work was not warranted by James Hardie. However, internally there was awareness of the importance of the coating to the durability of the board, and the potential for at least reputational damage when there were failures. James Hardie tested coating products for sufficient flexibility, but that was the limit of its testing.

[643] James Hardie oscillated between merely recommending applicators and authorising them. At times approved applicators were named; at other times users were urged to contact James Hardie for details of systems that should be used. At the same time, James Hardie encouraged and assisted applicators to seek BRANZ approval of their product for use with Harditex. Several did this over the years, and appraisals were issued.

[644] In the absence of direct evidence, and it not being a pleaded defect, it is not necessary to address the topic further.

Assessment on buildability

[645] If the necessary assessment is whether the plaintiffs have proved Harditex was too hard a product to build with, the answer can only be no, and by a margin so. Their witnesses lacked direct experience in building with Harditex on residential houses. That is not to say some are not experienced and respected in the industry, but from their evidence I took a message of poor building standards rather than a product that could not be built with. By contrast, the defendant's witnesses established that a competent builder could build a sound Harditex house. Indeed, I do not take Mr Proffitt, for example, to disagree with this.

[646] The greater familiarity with working with Harditex lay with the defendant's witnesses, and particularly Mr Donnan[146] and Mr Kennerley. It would, however, be too narrow to focus just on Harditex. Experience with sheet cladding is of considerable relevance. For the homeowners I consider the greatest exposure to building with Harditex lay with Mr Holmes, who was also a witness who was very good in his field. However, his field, for the time period in question, was very much large-scale Harditex construction, and so not as directly relevant to the case as some others.

[647] The second conclusion I reach is that the evidence does not establish Harditex, as a building product, was much of a change from existing sheet products. There are some caveats to that. First, everyone agrees the joins were different. That was in reality its innovation. Second, it is probably the case, as best I can infer from the evidence and reading the supporting information, articles and other material, that there was less experience generally in the building sector with sheet cladding than there was with timber weatherboards and brick. So, as sheet cladding became more popular, so there was a decline in the percentage of builders familiar with the cladding they were working with.[147]

[648] Third, and here the actual evidence is less clear so the Court's inference has more of a speculative nature, the increase in the use of sheet cladding seems to have coincided with a change in the trade model of how houses were built.[148] There are two parts to this. First, there was greater use of a model of foreperson and labour-only builders. This model was more vulnerable since it places a premium on the quality of supervision. Here one can recall also the Hunn Report observation of how building sites became fragmented with at times a loss of overall oversight and responsibility.[149] The second aspect is that there seems to have been an increase in do-it-yourself projects and spec-built houses.

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146 Mr Donnan's experience was not as extensive as first appeared in that he was an employed carpenter and all the 16 dwellings were single storey. This meant he had not installed an inter-storey h-mould, for example. In this regard his original evidence was overstated. It is the case, however, that he was a working builder on Harditex houses.

147 That is not to say sheet products were novel – asbestos fibre cement, plywood, fibrelite, and asbestos-free fibre cement had all been around.

148 Although I express some hesitancy in expressing too firm a conclusion, it is consistent with the evidence of witnesses from both sides, and my reading of the Hunn Report.

149 *Hunn Report*, above n 1, at 37: see above at [548].

[649] These matters combined to mean there was a decline in standards, and many errors were made. I can say confidently about the houses examined in this case that fundamentally bad building practices are evident in every one of them. Further, there is no logical reason to infer any of the other claimant houses are different. If they were better built, but still failed, one would expect to have seen them feature in the litigation, rather than the houses chosen. The evidence is that Mr Wutzler has inspected them all.

[650] It was earlier concluded that the Harditex system can drain and dry expected quantities of water. The reality shown in this case is that multiple building errors have led to homes experiencing too much movement, unsealed penetrations, poorly formed junctions and uncoated and unsealed bases of sheet. These, along with many other errors, have exposed the building envelope to far greater levels of moisture than it is reasonable to expect or model for.

[651] It is also the case, and again not disputed, that a direct-fixed system such as Harditex does not drain as well as, for example, a bevel backed timber house. The latter is more forgiving. It is, as I understand it, the reason why people such as Mr O'Sullivan agitated for a cavity because it introduces a layer of protection against error.

[652] On that topic of a cavity, it is too simplistic and a comment that carries a large measure of hindsight, to say direct-fixed sheet systems were an error. Drs Lstiburek and Straube gave many examples of such systems still working perfectly well in North America. The hindsight, I consider, is that they are not such a great idea when there is a significant deficit in the quality of many of those building the houses. Further, if they are to be built in such circumstances, it was also unfortunate that many were complex designs which abandoned traditional weatherproofing features such as eaves, and sloping roofs, and treated timber framing.

[653] My conclusion, therefore, which places most weight on the evidence of persons actually involved in building houses, some of whom have reasonable experience with Harditex and some of whom have considerable familiarity with sheet cladding, is that there was nothing particular about Harditex that made it different from building with

other sheet cladding. Further, although some details on their face perhaps required too much precision, all building systems require good builders, and involve aspects that are difficult and which are harder than the rest of the build. Harditex was no different, and these precise details could and were managed, in their own ways, by competent builders.

[654] In relation to the issue of whether a Harditex system house was able to be built safely, the evidence satisfies me it was. To put that in terms of the case onus, the plaintiffs' evidence does not satisfy me a Harditex system house could not be built safely. I will draw final conclusions on the JHTIs in a later section.

Inherent defect nine - maintenance

[655] The homeowners say that James Hardie provided insufficient assistance on the maintenance requirements. The focus seems to be on the maintenance of the coating.

[656] The 1993 version, the first to address maintenance at all, had a heading "Maintenance" and stated that the coatings will require regular maintenance. This involves regular inspections to ensure there are no cracks at sheet joints which may allow water entry. Although other areas that could be mentioned, such as base of sheet, were not, the statement at least raises maintenance, talks of regularity of inspection, notes the purpose being to avoid water entry, and provides one indicator, a crack.

[657] The next change was in the 1995 version. The essential message is the same, but the reader is directed to:

(a) PVC flashings and jointers;

(b) inseal and butynol strips; and

(c) sealants, coatings and cracks and joints.

[658] The final version in 1998 contains the same information but adds that regular maintenance is needed in order to meet the durability requirements of the Code, and then defines regular maintenance as being inspection every 12 months, and recoating

every seven to 12 years. I will defer consideration of duty and breach to the later discussion of whether the JHTIs constitute a breach of duty.

[659] The homeowners rely on opinion evidence from Mr Wutzler that the requirements are not enough as cracking can occur anytime, and that they are impossible to achieve whenever the feature is covered by the texture coating. What is underneath cannot be checked. While this is so, I observe the question is whether checking what is underneath is needed if the coating is properly maintained. Emphasis is also placed on the lack of any warning concerning the bottom edge and it is suggested that could and should have been the focus of a particular maintenance warning.

[660] James Hardie defends its performance by reference to various general factors. The first of these is that all houses require maintenance, and there were general documents to assist. In that regard Mr Longman identifies a BRANZ publication from 1995, "Maintaining Your Home", which covered the maintenance requirements of many claddings, including fibre cement.[150] He also refers to other BRANZ publications and to the Appraisal Certificate for Harditex itself which speaks of the importance of the integrity of the coating system and the need to check.[151]

[661] Mr Longman then analyses the maintenance requirements contained in competitors' technical information (Duratex, CSR, Primebase and Insulclad) and notes they are similar to or less than those in the JHTI. More generally he is of the view that hidden componentry, if installed correctly, should not need maintenance as long as the coating is maintained.

[662] This was not a topic where the evidence was particularly comprehensive. Everyone agrees maintenance is required, and then there were competing opinions on the sufficiency of what James Hardie did. It is relevant, I consider, that the Court has not been pointed to any comparable product literature that did more, and Mr Longman's analysis on this was not challenged.

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150 Trevor Pringle *Maintaining Your Home* (1st ed, BRANZ, November 1995).

151 BRANZ *Good Exterior Coating Practice* (November 1998); BRANZ, above n 55; and Anna Smith *Maintaining Your Home* (2nd ed, BRANZ, September 2006).

[663] This is an area where the enhanced details in later JHTIs point to deficiencies in the earlier ones. There can be no argument the earlier ones could have been better. If there was a duty to include advice on maintenance, palpably the 1988 version failed since it had none, but the later ones progressively improved.

NEGLIGENCE

Did James Hardie owe a duty of care?

[664] In this section the judgment first addresses the issue of whether James Hardie as a cladding manufacturer and seller owed a duty of care to the owner for the time being of a house reliant on such cladding for its weatherproof qualities. Such a duty being found to exist, the judgment addresses its application to three areas:

(a) the product and the system;

(b) the JHTI literature; and

(c) evolving knowledge of issues with the product and whether that gave rise to an obligation either to modify the product or warn consumers about those known risks.

James Hardie's argument

[665] James Hardie submits it is unprecedented for a dwelling owner to claim they were owed a duty of care by the manufacturer and supplier of some elements which form parts of the dwelling's enclosure. Whilst builders and council inspectors have been held to owe a duty, their situation is different as there is a "more direct relationship". James Hardie stresses that between itself and each plaintiff:

> there are the major and transformative interventions of a designer and a building team. Those interventions are inconsistent with James Hardie being held responsible for the physical damage to relevant buildings.[152]

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[152] It is difficult to accept the relevance of those interventions if the problem is that the sheet is flawed. Inherent flaws in the sheet that mean the building is not weathertight would not be the product of interventions by anyone.

[666] The plaintiffs' claim having been allocated the label "novel", James Hardie's submissions then analyse the settled approach that is taken to claims of a novel duty of care. In New Zealand it is recognised to be a two-step inquiry aimed at establishing whether it is fair, just and reasonable to impose a duty of care on the defendant. The two stages are:[153]

(a) the proximity between the parties; and

(b) the policy considerations at play that may tend to negate, restrict or strengthen the existence of a duty.

[667] Todd summarises it this way:[154]

> The first stage is "internal" and concentrates on the parties themselves and the proximity, or nature and closeness, of the particular relationship between them. No special standing is accorded to this stage of the inquiry, for determination of the proximity issue in favour of the plaintiff raises no presumption of a duty or prima facie duty. As for the second, "external", stage of the inquiry, this involves an explicit assessment of extraneous considerations of policy or principle both for and against a duty.

[668] Concerning proximity, James Hardie submits the key focus must be whether there is a close and direct relationship that enables a defendant ability to exercise control over the situation and therefore be regarded as having responsibility for it. This focus emphasises the interventions that occur between production and the completion of a house:

> It is exceptional to find in the law a duty to control another's actions to prevent harm to strangers. For example, a building contractor required by its contract to follow instructions of an architectural consultant owes no duty to second guess the architect's omission to carry out a building inspection.

[669] It is submitted that a 2013 amendment to the Building Act 2004, which for the first time imposed statutory responsibilities on a manufacturer, recognises this remoteness of the manufacturer to the process by creating a restrained liability:[155]

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153 *Carter Holt Harvey* [2015] NZCA 321 [*Carter Holt Harvey (CA)*] at [23].

154 Stephen Todd (ed) *Todd on Torts* (8th ed, Thomson Reuters, Wellington, 2019) at [5.2.03] (footnotes omitted).

155 Building Amendment Act 2013, s 7; and Building Act 2004, s 14G.

(2) A product manufacturer or supplier is responsible for ensuring that the product will, if installed in accordance with the technical data, plans, specifications, and advice prescribed by the manufacturer, comply with the relevant provisions of the building code.

[670] James Hardie next reviews numerous cases where it considers the concept of control, or lack thereof, has been determinative, or at least very significant, in resolving whether there is a duty. James Hardie characterises the plaintiffs' claim as being for economic loss. This seems to also be the view of the learned author of *Todd on Torts* who argues the owner is suing for a disappointed expectation as to the true value of the house.[156] If we take the facts of the famous case of *Donoghue v Stevenson* where the problem was a snail in a bottle of ginger beer, the homeowners' claim is said to be analogous to that plaintiff claiming not for injury from the presence of the snail, but for the money wasted in buying the bottle.

[671] The relevance of this, James Hardie submits, is that it is really a claim about the quality of the product, and quality falls into the domain of contract, not the law of negligence. An exception to this is if it is a case of dangerous products rather than shoddy ones, but here the argument is that the house is a shoddy product.[157] James Hardie puts its case for no duty this way:

188 This distinction between dangerous defects and quality defects can be understood from the perspectives of principle and policy. Tort law is principally concerned with "danger" preventing likely physical injury or property damage. As a matter of logic, a product with a defect in quality has not caused damage to person or property, whereas danger involves exactly that. Damage to the article itself cannot sensibly be regarded as property damage; the article is simply less valuable than it otherwise would have been – i.e. economic loss.

189 For this purpose, a complex structure or product must be considered as an integral whole and not divided into its constituent parts. The plaintiffs bought a house, not a cladding sheet / system. The remedies sought by the plaintiffs are illustrative of the economic nature of their loss. They have claimed the cost of recladding and an alleged diminution in the value of their house, not the amount of the damage to the timber framing of their house.

190 The loss arising from a quality defect is "essentially the failure of the purchaser to receive the benefit of its bargain—traditionally the core concern of contract law". The legal policy concern is that, if the

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156 Stephen Todd, above n 154, at [6.4.01(1)].

157 Relying on the Supreme Court of Canada in *1688782 Ontario Inc v Maple Leaf Foods Inc* 2020 SCC 35, [2020] 450 DLR (4th) 181 at [43]–[47].

> development of tortious product liability "were allowed to progress too far, contract law would drown in a sea of tort". In other words, non-dangerous defects bring into play questions of quality of workmanship and fitness for purpose.

[672] James Hardie accordingly submit the plaintiffs' claim is for economic loss where the issue is the quality of the product. The relationship between plaintiffs and defendant is remote, which tells against the existence of a duty.

[673] Turning from the internal proximity inquiry to the second external step of policy factors, James Hardie puts in issue a concern about indeterminate liability, and a plea for coherence in the law. It is submitted the particular claim has the potential for the type of ripple effect which the law has always guarded against. The ripple effect arises if a duty of care is placed on manufacturers to avoid economic loss arising from an alleged defect in the quality of a product. The coherence point is really the same proposition, namely that this claim should be resolved by the law of contract, and the separate roles of tort and contract should be maintained.

The homeowners' case

[674] The plaintiffs dispute the case is novel[158] and submit that in New Zealand potential liability for those involved in the construction of a leaky house is well established. Reference is made to a trilogy of Supreme Court decisions that are submitted to put the matter beyond dispute – *Sunset Terraces, Spencer on Byron* and *Carter Holt Harvey.*[159] Mr Farmer QC submits that the cases which the defendant regards as part of an exceptional "category of duty for pure economic loss" represent the response of the common law to the growing need to provide legal redress for economic harm arising from buildings with latent defects. Mr Farmer refers to a number of cases decided in 1986 that extended legal liability in tort which previously limited a homeowner's claim to instances where physical damage had occurred, to

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158 Reference is made to a statement by the Court of Appeal during the interlocutory stage of the current proceeding where it is noted there has never been a "concluded" claim, not that there has not been such a claim: see *Cridge v Studorp Ltd* [2017] NZCA 376, (2017) 23 PRNZ 582 at [27].

159 *North Shore City Council v Body Corporate 188529* [2010] NZSC 158, [2011] 2 NZLR 289 [*Sunset Terraces*]; *Body Corporate No. 207624 v North Shore City Council* [2012] NZSC 83, [2013] 2 NZLR 297 [*Spencer on Byron*]; and *Carter Holt Harvey v Ministry of Education* [2016] NZSC 95, [2017] 1 NZLR 78 [*Carter Holt Harvey (SC)*].

situations where there was no physical damage, but the properties had diminished in value.[160]

[675] On the contract point, the homeowners refer to the response of the Supreme Court to the argument advanced in *Carter Holt Harvey* (and similar to the position taken by the defendants in the current case) that it was open to a building owner to seek warranties from the manufacturers and suppliers of building components. In that case, the Supreme Court noted it was unrealistic for the owners to protect themselves by those sorts of contractual measures. Such measures "would require the head contractor on each building project to approach each supplier to negotiate warranties from the nails to the paint to the glass, and for the building owner to satisfy itself as to the adequacy of each one".[161] As latent building defects can only be identified with special assistance, the Court concluded there was no other available form of protection for a building owner, who on their own could not have been expected to know of the defects or take steps to protect themselves against them.

[676] In relation to incoherence, reliance is placed on the three cases and others to support a submission the issue is settled. There is a place for tort, albeit in a particular case such as *Rolls Royce*[162] the parties may choose to allocate risk between themselves. These cases are likely to be the exception. Similarly the Courts have not been slow to disregard floodgates arguments in the area of defective products. As Tipping J noted in *Spencer on Byron*,[163] only a current owner can sue which itself is a break on indeterminacy.

[677] In summary, the plaintiffs submit James Hardie is advancing arguments that have been heard and rejected. It is, for example, settled law that there is scope in this area for contract and tort to co-exist, and the coherence of the law plea has for some time not been regarded as a valid concern. The same goes for the floodgates argument,

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160 See *Stieller v Porirua City Council* [1986] 1 NZLR 84 (CA); *Williams v Mount Eden Borough Council* (1986) 1 NZBLC 102, 544 (HC); *Brown v Heathcote County Council* [1986] 1 NZLR 76 (CA); aff'd [1987] 1 NZLR 720 (PC), as cited in *Invercargill City Council v Hamlin* [1994] 3 NZLR 513 (CA) at 529.

161 *Carter Holt Harvey (SC)*, above n 159, at [54].

162 *Rolls-Royce NZ Ltd v Carter Holt Harvey* [2005] 1 NZLR 324 (CA).

