VICTORIAN CIVIL AND ADMINISTRATIVE TRIBUNAL

CIVIL DIVISION

VCAT REFERENCE NO. D1266/2012

BUILDING AND PROPERTY LIST

CATCHWORDS

19 unit residential town-house development-various items of damage to common property alleged to have been caused by multiple failures by the respondent builder to comply with the plans and specifications, in breach of the implied warranties-multiple failures proved.

Major item of alleged damage is a concrete slab, being the surfacing layer of a pavement serving as common driveway to each of the townhouses-extensive cracking to the surface of the slab.

Whether any and if so which of the multiple failures caused the damage to the slab.

Whether the nature of the multiple failures and the consequential damage was such that total replacement of the pavement was necessary to achieve conformity with the contract.

Consideration of whether damage to the slab had stabilised-whether they were shrinkage cracks only for which a limited rectification scope was recommended by respondent, or whether they were cracks caused by both shrinkage and deflection under vertical load-whether the failures by the respondent meant, on the balance of probabilities, that the cracking would continue and therefore warrant total replacement.

Whether the respondent had discharged the onus of proving that total replacement of the pavement was not a reasonable course to adopt within the meaning of the principle in *Bellgrove v Eldridge*-consideration of efficacy of the respondent's rectification proposals.

Total replacement of the pavement ordered.

APPLICANT	**OWNERS CORPORATION NO 1 PS611203E**
RESPONDENT	**FURMAN CONSTRUCTIONS PTY LTD ACN 005446 373**
WHERE HELD	Melbourne
BEFORE	Member A Kincaid
HEARING TYPE	Hearing
DATE OF HEARING	12-15th May 2014, 5 August 2014, 8 August 2014 (Final Submissions)
DATE OF ORDER	13 October 2014
CITATION	Owners Corporation No 1 PS611203E v Furman Constructions Pty Ltd (Building and Property)[2014] VCAT 1282

ORDER

1. For the reasons provided, the respondent must pay the applicant $170,110.

2. Costs and interest reserved.

3. Liberty to apply to the principal registrar for a hearing before Member Kincaid on the questions of interest and costs, allow 2 hours.

Member A T KINCAID

APPEARANCES:

For the Applicant	Mr K Oliver of Counsel
For the Respondent	Mr A Richie of Counsel

REASONS

1 The applicant owns the common property of a residential development of 19 town houses at 9-11 Manikato Avenue, Mordialloc, Victoria (the "**development**"). The development is on a corner block, bounded by Manikato Avenue on the eastern side and McDonald Street along the south side.

2 The respondent was the builder of the development under a contract dated 19 March 2007 (the "**contract**").

3 A Certificate of Occupancy in respect of the development was issued on 2 February 2009.

4 Each of the town houses has a garage that is accessed by a common driveway running in a west east direction, with a common entrance and exit at Manikato Avenue (the "**driveway**"). The driveway is about 70 metres long and about 6.5-7.0 metres wide.

5 The intended design life of a driveway of this nature is about 40-60 years.[1]

6 A concrete pedestrian path runs from about the mid point of the driveway, in a southerly direction, towards McDonald Street (the "**pathway**").

7 Prior to October 2011, the applicant identified four sections of cracked slab (about 60 square metres). Following attempts by the parties to come to an arrangement concerning rectification, the applicant started this proceeding on 14 August 2012.

8 The applicant claims that the respondent defectively constructed parts of the common property, in particular the driveway and pathway. It says that the respondent failed to construct them in accordance with the plans and specifications set out in the contract. If that is so, the respondent will be in breach of the implied warranty contained in section 8(a) of the *Domestic Building Contracts Act 1995*.

9 The applicant also makes separate claims in respect of alleged damage to other common property, in particular a timber paling fence on the western boundary of the development, and rendered brick piers at the eastern and southern entrances to the development.

ISSUES

10 The amount claimed in respect of the driveway comprises over 80% of the total amount claimed by the applicant. In respect of the driveway, the issues are:

(a) whether the respondent is in breach of any of the warranties implied by section 8 *Domestic Building Contracts Act 1995*;

[1] I adopt Mr Campbell's evidence that this is provided for in AS3600.