163 *Spencer on Byron,* above n 159, at [45].

with Tipping J in *Spencer on Byron* noting a level of determinacy is achieved by the reality that only the current owner can sue.[164]

Assessment

[678] It is in my view reasonably plain that a duty of care is owed by James Hardie, the manufacturer of Harditex, to the plaintiffs being the owners of houses clad in Harditex. I base this conclusion on two factors:

(a) the decision of the Supreme Court in *Carter Holt Harvey*, a case very similar to the present, which holds that there are no conceptual obstacles to such a duty. In reaching this conclusion the Court addressed proximity under four topics – the parties' relationship, the contractual matrix, the statutory framework and vulnerability. As regards policy factors, topics addressed were incoherence, contractual claims and commercial certainty (essentially all of James Hardie's submissions and more).[165] Further it can respectfully be observed the Supreme Court decision was hardly surprising given the development of negligence liability in New Zealand in the area of defective homes. The Supreme Court by its decision was confirming the same result that had been reached in the High Court and the Court of Appeal; and

(b) the evidence in this case, as it relates to these topics, has been entirely predictable (to the extent there is any evidence about any of it). No contracts have been entered into evidence to support any suggestion of a pre-eminent contractual chain. Nothing has emerged about the plaintiffs to characterise them as anything other than what will be the case with all the group – they are subsequent purchasers of leaky homes. James Hardie did indeed sell Harditex cladding to the general market on the basis that it was a sound product which if installed correctly would produce a weathertight home. In terms of "vulnerability", Mr Woodhead, for example, had two reports in relation to Woodhouse which essentially said

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164 At [45].
165 See *Carter Holt Harvey*, (SC) above n 159, at [17]–[71].

> it was fine. No doubt that will be the case with many in the group. In short, the context that exists is the one in contemplation in *Carter Holt Harvey*. If anything, one would consider the purchasers of residential homes more vulnerable than a large state entity such as the Ministry of Education.

[679] Put concisely, the Supreme Court in effect says a manufacturer is conceptually no more immune from tortious liability than any other player involved in the construction of the homes, and there is nothing particular in this case to set it apart. Against that general conclusion, it will be necessary only to comment on some aspects of the defendant's contrary proposition.

[680] I do not understand there to be any dispute about what the Supreme Court says. Rather, Mr Hodder QC emphasises the preliminary nature of the Court's conclusion and the fact that the Court emphasised it will require careful analysis by the trial court. That is indeed so, but the duty arguments now advanced by James Hardie are not at all trial-specific. The submission does not, as far as I recall, draw on any trial evidence but repeats in a developed way the arguments considered and rejected by the Supreme Court. It is for this reason I consider this judgment can rely on the responses given by the Supreme Court.

[681] I consider the proposition of no duty is untenable as regards the sheet itself. If, for example, the sheet's composition was flawed, it is hard to imagine that would not constitute a breach of duty to homeowners suffering loss as a consequence. It would be a latent defect in a product that is a key component in a house which is, for many New Zealanders, the major investment and asset in their life. Further, in terms of policy factors, it is wrong to see a residential home as just an asset. If it is the family home, it is much more than that and to the extent there are health consequences – not yet directly proven but very likely – the vulnerability of persons, and the sure knowledge that residential houses will usually be family homes, makes it the type of relationship where the imposition of a duty of care seems just and reasonable.

[682] I doubt the label "novel" is particularly appropriate here except in a technical sense of this being the first time in New Zealand one of these cases has required a trial

judgment to confirm a duty which various preliminary decisions of our highest courts have recognised likely exists. The manufacturer is the start of a chain of persons involved in the building of a house, and I believe it to be accurate to say a duty has been recognised on every actor subsequent in the chain to the manufacturer. The obvious difference is the manufacturer's role is generic, whereas the role for everyone else in the chain is house specific. This is the essence of the transformative interventions point made by the defendant.

[683] As regards that, there seemed a danger of running together breach arguments and duty analysis, and of seeing scope of duty arguments as denying the existence of the core duty. Save perhaps in one respect, the plaintiffs' claim does not seek to make James Hardie liable for the acts of others. The claim is that:

(a) James Hardie negligently designed a flawed, not-fit-for-purpose product;

(b) James Hardie issued instructions on how to install the product that were deficient and which even if followed would produce a non-compliant house that failed to manage water and thereby caused loss; and

(c) James Hardie came to realise around 1999/2000 that its product was a failure, or came with significant risks. It therefore had a duty to act on this knowledge so as to protect people, and failed to do so.

[684] These are all allegations concerning James Hardie's conduct. They are all matters that James Hardie could control. The essence of the plaintiffs' claim is that even if one built this house properly, it did not work. For example, the claim is that if a builder used the h-mould accessory, and constructed it in accordance with the JHTI and good building practice, its flawed design meant it would still let water in. Lack of control is not a valid response to the claim of a duty in relation to this situation.

[685] The potential exception is the claim that James Hardie knew or ought to have known that the skill level of persons using its product could be below the level of a competent builder and have designed the product in a way that allowed for this, and/or should have targeted its literature towards this group. That is the claim that comes

closest to recognising a duty or defining the scope of the duty by reference to third parties' acts. Even there, however, it would not seem a particularly novel idea that a manufacturer should be aware of the likely users of its product and act accordingly.

[686] For these reasons I agree with the plaintiffs that James Hardie owed them a duty of care. I consider the best way to then apply this duty to the facts of the case is to consider issues of its scope and breach in the context of three areas that were the focus of the plaintiffs' claim. These areas are the product and the system, the literature, and the issue of a duty to warn. Issues of causation must be addressed as regards the current plaintiffs, but are otherwise for subsequent trials.

Breach of duty – the product and the system

[687] This first subject area, the product and the system, is the most straightforward. The analysis and conclusions already reached in the judgment mean the findings must be against the plaintiffs' case and little is to be gained by repetition. As regards product, the judgment has concluded the sheet was durable and fit for purpose.

[688] The homeowners paid much attention to the adequacy or otherwise of the testing behind the product, saying it fell below the standard expected of a reasonable manufacturer. I doubt there is merit in the point as a standalone claim. If the sheet in fact works and, for argument's sake that is a product of good luck rather than good management, the reality is nevertheless that the product works. A lack of testing could not be causative of loss. That said, I do not agree the testing fell below the necessary standard. I accept Mr Cottier's evidence, and his comparative analysis as regards what was done, for example, by Dr Akers with his product. The homeowners' case was premised on Harditex being more evolutionary than the judgment accepts it is. Finally, I did not accept it was an error to not test the facade. There was not a suitable test,[166] and it was not industry practice.

[689] As regards the system, breach analysis engages with the topic of buildability, and the adequacy of the JHTI. The latter is to be addressed in the next section. On buildability, the judgment's conclusion is that the system could be installed safely by

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166 At [893]–[899].

a reasonable, competent builder. Overall the system was fit for purpose which, for the focus of this case, was to provide a waterproof cladding for a New Zealand residential home constructed in accordance with applicable standards and sound building practice.

Breach of duty – the technical literature

The duty

[690] The homeowners claim that technical literature produced by James Hardie to assist users of the product was deficient and did not discharge James Hardie's obligation as a manufacturer to take reasonable care by providing appropriate assistance so as to ensure that its product would be installed correctly and safely. No argument was advanced by James Hardie that if a general duty to take care was owed, it would not include this obligation to provide sufficient technical assistance.

The alleged breach

[691] The homeowners' case on the adequacy of the JHTI is set out well in the closing submissions:[167]

> 552. The technical literature accompanying a proprietary cladding system such as Harditex should include sufficient information that a user of the product can install the system in a way that will perform its functions adequately and with only normal maintenance.
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> 553. Mr Sutherland gave unchallenged evidence as to the standard of literature that would be expected from technical literature at the time Harditex was on the market.
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> 554. NZS 3604: 1984 referred to a British Standard, BS4940: 1973 "Recommendation for the presentation of technical information about products or services in the construction industry. Mr Sutherland's evidence was that he would expect a manufacturer of a cladding product to follow this standard, which sets out the type of information that should be covered in technical information.
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> 555. In addition, as Harditex was an Alternative Solution under the Building Code once the Building Code came into force, it was critical for the Technical Information to provide full details to allow the minimum requirements of the Building Code to be met. This is consistent with Mr Knox's statements that "*my view is that the primary function of product technical literature is to provide sufficient*

[167] Footnotes omitted.

guidance to a competent building professional that he or she is able to integrate the product concerned (in this case Harditex) into a building such that the completed building will perform as required and desired" and *"the best that is realistically possible is to cover most of the standard details that would be required to build a basic building".*

559. Critical to the assessment of the JHTI is the fact that Harditex is a system, and not just a sheet product, as outlined above. It was therefore critical that James Hardie provided details which showed how the sheets and various accessories should be assembled, integrated and finished.

[692] For completeness I record the actual pleadings. For Bay Lair, the pleading provides:

(e) the Harditex JHTI up to and including the Harditex July 1991 Technical Information was inadequate and incapable of providing a cladding system which was fit for its purpose as a durable and weathertight exterior wall cladding system and able to meet appropriate standards and requirements for building;

(f) The Harditex JHTI up to and including the Harditex July 1991 Technical Information failed to specify a method of installation of the Harditex cladding system which makes adequate allowance and tolerances for the typical conditions that exist on a building site including climatic conditions, the skill and precision of a reasonable cladding installer and the tolerances to which buildings are constructed.

(g) The Harditex JHTI up to and including the Harditex July 1991 Technical Information failed to provide details and specifications for important and commonly occurring details including face sealed window junctions, terminations of the horizontal control joints and exterior and interior corners.

[693] Prior to that, [9]–[11] of the pleading set out a series of extracts from the 1988 and 1991 JHTIs. The same pattern exists for the Woodhouse pleading, with the JHTI extracts coming from the 1993, 1994, 1995 and 1998 versions.

[694] James Hardie raises an issue as to scope of this proceeding and therefore which JHTIs should be considered by the Court. Its proposition is that because neither of the plaintiffs' houses, nor indeed the sample houses, were built at a time when the initial 1987 JHTI was the operative document, it is irrelevant to the proceeding. The first relevant JHTI is 1991 which applied to Bay Lair. The homeowners contend that the class action status of the proceeding alters this, although it has not been confirmed that any of the class were built under the 1987 or 1988 JHTI.

[695] The proceeding applies to the whole class. I accept that does not make the individual circumstances of the plaintiffs irrelevant. Their litigation remains the primary determinant of scope and relevance, but the wider class should not be ignored. It is likely that most or all of the JHTIs will be relevant to one of the properties and accordingly I propose to consider them. Whether that generates an issue for subsequent proceedings in terms of whether my conclusions are binding can be determined by the later Court. For clarity I note the JHTIs relevant to the plaintiffs are 1991 (Bay Lair) and 1998 (Woodhouse).

The JHTI documents

[696] A JHTI was first produced in 1987. Thereafter there were new or updated versions in 1988, 1989, 1991, 1992, 1993, 1994, 1995, 1996 and two in 1998 which were the last versions. There was considerable development in the documents across this period. For example, the 1987 JHTI was eight pages long with 10 diagrams or details. The last version was 41 pages long with 37 pages of technical information and 69 diagrams or details.

[697] Despite this significant evolution of the document from 1987 to 1998, both parties addressed the topic of breach on an all-or-nothing basis. This makes the topic somewhat difficult to address since the 1998 version is wholly different from the 1987 one. Further, there seems a measure of agreement that the 1998 version is at least close to an adequate version. The judgment will set out the 1987 version and then touch on key additions along the way before concluding on the 1998 JHTI.

[698] The 1987 document stands apart as being a mixture of brochure and technical data. It was not called a Technical Information document. Recognising it had this brochure content, I assume the target audience was broad and included potential homeowners. By 1991 the JHTI was more clearly a document aimed at industry participants.

[699] The brochure portion of this JHTI contains various general statements about the qualities of Harditex fibre cement, highlighting its "proven durability" and safety, that it is unaffected by water, insects, termites or sunlight and will not split, rot, twist or warp. There are also claims that it is a suitable substrate for textured coatings, has

unsurpassed versatility and that it is the "complete cladding for today's architecture". This brochure component invites inquiries on the extensive range of James Hardie's fibre-cement products.

[700] Turning to what can be termed the technical component of the document, the following is covered:

(a) handling and storing instructions;

(b) design considerations – only suitable for two-storey houses unless specific design, horizontal joint required for two storeys unless kiln-dried timber, not for pole houses because of excessive structural movement, and information on when horizontal and vertical expansion joints are required;

(c) a description of the dimension, mass, and straight edge finishes of the sheet;

(d) a list of accessories, being a Hardiflex nail, and reinforcing tape;

(e) instructions on cutting and hole forming within a sheet;

(f) framing and fixing procedures (expanded below);

(g) how to do sheet jointing, with a warning about the dangers of finishing sheets above and below window and door lines. The identified danger of non-compliance is cracking due to structural movement. Details are provided on how to avoid this; and

(h) information on jointing and coating systems. It is noted the product requires proven proprietary high-build flexible acrylic surface coatings.

[701] In relation to the framing and fixing requirements ((f) above), the following are noted:

(a) Harditex must be framed in accordance with NZS 3604;

(b) Harditex must not be fixed to timber with moisture content greater than 24 per cent;

(c) kiln-dried timber is preferable;

(d) 45 mm framing is to be used with the centres for the noggins and the studs set out;

(e) the need for rigid framing with all sheets supported; line and face accuracy to be checked;

(f) when vertical expansion joints are needed;

(g) building wrap specifications;

(h) sheets to be dry and held firmly against stud when nailing; and

(i) the required pattern of nailing, including where to commence nailing on a sheet.

[702] There are within the document six details which cover vertical sheet fixing, vertical expansion joint, internal and external corner details, and two options for sheet joining.

[703] Turning to subsequent JHTIs, the second version in 1988 was called Technical Information, and covered five James Hardie products – HardiePlanks, rusticated weatherboards, HardiePanels, Hardiflex and Harditex. The Harditex-specific material was not much changed from the 1987 document but overall had more information including a general section which had aspects that were both product-specific and general.

[704] The 1991 version was Harditex-specific and was again called "Technical Information". It was by now 20 pages, of which at least 11 contain technical information. There are now 31 details, several of which provide alternative ways of doing a join. There are a number of details for deep reveal windows (ie windows set

back rather than flush with the wall), and some transition details – ie, where Harditex meets some other material.

[705] The JHTIs continued to expand along similar lines through their next iterations, with further details being added. By 1995, for example, it was 33 pages and 69 details.

[706] It is not possible to set out all the detail of the 1998 JHTI because of its length. It may assist, however, to note the contents page which itself is a full page of the document:

(a) Introduction – including checklist of requirements and list of accessories;

(b) Section One – product information, handling and cutting, and safety. The topics covered include bracing, sheet properties, finishing, handling and storage;

(c) Section Two – framing;

(d) Section Three – sheet layout and fixing;

(e) Section Four – control, expansion and corner joints;

(f) Section Five – bracing systems;

(g) Section Six – New Zealand Building Code compliance; and

(h) Section Seven – finishing the system.

The evidence[168]

[707] A key witness for the plaintiffs was Mr Sutherland. He is an architect of 60 years' experience, well recognised in his field. He has held various positions in the profession and has been appointed an Officer of the New Zealand Order of Merit for

[168] There was an experts' conference. I did not find the product helpful. It largely represents a restatement of existing evidence and views.

services to architecture. He was the Dean of Architecture at Unitec Auckland for many years.

[708] From 1968–1984 Mr Sutherland was a director of JASMaD and in charge of an information group within that organisation that wrote technical information for products. Mr Sutherland advises they won many awards in national trade literature competitions. Mr Sutherland says that as a guiding document they used a British standard, BS 4940: 1973. However, no documents or trade literature, award winning or otherwise, were produced as examples of how something should be done.

[709] Mr Sutherland gives evidence that the JHTIs were deficient from start to finish. He contests the correctness of specific details that were included, but the more important aspect is his position that the JHTIs all needed to be comprehensive, and were not. The key reasons for Mr Sutherland's opinion were:

(a) a viewpoint that a product's technical literature should be a comprehensive stand-alone document that does not rely on predecessors. It is not clear the extent to which this view extends to a manufacturer relying on contemporary documents available in the industry (such as good carpentry guides), but if it is a detail that is relevant, I apprehend Mr Sutherland's opinion is that it does not matter that it is available elsewhere. It should be in the JHTI;

(b) a view that Harditex was a new product not an evolution;

(c) the fact that it was an Alternative Solution under the Code. This meant that documents needed to be comprehensive in order to satisfy the territorial authority that, if built in accordance with its requirements, it would satisfy the Code; and

(d) a view that Harditex was a face-sealed system that did not drain. This increased the necessity to provide workable details to prevent moisture penetration.

[710] Mr Sutherland was also critical of the JHTI referring to Harditex as a system because an essential component of the system, the coating, was not the subject of a James Hardie warranty. It does not seem to me that takes one anywhere even if correct, but it was firmly adhered to.

[711] Mr Sutherland is not a lone voice for the homeowners on this topic but his is the most authoritative. The other evidence, which consisted of either or both a commentary on general inadequacy and missing information, or a criticism of a specific detail, came from Mr Proffitt, Mr Peryer, Mr Wutzler, Mr Lalas, and Mr Holmes.

[712] The homeowners' closing submissions claim Mr Sutherland's evidence on the issue to be unchallenged. I do not accept that is so. Context is important – at issue is the adequacy or otherwise of a document. The challenge is to its comprehensiveness. What is in the document is fact. The defendants led contrary evidence which said why those witnesses thought it was comprehensive enough. Mr Sutherland was questioned about aspects of his opinion, and I consider that met the obligations to put the case as agreed by the parties.[169]

[713] Competing views come primarily from Mr Pynenburg, who was supported by Mr Longman, Mr Sylvia and Mr Donnan. Ms Johnson also comments, as did Mr Knox who was the senior research and development manager for a period at James Hardie in Auckland. I see his evidence as relevant to why things were done, but consider care is needed because of his position before placing weight on his opinions on the merits of the JHTI.[170]

[714] Mr Pynenburg is an architect with 40 years' experience who, like Mr Sutherland, is a life member of the New Zealand Institute of Architects and has

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169 If explanation is needed for my different comments concerning the lack of cross-examination of Dr Lstiburek, the key lies in the nature of the evidence. Dr Lstiburek was giving science-based opinion evidence where the underlying principles or their application were capable of challenge. Here Mr Sutherland is commenting on an area where it is more of a general assessment where there are just competing opinions.

170 To avoid any incorrect impression being given, I record I considered Mr Knox a very good and reliable witness who was thoughtful and open to criticism of James Hardie's position and the product. However, it is not necessary to rely on his opinions on this topic so I put them to one side.

been its President. He was the founding Chair of the New Zealand Registered Architects Board and has been a member of and adviser to various industry bodies. As with Mr Sutherland, he brings experience and standing to the issue. His opinion is the opposite of Mr Sutherland's in that he considers the JHTIs were at all times adequate. His opinion is based on:

(a) a view that Harditex was not materially different from other sheet cladding that had been around for many years (other than the flush jointing system);

(b) the JHTI addressed from the outset the details relevant to the specific changes which Harditex represented. As an example, Mr Pynenburg comments on the oft-criticised fact that the 1991 JHTI introduced a detail for an uncommon recessed window, but not one for the common flush window. In his opinion that was a correct approach because fitting aluminium windows into sheet walls was a long-established task. Recessed windows were new and different so a detail was appropriate.

[715] Mr Pynenburg supported his evidence by a detailed analysis of how the initial JHTI addressed the key differences which Harditex represented. He assessed it as appropriately dealing with all new features, and thought everything else fitted within existing building experience.

[716] The other witnesses who commented gave opinions which generally reflected the viewpoints of either Mr Sutherland or Mr Pynenburg.

[717] An important witness on the content of the JHTIs is Mr MacIntyre. He was the development engineer at James Hardie responsible for building and product development in New Zealand across the range. Mr MacIntyre had died by the time of trial; his evidence consisted of a brief prepared for earlier litigation so when referring to it I bear in mind the inability of the plaintiffs to question Mr MacIntyre.

[718] By way of explanation for the sparse initial content of the JHTI, Mr MacIntyre states:

The Technical Information

> 38 As far as we were concerned, there was nothing else particularly new about the Harditex product when it was introduced. This is evident from the first Harditex brochure published in 1987. It contains only basic information on how to install the product. Much of that information talks about how to work safely and effectively with the fibre cement itself, rather than how to construct certain details.
>
> 39 For example, the first brochure contains no information about how to build a horizontal control joint. It simply says that such joints are necessary unless kiln-dried timber was being used and requires the monolithic area of cladding to be limited to 25m². Beyond that, the method of detailing the control joint is left to the builder and designer.
>
> 40 This was not because James Hardie did not know how to build such a joint, or because it was not important to build the joint properly. It was because we expected (reasonably, in my opinion) that competent tradespeople would understand how to construct a joint of this kind and did not need to be told. As I have said, Harditex was not a revolutionary product, and the principles applicable to Harditex construction were more or less identical to those applicable to well-known and established sheet claddings. Also, if a builder was unsure he could always contact James Hardie for assistance, or get the designer of the specific project to provide a detail. This was made explicit in the first few editions of the Harditex Technical Information, which said that the document was not comprehensive, and was designed simply to assist competent tradespeople.

[719] Mr MacIntyre says James Hardie's approach was borne out in the early days. There were few problems when the product was introduced because most builders knew how to work with it. He attributes the growth of the document to a progressive discovery that building competence was dropping away and matters considered good building practice were not being done. His specific example is head flashings. It had never been thought necessary to tell people to install them until in the early to mid 1990s when James Hardie discovered some houses without them. Accordingly, from the 1995 JHTI they became mandatory.

[720] Mr MacIntyre testifies that a second impetus for change to the content of the JHTI was the BRANZ appraisal process. From that point the JHTI needed to be reviewed by BRANZ which was of course privy to much knowledge of building trends and issues. Accordingly, some of the impetus for more content came from BRANZ.

[721] Mr MacIntyre also addresses the reasons for some changes that were made in the 1998 JHTI. In the period prior to the 1998 version, James Hardie had been addressing two known industry issues. First it was recognised that 35 mm timber studs

were proving too difficult for many builders to achieve a firm enough fix. James Hardie accordingly initiated an industry-wide process to convince people to use 45 mm, and undertook a national tour as part of this. By late 1997 James Hardie considered it had succeeded in its aim and so one of the changes in the 1998 JHTI was to make 45 mm studs mandatory. The second issue was nail corrosion and stainless steel fixings. This was mainly an aesthetics issue. James Hardie initiated a series of tests that suggested there were problems with the mixed quality of the galvanisation of some nails. James Hardie accordingly sourced stainless steel nails which it then marketed as Harditex nails. These were made mandatory in the 1998 JHTI. A third change concerned the horizontal joint. James Hardie had come to the view that the h-mould alternative of using a kiln-dried joist alternative was not working. Too often pouting was occurring. An h-mould was made compulsory.

[722] While commenting on Mr MacIntyre's evidence, it is useful to note some comments he makes on earlier topics. Mr MacIntyre adds his opinion on the validity of the h-mould design, and explains why it was not covered in early versions (because it or variations had been around from the 1970s). On the topic of sealing the sheet, the JHTI did not address it because coating systems differed in their requirements, and James Hardie took the view it was the responsibility of the applicator to know what was needed. The Equus system, for example, had both normal sealing requirements (face and edges) but also some back face sealing requirements in some situations. It was for the builder to know the system to be used, and its requirements, and to anticipate them while constructing the house.

Legislative and other background context

[723] The relevant statutory context for much of the life of Harditex was the Building Act 1991. Buildings required a building consent from the relevant territorial authority prior to the build starting. The territorial authority had to be:[171]

> satisfied on reasonable grounds that the provisions of the building code would be met if the building work *was properly completed* in accordance with the plans and specifications submitted.

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171 Building Act 1991, s 34(3) (emphasis added).

The specifications reference would include the JHTI. I agree with Mr Pynenburg that the wording of the test meant that the Authority could assume competent construction.

[724] The Building Code was associated with the Act. It was a performance-based document which focused more on outcomes than the process to get there. Mr Sutherland, in a 2003 Conference Paper, described it as "largely word not number driven."[172] The Code set out the functional requirements and performance criteria a building had to meet. There were a number of chapters, called clauses, on specific topics. Those referenced earlier in the judgment include B2 – durability, and E2 – external moisture. It can be recalled for external moisture the relevant criterion was that the exterior walls:

> shall prevent the penetration of water that could cause undue dampness or damage to building elements.

This makes plain the "outcome" focused style of the requirements. It is about what must be achieved, not how to get there.

[725] For durability, the requirement was the building elements must continue to do their job for 50 years if they were a bracing element, or a feature that was difficult to access or replace, or the element was one the failure of which would go undetected during normal maintenance. Otherwise the durability requirement is 15 years.

[726] Within this overview of the regulatory context, reference should be made to the concepts of Acceptable and Alternative Solutions. Acceptable Solutions were recognised designs that a territorial authority was obliged to accept. In the area of claddings, these were timber weatherboard, masonry veneer and stucco. If a consent application involved one of these claddings and the house was to be built in accordance with NZS 3604, the territorial authority had to accept that aspect of the consent application.[173]

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172 John Sutherland "Leaking Buildings: An Industry in Denial" (paper presented to Facade Design and Procurement Conference, Bath, 2003).

173 In addition to Acceptable Solutions claddings, there were also Verification Methods. If a product had been shown to have been tested in accordance with an approved Verification Method, then it acquired the same mandatory status as an Acceptable Solution. The evidence is that this route was rarely used.

[727] All designs involving claddings other than the three mentioned were classed as Alternative Solutions. With these, the Authority instead was required, before issuing a consent, to make a decision on whether, if built properly according to the plans and specifications, the house would meet the performance requirements of the Code. Assuming, as the evidence suggests, that there were more than 110,000 Harditex homes built, that is the number of time decision-makers within territorial authorities have answered that Alternative Solution question in the affirmative as regards a design using Harditex cladding.

[728] Of course it would be wrong to suggest there would have been a detailed individual analysis on each of these occasions. One factor seen by territorial authorities as removing the need for a detailed individual analysis was the existence of a BRANZ Appraisal Certificate. Manufacturers could choose to submit their product for a BRANZ appraisal. James Hardie did so with Harditex (as it had successfully done with New Hardiflex). Although the formal certificate was not issued until 1995, BRANZ allowed James Hardie to claim its existence from 1993. The Certificate provides that:

> **New Zealand Building Code (NZBC)**
>
> In the opinion of BRANZ, Harditex Wall Cladding, if used in accordance with the statement and conditions of this Certificate, will meet the relevant provisions of
>
> NZBC B1 STRUCTURE, B2 DURABILITY & E2 EXTERNAL MOISTURE
>
> Specific NZBC compliance details are contained within this Certificate

Other material

[729] The best objective fact in favour of the homeowners' case is the evolution of the JHTI. The 1998 version is a very different document from the initial 1987 version, and undoubtedly a better, more comprehensive one. This inevitably suggests the earlier one may be deficient.

[730] Related to that, however, is what other manufacturer literature looked like at the time. Mr Sutherland considers what other manufacturers were doing is irrelevant. The focus, he suggests, must be on the JHTI only. However, the underlying question

is whether James Hardie in manufacturing and supplying this product breached the standards expected of a reasonable manufacturer. It is relevant and helpful in the context to consider what other manufacturers were doing. Ignoring indicators such as other product literature is a certain way to reduce the topic to mere competing opinions.

[731] It is common ground, or at least not seriously disputed, that the JHTIs were as comprehensive as the technical literature of any contemporary cladding manufacturer. Further, no evidence was led that manufacturers in other areas of the building industry, windows for example, were different or better. Dr Lstiburek likewise observes the JHTIs were at least as good as those accompanying any overseas products with which he was familiar.

[732] Mr Sutherland, I understand, despite his criticisms as to inadequacy, acknowledges the JHTIs were as good as or better than any comparable cladding literature and explains this by reference to James Hardie's standing as the market leader. Mr Longman was of a similar view, noting:

> In my opinion the earlier versions of the JHTI in the 1980s and early 1990s were also reasonable in terms of their length and content judged by industry standards and expectations at the time. In my experience the James Hardie's product literature, including the various versions of the JHTI (which included more and more useful content over time), were generally well regarded in the industry and if anything had a reputation for being market leading as opposed to lagging behind.

[733] Looking further for other sources of information on the topic, there is a letter on file from BRANZ to James Hardie. A caveat to reliance on this comment is that it is contained in a non-public letter to James Hardie, but there is no reason to doubt its genuineness. The BRANZ author observed in 1995:

> Thank you for the recently supplied Harditex and Villaboard Technical Information. They are excellent pieces of Technical Literature – well laid out and thorough. (We wish all our customers literature were up to the same standard.)

A further context factor is that the preponderance of the evidence in this case from those who have actually built with Harditex is that the literature was sufficient.

[734] To complete the identification of relevant context, I address the homeowners' proposition that Harditex's status as an Alternative Solution meant the literature had to be more comprehensive. It is not, in my view, a logical analysis of the situation. The JHTI was part of the information available to the territorial authority. As noted, approval was given by territorial authorities probably more than 100,000 times. Logically, therefore, the JHTI as it was seen as adequate to enable territorial authorities to make their decision. There is nothing in this process that can be seen as necessitating a more comprehensive document. The opposite is true. The territorial authority was plainly satisfied with the information it already had.

Assessment

[735] The key issue is whether James Hardie was correct in its view that its duty was to assist competent builders as regards the features of Harditex that were different from previous claddings used in New Zealand. In terms of evidence contrary to that proposition, Mr Sutherland's view is of course due respect, and he has the extra dimension of previously being involved in drafting these documents, and obtaining awards for that work. That may of course mean more that he recognises a gold standard rather than what is needed to discharge the duty, but his is an opinion meriting serious consideration.

[736] However, the two objective contemporaneous facts are, first, that there is no product literature before the Court, be it dealing with cladding or another industry sector, where a manufacturer does more than that which James Hardie was doing. Second, BRANZ, an independent organisation with expertise in the area, signed off on every JHTI from the 1991 version onwards. It seems to have been the BRANZ assessment that the literature was superior to others.

[737] None of this arguably would matter if the evidence was that builders found it inadequate, but that is not the evidence. Rather, the preponderance favours the opposite conclusion.

[738] It could be argued that self-evidently JHTIs were inadequate because houses failed, and this failure must reflect an incorrect standard or target group. Support for

this comes also from the acknowledgment by James Hardie of a growing awareness of building standards deficits.

[739] In relation to this it can be observed:

(a) it is important not to confuse duty and breach. As at 1987 the evidence suggests the appropriate target for a cladding manufacturer was the competent builder, and the appropriate task was to highlight and assist on those matters that are new or different; and

(b) it may be that what was required of a reasonable cladding manufacturer might have changed by the mid to late 1990s as the assumption of core knowledge became less valid. But that would not change the duty as it existed in 1987.

[740] I accordingly conclude that the JHTI in 1987 discharged the obligation that then existed on a reasonable cladding manufacturer issuing a product such as Harditex. This reflects the earlier conclusion that Harditex was a modest development, from a building perspective, on earlier sheet claddings. It also accepts that a pivotal aspect of the house is the timber frame and that it was reasonable to assume knowledge of, and capacity to comply with, NZS 3604.

[741] The evolution of the JHTI has been noted. Mr MacIntyre explains the increase was reflecting James Hardie knowledge as to apparent issues that were arising. The 1998 JHTI seemingly also reflects BRANZ input into matters that could also helpfully be addressed. Witnesses such as Messrs Wutzler and Sutherland may be correct that there were further topics that could have been added, but it is not a duty to be perfect.

[742] I am confident that from 1991 the document discharged any duty and that from 1998 there cannot be a serious claim that it did not meet a manufacturer's obligations. The greatest uncertainty is from 1987 to 1991 when the document was its most sparse. These versions were not subject to any BRANZ assessment and the first version was as much brochure as technical information.

[743] My preference would be to restrict the conclusion, as James Hardie wanted, to 1991 and subsequent as I am conscious there was insufficient analysis by the parties as to the evolving changes. However, for the reasons given and relying on Mr Pynenburg's evidence as supported by the objective factors previously outlined, I conclude a breach of duty is not established for any of the JHTIs.

[744] I conclude with two observations which go to causation. There is no basis on the evidence in this case to conclude that the increased detail actually made any difference. It has not been advanced, for example, that problems declined after the much fuller, and in my view clearly adequate, 1998 version. Establishing a link between the alleged missing detail in the earlier JHTI, and a failed house would not be straightforward. Second, related to this, there is evidence that could support a positive conclusion that further detail would not make any difference. There are witnesses such as Mr Proffitt with his bleak assessment of the quality of builders at the time, and there is evidence such as the deconstruction of eight houses which reveals scant regard by builders to the requirements of the JHTI. Together they might suggest the proposition that a better JHTI would be any form of panacea is optimistic and perhaps unreal.

Breach of duty – the failure to modify product or warn consumers of the risk

The duty

[745] A duty to warn is recognised in New Zealand as an element of a duty of care. A failure to warn breach was pleaded in the comparable cladding case of *Carter Holt Harvey*.[174] In the context of dismissing a strike-out application, the Court of Appeal observed:

> [129] In the context of product liability of manufacturers as it has developed, the tortious duty of care may include a duty to warn customers or users if the product has dangerous features or potentially harmful qualities. Such liability has been found to exist in a range of different factual situations.
>
> [130] The underlying rationale for the duty flows from an imbalance in the information held by a manufacturer (and hence knowledge) as compared with the consumer or user about the risks or dangers inherent in the use of the product. The authorities suggest more than just an imbalance is required—the manufacturer will almost always possess greater knowledge about the product

[174] *Carter Holt Harvey (CA)*, above n 153.

> they manufacture than the consumer. Traditionally therefore the duty to warn has been held to arise in circumstances where the manufacturer holds knowledge or information about the danger that the consumer could not reasonably be expected to possess. The imposition of a duty to warn is needed to address or rectify the imbalance.

[746] The obligation is to take reasonable care in the manufacture and supply of the product. What steps are required to discharge the duty may vary as knowledge changes. At a certain point a failure to warn may amount to a breach of the duty to take care. The proper focus here is on whether there existed facts that required a response from James Hardie in the form of a warning or even the more extreme step of product withdrawal.

[747] Because it is just a manifestation of the duty to take reasonable care, there are no special rules. In overseas jurisdictions, the relevant risk which might give rise to a duty to warn initially appeared limited to situations involving danger.[175] However, in New Zealand, at least in the building context, a distinction between dangerous defects and other defects has long been abandoned, and that is equally so in this area of a failure to warn.[176] It is not yet settled whether the obligation will arise when the person subject to the duty "ought to have known" of the circumstances giving rise to the need to warn.

[748] The assessment of whether a particular risk called for a response is contextual. James Hardie refers to a statement from a High Court of Australia decision:[177]

> In deciding whether there has been a breach of the duty of care the tribunal of fact must first ask itself whether a reasonable man in the defendant's position would have foreseen that his conduct involved a risk of injury to the plaintiff or to a class of persons including the plaintiff. If the answer be in the affirmative, it is then for the tribunal of fact to determine what a reasonable man would do by way of response to the risk. The perception of the reasonable man's response calls for a consideration of the magnitude of the risk and the degree of the probability of its occurrence, along with the expense, difficulty and inconvenience of taking alleviating action and any other conflicting responsibilities which the defendant may have. It is only when these matters are balanced out that the tribunal of fact can confidently assert what is the standard of response to be ascribed to the reasonable man placed in the defendant's position.

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175 *Goldswain v Beltec Ltd* [2015] EWHC 566 at [77].

176 *Carter Holt Harvey*, above n 153, at [136]. See also *Spencer on Byron*, above n 159, at [146].

177 The age of the decision is reflected in its use of the male pronoun – *Wyong Shire Council v Shirt* (1980) 146 CLR 40 at 47–48.

This provides a useful statement of the task.