(b) if so, whether any and if so what breaches caused the damage to the driveway;

(c) if the answers to (a) and (b) are yes, whether the total replacement of the driveway is necessary to achieve conformity with the contract; and, if so

(d) whether the respondent has demonstrated that total replacement of the driveway is not a reasonable course to adopt in the circumstances.

WITNESSES

11 During the hearing evidence was given by the following expert witnesses:

(a) Mr Chris Alkemade, Geotechnical Engineer, called by the applicant;

(b) Mr Tom Casamento, Consulting Structural Engineer, also called by the applicant; and

(c) Mr Kevin Campbell, Chartered Professional Engineer, called by the respondent.

12 Mr Moshe Furman, director of the respondent, also gave evidence.

DEFINITIONS

13 The driveway is a concrete "pavement", to which the Australian Standard *Guide to Residential Pavements* ("**GRP**") is applicable.

14 "**Pavement**" is defined in the GRP as the one or more layers of material, described as the "**surfacing layer**", the basecourse (the "**basecourse**") and, below that, the sub-base (the "**sub-base**").[2]

15 The slab in a concrete pavement is both the surfacing layer and basecourse. It is also the main structural element.[3]

16 The sub-base should be a well-graded granular material such as sand, gravel or crushed rock with a maximum particle size not more than one-third of the sub-base layer thickness.[4]

17 The elements of a pavement, being the surfacing layer, the basecourse (if required) and sub-base, rest on a sub-grade. The sub-grade is the natural soil or fill underlying the pavement (the "**sub-grade**").[5]

WHAT WAS THE RESPONDENT REQUIRED TO DO?

18 I consider first whether the respondent is in breach of the warranty implied by section 8 of the *Domestic Building Contracts Act 1985* by failing to construct the driveway in accordance with the plans and specifications.

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2 Clauses 3.17 and 3.23 GRP.
3 Clause 3.22 GRP.
4 Clause 6.11 GRP.
5 Clause 3.24 GRP.

19 The three Drainage and Paving Design Drawings No 4745DRN Rev B dated November 2006 (the "**engineering drawings**") which, I find, formed part of the contract, required the respondent to construct the driveway by:

(a) constructing a "compacted suitable sub-grade";

(b) laying on the sub-grade a sub-base comprised of a 50mm deep layer of compacted Class "2" Fine Crushed Rock (20mm nominal size);

(c) laying on the sub-base a concrete slab, being a 125mm deep layer of concrete at 25 *MPa*;

(d) inserting a layer of F72 reinforcement mesh within the slab; and

(e) constructing in the slab "expansion joints"[6] every 12 metres, and "contraction joints"[7] every 3 metres.

20 Drawing 3 of the engineering drawings provided that the reinforcement mesh should be located in the top third of the slab.

21 Clause 8.3 of the GRP states as follows:

> Reinforcement, where used, should be located in the top half of the slab with a minimum cover of 30mm but not lower than the mid-depth of the slab, and should be supported to retain its position by, for example, bar chairs at 1m centres.

22 The Planning Permit required the surface of the slab to be finished in exposed aggregate.

23 A Site Investigation Report provided by CE Lawrence & Associates dated 13 March 2007 (the "**Building Permit Soils Report**")[8] provided an analysis of the geology taken from 9 boreholes.

24 The borehole plan forming part of the Building Permit Soils Report shows that Boreholes 1-3 were in a west-east line along the southern side of the development, boreholes 4-6 were in a west east line approximately through the centre of the development (approximately where the driveway was subsequently located), and boreholes 7-9 were in a west east line approximately along the north side of the development.

25 The analysis showed:

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6 I accept the evidence of Mr Casamento that this is a reference to what is also called a "movement joint", a "control joint" and a "construction joint". An expansion joint is about 10mm wide, and occurs between two sections of a slab. It occurs at a position in a slab which indicates the end of a single pour of concrete during the slab's construction. At this point one section of slab is commonly anchored to its adjacent section of slab by a steel dowel. The dowel restrains vertical differential movement between the slab sections, but still allows for horizontal expansion and contraction of the adjacent sections of slab, and for shrinkage.

7 I accept the evidence of Mr Casamento that this is a reference to what is commonly called a "saw-cut joint". It is about 3mm wide and 30mm deep, created at intervals in the slab by a sawcut after the pouring of the slab. A weakness is created where the saw-cut occurs, thus encouraging shrinkage cracks not to occur randomly over the surface of the slab, but to occur vertically from the base of the saw-cut where they will not be seen.