The alleged breach

[749] The homeowners' case, as set out in their closing submissions, is:

> In the context of the present case, James Hardie had a duty to take reasonable care in the design, testing, manufacture, supply and marketing of Harditex. That duty extended to providing accurate information about the performance and safety of the system and its product, *including warnings about potential complications and contraindication. The duty was not confined to the period before Harditex was placed on the market, it was a continuing obligation to evaluate its performance and safety and to keep abreast of information about the nature and extent of potential complications and to convey that information to users of that system and products.*

[750] The breach is said to have arisen in three areas:

(a) not informing consumers (and others) of problems with the Harditex system;

(b) not informing consumers about the dangers of untreated timbers; and

(c) not informing consumers of the weaknesses in Harditex as evidenced by the improvements in Monotek.

[751] By way of introduction the following are matters concerning which the homeowners allege James Hardie had knowledge – joint cracking and failures, insufficient detailing in the JHTI, joint and system failures, dry rot and declining building standards. It is submitted that the Harditex Improvement Project which commenced around 1999 is evidence of James Hardie's awareness that its product was not fit for purpose. It is argued that James Hardie breached its duty by failing to respond to this.

[752] The detail of what James Hardie should have done, and when, is somewhat elusive. It is one thing to say James Hardie knew of some instances of joint failures; it is another to articulate a proposition as to what level of failure was needed to require James Hardie to take what steps in relation to such a failure. I consider the homeowners' case was lacking in this critical second aspect.

The evidence

Pre-1999

[753] The homeowners rely primarily on documents created as part of the Harditex Improvement Project to establish James Hardie's knowledge of defects. This section considers material arising before then. These documents were identified in an appendix to the closing submissions. Of them, the homeowners said:[178]

> As to what is said in them, in summary, of these documents for the period 1994-August 1999, seven refer to "system failures", two others refer to failures in terms such as "not regarded as minimal", two refer directly to liability and another to the need for James Hardie to set up a defence plan akin to Shingles, (Mr Mann said the provisioning for Shingles claims in FY 1998 was most of $5.465M) one refers to defective componentry, two refer to doubts regarding re-coating and three refer to questionable quality of the Harditex literature or it being misleading. Observations include there being "growing performance issues", a "groundswell of dissatisfaction" and contain the warning that "performance leaking issues will substantially increase". There are observations as to the non-user friendly nature of Harditex in winter months, and that framing conditions of moisture and dimensional tolerance are difficult to meet in adverse conditions. There are observations that the CFAR's are incomplete and that technical research is ad hoc and inconsistent.

[754] It will be helpful to traverse some of the documents for the purposes of understanding the basis for the submission cited.

[755] The first document is the 1994 "Harditex Business Plan", with its purpose being to identify "a strategic marketing focus" for Harditex. The Executive Summary states, on page two:

> In order to protect its position and to grow Harditex sales by 15% (above the market) over the next 3 years this plan proposes several key initiatives in terms of product development and enhancements, system and product warrantees, distribution, industry education and promotion. This strategy is summarised in the action programme shown in section 4 4.5.
>
> Given the products susceptibility to changes in design trends together *with growing system failures* it is important to protect and grow further this extremely profitable product by actioning the elements of this plan

[756] The homeowners rely on the reference to system failures. The document does not develop what is meant by that. I consider the context of the document means it is

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178 Footnotes omitted.

likely a reference to jointing and coating, as they are the weaknesses mentioned within the plan.

[757] The second document is a sales report for November 1994. The homeowners' closing submissions highlight it for the reference to Harditex issues being on the rise. The relevant passage reads:

> *Harditex issues on the rise*. In the main due to Plaster systems coating/joint issues. BRANZ advise these issues are becoming increasingly serious and have mentioned likelihood of Fair Go becoming involved.

[758] The next document is the 1995/96 Operating Marketing Plan, which relates to James Hardie as a whole. The plan tracks through various James Hardie Products. The objectives for 1995/96 are listed and read:

> To reinforce Harditex as the ideal substrate for a monolithic cladding look.
>
> To extend the product life cycle as Harditex enters maturity.
>
> *To minimise system failures and limit reputation damage as a result of these failures*.

[759] There is then within the document a section on issues and underlying causes. An entry under issues is "rising number of system failures", and the identified underlying cause is incorrect fixing and jointing.[179] The same ideas are contained in the 1995 Business Plan to which the homeowners also referred.

[760] The next document is an internal memorandum written by Mr Cottier, sent primarily to persons based in Australia. His concern was that the company was making an error in promoting a system when really it was selling a sheet. He was also unhappy about the idea of approved coatings when what James Hardie was really testing was the flexibility of the coating in terms of building movement but otherwise did not test the quality of coating products, nor control this aspect. He noted intense competition amongst coating providers, with cost cutting and bad practice common place.

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[179] I note that the statement in the objectives reflects a common theme in the documents which is James Hardie's concern that errors by others, particularly the coating part of the build, were causing reputational damage to James Hardie.

[761] A reply to this emanates from a New Zealand recipient. The homeowners rely on it for the acknowledgment within it that:

> Claims for failed or unsatisfactory jobs in New Zealand are not regarded as minimal, in fact we are quite mindful of the current and potential liability. This is probably the principal motivator for us reviewing our policy on Harditex.

[762] For context, however, given the overall topic is James Hardie knowledge, the opening two paragraphs should be cited:

> Thank you for your recent memo on the subject of your concerns with the promotion to date of Harditex. We share some of your concerns and believe that we have taken steps to address the major issues. The following is our brief observations of your main points and we trust that you will find our actions satisfactory. We would welcome further critique.
>
> 1. For some time we have been concerned that we have been promoting a "system" that we merely contributed to by supplying a base sheet. To rectify this we have developed new literature, a copy of the final draft of which is enclosed. Launch date for this literature is Tuesday 1st August.

[763] The documents covered thus far give a fair reflection both in terms of content and context of the material which underpins the homeowners' case. The statements say what they say, but it is notable they are mostly references to concern about third party work rather than the James Hardie input into "the system". In particular, it is the performance of coatings that is plainly the primary concern. Although further documents are relied on by the homeowners, the judgment will not refer further to bare statements of system failure where the context does not provide any reasonable basis for knowing what is being referred to. I do not consider they can assist the homeowners.

[764] The homeowners next refer to a June 1995 Sales Report, which contains reference to "coating failures gaining momentum", "weather conditions becoming a real issue" and a "need to establish a defence plan for dealing with Harditex complaints similar to Shingles".[180] My reading of the document is that the weather reference relates to why sales are declining. The "defence plan" is the author's thinking about a need to get ahead of the situation, so the author obviously foresees

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[180] At some point, prior legal action had been taken against James Hardie in relation to a shingles product it sold.

legal claims. As the document is written, that could only relate to coating failures. In the February 1997 Sales Report (it would appear these are monthly documents) there is a reference to complaints about "metal corrosion joint failures" being on the increase.

[765] An August 1997 document contains the minutes of a meeting James Hardie held with a group of builders (from the Waikato branch of Master Builders). The areas of concern arising were specifications, jointing systems and applicators, and consumer perceptions. The main specifications issue was unhappiness with the moisture content requirements when the wood is not stored under cover by suppliers and arrives saturated. The builders also noted difficulties in finding room on sites to stand the sheets to dry. There was further concern about changed specifications which seem to be the requirement to use stainless steel nails, and new rules around relief joints. Another James Hardie employee, Mr Going, agreed horizontal relief joints should in the past have been emphasised more, and now were.[181]

[766] The next document to note is the June 1998 Business and Operating Plan for 1999–2002. The document includes a review of the market position of James Hardie NZ. The plan identified that profitability was at risk and there was a lack of competitive advantage. Eight underlying causes are identified, one of which is:

> There is a developing groundswell of dissatisfaction with Harditex.

[767] In 1998 James Hardie entered into a Harditex Premium Warranty trial which concerned working with jointing and coating manufacturers to assess whether, as the name suggest, a whole of system warranty might be possible. During this trial, houses displayed issues, particularly at joints where pouting and sheet compression were the most prominent failings. Two reports were obtained considering this issue: the first written by Mr O'Sullivan, of Prendos Ltd. Mr O'Sullivan is a building surveyor with a prominent reputation and someone keenly interested in building standards. A second BRANZ report was written by Mr Cooney, a retired civil and structural engineer and registered building surveyor.[182]

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[181] In his evidence Mr MacIntyre had listed horizontal joints as an example of a detail that was not an issue initially, but became so as building standards declined. Hence its later inclusion in JHTIs.

[182] I note that both report writers were called by the homeowners.

[768] Mr O'Sullivan considered the primary cause to be shrinkage of the timber frame subsequent to coating. He also recommended a move to 45 mm studs (a requirement James Hardie implemented in the 1998 JHTI) and reduction in the permissible moisture content of timber framing to a range of 12–16 per cent. He doubted the value of vertical relief joints.

[769] Mr Cooney concluded there was insufficient data to conclusively understand the cause of the issues while noting it was something he had seen on other houses built in Auckland. He, however, thought it due to timber shrinkage after cladding and some poor sheet fixing. He also recommended 45 mm studs and a moisture content of 16 per cent.

[770] My overall sense of the documentation so far relied on by the homeowners is that it is evidence of some awareness of issues at a particular point in time on the part of some employee, but it is far from establishing anything close to entity knowledge. What is being talked about is often very general, and the scale of the issue being talked about is impossible to determine.

[771] There is, however, some material that is of better value for the plaintiffs, and this extract from a 1998 letter of Mr MacIntyre is an example. He is responding to a query from Australia about expansion joints:

> New Zealand framing has for many years been reliant on wet Radiata Pine framing. It is only in the last 4 years kiln dried framing has been available. This has had a major influence on our traditional thinking. Even though kiln dried framing is used more at present (about 60% of construction) it does not entirely solve the problem. This is because in the New Zealand climate dry frame can rapidly become wet and nullify most of the benefits of this dry frame use. There is a great deal of education to be done with builders to encourage them to close the frame in as soon as possible to keep dry.
>
> Another fact is that most floor joists (at least 80%) are still green frame therefore suffer from large vertical shrinkage with 12mm not being uncommon. We therefore must insist on horizontal control joints at this joist level in 2 storey construction.
>
> In recent times we have published articles that the jointing of Harditex™ (not fixing) should not be undertaken until the frame has reached 18% moisture content. *We dare not publish this in our literature as mandatory in New Zealand because in winter this figure is very difficult to achieve on a building site. At this stage it is a guide only*.

[772] He concluded the email by observing:

> In summary the main reasons for our strict control and expansion joint regime is the high drying shrinkage encountered in New Zealand framing timbers and the high and frequent rainfall encountered on most New Zealand building sites.

The Harditex Improvement Project (1999–2001)

[773] Moving then to the Harditex Improvement Project, and onwards, it is sensible to begin with an assessment of what the genesis for the project was. The homeowners suggest it was driven by an awareness of Harditex's flaws, but I consider that is not correct. The situation was, I consider, more complex or nuanced, and involved many factors. In the 1998 Operating Plan previously noted, there is a recognition of declining sales, increased low price import competition, the lack of new product development and commercialisation, the lack of a premium product, dissatisfaction with Harditex, little apparent technical superiority and difficulties with order and inventory management systems. A plan some years earlier had already then referred to Harditex having reached maturity.

[774] There can be no doubt that James Hardie was aware that there were issues with Harditex. It was no longer dominating the market and it seems that was a product of many factors, some of which were performance related, particularly coating. It was also the case that the leaky building crisis was starting to be more widely appreciated, and major players in the industry such as James Hardie would have been well aware of looming changes to the regulatory environment. Mr Rigby, who oversaw the project at senior management level, identified the motivations for the Project as:

(a) declining sales;

(b) the fibre cement segment had "matured" and competitors were catching up so a new generation product was needed;

(c) installation standards were dropping and unfair reputational damage was being experienced:

(d) a system house cost around $70 per square metre but James Hardie was receiving only $13.50 of that; and

(e) a new established competitor had entered the market.

The aim of the project was to come up with a better and more differentiated flat sheet product.

[775] Overall, the evidence on this was clear. All these factors, consistent one might think with how a large business such as James Hardie must operate, meant it was time to look at the product and assess what to do with it, and that is what the Harditex Improvement Project was about. As will now be seen, part of that exercise was to critique the existing product. That was an exercise that has produced a rich source of material for the homeowners. The preceding analysis is not directed to the value of that evidence. Rather, it rejects the proposition that the genesis for the project was existing awareness of a deficient product from a performance viewpoint.

[776] As a general observation, there were many internal documents created during this period that contain statements critical of Harditex and its performance. Whilst James Hardie would argue they reflect a culture of open discussion, and of breaking a product down to create a better one from the ashes as it were, it remains the case that the statements exist in the documents. However, it is often the case that the whole of the document provides a context which ameliorates the apparent starkness of the critical observation.[183]

[777] To provide an example of this pattern of stark criticism balanced by context, one document starts with a statement that there are a range of potential problems with Harditex, including poor fixing, stopping and coating, owner/developers and after-the-job problems such as creasing and tears. In some cases, it is being discovered that no head flashings were installed. The homeowners fairly rely on these introductory comments as evidence of awareness of wider system issues, albeit the scale of them

[183] In terms of format, many of the documents are discussion point documents for meetings, records of meetings, or overhead slides presumably for presentation at meetings. Sometimes authors are known, many times not.

cannot be determined. The conclusion to the document, however, balances this to the extent that it reveals James Hardie's perception of the problems:

> H/Tex
>
> We need a meeting with DEM KM GDH JGB & other interested parties to formulate answers & policies of how we handle complaints on Harditex System!
>
> – letters on builders who have fixed incorrectly – copy on file to come – JHBS.
>
> – Education to the trade on why they should do it correctly & consequences if they don't
>
> – Have our own supply fix a Coating Service ? which we carry the can. i.e. warrantees on System
>
> – Educate the sales team to recognize the problems & work out solutions.
>
> Should our sheets be totally sealed, if so, with what? Must be [compatible] with a large variety of coating applications

[778] The conclusion highlights an oft-repeated criticism of James Hardie – namely, that it always saw it as someone else's problem. In this document it is builders, trade, and the coating systems. The criticism is, I consider, a valid observation, but it is also relevant to determining whether James Hardie had knowledge of a flawed product. As this reflects, James Hardie believed its product was sound and it was those using it who were making the errors.

[779] Five further documents can be used as representative examples of the homeowners' basis for alleging actual or constructive knowledge of problems. The documents are said to show James Hardie was aware of fundamental problems but persevered with Harditex anyway. The first document is a set of notes dated 30 September 1999. They are said to show both awareness of issues, and also a core lack of knowledge on James Hardie's part about its own product. This lack of knowledge is submitted to reflect the absence of testing that should have been done prior to the launch of the product:

> Joint & coating Systems
>
> (1) JH has not kept abreast/up to date with in changes in jointing & coating Systems

(2) No performance criteria for inservice conditions of Harditex Joint & Coating Systems.

(3) There is very limited [liaison]/relationship between JH & Coating Systems manufacturer

(4) lack of knowledge of integratory of the sheet edge after recessing.

(5) Lack of knowledge of the technical [characteristics] of jointing & Coating Systems

Recommendations

(1) determine the [characteristics] of the currently recommended jointing & coating systems

(2) Establish a formal performance Specification for Joint/Coating [manufacturers]

Action Plan

– To contact & introduce JH evaluation programme. Begin obtained samples & specification

M.R.G. Selected – Fosroc, Nuplex, Resenes, Wattyl, ICI.

[780] The second document contains notes of a project meeting held on 16 September 1999:

> Gather information on the performance of Harditex in existing installations.
> Objective.
> To gather the experience of James Hardie, texture coating manufacturers, installers and BRANZ in order to identify the key contributing factors in the field performance of Harditex
> Purpose.
> To ensure that all the factors influencing the system are identified and the observed response of the Harditex system to these drivers is understood
> Task.
> Convene a meeting to download all issues related to Harditex failures
> Identify common causes.
> Assign members of the group to research particular issues
> Reconvene, discuss and agree on the key technical drivers that affect Harditex monolithic systems.
> Make recommendations for study and improvement

[781] The third is an undated typed document labelled "Systems issues" under which are recorded:

– joint performance

– surface finish

– mechanical leaks.

[782] After this list there is then a handwritten question suggesting a fourth:

– product – ease of use?

[783] The fourth document is a handwritten page noting:

– The Harditex System Construction process is complex
– Industry does not have a large pool of suitably trained and skilled installers;
– In an increasing cost driven industry, short cuts are used to maintain builder margins.

[784] Finally, it is important to refer to a document penned by Mr Knox. Mr Knox was head-hunted, for want of a better word, from a concrete construction firm and was to become the successor to Mr MacIntyre. When he came to James Hardie he was seen as a young talent who could shake up the thinking and advance matters. Mr Rigby, who recruited him, described him as a fresh set of eyes.

[785] About four months after joining the company, Mr Knox wrote an issues paper called "Framing and the Harditex Improvement Project". It was about timber framing and various industry players were consulted. In this paper Mr Knox concluded direct-fixed systems were flawed. The paper also appeared to regard Harditex as a face-sealed system (both points which James Hardie dispute). Of Harditex, Mr Knox suggests:

> The concept of direct applied cladding systems is proven to be unreliable and if any aspect of the design, construction process and componentry of the current Harditex offer are not perfect, then the system is likely to be unreliable.

Under Recommendations he wrote:

> <u>Recommendations</u>
>
> A proposed method of overcoming these issues, which has been discussed, is to move the watertight skin away from the structural frame in order to create a cavity and a degree of separation between the frame and the watertight skin. This can be achieved by fixing a batten to the wall which will alleviate reflective movement in sheets caused by framing movement.
>
> The second proposal is to include a drainage system in the cavity provided, so condensate and moisture can escape, thus minimizing frame movement and

> improving the prospect of durability of framing (thus should allow the confirmation that environment is in fact H1).
>
> Along with these two system changes, it will be imperative that flashing systems perform adequately. Therefore a new range of flashings shall be provided.
>
> The above three would be classed as leadership or innovation. It is questionable whether these are merely improvements or new system concepts. There is growing urgency to ensure these system developments are implemented without delay.
>
> A secondary measure could be in partnering with say Winstone Wall Boards and/or Timber Manufacturers in order to promote good construction practice for timber and steel frame, and this may be an interim measure.
>
> One long term initiative could be to commission Forest Research to provide a specification based on the Harditex system for the timber which is used, ie. to assess the environment and conditions (durability and stability) and give an opinion on the treatment level of timber that is required Should chemical free not be acceptable, James Hardie could then take a leadership role in disallowing the use of chemical free timber with their products This may then pull the industry into looking more closely at chemical free timber.
>
> There is also other long term developmental opportunity with Forest Research for funding, in terms of the adoption of overseas drying processes and methodologies, and new age treatment products However for this to be of benefit we would need a clear strategy and purpose for doing this
>
> As we can see, our current system is behind the eight ball, if we wish to participate in our industry as a leader or innovator in fibre cement cladding we must keep abreast of overseas developments and trends. This will require a conscious investment from the technical team, and if well done, will have value for the US and Australian Businesses.
>
> One final suggestion is that we might develop a template for cladding system concept and development, which may become a part of the PAC process

[786] Coming as it does from a system designs engineer in James Hardie, and someone who was later to become a Development Project Engineer, this is a high-water mark document for the homeowners' case.

[787] One of the persons consulted by Mr Knox in preparing the paper was Mr O'Sullivan of Prendos. Mr O'Sullivan was a vocal critic of the use of untreated timber, and an early and persistent advocate for the use of cavities. James Hardie was one of the targets he sought to convince. Based on Mr O'Sullivan's evidence in this case, and his writings from that period, what Mr Knox wrote in this document suggests he was influenced by Mr O'Sullivan's viewpoint.

[788] While on the topic of Mr O'Sullivan, I observe that his views were not universally accepted. This is evidenced by the fact that the main regulatory change in 2005 still allowed direct-fixed fibre-cement cladding in many situations. Likewise, BRANZ maintained its accreditation certificate for the life of Harditex. Eventually the regulatory solution swung Mr O'Sullivan's way, but I do not consider it can be suggested James Hardie was somehow at fault for choosing not to change because Mr O'Sullivan suggested it was the way to go.

[789] Continuing with the homeowners' case that by the end of the year 2000 James Hardie had or should have had sufficient awareness of a faulty product to have acted, the closing submissions identify several matters that reinforce this proposition:

(a) Mr O'Sullivan's various statements, known to James Hardie, concerning the desirability of treated timber and cavities;

(b) discussions within James Hardie about the need to update the JHTI;

(c) discussions within James Hardie that reveal awareness of an initial lack of testing and of the current need for more;

(d) discussions within James Hardie about potential legal liability. This is said to both be indicia of an awareness of real exposure and a topic that must reflect internal uncertainty about the merits of the product; and

(e) numerous references in documents to the need for urgent action.

[790] It is fact that all these topics arose somewhere in one or more documents. Some documents expressed greater conviction about the existence of issues, or at least greater anxiety over them than did others, and some expressed themselves more colourfully or emphatically than others. As an example, Mr Bloxham held a senior position in sales and marketing in James Hardie. His internal correspondence is a rich source for the homeowners. An internal memorandum he wrote in November 2001 provides an example:

> Events continue to unfold and learning occurs weekly if not daily. Although James Hardie are without documented evidence at this point the following issues may affect James Hardie's liability. Action may be required to avoid creating further liability.
>
> 1. The fibre cement clad medium density housing stock, that we have knowledge of, affected within two years of construction in Auckland alone exceeds 300 units and growing. Remedial costs may be approaching $10m.
>
> 2. Some of these homes are affected with rots that produce carcinogens and toxins requiring occupant relocation

[791] Strong words indeed, but, as is frequently the case, the balance of the document reflects a viewpoint of other persons being at fault. The memorandum sees the choice of timber as the primary source of rot issues;[184] it doubts cavities would solve this issue; it notes increasing requests for James Hardie to attend the site, seen by the author as an attempt to move liability around; it notes some cladding partners (coaters) are acting without integrity, and that none understand well the current timber issues; it records a concern James Hardie is being seen as condoning bad practice, and in this context makes a point about the JHTI which the homeowners highlight:

> The "gaps", anomalies and partner integrity of our current published "Harditex" system is clearly unreasonable in today's environment.

The memorandum continues on to note a contradiction between James Hardie's focus on its sheet, and the industry's focus on its system, and concludes that any site visits need to be better considered, and their scope clarified.

[792] Next, in March 2002, in a monthly report, Mr Bloxham wrote:

> **Issues**
>
> - JHNZ "relationship" with Wattyl is extremely difficult to defend after months of them being unable to supply a warrantable jointing system to a couple of significant sites urgently requiring rework.
>
> - No attempt to date by SAP team to provide FMU & Contracting modules which is an essential tool for these operations
>
> - Literature being mailed out in quantity daily still specifies chem. free timber with no addendum alerting readers of the issues, this must now be deemed as technically irresponsible and I fear our legal obligations

[184] In another document Mr Bloxham refers to a Forest Research study which may suggest treated wood was less effective than kiln-dried.

> on any buildings constructed in the last 6 months to our published specification failing.

[793] The homeowners understandably refer to the last bullet point. There are other documents to like effect. There is no doubt Mr Bloxham had concerns about the state of the literature, and particularly the situation with timber framing. The documents generally do not explain what Mr Bloxham actually wanted done, but it is clear he wanted modifications.

[794] As stated at the outset, I accept there are internal documents which suggest that some staff members, of at least reasonable seniority, had concerns about aspects of the Harditex system. This is not surprising in a way given that there was by now national concern over leaky homes and James Hardie was a major industry player. Different people within James Hardie inevitably had different takes and insights, and indeed different stress levels and resilience to these matters.

Senior Management

[795] Before concluding on whether James Hardie had knowledge of risks, or ought to have known of them, such as to require it to act by warning, it is necessary to set out evidence from members of the senior management team at James Hardie. Many but not all of the documents to date have been documents internal to groups within James Hardie. Exceptions to this are business and operating plans which are company-wide documents. Further, within each group there would have been a senior management person who presumably saw most of the group's documents.[185]

[796] The defendant called three witnesses from the senior management team:

(a) Mr Mann who was financial controller, and then Finance Manager and Company Secretary from 1986–2001. He was a director of various entities within the James Hardie Group, including James Hardie Building Products (now Studorp) from 1993–2001, and between 1998–2001 was a director of James Hardie New Zealand Ltd and its holding company, James Hardie New Zealand Trustee Ltd.

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[185] For the Harditex Improvement Project, that person was Mr Rigby who testified.

(b) Mr Rigby who was initially Commercial and Product Development Manager, and then Sales, Marketing, Planning and Product Development Manager from January 1998 to December 2002; and

(c) Mr Kidd who was General Manager, Sales and Marketing, in 2004–2005. This was immediately prior to Harditex withdrawal. Then from 2005 he was the overall General Manager of James Hardie New Zealand.

[797] Mr Mann describes the purpose of his evidence was:

> …to give my perspective on the view within James Hardie management of Harditex as a product; on management's awareness of some issues associated with buildings that were clad with Harditex; and on the nature and style of management at James Hardie.

[798] The focus of the judgment will be on the first two aspects.

[799] Mr Mann's primary responsibility as Finance Manager was to manage the accounting for James Hardie Building Products. In this context he was one of the first to hear about any threatened claim or litigation. Mr Mann describes a pattern of monthly management meetings within which financial updates were considered and at which each departmental head provided an update on their area. Following the meeting, the New Zealand General Manager provided a report to the Australian manager.

[800] Mr Mann says that if there were real concerns that a sub-standard James Hardie product was contributing to leaky building issues, it would have been raised at the meeting. To his knowledge it never was. To the extent this topic of leaky buildings came up, the analysis lay the blame at the feet of faulty workmanship and timber framing issues. Mr Mann says that James Hardie was proud of Harditex which was a successful product. Issues with products were sometimes referred to senior management, and two he noted with Harditex were mould, and jointing and coating issues.[186] In Mr Mann's view, the reported issues were small relative to sales, and

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[186] James Hardie's analysis, well documented elsewhere, is that the presence of mould was down to a paint issue, and that the coating and jointing issues, mainly pouting, were aesthetic rather than fundamental.

provision was never made in the accounts for potential liability for moisture issues with Harditex. Had that been seen as a real risk, provision would have been made.

[801] Cross-examination of Mr Mann largely followed a pattern of putting to him documents he would have seen, or probably saw, over the years. These documents contained reference to issues, or system issues. James Hardie is correct it was never put to Mr Mann that he or the senior management team must have known there were performance issues with Harditex. Possibly the aim of the examination was more to establish a "should have known" situation.

[802] Mr Rigby joined James Hardie in 1998 from Firth Concrete, which is the firm from which he recruited Mr Knox. Mr Rigby was on the same level within the management team as Mr Mann. The Harditex Improvement Project was under his control.

[803] The tenor of Mr Rigby's evidence is that the Harditex Improvement Project was not an initiative driven by a concern that Harditex was failing. To the extent that the project generated documents critical of Harditex, this was part of a management/project style that encouraged a ground up analysis and tested existing thinking. More generally, and in response to differing views from Mr O'Sullivan, Mr Rigby advances the proposition that James Hardie was a responsible and interested leader in the building industry and at the forefront of efforts to resolve the leaky building crisis.[187]

[804] Mr Rigby was asked about Mr Knox's framing paper where Mr Knox had concluded that the direct-fixed system was unreliable.[188] Mr Rigby explained that it was Mr Knox's role, to challenge, but that he disagreed with the paper. Further, after discussion he considered Mr Knox agreed it was overstated.[189] To the extent the Knox paper is relied on by the homeowners, I record that I accept Mr Rigby's evidence. It

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187 A significant portion of the evidence covers Mr Rigby's interactions with Mr O'Sullivan. There are differing recollections it is unnecessary to resolve. However, to the extent Mr O'Sullivan thought Mr Rigby had committed James Hardie to some Harditex change, I consider it a misunderstanding on Mr O'Sullivan's part, and something not reflective of how a large business would implement change.

188 See above at [785].

189 My words.

was obvious it was a challenging paper written by someone who had only recently engaged with sheet cladding and timber framing. I accepted Mr Knox's own review of it that he gave while testifying in this case. He considers aspects of the paper wrong and notes the lack of actual evidence to support his generalised conclusions.

[805] The topic of whether James Hardie should have led the market by stipulating for H3 treated timber was explored with Mr Rigby. He considered it was not an initiative that James Hardie could just mandate. Untreated timber was permitted by the code, and as a consequence there was not much treated timber available in the market. Mr Rigby believed that it was an area that required collaboration with, and the cooperation of, main timber suppliers.[190]

[806] The third of these senior management witnesses is Mr Kidd. He was at James Hardie, initially overseas and then in New Zealand, from 1996–2010. He was General Manager by the time Harditex was removed from the market. Prior to coming to New Zealand, he was not involved in the fibre cement aspect of the business and had no personal view on Harditex. The focus of his evidence is on the years 2004 and 2005 and the decision to discontinue with Harditex.

[807] Mr Kidd says in 2004 monolithic cladding sales were generally in decline, and the company was struggling to achieve an uptake of Monotek. Harditex had, he considered, become synonymous with fibre cement products, and had suffered brand damage as a consequence. Mr Kidd says there was no collective view within James Hardie that Harditex was a defective product:

> Our view, and my view, was that the instances of failed projects that had been clad with Harditex were due to a combination of inadequate [house] design and workmanship practices, and to some extent with performance issues arising out of the underlying timber framing or the jointing and coating systems. Harditex remained an important product for James Hardie. It had performed very well for a long time and we believed that it worked when it was installed by a competent tradesperson in a properly designed and well-built house.

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[190] James Hardie, as evidence of its claimed good citizenship in the building industry, cites the evidence about it following such a process in relation to shifting the industry from 35 mm to 45 mm studs.

[808] Mr Kidd then explains the strategy with Harditex and Monotek. It was believed Harditex would become an Acceptable Solution under the revised Code and remain as a generic product with a product only warranty. Monotek would be marketed as a "value-added proposition" at a higher price point with a comprehensive warranty. Thinking changed, however, as Harditex sales declined and there was ongoing uncertainty about the final format of the new Acceptable Solution criteria.

[809] Mr Kidd then reviews discussion with BRANZ over the appraisals for both products, and the implications of delays in an appraisal for Monotek. He linked these delays to the fact that Monotek appraisal was going to include approved coating systems, and there existed no established method of testing their performance. His evidence then traverses the history of internal discussions and the cumulation of factors that saw Harditex removed. The point, as I understand it, to this evidence is to support the defendant's position that it was not discontinued because of known defects. Mr Kidd was not cross-examined on this evidence.

[810] The homeowners point to two categories of witnesses that were not called:

(a) Witnesses who make statements (in the documentation) that could be or are of assistance to the plaintiffs. In particular, reference is made to Mr Bloxham, and to Mr Going who was in the tier below Mr Rigby but a person with whom Mr Rigby consulted; and

(b) Witnesses who might have been thought to be in a position to support the lack of knowledge defence but were not called.

[811] The Court is invited to draw adverse inferences. Reliance is placed on this passage from *Ithaca (Custodians) Ltd v Perry Corporation*:[191]

> [153] The absence of evidence, including the failure of a party to call a witness, in some circumstances may allow an inference that the missing evidence would not have helped a party's case. In the case of a missing witness such an inference may only arise when:
>
> (a) The party would be expected to call the witness (and this can be so only when it is within the power of that party to produce the witness);

[191] *Ithaca (Custodians) Ltd v Perry Corporation* [2004] 1 NZLR 731 (CA).

(b) The evidence of that witness would explain or elucidate a particular matter is required to be explained or elucidated (including where a defendant has a tactical burden to produce evidence to counter that adduced by the other party); and

(c) The absence of the witness is unexplained.

[154] Where an explanation or elucidation is required to be given, an inference that the evidence would not have helped a party's case is inevitably an inference that the evidence would have harmed it. The result of such an inference, however, is not to prove the opposite party's case but to strengthen the weight of evidence of the opposite party or reduce the weight of evidence of the party who failed to call the witness.

[812] I accept the absence of Mr Bloxham who works still for James Hardie is not satisfactorily explained. The point on all this material, however, is that the inference sought by the homeowners is in fact drawn by the Court. Namely, there were persons within James Hardie who believed there were issues with Harditex needing to be addressed. The evidence does not suggest their circumstances were such as to make their viewpoint any more authoritative than others, and what they have said is part of the record. I accept the homeowners have lost the opportunity to explore with, say, Mr Bloxham why he thought what he did, but am not willing to go beyond his written generated assertions.

[813] As for the lack of knowledge "defence", I am satisfied that persons able to speak to the viewpoint and knowledge of senior management were called. These included the General Manager at the relevant time, the main financial officer, and the head of the team responsible for the Harditex Improvement Project and the development of Monotek. That seems to me a reasonable group to make available for cross-examination.

[814] Overall the witnesses left me in no doubt that there was no corporate belief within James Hardie that Harditex was a defective product. The witnesses said this clearly in their evidence, were not directly challenged on it, and were, in my view, very sound witnesses.

[815] More generally, although there is a lot of talk in documents of system failures, and system issues, a very small percentage of that talk is linked to anything other than failings with the coating. These of course can have moisture implications but the

primary issue from James Hardie's viewpoint was that it looked bad and this undermined the Harditex brand. That is not to say there were never issues about performance, with rusty nails, and the 35 mm stud being examples. But overall the content of the document did not point to a knowledge of a failed product.

Assessment

[816] I turn to the three areas which it is alleged that James Hardie has breached its duty by failing to react to an emerging situation –

(a) whether there existed a body of knowledge that meant James Hardie should have warned consumers about the dangers of Harditex;

(b) whether James Hardie should have done something about untreated timber; and

(c) whether the improved aspects of Monotek meant product modification was required in relation to Harditex.

Knowledge of problems requiring consumers to be warned

[817] It is necessary to begin by stating the obvious. Since the conclusion of the judgment is that Harditex is not a fundamentally flawed product in terms of weathertightness, it is unlikely that James Hardie breached its duty of care by not alerting the consumer or community or users to weathertightness deficits. Basically, if the Court's conclusions are correct, it follow James Hardie could not have known of deficits that did not exist. However, it is appropriate to consider further the homeowners' case.

[818] There is little in the documentation that suggests there was a belief, or should have been a belief, that aspects of the Harditex product were failing or concerning which a risk required special action. Issues came up along the way, but were dealt by other means. Examples of this were mould (traced by James Hardie to issues with paint), rusty nails (traced by James Hardie to galvanisation issues but responded to by obtaining and mandating a different option) and 35 mm timbers (permitted by the

Code but recognised to be a difficulty for builders, so responded to by initiating an industry-wide project to change views and then mandating bigger studs). It is possible to debate whether the conclusions reached by James Hardie were correct, but in this context a point to be made is that these other processes show that issuing warnings is just one option, and possibly one of the last ones.[192] Fixing the problem would seem a better option, and if it is not a problem which creates a significant risk for existing dwellings, then nothing else is needed of the reasonable manufacturer.

[819] Some contextual matters are relevant here. If one takes the Hunn Report's conclusions, there is no real suggestion that faulty products are the cause of the leaky home crisis. Harder to work with products, or products less tolerant of mistakes, no doubt contributed, but that is not of itself a flaw with the product. Likewise, as noted before, in 2005 the new regulatory scheme made direct-fixed fibre cement like Harditex an Acceptable Solution for some designs. It was not until 2011 that the government concluded cavities were necessary in all cases. If James Hardie considered direct-fixed fibre cement to still be a sound cladding option, and it did, it was not alone.

Untreated timber

[820] It was a regulatory change that allowed the use of untreated timber, and there is no evidence that there is any untreated timber issue specific to Harditex. In other words, the problem is the reaction of the timber to moisture, not to Harditex or any other cladding. I was pointed to no authority that would support the proposition that in such circumstances Harditex breached its duty by not either warning consumers of the risk of untreated timber, or not mandating its use. I also observe it is also a risk that is completely obvious – if timber is not treated, it is more vulnerable to the very threats that were the reason it was previously treated. It is not an obvious subject for a warning.

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[192] Note should be made to the evidence of Mr Tyson, the Managing Partner of a large international strategic communications firm. He gave evidence on the processes that would be followed within a large company in terms of addressing something such as a product warning. I have not found it necessary to rely on the evidence.