8 Obtained, it appears, only after the preparation of the engineering design drawings.

(a) a first layer of "grey/brown silty sand filling" at boreholes 1, 3, 4, 5, 6 and "silty sand plus rubble filling" at boreholes 2, 7, 8 and 9, of "poor", "poor to moderate", "moderate" and "variable" compaction. This layer was found to exist from the surface down to a depth of between .70 metre and a maximum of 1.25 metres;

(b) below the layer described in (a) above, and only in respect of boreholes 1-3 and 7-9, a layer of "grey/brown clayey sand to sand" of "medium dense" compaction. This layer was found to exist from between .70 metre in depth down to a depth of 1.35 metres; and

(c) below the layers described at (a) and (b), from between .50 metre in depth to at least 1.50 metres depth, a layer of "grey/black to grey/brown/orange silty/sandy clay (highly reactive)", the density of which is described as "stiff to very stiff".

WHAT DID THE RESPONDENT ACTUALLY DO?

Findings of Mr Alkemade

26 Mr Alkemade was engaged by the applicant to carry out an investigation of the pavement and the sub-grade. He did so on 11 April 2013. He took 3 samples of slab from 3 borehole locations. Borehole 1 was outside unit 17, to the north of the driveway. Borehole 2 was located outside unit 13, adjacent to one of the 3 drainage pits. Borehole 3 was located outside units 11 and 12.

27 In his report dated 18 April 2013 Mr Alkemade provided his findings, as follows:

(a) there is no sub-base;

(b) the slab itself varies in thickness between 105mm and 170mm;

(c) the reinforcement occurs, on average, about 20mm-30mm above the base of the slab. This suggests, in his view, that the reinforcement had been placed directly upon an uneven sub-grade, without bar chairs, as would have ensured that the reinforcement would have sat higher in the slab.

Findings of Mr Casamento

28 Mr Casamento inspected the driveway on 28 March 2013. He found that there is only one expansion joint, situated about half way along its length. Given that expansion slabs were prescribed at 12 metre centres, he considers that there should have been about six expansion joints over the length of the 70 metre slab. Mr Casamento said in evidence that he concludes from this that the respondent chose to construct the slab in two pours only, when there should have been six.

29 He also found that contraction joints were constructed by the respondent at intervals of 4.5-6.5 metres, rather than the 3 metre centres specified.

30 He also found that the surface of the slab is not finished in exposed aggregate. He explained during evidence that such a finish is normally achieved by washing off the cement slurry once the concrete has achieved a certain consistency during setting or, less commonly, by grinding off the cement slurry before the slab achieves full drying strength.

31 He considers that a paving paint of unknown origin and characteristics has been applied to the surface of the slab. It is not a "full depth" concrete colour, and has deteriorated significantly, leaving patchy unsightly streak marks on the surface of the slab.

32 He also notes that no caulking was installed to the single expansion joint or any of the contraction joints. In the case of the expansion joint, this means that the joint does not move in the way described in footnote 6, which increases the risk of cracking in the slab.

IS THE RESPONDENT IN BREACH OF THE IMPLIED WARRANTY?

33 The respondent did not lead any evidence that contradicted these findings. They were plainly observable, or confirmed by the core samples taken by Mr Alkemade.

34 I find that the respondent failed to carry out the works in accordance with the plans and specifications, in particular:

(a) it failed to provide a sub-base;

(b) it failed to provide a 125mm deep concrete slab;

(c) it failed to insert the F72 reinforcement mesh in the top half of the slab;

(d) it failed to provide expansion joints at 12 metre centres and contraction joints at 3 metre centres; and

(e) it failed to provide a slab surface of exposed aggregate, but instead applied a surface paint which has since broken down.