[821] It could be argued that as awareness of the leaky house crisis emerged, the obligation to warn about untreated timber, or to mandate treated timber arose. The proposition would be that once there became knowledge of a greater number of houses allowing moisture ingress, so there must have been awareness that using untreated timbers in houses increased the risks of damage. That was certainly Mr O'Sullivan's message. The proposition that there should have been this awareness must be correct, but it is still a considerable step to reason from that position to the proposition that a specific manufacturer, no different from any other manufacturer, had a duty to warn of the perils of framing a house with material the regulatory scheme had specifically been amended to allow.

[822] I accept it was within the capacity of James Hardie to either require treated timber (as it did with 45 mm studs), or to warn in its literature of the risks of using untreated timber. It is unclear to me on the evidence exactly when the point might have been reached, but in any event I do not accept there was a breach of duty. A contrast can be drawn with the 35/45 mm stud issue. It was an issue directly linked to the Harditex product and how it performed. Untreated timber has nothing to do with the product and how it performed.

[823] It is also relevant context to whether a duty arose that both Mr Rigby and Mr Knox commented that by 2000 treated timber was being phased out (Mr Knox thought aggressively so) and kiln-dried chemical-free timber was the predominant product available. It would not be reasonable to require a cladding manufacturer, whose product worked equally well with either permissible form of timber, to stipulate for one type which was comparatively scarce. The effect would inevitably be to undermine sales of the product.

[824] It has not been shown that James Hardie breached its duty by failing to stipulate for untreated timber, or warning consumers of the dangers of using it.

Monotek improvements

[825] The existence of a better product cannot of itself require a manufacturer to give warnings about the deficits in its lesser product. James Hardie rely on a passage from the Canadian Supreme Court.[193]

> Technological change is a modern-day reality that is characterized by the rapid pace at which improvements are made to products. The trial judge rightly noted that manufacturers are constantly redesigning their products: [2003] R.J.Q. 2194, at para. 161. He was wary, and rightly so, of a tendency to condemn a manufacturer simply because a different version of the original product has since emerged on the market. Selling an improved or better performing version of a product does not render the previous version defective. Differences in quality and possible use between these two versions of the product cannot be characterized as a latent defect.

[826] It is unnecessary to address this further since the focus must be on Harditex and its performance, not on whether Monotek was better. As an example, the h-mould for Monotek had a sloping rather than flat surface. Conceptually this is a better design from a rainwater viewpoint. However, the earlier analysis of the building science led to a conclusion that the existing flat h-mould surface worked. The better later one does not make the existing one defective, just not as good. The earlier conclusions concerning Harditex mean that the developments in Monotek, even if an improvement, did not require changes to be made to Harditex.

Conclusion

[827] First, some formal conclusions on knowledge.

[828] The evidence shows James Hardie was a leading figure in the building industry, and involved in many aspects. It recognised, for example, that it had a role to play in solving the leaky home issue even if it did not believe its product was a cause. My assessment is that James Hardie, as no doubt do numerous big industry players, had very knowledgeable employees who understood the area and kept abreast of issues. The company's position and activities meant its employees were in regular contact with organisations such as BRANZ, an obvious source of input and information on

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[193] *ABC v Domtar Inc* 2007 SCC 50, [2007] 3 SCR 461 at [49]. In that case a vendor was deemed, pursuant to the Civil Code, to have knowledge of the defects in aspects of the goods it was selling, and to have breached its duty to inform the purchaser of that defect.

industry matters. James Hardie was regularly represented on industry forum bodies such as the Claddings Institute. It seemed to have regular contact with, and keep abreast of work done by, organisations such as Forestry Research.

[829] I accordingly would first find as a fact that if there existed relevant industry information, James Hardie would know of it. Accordingly, if there was a published evidential basis that established a risk concerning which action should be taken, it is almost certain James Hardie would know of that evidential base and have access to it. Further, even if not published material, James Hardie would also generally be aware of industry concerns. Its meeting with the Waikato Master Builders is an example of the type of contact that informed James Hardie of industry experiences and concerns.

[830] Second, the senior management witnesses said that there was no understanding within James Hardie that Harditex was a flawed product from a performance weathertightness viewpoint. I accept that and do not consider the internal documentation undermines that evidence. I accordingly find as a fact that senior management did not know or believe there was a problem with Harditex.

[831] Third, the technical teams also attributed issues to third party errors. That is not to be confused with a belief Harditex was perfect or could not be better. Just that it worked, and that emerging issues were down to declining building skills. The evidence in the case is that the evolving JHTI was a response to that decline, as were the BRANZ initiatives such as the Good Texture-Coated Fibre-Cement Practice Guide it published in 2001.

[832] I move from these three formal conclusions on actual knowledge to the topic of whether James Hardie should have been aware of issues that in fact required a public response in order to avoid breaching the duty of a reasonable manufacturer to take care. Consistent with earlier conclusions in the judgment, I formally conclude there were no issues that gave rise to a need to warn, or to change the product. It follows that James Hardie ought not to have been aware of them.

[833] The homeowners therefore fail in the claims in negligence under the three areas in which I have analysed the case.

FAIR TRADING ACT CLAIMS

The Law

[834] Focusing essentially on the JHTIs, the homeowners alleged that in numerous ways James Hardie breached the Fair Trading Act. The two relevant provisions are ss 9 and 10 which provide:

> **9 Misleading and deceptive conduct generally**
> No person shall, in trade, engage in conduct that is misleading or deceptive or is likely to mislead or deceive.
>
> **10 Misleading conduct in relation to goods**
> No person shall, in trade, engage in conduct that is liable to mislead the public as to the nature, manufacturing process, characteristics, suitability for a purpose, or quantity of goods.

[835] To illustrate the claim, the pleadings in relation to Bay Lair say:

> 33. At all material times James Hardie was in trade in relation to the design, development, manufacture, testing and supply of James Hardie building products, approved accessories and systems, the Harditex 1987 and 1991 Technical Information documents and the Harditex Cladding System used at the property.
>
> 34. James Hardie engaged in misleading and deceptive conduct in the design, development, manufacture, testing and supply of James Hardie building products, approved accessories and systems, and in the statements made in the James Hardie Technical Information documents up to and including the Harditex July 1991 Technical Information and the Harditex Cladding System used at the property (as pleaded below).

[836] Preliminary issues requiring consideration are the scope of the concept of "in trade", who should be seen as the consumer of the literature, what is needed to show a particular plaintiff has suffered loss or damage by reason of a breach (the causation issue), and a Limitation Act defence.

[837] Concerning the statutory concept of "in trade", it can be seen that the homeowners claim breaches by James Hardie in relation to the design, development, manufacture, testing and supply of the Harditex sheet and system. This necessarily represents a submission that all these activities fall within the concept of "in trade". It is common ground that James Hardie was in trade in relation to the supply of Harditex, and in publishing the JHTIs. James Hardie otherwise submit that internal matters such

as design and testing are not conduct "in trade" for the purposes of FTA. They are matters that are preparatory to conduct in trade but do not themselves have that quality.

[838] Trade is defined as:[194]

> … any trade, business, industry, profession, occupation, activity of commerce, or undertaking relating to the supply or acquisition of goods or services or to the disposition or acquisition of any interest in land".

[839] The requirement is that the impugned conduct be in trade. It is not enough that the entity in general is in trade. The following passage from *Concrete Constructions (NSW) Pty Ltd v Nelson*, commenting on equivalent Australian legislation, assists:[195]

> Indeed, in the context of Pt V of the [Trade Practices Act 1974] with its heading 'Consumer Protection', it is plain that s. 52 was not intended to extend to all conduct, regardless of its nature, in which a corporation might engage in the course of, or for the purposes of, its overall trading or commercial business. … What the section is concerned with is the conduct of a corporation towards persons, be they consumers or not, with whom it (or those whose interests it represents or is seeking to promote) has or may have dealings in the course of those activities or transactions which, of their nature, bear a trading or commercial character. Such conduct includes, of course, promotional activities in relation to, or for the purposes of, the supply of goods or services to actual or potential consumers, be they identified persons or merely an unidentifiable section of the public.

[840] The homeowners rely on statements in various decisions that refer to the concept of "in trade" as being "a broad term encompassing all kinds of commercial dealing",[196] and cite particularly this passage from *Peterson v Merck Sharpe and Dohme*, a first instance decision of the Australian Federal Court:[197]

> The respondents also submitted that so much of MSDA's activities as were constituted by the (internal) development of its marketing campaign did not amount to conduct "in trade or commerce" because such activities did not occur "in the marketplace". Such a proposition is too sweeping. *It is clear from Concrete Constructions that things said and done (and, for that matter, omissions) internally to a trading organisation may, in appropriate circumstances, amount to conduct in trade or commerce within the meaning of s 52. All will depend on context.*

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194 Fair Trading Act 1986, s 2.

195 *Concrete Constructions (NSW) Pty Ltd v Nelson* (1990) 169 CLR 594 at [7], cited in Robert Hollyman *Falsehood and Breach of Contract in New Zealand: Misrepresentations, Contractual Remedies, and the Fair Trading Act* (Thomson Reuters, Wellington, 2017) at 141.

196 *Red Eagle Corporation Ltd v Ellis* [2010] NZSC 20, [2010] 2 NZLR 492 at [26].

197 *Peterson v Merck Sharpe and Dohme (Aust) Pty Ltd* [2010] FCA 180, (2010) 184 FCR 1 at [890] (emphasis added).

[841] I accept for present purposes the proposition that something internal may in appropriate circumstances amount to conduct in trade. However, there is nothing specific in relation to the development of Harditex that suggests its design, planning, development or testing was conduct in trade. If it were, all product development would be.

[842] *Peterson* is actually an example of the limits of the concept of "in trade". The issue there was whether product information associated with an anti-inflammatory drug was misleading, essentially because of what it did not say about a side-effect. The plaintiff in that case had put in issue the marketing strategy in relation to the drug as a relevant category of information. However, the case does not suggest this strategy could amount to conduct in trade. This is clear from the balance of the paragraph from which the earlier extract was used:[198]

> However, the limits of such a proposition do not need to be tested in the present case. To the extent that it was based on what was said to be MSDA's marketing campaign for Vioxx, the applicant's case required that the "Vioxx representations" be disseminated to pharmacists, medical practitioners and other health care professionals. His s 52 case did not involve the contention that, merely by internally developing that campaign or an associated strategy, MSDA would contravene the section. In one aspect of the way the applicant developed his case, he did submit that an inference of external dissemination should be drawn from the internal development of the marketing campaign. *That is an evidentiary question to which I shall turn, but in no sense was the applicant contending that the internal development of the campaign was, as such, the conduct in trade or commerce on which he relied*.

[843] The only other authority relied on by the homeowners in support of their wider scope of "in trade" is an unreported New Zealand High Court decision *Norbrook Laboratories Ltd v Bomac Laboratories Ltd (No 3).*[199] There Heath J held that representations made to a regulatory body in order to gain approval to release a drug were conduct in trade.[200] It can be observed that in that situation there is a much more obvious and proximate connection to supply than the conduct identified here. There the conduct is acts done to obtain a licence to supply in trade. Further, and highlighting that the concept of "in trade" is not one which has generally been extended back into the development phases of a product, Jessup J in the *Peterson* case took the opposite

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198 At [890].

199 *Norbrook Laboratories Ltd v Bomac Laboratories Ltd (No 3)* HC Auckland CP249-SW02, 2 December 2002.

200 At [215].

view to that of Heath J and doubted that statements to the drugs regulator for the purposes of approval were conduct in trade.[201]

[844] I consider these authorities fall someway short of bringing within the definition of conduct in trade, activity which on the plain definition would appear to fall well outside it. I accordingly take the view that conduct such as design and testing, where it is itself not the subject of a relevant representation within the JHTI, does not fall within ss 9 and 10 of FTA.

[845] The second preliminary issue is the class of persons to whom the statement should be regarded as being directed. This has already been considered in earlier parts of the judgment.

[846] James Hardie says the JHTI was directed at, and correctly so, competent professionals. The homeowners respond by saying it was known, or should have been, that owner-builders were "a substantial part of their customer base". I am unclear as to the evidential basis for the "substantial" component of that statement, but also observe it avoids the question. Is the reasonable target audience an owner-builder with no idea of how to build and no sound basis on which to be trying to do so? There is no evidence to suggest such a person should have been understood by James Hardie to be a likely consumer of this material.

[847] The context in which a house is built tells against such a proposition. The owner-builder has to submit plans for a consent to build. Those plans have to be of a level that will satisfy the relevant territorial authority that if the house is built in accordance with the plans and the JHTI, it will meet the performance requirements of the Code. The Code consists of, or incorporates, numerous standards, some of which are highly technical and require specialist knowledge and skill. One is not talking here about putting together a kitset, an activity most people are willing to try (once) and where a reasonable literature producer should assume only a very rudimentary knowledge. James Hardie were entitled to assume that only persons with the necessary skill and knowledge would undertake construction of a home. I see no reason why they should expect or cater for an owner/builder who did not meet that skill level. The

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[201] *Peterson*, above n 197 at [887].

homeowners' reliance on owner/builders does not therefore alter the correct analysis of who the target audience was, and should have been.

[848] The defendant's further propositions on the topic are otherwise unanswered by the plaintiffs:

(a) the appropriate target audience was designers and builders capable of reading a JHTI as a whole, and bring to the exercise knowledge of the building industry; and

(b) on reading the JHTI as a whole, any member of the target group would understand it augments other knowledge and literature. It was not a comprehensive building manual, nor intended to be, and this would be known to the target audience.

I agree.

[849] The third preliminary topic is causation. Causation issues only arise once a breach is established. In order to prove breach it is necessary only to show that a statement was false or misleading, or likely to be. Reliance comes at the next stage, where s 43 provides the power to award compensation if the plaintiffs have suffered or are likely to suffer loss *because* of a breach. It is notable in the present case that neither the pleadings nor the homeowners' submissions undertake a reliance and loss analysis for either of these plaintiffs. The closing submissions refer to causation as a stage two issue (stage one being about establishing the breach) but that is not so for the plaintiff properties. This is their whole case which is why, for example, specific repair evidence was led.

[850] The causation analysis is not straightforward. Neither plaintiff was the builder or the person who arranged for the building to happen. As regards Bay Lair, Ms Cridge and Mr Unwin were the fourth owners (second substantial owners). Assuming a misstatement in the JHTI, neither would have seen such a statement until after purchase if at all. The causation route, therefore, is presumably through alleged reliance on the misstatement by the builder or designer. Neither of those people gave

evidence in relation to either house, despite being known for both. Further, on the evidence that is available, I would not be prepared to assume the builder relied on anything in the JHTI, especially in the case of Bay Lair.

[851] Drawing on such causation analysis as was undertaken by the plaintiffs in the negligence claim, I understand the case to be that James Hardie's breaches were a contributing cause to the loss. Bringing that across to the present topic, the argument would be that the misstatement in the JHTI contributed to the builder constructing a detail incorrectly, or the absence in the JHTI of instruction how to build a detail contributed to the builder doing it wrongly. Built into this would have to be some acceptance by the Court that the builder (or designer) was engaging with the JHTI; otherwise perceived deficiencies in the JHTI would be at most an opportunity for loss rather than a cause.

[852] The fourth topic is limitations.

[853] The defendant raises an issue concerning a January 2020 amendment to each of the plaintiff's statement of claim. The amendment introduces pleadings in relation to four JHTIs that were not previously the subject of pleadings. The four documents are the JHTIs published in February 1988, March 1989, June 1996 and June 1998.[202] The affected paragraphs are noted below. I note none of these four JHTIs were applicable to the plaintiffs' properties.

[854] Section 43A of the Act allows claims for up to three years after the date on which the loss or damage was reasonably foreseeable. The defendant submits that at its latest the start of this period must be when the original pleading, with its claims of Fair Trading Act breaches, was filed.[203] It follows that fresh claims in relation to new documents first filed more than three years after the initial pleading are time barred.

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202 The relevant pleadings paragraphs are Cridge, second amended statement of claim, at [9A], [9B], [20(t)], [21(e)–(g)], [29(e)], [34], [35A], [35B], [37(i)(5)] and [37(w)]; and Fowler, second amended statement of claim, at [11(b)–(c)], [12A], [12B], [15A], [22A], [36(c)], [36(g)], [48], [49(d)], [49(1)(5)]. These paragraphs were repeated in the next final version of each pleading.

203 In *Credit Suisse Private Equity LLC v Houghton* [2014] NZSC 37, [2014] 1 NZLR 541 at [170], it was said the date of the filing and the date of representative orders start statutory timeframes running.

[855] The relevant principles concerning whether an amendment is a new cause of action are:[204]

(a) A cause of action is a factual situation which entitles a party to obtain a legal remedy against another.

(b) Only material facts are taken into account and the selection of those facts "is made at the highest level of abstraction".

(c) An amended pleading will be "fresh" if it is something "essentially different". This is a question of degree.[205] The necessary change in character could be brought about by alterations in matters of law, or of fact, or both.

(d) After the period of limitations has run, a plaintiff is not able to set up a new case "varying so substantially" from the previous pleadings; that is, new allegations that would involve the *investigation of an area of fact of a new and different nature, or a new and different legal basis*.

(e) It is possible for a different "fresh" cause of action to arise out of the same or similar underlying facts, if the plaintiff seeks to derive a *materially different legal consequence from the facts*.[206]

In summary, the Court of Appeal essentially concludes that the key question is whether a proposed amendment changes the essential nature of the claim and adds a new area of factual inquiry.[207]

[856] The issue raised by James Hardie is simply stated but capable of different resolutions. The core allegations contained in the amendments are not fresh but

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204 *ISP Consulting Engineers Ltd v Body Corporate 89408* [2017] NZCA 160, (2017) 24 PRNZ 81 at [1]. See also *Ophthalmological Society of New Zealand Inc v Commerce Commission* CA168/01, 26 September 2001 at [22]–[24]; and *Transpower New Zealand Ltd v Todd Energy Ltd* [2007] NZCA 302 at [61].

205 *Smith v Wilkins & Davies Construction Co Ltd* [1958] NZLR 98 (SC) at 961; and *ISP Consulting Engineers*, above n 204 , at [26].

206 *ISP Consulting Engineers*, above n 204, at [25].

207 At [25].

substantially reflect existing allegations. The documents in which they are found are new and have independent relevance in that each may be, for some of the representative group, the JHTI operative at the time of building. That feature of new documents is capable of supporting a conclusion the amendments are time-based, but I prefer to focus on the concept underlying the idea of limitation. The amendments add nothing substantively new to the proceeding as it existed prior to the amendment. They are just further examples of existing alleged issues.

Alleged misstatements – Bay Lair

[857] It is necessary to begin by noting that the plaintiffs' closing submissions attempt no analysis of these claims. This part of the judgment, for its structure, will therefore inevitably reflect the defendant's more detailed analysis.[208]

[858] Concerning s 9 of the Fair Trading Act, the homeowners cite extracts from the 1987, 1988 and 1991 JHTIs, all of which are relied on as if pleaded in full. For 1991, being the JHTI applicable to Bay Lair, the statements identified in the pleading as being misstatements are:

(a) Harditex is an exterior cladding in its own right and does not rely solely on textured coating for its performance as do many other systems;

(b) the sheets provide a suitable substrate for textured coatings;

(c) all the textured exterior finishes recommended for use with Harditex have met the rigorous Harditex testing criteria;

(d) offering the durability and peace of mind of fibre cement, Harditex is the complete cladding system for today's architectural trends;

(e) Harditex sheets are immune to permanent water damage and will not rot;

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[208] The lack of detailed submission possibly reflects the significant overlap between the claims and the core case. The plaintiffs have not attempted to find in the FTA claims statements where the falsity or deceptiveness does not depend on the homeowners establishing their core arguments.

(f) within the normal range of applications, the life of the product is limited only by the durability of the supporting structure and the materials used in that fixing;

(g) accelerated durability testing is undertaken on the Harditex external cladding system to ensure that each texture coating system tested has sufficient flexibility to accommodate sheet frame movement. … This harsh test is designed to mirror the varying climatic conditions that occur in New Zealand. James Hardie is therefore very confident about the performance of those proprietary systems which pass;

(h) Harditex fibre cement withstands extreme conditions from blistering sun, salt laden air and pelting rain to moist steamy conditions. Fibre cement is completely unaffected by water. It never rots or decays.

[859] There then follow 23 particulars, one of which includes nine sub-paragraphs, which appear to be homeowner submissions about why the JHTI propositions are false or misleading. However, these particulars are not expressly linked to a particular statement in the JHTI.

[860] The defendant has grouped the pleaded particulars into topics in a manner which satisfactorily covers the various issues:

sheet –	is not a suitable base; does not provide durability or peace of mind; it is absorbent and adversely affected by water; it is not immune to rot; it can suffer the effects of swelling, rotting and decay; the wood fibres, when wet, are prone to decay and affect bracing performance; the product is not proven given the inadequacy of testing; the sheets transfer moisture to other building elements; the sheets did not comply with AS/NZS 2908.2:1992 in relation to thickness and dimensional tolerance.
system –	is not suitable; does not provide durability and peace of mind; did not provide a complete cladding system for architecture; did not provide security or durability or "the security of proven performance"; did not have proven performance or provide durability; is affected by water; if installed in accordance with JHTI is not capable of complying with B1, B2, E2 and F2 of the Building Code; the testing was inadequate; does not appropriately manage water ingress; fails to adequately accommodate movement; the

accompanying literature could not provide a fit for purpose cladding system;

buildability – the JHTI does not specify a method of installation which makes adequate allowances and tolerances for the typical conditions that exist on a building site.

Bay Lair – the design and installation detailing for the h-joint was inherently flawed; inappropriate and inadequate details for vertical control joints; inappropriate reliance (presumably in JHTI) on inseal and inappropriate reliance on exposed sealant; inadequate details for recessed windows*, transitioning between claddings and inadequate overhang defects.* (Although pleaded as part of the Bay Lair case, it is acknowledged by the plaintiffs that those marked * are not present at Bay Lair.)

[861] I address each topic, but restate an earlier observation. It is very difficult for the Court to assess the merits of the pleaded particulars when they do not respond to specific statements in the JHTI, nor identify those passages of the JHTI to which they collectively respond, if that is their genesis. I recognise omissions cannot be connected to a specific statement in the document, but otherwise consider the lack of detail a flaw in the case.

Sheet statements said to be false or misleading

[862] The relevant content of the JHTI to which the pleading relates is found on the last page. It is helpful on the first occasion to set out what is said in the JHTI:

> Not only do Fibre Cement building products look superb and have design flexibility, their inherent qualities and benefits give you great looks that last a lifetime.
>
> Hardie's Fibre Cement withstands extreme conditions, from blistering sun, salt laden air and pelting rain to moist steamy conditions in bathrooms and kitchens. Fibre Cement is completely unaffected by water. It never rots or decays.
>
> A tough match for timber, Fibre Cement won't burn. In fact, it's one of the safest building materials you can use.
>
> With Hardies, great looks are made to last.
>
> So when it's a question of building or renovating, Hardies has the answer, with a range of quality building products for both the interior and exterior of your home.

[863] The impact of the lack of detail in the homeowners' case is immediately apparent. James Hardie sets out its position on how a particular statement in the JHTI would have been understood by the claimed target audience:

> Provided it is [properly] installed, texture coated and maintained in accordance with the JHTI and good trade practice, Harditex is a durable substrate, which is immune to permanent water damage and will not rot or burn.[209]

There is no homeowner response to this.

[864] The JHTI propositions are false if they are read as an absolute without the qualifier that what is being talked about is a properly installed sheet. However, I accept the general qualification that James Hardie proposes. In doing so I have not ignored that the particular page is about fibre cement rather than Harditex, but the reality is that the product is not sold to be used in its raw state. It is sold as a substrate and so that affects the context. On balance, the statements are therefore not misleading. For example, stating the sheet "never rots" is fairly qualified in the way James Hardie suggests, and when read that way is a correct statement.

[865] One statement requires further analysis. The statement that the sheets are "completely unaffected by water" is problematic. A properly installed sheet is nevertheless still affected by water. The whole basis of Dr Straube's and Dr Lstiburek's endorsement of fibre cement is its capacity to manage moisture by absorbing it, storing it and then ejecting it as vapour. The sheet will have different qualities depending on its water content at any particular point in time. It may be less strong for the period of greater moisture but will regain its strength as it dries out. It may also swell, but again will shrink. Describing the sheet in this way may have been intended to reflect the fact that if allowed to dry, the sheet will return to its initial state. It is, however, a clumsy shorthand for this proposition.

[866] The next sheet proposition said to be misleading is that the sheet was proven by testing. That topic is briefly addressed in a section of the Appendix. There is no misleading statement.

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[209] The concept of "properly" is added to the quote to reflect other submissions made by James Hardie.

[867] The next sheet challenge is to the claim that Harditex has sufficient durability to meet the Code's bracing requirements. The challenge seems to reflect the homeowners' claim that the Harditex sheet can decay. If it does, it will lack sufficient durability. The decay thesis having been rejected, this challenge must fail. It can be further noted that Harditex at all times had BRANZ appraisal saying it met the bracing requirements of the Code (if installed as a bracing element and in accordance with the relevant requirements).

[868] The final sheet challenge to be considered is the homeowners' assertion that Harditex is moisture absorbent and transfers moisture to the timber framing, or wrap. It is difficult to ascertain what specific JHTI statement this challenge relates to. Most of the moisture comments in the JHTI are about keeping the product dry, and permissible moisture content. For the reason that there appears no relevant statement, the claim is rejected. Reference can also be made to the likelihood it is based on a misunderstanding of how moisture leaves the sheet.

System statements said to be false or misleading

[869] Taking the 1991 JHTI as an example, the concept of system appears in numerous places in the literature. First, and following on from a claim that Harditex is the preferred exterior cladding substrate for textured exterior finishes, of Harditex the document asserts:

(a) it is an exterior cladding in its own right and does not rely solely on the textured coating for its performance as do many other systems;

(b) it offers the durability and peace of mind of fibre cement, and is the complete cladding system for today's architectural trends; and

(c) the Harditex System is comprised of four basic components – Harditex sheets, jointing systems, architectural shapes and coating systems.

[870] Next, under a heading "jointing system", it is said the sheets are jointed with tape reinforced flexible compounds to give a long-term durable jointing system. This

is to be done by approved applicators. Further on is an entire page dedicated to the Coating System (most of it is photos).

[871] Some relevant text from this page includes:

> The coating system is to be applied only by approved applicators. The systems suitable for use with Harditex are 100% pure elastomeric high build texture coatings or flexibly modified plasters. These are fade-resistant, water-resistant and together with the tape reinforced joints are flexible enough to accommodate thermal expansion and contraction that will occur in the framing and the Harditex sheets.
>
> …
>
> The selected finish coat provides another dimension of weatherability providing a tougher, harder-cured surface which is still flexible enough to withstand the thermal expansions and contractions of your building. The approved coating systems are highly resistant to ultraviolet light, salinity, alkali and chemical attack contributing to a long lasting, peel, fade and stain-resistant exterior.

[872] On the following page of the JHTI there is a heading "System Guidelines" which is a list of what I would term "must dos". This includes ensuring the framing is thoroughly dry; that jointing, architectural shapes, and finish coatings are only to be done by approved applicators; that the only coating systems to be used are those proven by test to resist expansion and contraction of framing and sheets; that low build acrylics are not suitable finishes; and that only light to medium colours should be used.

[873] The balance of the JHTI moves on to technical instructions which, as previously noted, have expanded from the 1987 JHTI to already now being 11 pages with 35 illustrated details. This section starts with the claim that Harditex cladding systems are suitable for both commercial and domestic applications, but notes that builds of more than two storeys need specific design. "Systems" in this context can only sensibly be read as meaning a system comprising the four system elements early identified in the document – sheet, jointing system, architectural systems, and coating systems.

[874] The first particular which James Hardie identifies, and then restates in its qualified form, is:

> Provided it is properly installed (in accordance with the JHTI and good trade practice), texture coated and maintained, the Harditex cladding system is fit for the purpose of managing water ingress.

[875] I observe the JHTI never expressly uses the term "fit for purpose". However, I accept it is an implied claim. The judgment as a whole responds to the proposition it is false and further comment is not needed.

[876] The next system statement challenge that merits comment is that the Harditex cladding system did not provide, as claimed, "a complete cladding system for architecture". There is a statement expressly found in the 1991 JHTI:

> Offering the durability and peace of mind of fibre cement, Harditex is the complete cladding system for today's architectural trends.

[877] In the absence of any submission on it, I assume the statement is also being used by the homeowners as a vehicle through which to advance their case that Harditex is not fit for purpose. Possibly the complaint is to the use of the word "complete", which runs counter to the homeowners' case that the literature was incomplete. This is, however, speculation on my part because the homeowners do not explain it. It is hard otherwise to make anything of the statement which just seems a broad marketing type proposition.

[878] The remaining system statement challenges were that the system was not proven, and that the system cannot accommodate building movement. These are adequately addressed elsewhere in the judgment.

Buildability statements said to be false and misleading

[879] The plaintiffs under this section repeat their claims that the system did not allow for normal building conditions, required too much precision, and provided inadequate assistance on how to build. At the risk of repetition, I observe it is again unclear where in the JHTI the homeowners are saying that these misrepresentations are made. Specific statements are not identified. I conclude therefore that this challenge completely overlaps the negligence claim. I rely on the earlier analysis and see no need for further comment.

Bay Lair statements

[880] The headings being used come from the defendant's submissions. The reason for adopting this approach has previously been stated, but in essence it is because the plaintiffs' submissions neither provide a framework or analysis. That said, Bay Lair is not a heading that is particularly helpful. Grouped within this category are claims by the homeowners that the JHTIs expressly or by omission make misleading statements about a number of building details. In particular, the h-mould, the vertical control joint, inseal strips, exposed sealant, soffit drip detail, overhang details and maintenance.

[881] To the extent some of these claims plead a specific detail or diagram as a standalone misrepresentation, the judgment has not sought to resolve the disputes about the correctness or otherwise. The finer points of the dispute were very technical, and at times witnesses of equal qualification and experience just had different views on it. As with other aspects of the Fair Trading Act cause of action, the overlap with the negligence claim areas means it is not necessary to consider this separately.

Other alleged misrepresentations

[882] There are a number of other alleged misrepresentations not covered by the categories already addressed. First, there are claims that statements by James Hardie in relation to two Standards are incorrect. Only one requires comment, namely the claim that Harditex conforms with AS/NZS 2908.2:1992 Cellulose Cement Products – Flat Sheets.

[883] Standard AS/NZS 2908.2:1992 relates to the required thickness of the sheet. Based on internal James Hardie documents, Mr Wutzler formed the view that the sheets were not compliant and James Hardie knew this (despite having a Certificate of Compliance). The matter was explained at length by Mr Knox, and touched on by Mr Cottier. The plaintiffs did not satisfy me there was an issue.[210]

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[210] Mr Wutzler, it seems, read much of the disclosure. His evidence includes opinions on what message should be taken from these documents in terms of what James Hardie knew. I do not accept such evidence is admissible. The drawing of inferences is the Court's task. I note for the record that I disagreed anyway with many of what I considered strained interpretations of documents that Mr Wutzler contended for. This comment is equally true of his, and Mr Lalas', reading of the JHTIs. It was often unrealistic and ignored context.

[884] Another alleged misstatement is that James Hardie advertised Harditex as having a BRANZ appraisal prior to the appraisal being formally issued. This does not arise for either of the JHTIs relevant to the plaintiff properties but applies to the June 1993, August 1994 and July 1995 JHTs.

[885] The statement made in the June 1993 JHTI was:

> BRANZ APPRAISAL
>
> Harditex has received the following appraisals: BRANZ Appraisal Certificates Nos. 229 (1993) and No. 243 (1993).
>
> NEW ZEALAND BUILDING CODE (NZBC)
>
> Harditex, when used in accordance with this specification and the statements and conditions of the BRANZ Appraisal Nos. 229 and 243 will meet the relevant provisions of:
> NZBC Clauses B1 Structure
> B2 Durability
> E2 External Moisture

[886] It is difficult to resolve this claim of falsity as it is unclear what document James Hardie had from BRANZ. There is, however, clear evidence that BRANZ had specifically approved James Hardie claiming it had an appraisal. Further, BRANZ must have provided the actual Appraisal Certificate Number for James Hardie to use. The certificate number cited is the one ultimately issued. These matters lead me to conclude the statement is accurate, although I recognise the evidence is vague.

Conclusion

[887] The claims under the Fair Trading Act involve a large degree of overlap with the inherent defects and the negligence claim. To the extent possible, the judgment has sought to identify challenged statements that might have some content independent of the core case issues. There are not a large number these and I have concluded none represent a breach of the Act. The Fair Trading Act claim accordingly fails in its entirety.

OVERALL CONCLUSION

[888] The homeowners' case fails in its entirety.

[889] On the evidence in this case it has not been shown that Harditex was a flawed product unable to deliver a watertight house. Witnesses of international standing have established that the product was not conceptually flawed and could work. Analysis of the plaintiffs' houses, including six houses from the wider claim group, has revealed a disturbing pattern of incompetent building and poor texture coating that is more likely, in my view, to be the cause of the damage suffered by these properties.

[890] The judgment concludes that Harditex was not as innovative a product as the plaintiffs claimed, but from a buildability viewpoint was more just another example of sheet cladding. That is not to say there were not new aspects such as the recessed edges which allowed a monolithic finish, but in general a reasonably competent builder could and did use Harditex to build a sound waterproof house. It is appropriate to note that some of the plaintiff expert witnesses were not, in my view, reliable, and others strayed outside their area of expertise. This significantly reduced the weight that could be given to their evidence, and weakened the plaintiffs' case. That said, there was considerable strength in much of the expert evidence led by James Hardie from a collection of witnesses of clear standing in their field.

[891] The claims are formally dismissed. The parties may file cost memoranda if that is necessary. I will leave it to counsel to agree a timetable.

_____

Simon France J

Solicitors:
Parker & Associates, Wellington for Plaintiffs
Chapman Tripp, Wellington for Defendant

APPENDIX

[892] In this part of the judgment I note a number of topics that were raised by the parties and which have not been the focus of analysis in the judgment.

Testing of Harditex before its release on the market

[893] An important aspect of the homeowners' case was that James Hardie did not do the testing expected of a reasonable manufacturer before releasing Harditex on the market. There are two aspects to this:

(a) testing of the sheet; and

(b) testing of a Harditex wall such as was done in the Helfen test.

[894] The judgment reasoning did not need to analyse this because once the conclusion was reached that the product worked, it was not necessary to reach a view whether that was the product of a sound process or good fortune.

[895] The testing of the sheet raises again the issue of what sort of evolution or innovation Harditex represents. From James Hardie's viewpoint the technology being used – autoclaving of fibre-cement sheets, and more recently autoclaving of asbestos-free fibre-cement sheets – was established and something with which it was familiar. This influenced the testing required.

[896] The main homeowner witness was Dr Akers who was involved in the development of a premier Swiss product, Eternit. His initial evidence suggested that the testing process he had followed was far more thorough than was done for Harditex. In my view that impression was considerably weakened by the James Hardie witness, Mr Cottier. He compared the two testing regimes and satisfied me they were comparable. My sense of Dr Akers' evidence is that he had moved somewhat to that position as well.

[897] Concerning testing of the whole wall, this is the issue of whether there was a suitable test to enable such testing. It is common ground there was no specific test but

plaintiff witnesses submitted what was called the SIROWET test could have been used. This test has previously been referred to. It has subsequently been adapted to be a test for residential homes built with a cavity – AS/NZS 4284. The written documentation around the test suggested its initial role was in relation to large commercial buildings, and I have previously cited from the current external moisture standard which recognises this.[211]

[898] Two homeowner witnesses, however, Mr Lalas and Mr Bennie, were involved with SIROWET from the start. Both said it was capable of being modified to use on residential homes, and this was known. I have previously concluded that the supporting evidence does not establish recognition of a role for SIROWET in residential housing.