Compaction of the Sub-Grade

35 The respondent challenged the allegation that the pavement was not constructed on a "compacted suitable sub-grade".

36 In order to determine the level of compaction of the sub-grade, Mr Alkemade undertook dynamic core penetrometer testing of the sub-grade. This involved compressing the sub-grade by applying mechanical "blows", and recording how many blows it took to reduce each 100 mm layer below the 200 mm deep starting point. He then calculated California Bearing Ratios ("**CBR**") values for each 100mm of sub-grade depth. CBRs are a measure of bearing pressure. The CBR correlations of all layers at Borehole 1 ranged between 7.5% and 28%. The CBR correlations of all layers at Borehole 2 ranged between 6% and 15%. The CBR correlations of all layers at Borehole 3 ranged between 3.5% and 25%.

37 Following his first visit to the development, Mr Casamento provided reports dated 26 April 2013, 5 June 2013 and 30 July 2013. He was then provided with the structural drawings, and he provided a further report dated 14 November 2013 summarising his views. In summary, he noted that:

(a) the Building Permit Soils Report reveals that extensive uncompacted "rubble fill" was present at the site; and

(b) the CBR tests undertaken by Mr Alkemade show that the respondent failed to compact the sub-grade in accordance with the requirements of the plans and specification.

38 Mr Alkemade considers that CBR values above 10% are suitable for sub-grade material, but are too low if, as in this case, there is no sub-base. He considers that, in this event, CBR values of at least 70% are required.

39 Mr Casamento gave evidence that the subgrade is loose unconsolidated, uncompacted fill. He thinks it probable that the respondent would have built up the site in order to create floor levels above the deemed flood level, known as "freeboard". He thinks that the fill would have come from another location.

40 Mr Casamento expressed his view in evidence that the sub-grade will continue to settle and consolidate. He considers that fill is capable of forming an appropriate sub-grade for a slab, even without a sub-base, provided it is compacted with a vibrating roller in layers of 150mm and brought up to a compaction standard of 98%. He says that this level of compaction is required to carry the expected bearing pressures on the sub-grade. What is required, he says, is a good metre of ground below the slab that is of good, solid compaction, so that it will not move. He considers that this level of compaction is in accordance good well-accepted building practice. He said that an experienced general contractor and, more particularly, an experienced concretor engaged by a contractor, would know this to be the case.

41 He is of the opinion that the cores taken by Mr Alkemade demonstrate that there had been no compaction. He considers that if the sub-grade had been compacted at 98%, in accordance with good building practice, CBR values would be recorded at 50-70%. In the event, they are between 3.5% and 28% maximum.

42 Mr Casamento considers that, in this case, where there is no sub-base, there is a greater need for a properly compacted sub-grade. This is because, he says, a sub-base tends to distribute vertical loads more broadly through the bearing area provided by the sub-grade.[9] This means that with a sub-base of fine crushed rock, some allowance below the 98% would be acceptable. However in the event of there being no sub-base, he sees little room for

[9] The evidence appears at pp 201-203 of the transcript. Mr Casamento uses the expression "base-course" where, as is apparent to his reference to crushed rock, he intended to use the expression "sub-base".

departing from the compaction levels which he described, which are dictated by good building practice.

43 Mr Casamento states in his report dated 14 November 2013 that Mr Campbell makes no mention of the "uncompacted 1.0 deep rubble fill under the slab" in his June 2013 report. This suggested to him, he stated, that Mr Campbell cannot have been provided with copies of the Building Permit Soils Report or the Alkemade report.

44 Mr Campbell responded to these observations in his report dated March 2014. He expressed his disagreement with Mr Casamento's view that the sub-grade comprises uncompacted fill. He considers that, in contrast to the Building Permit Soils Report principally relied on by Mr Casamento, Mr Alkemade's report identified "predominantly sand with occasional gravel and trace clay". He also noted that Mr Alkemade's report does not identify uncompacted fill.

45 In his March 2014 report, Mr Campbell also disagreed that the CBR values provide support for Mr Casamento's proposition that the sub-grade is insufficiently compacted. Mr Campbell is of the view that they are reasonable for the sub-grade.

46 The traffic conditions that can be expected on the slab was debated in this context. Mr Casamento questioned whether the "light traffic" design adopted in the engineering drawings was appropriate. Medium traffic design, he said, allows for vehicles with a gross mass of 10 tonnes, with infrequent use by heavier vehicles not exceeding their statutory limits for tyre, wheel and axle loads. In his opinion, driveway slabs need to be designed to cater for heavy furniture trucks and garbage trucks. Mr Campbell, on the other hand, considered that usage of the pavement by an occasional furniture truck does not result in the appropriate design being other than for "light traffic". He expressed the view that light traffic design was appropriate in this instance. He disagreed with the observations by Mr Alkemade and Casamento to the effect that the pavement is a "minor road". For these reasons, he considers, CBR values of 15-25% would be adequate.