[899] Mr Bennie's evidence on the ability to adapt SIROWET was not challenged, and given it now underpins AS/NZS 4824, it is evidence that should be accepted. I do not accept, however, it has been shown there was widespread understanding of this. It is also clear that no cladding manufacturer was so using it. It does not seem to have been used in this way prior to 2000 at the earliest. I would not have concluded James Hardie breached any duty in failing to conduct this test in the mid-1980s.

BRANZ

[900] As noted from 1995, and probably two years earlier,[212] BRANZ maintained a favourable appraisal for Harditex. There were in fact two appraisal certificates being for bracing rules and for the product more generally. James Hardie relied on the appraisal as support for its proposition that Harditex was a sound product, compliant with the Code and fit for purpose. The judgment reached conclusions that mirror the BRANZ assessment but has not relied on that assessment to reach that point.

[901] The homeowners were critical of the BRANZ appraisal in two regards – they disputed the basis on which BRANZ reached its opinion, and they questioned the independence of BRANZ from James Hardie.

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211 At [586].
212 Appraisal certificate was issued in 1995 and published in July 1996.

[902] The Appraisal Certificate is four pages long and clear on its face as to its terms and scope. The appraisal describes itself as relating to the "Harditex Substrate for Exterior Textured Coatings", and explains:

> *The product has been appraised for use as a wall cladding substrate for proprietary jointing and textured coating finishing systems which meet the test criteria for performance of James Hardie Building Products. The product has been appraised for use as an exterior wall cladding over timber or steel frame buildings.*
>
> *This Certificate must be read in conjunction with the manufacturer's document James Hardie Technical Information – Harditex™, dated February 1996.*

[903] The opinion the Certificate represents is then set out:

> **New Zealand Building Code (NZBC)**
>
> In the opinion of BTL, if Harditex™ Substrate for Exterior Textured Coatings is used and installed in accordance with the statements and conditions of this Certificate, the relevant provisions of the following NZBC Clauses will be met:
>
> B1 STRUCTURE; B2 DURABILITY; E2 EXTERNAL MOISTURE and F2 HAZARDOUS BUILDING MATERIALS.
>
> Specific NZBC compliance details are contained within this Certificate.

[904] In relation to the contents, the appraisal has a section entitled "Product Information" which contains a series of statements and information similar to material in the JHTI. Topics covered include:

(a) General, which notes it is a fibre cement wall cladding substrate finished with joint and coating systems which have been tested by James Hardie;

(b) Description of the sheets including their composition and size;

(c) Available accessories;

(d) Handling and storage;

(e) Design information – which says it must be fixed over underlay and that the Certificate must be read in association with the JHTI;

(f) Framing which requires compliance with 3604, or an approved specific design. Moisture content, and stud and dwang gaps, are specified;

(g) Control joints;

(h) Jointing and coating systems;

(i) Ground clearance;

(j) Thermal bridging; and

(k) Code Clauses.

[905] Of these, illustrative passages can be taken from two sections:

> **Joint and Coating Systems**
>
> The joint and coating systems are applied by specialist independent contractors. As these are outside the control of James Hardie Building Products, all details and warranties must be given by these specialist contractors.
>
> The textured coating system provides a decorative finish and resistance to wind driven rain. The finishing systems must be maintained to protect the sheets and fixings for the life of the building.
>
> This Certificate does not cover the textured coating finishing or jointing systems. Advice must be sought from James Hardie Helpline, 0800 808 868, for a list of manufacturers with tested coatings.
>
> **Weathersealing and Finish**
>
> Harditex™ sheets must be dry immediately prior to the joint and coating systems being applied.
>
> Harditex™ must be made weathertight by jointing, flashing, and sealing in accordance [with] this Certificate and the manufacturer's technical literature, and applying and maintaining joint and coating systems in accordance with the coating manufacturer's instructions.

[906] I do not agree that it is flawed for BRANZ to rely on manufacturer-sourced data and testing. It is unrealistic to expect any agency like this to undertake its own testing from the outset of a product. What is needed is expert review, no doubt with some targeted testing.

[907] The homeowners draw support in their criticism of BRANZ from internal James Hardie memoranda when particular authors express doubt over BRANZ ability. Mr Knox, when asked to comment, said it was not a general perception, and I accept that. The main document relied on is anonymous, and provides no reason to question the recollection of a sound witness. The document is likely to have arisen at the time BRANZ was seeking participation in a publication, which ultimately happened, called the Good Texture-Coated Fibre-Cement Practice Guide.[213]

[908] First published in 2001, it was an effort by BRANZ to lift building standards and is quite a comprehensive building guide. James Hardie declined to participate on the basis that involvement would mean disclosing a considerable amount of its fibre-cement intellectual property. The documents around the time indicate some within James Hardie thought this consequence of loss of intellectual property equally occurred through participation in an appraisal process. The knowledge BRANZ acquired through that process was inevitably transferred, some argued, to competitors when BRANZ appraised their products. The documents speak for themselves and the views of the authors, but it has to be noted generally they are drafts or discussion points. None seem a record of a concluded view that could be called a "James Hardie" view, and Mr Knox's evidence is to the opposite.

[909] It is not necessary at this stage to provide the detail of the numerous challenges made by the homeowners. As noted in the last point, the Certificate challenges reflected the core challenges to the product, and this was inevitable. If the product is flawed, BRANZ endorsement of it must equally be so. And the homeowners had to point to how BRANZ could have erred. The focus was that BRANZ relied on the same basis as James Hardie did for its claims, and so did not represent an independent review.

[910] There were comments both in the Hunn Report and in the Report on the Weathertightness of Buildings in New Zealand by a Select Committee on the issue of BRANZ independence from commercial interests.[214] The Hunn Report spoke of

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213 BRANZ, above n 55.

214 *Hunn Report*, above n 1, at 30; and Government Administration Committee *Weathertightness of Buildings in New Zealand* (March 2003) at 94–95.

perceptions within the industry of a lack of independence, and the Select Committee contemplated a process of independent verification of appraisals, although itself describing BRANZ as New Zealand's primary source of independent technical advice. The overall evidence, however, did not point to any tenable basis on which to doubt BRANZ or its work.

[911] A final topic to note is the issue of the appraisal remaining in place through to the end of the life of Harditex. In June 2002 BRANZ advised manufacturers of a new set of criteria with which it said all appraised fibre-cement cladding systems would need to comply. Following this notification, it was contemplated that within a few weeks an appraisal contract for BRANZ to check compliance would have been agreed. It was expected the revised BRANZ criteria would be operative by the end of 2002.

[912] For whatever reason, BRANZ did not ultimately pursue this change. It issued the criteria as a consultation document but then subsequently advised appraisal holders that the project was being reconsidered. Existing appraisals were re-issued. James Hardie submits the documents show BRANZ still had much to do to be able to confirm its criteria – it was testing generic window details, assessing generic cavity-based details, considering a requirement to seal the back of sheets, and still had no settled test methodology for joints and coatings.[215] Then, in 2003 BRANZ provided James Hardie with the results of some joint testing it had done, and James Hardie replied critiquing what it saw as errors in the methodology.

[913] There were further like exchanges on various topics but the end result is that the appraisal continued. Influencing this was that the External Moisture Clause of the Code was under review and it seems to have been generating uncertainty as to which way it would go. BRANZ ultimately decided to leave its current appraisals in place until the new external moisture Clause E2 was issued. This occurred in June 2004.

[914] Following that, BRANZ said it would add a qualifier to existing appraisals but otherwise wait until the new Acceptable Solutions model came into force on 1 February 2005. However, in April 2005 the product was withdrawn. This coincided with the need otherwise for a new appraisal certificate given the changes to E2.

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[215] Various documents are referred to that underlie this submission.

[915] If conclusions were needed, I would hold that the BRANZ appraisal provided independent support for the conclusions otherwise reached in the judgment. I do not see it as flawed that an organisation performing a function such as BRANZ draws on manufacturer supplied testing and data, and suggest that is not uncommon. What is needed is an expert capacity to review and assess that data. Comments made about the independence of BRANZ exist, but there is not evidence in this case to cause me to devalue on that basis BRANZ opinion.

Complaints system and number of houses

[916] There was evidence about the reliability of the system by which James Hardie recorded complaints. This is a topic perhaps best seen as a claimed plank in the defendant's case, and a claim resisted by the plaintiffs. James Hardie use it by pointing to the (estimated) number of houses built in Harditex and the (allegedly) low number of complaints recorded. The homeowners challenge both parts of the equation.

[917] Concerning houses built, the figures are an estimate. There is reasonably sound evidence about the amount of Harditex sheet sold – 8.5 million square metres. Translating that to a number of residential houses is speculative because it needs to exclude commercial use, account for varying house sizes, and recognise some houses use more than one type of cladding material.

[918] Various data sources were available to assist with the exercise – market research surveys commissioned throughout the period by James Hardie to assist with its understanding of the market, and territorial authority records on a number of house permits (378,285 over the 18 year period) being two such sources. From these figures Mr Schumacher calculated a figure in excess of 100,000 which would represent more than a quarter of houses built in the time.

[919] Ultimately, it was not an issue worthy of detailed consideration for several reasons. Complaints received is of some relevance to whether there is an issue but is limited. The consumer may not, for example, have known the cause of or entity responsible for the defect. Further, the latent nature of these defects is well known and some may not have been discovered until searched for (there are aspects of this with the Woodhouse property). And, of course, not everyone formally complains.

[920] Case-specific limitations include that James Hardie's complaints system was targeted at product complaints. Matters regarded, by James Hardie, as third party issues were not always, or perhaps seldom, recorded.

[921] Conclusions I was drawn to were that for a period Harditex was a significant portion of the residential market, and that the complaints received and logged by James Hardie were not of a type and scale to suggest to it that Harditex was a faulty product. I would not have attached much weight to the idea that the James Hardie complaints system helped show Harditex was a sound product.

Repairs

[922] Given the outcome of the judgment, this section is limited to the plaintiffs' properties concerning which there was not a significant divide between the parties.

[923] There was an issue as to whether Woodhouse should be costed as two separate projects (thereby replicating some costs) or a single project undertaken by two owners separately. Generally the answer must be the latter – they are separately titled properties concerning which the owners can make their own decisions on the nature and timing of repairs. However, here, purely as a case-specific factual finding, I would have concluded with a reasonably high level of conviction that Ms Fowler and Mr Woodhead would do the repairs as a single project. Accordingly, for Woodhouse that would be the costing basis. It would apply only while they were the respective owners.

[924] There was a dispute about post-remediation stigma damages. Post-remediation stigma allegedly arises from the very fact of remediation. It is separate from stigma attaching to the monolithic nature of the house. The evidence and topic merit a more in-depth analysis than this summary represents. The case law appears divided over the topic although in several cases they have been awarded.[216] It must be, therefore, that they are to this extent a recognised head of damage.

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[216] *Morton v Douglas Homes Ltd* [1984] 2 NZLR 548 (HC); *Scott v Parsons* HC Auckland CP776/90, 19 September 1994; *Evans v Gardiner* (1997) 3 NZ ConvC 192476; *Mikitasoy v Collins (No 4)* (2009) 11 NZCPR 617 (HC); and *Body Corporate 90247 v Manfrini Ltd* [2014] NZHC 295.

[925] It is, however, unclear the extent to which the Court in most of those cases heard detailed evidence disputing the existence of post-remediation stigma.[217] Here, James Hardie called evidence from Mr Gamby who is one of New Zealand's most distinguished valuers, and Dr Rehm an Auckland-based academic with a body of relevant publications. Their combined evidence satisfied me that no allowance should be post-remediation stigma.

[926] Mr Gamby is an eminent New Zealand valuer. He disputes that there is any market evidence supporting discounting the value of a house for post-remediation stigma reasons. Contrary evidence had been presented by the plaintiffs through a Wellington valuer, Mr Bills. I accept Mr Gamby's critical analysis of Mr Bills' methodology.

[927] Dr Rehm is a senior lecturer in the Department of Property at the University of Auckland. In 2019 he published a peer-reviewed research study which he describes as the only New Zealand empirical investigation into post-remediation stigma. It analyses 55,000 residential sales transactions in Auckland between 2011 and 2016. Based on this research Dr Rehm says there is no evidence that post-remediation stigma is a matter to be taken into account when valuing. Dr Rehm also critiqued Mr Bills' analysis and, similarly to Mr Gamby, disputed its reliance on certain Wellington sales and its interpretation of and reliance on some published literature.

[928] The combined evidence of these two witnesses was compelling. I would not have made any allowance for post-remediation stigma. For clarity I emphasise that post-remediation stigma is different from general market stigma which is recognised to exist in relation to monolithic cladding, for which damages will not be awarded. It would apply to the post-remediation value of these properties since they are being reclad in a monolithic finish, albeit over a cavity.

[929] Turning to case-specific issues, there was a methodology dispute. For the plaintiffs Mr Scott did a scope of works exercise, and then Mr Hanlon, an independent quantity surveyor, priced the scope of the works. For James Hardie, the equivalent professionals adopted a more collaborative approach. It seems unnecessary for the

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[217] *Body Corporate 90247 v Manfrini Ltd*, above n 216, is one where the existence was disputed.

Court to venture an opinion on such a specialist topic. Instinctively it did not seem an exercise mandating independence between scoping and costing of that work, and the evidence did not seem to point that way, but beyond that I do not comment.

[930] The approach of the homeowners' quantity surveyor was challenged as being excessive in its costings and allowances. In some aspects this was established. As an example, Mr Hanlon added extra allowances for professional fees not provided for by Mr Scott in his scoping exercise. As noted, he was working independently from Mr Scott by his own choice; it seemed to me if that were the basis of his approach he should have costed the scope as done, or referred any alterations back to Mr Scott. In his reply evidence, Mr Hanlon sought to analyse differences between him and the defendant witness Mr Chapman by reference to established repair costs in 14 other properties. The idea of using this as a comparison was sound but the clear outcome of the exercise was that Mr Hanlon's costings were shown to be significantly excessive. By contrast, Mr Chapman's were close to the average cost of repairing the 14 properties. For this reason, in terms of the costing work, I had a clear preference for the approach of Mr Chapman and would apply his rates.

[931] To the extent that specific decisions make any sense at this point, and for the benefit of the parties:

(a) I did not have a particular preference between the witnesses as regards the scoping assessment, other than Woodhouse should be assessed as one project. I have not analysed the differences between Mr Scott, and Messrs Donnan and Sylvia, to comment beyond that;

(b) I preferred and would adopt Mr Chapman's assessments in preference to Mr Hanlon. This includes on contingency;

(c) it is reasonable to re-use the windows, or at least to cost on that basis with the owner to choose whether to incur the extra cost; and

(d) I have not formed a final view on betterment considering it unnecessary in the circumstances to review the evidence in sufficient detail. My

impression at trial was that there would be no adjustment or at the most a very modest adjustment.

Evidence challenges

[932] James Hardie maintained a number of evidence challenges. It is not necessary given the outcome to resolve all of them. I have commented already on the complaint concerning the scope of the reply evidence. It was at times excessive but in part an inevitable product of the process. A detailed analysis of which aspects constitute excess is not warranted. I have commented on matters such as lack of objectivity, and outside scope of expertise to the extent necessary. There are no other matters of sufficient importance to require decision.

Recall application

[933] This year a further class action concerning Harditex commenced in the Auckland High Court. The defendant in this litigation is also a defendant in that proceeding. However, unlike here, James Hardie Australia is also an Auckland defendant. In March of this year, James Hardie Australia disclosed in that proceeding documents it had located relating to testing. One of the documents is the complete version of a partial document that was available in this trial, and which had been the focus of evidence.

[934] The homeowners sought discovery of the Auckland tranche of documents. The defendant resisted on the basis that it came into its possession only as defendant in the other litigation. A hearing was scheduled. To put the matter in context, at this point the judgment in this case was largely written. Necessarily that means I had already formed the views that are reflected in the judgment.

[935] The need for a disclosure hearing was removed because the defendant obtained permission from James Hardie Australia to disclose the documents. It was agreed by the parties that the entire tranche of documents would be admitted as evidence in this proceeding. The homeowners then applied to recall a James Hardie witness, Mr Cottier. This was opposed.

[936] The application was based on the proposition that the documents undermined aspects of Mr Cottier's evidence. It appeared from the documents he was more involved in the Allunga Tully testing, or at least more aware of it, than had appeared at trial. It is also the homeowners' position that the documents undermine Mr Cottier's general evidence about the proven durability of the product. I accept Mr Cottier was the James Hardie witness most relevant to James Hardie's testing, and knowledge of any defects of the product.

[937] I declined the application. These are the reasons which can be broadly stated. The homeowners were seeking, in relation to the new evidence, not to lead evidence of their own as to its significance but rather to impeach a defendant witness. In the context of the trial generally, that seemed to me of minor significance. The homeowners' application was primarily focused on the proposition that Mr Cottier had, 30 years later, forgotten rather than deliberately misled. Without the plaintiffs being given the opportunity to ask Mr Cottier the question, I have no doubt that is the explanation.

[938] I consider an application to lead evidence from, for example, the plaintiffs' own witness Dr Akers about the significance of the documents would have had more strength. The timing context was also important. The judgment was largely written. An application to recall one witness to deal with the implications of pre-release testing, and the fragility of his memory or otherwise, did not carry the potential to influence the decisions reached. The parties of course did not know that, but it was my perspective.

[939] I acknowledge some positive (for the homeowners) evidence might have been obtained from Mr Cottier who is an experienced and knowledgeable witness. However, that seemed to me a thin basis for recall so many months after the trial. I remain of the view that to have any real merit the plaintiffs had to have their own evidence that sought to link the new disclosures to the key trial issues being the performance of Harditex in service in New Zealand.

[940] The application was declined. The parties were given time to make submissions on the evidence – three weeks for the plaintiff and two for the defendant.

The judgment proper deals with the material (at [181]–[205]). The process itself delayed the release of the judgment by a considerable amount of time.