47 He considers that there is no need to have a sub-grade with a CBR of over 70%. This would only be appropriate he says, if an engineer was designing for an asphalt surfacing layer, with multiple repetitions of heavy duty axles for an expected period of 20 years. Mr Campbell considers that there will be few commercial vehicles traversing the slab over an extended period.

48 Mr Furman was unable to say whether, from his own observations during the construction process, the respondent's sub-contractor compacted the sub-grade. His evidence was that he "saw some rollers there at some stage" but otherwise could provide no further detail on whether the sub-grade had been compacted. His evidence was that, given the size of the project, he relied on a Mr John Shepherd, a carpenter by trade, to manage the construction full-time. He believes Mr Shepherd is "still around". He was not called by the respondent to assist on the resolution of this issue. I draw

the inference that the evidence of Mr Shepherd, concerning whether the sub-grade was compacted, would not have assisted the respondent.

49 I accept Mr Casamento's view there is little basis for knowing whether the CBR values below the slab as a whole are nearer to 3.5% (being the lower end of Mr Alkemade's findings-which would be classified between poor and medium) or nearer 28% (the upper end of Mr Alkemade's findings-which would be classified as good).

50 I am satisfied that the CBR values taken by Mr Alkemade (particularly the fact that one of the CBRs was as low as 3.5%) support the proposition that the sub-grade was not compacted in accordance with the good and proper building practice described by Mr Alkemade and Mr Casamento. I also accept the opinion of Mr Alkemade that the varying widths that he measured in respect of the slab indicate an undulating sub-grade surface, and therefore a lack of compaction.

51 Having regard to all the evidence, I find that the respondent failed to provide a suitable compacted sub-grade in accordance with the plans and specifications.

52 In respect of this failure, and the five other failures to which I have already referred, the respondent failed to carry out the work in accordance with the plans and specifications set out in the contract. It is therefore in breach of the implied warranty set out in section 8(a) *Domestic Building Contracts Act 1985*.

IS THE DAMAGE TO THE SLAB CAUSED BY THE ABOVE BREACHES?

53 I shall now consider whether any, and if so what failures by the respondent to comply with the plans and specifications, caused the damage to the surface of the slab.

CRACKING

CAUSE OF THE CRACKING IN THE SLAB-WHAT DOES THE APPLICANT SAY?

54 The applicant relies on the expert opinions of Mr Alkemade and Mr Casamento.

55 It alleges that the respondent's failures to comply with the plans and specifications have caused random cracking to the slab.

56 I accept the description of Mr Alkemade that "deflection" occurs wherever one part of the surface of a slab moves relative to another part of the surface, usually by displacement under compression caused by a vertical load ("**deflection**").

57 The applicant says that the slab is deflecting under vertical load from vehicles, at the areas where shrinkage cracks occur. Given the other defects in the construction of the slab, it also says that deflection caused by vertical loads is also the cause of cracking.

58 The reason for deflection at the cracks, the applicant claims, is the absence of a required fine crushed rock sub-base immediately below the slab, combined with an uncompacted sub-grade. The relevant drawings and specifications required a sub-base to be constructed. The applicant says that the inclusion of a sub-base would have spread the compressive loads upon the slab over a larger area, and thus reduced deflection and subsequent cracking. The absence of a sub-base, the applicant says, means that the slab is less able to resist the downward forces applied at the areas where cracks have occurred.

59 The applicant also says that the absence of a fine crushed rock sub-base increases the chance that water will saturate the sub-grade, thus increasing the prospect of differential settlement of the slab, the varying width of which is insufficient to withstand the differential movement forces.

60 It also says that the distress in the slab is compounded by an insufficiently compacted sub-grade which (in the absence of a sub-base) lies immediately below the slab. As the sub-grade suffers differential settlement, so too, the applicant claims, does the slab.

CAUSE OF CRACKING IN THE SLAB-WHAT DOES THE RESPONDENT SAY?

61 The respondent relies on the opinion of Mr Campbell.

62 It denies that the cracking in the slab have been caused by deflection, or that any significant stepping has occurred. It says that the more likely cause of the cracking of the slab is uncontrolled shrinkage cracking, caused by the respondent failing to insert contraction joints at proper intervals and to cut them deep enough. It says that it is only liable to rectify such cracks that are greater in width than 1.5mm.[10]

63 The respondent denies that there has been any vertical movement (or stepping), save at a drainage pit at the western end of the pavement.

CAUSE OF THE CRACKING TO THE SLAB-CONSIDERATION OF EXPERTS' REPORTS

Applicant's Expert-Report dated 14 November 2013

64 Mr Casamento made his first visit to the site on 28 March 2013.

65 Mr Casamento's primary conclusion, expressed in his report of 14 November 2013 and earlier reports, is that cracking has occurred to the slab as a result of differential movement, caused by:

(a) the uncompacted rubble fill sub-grade;

(b) the absence of a sub-base;

(c) the variations in slab thickness;

(d) the incorrect location of the reinforcement; and

[10] It relies on the *Guide to Standards and Tolerances* (2007).

(e) contraction joints spaced at 4.5 to 6.5 metres instead of 2 metre spacing as prescribed by AS 3727.

66 I accept the evidence of the three experts called that reinforcement placed below the top half of the slab fails to control cracking at the surface of the slab: it simply acts to reduce the cracking rising from the bottom surface of the slab caused by tension at that location. Mr Casamento accepts that random cracking has therefore also occurred for this reason.

67 Mr Alkemade also concludes, from the pattern and spacing of the cracking to the surfacing layer, that the control joints are not working as intended. He gave evidence that where the thickness of the slab varies, the strength of the slab also varies. This also results in cracking of the slab where it is thinner, rather than at the expansion joints and contraction joints.

68 Mr Casamento said in evidence that water penetration into the sub-grade, through cracks in the slab, increases the risk of differential consolidation of the insufficiently compacted sub-grade. Those parts of the sub-grade affected by water ingress tend to "soften" in comparison with parts not affected. He believes that this has occurred here.

69 Mr Casamento says that there is a "trip hazard" presented by cracks, spalling and differential settlement of the slab.

Respondent's Expert-June 2013 report

70 Mr Campbell visited the site for the first time on 3 May 2013.

71 He provided a report dated June 2013. He concludes as follows:

(a) the cracks are "shrinkage cracks", caused by the evaporation of water from the surface of the concrete due to environmental conditions such as temperature and wind, particularly wind at this location. It occurs, he says, when concrete hardens and loses the excess water contained in it. He says that shrinkage cracking occurs on the day of placement of the concrete, and the bulk of shrinkage occurs in the first 9 months after placement.

(b) He ascribes the random nature of the cracking (and the width of the cracks) to the fact that the depth of the contraction joints was insufficient, that is to say, the saw cuts should have been founded to a depth of ¼ of the pavement (in the case of a 125mm wide slab, about 30 mm deep),[11] and they are not. Mr Casamento agrees with this as far as it goes.

(c) Mr Campbell considers that the fact that the reinforcement is placed, on average, about 20mm-30mm above the base of the slab, and not 30mm from the top of the slab, means that the slab is also behaving "as an unreinforced slab for shrinkage control". This is consistent with the views of Mr Casamento.

[11] This is supported by clause 8.3 of the *GRP*.

(d) Mr Campbell relies on paragraph 1.01 of the *Guide to Standards and Tolerances 2007* ("**GST**") which states as follows:

> Cracking in concrete is common and is not always attributable to unsatisfactory workmanship. Common causes of cracking include shrinkage, stress due to trees, commercial or heavy vehicle traffic, soil movement due to changes in the moisture content due to garden watering or drainage problems.
>
> Cracking not attributable to the workmanship of the builder (e.g trees planted too close to paving, commercial or heavy duty vehicle traffic, use of sprinkler system etc) is not a defect.
>
> Cracking…where the builder did not make allowances for shrinkage or general movement of the concrete…shall be assessed in accordance with table 1.01 and is defective where the limits in that table are exceeded.

For cracks in concrete paving, the limit is expressed in table 1.01 as 1.5mm.

Mr Campbell appends photographs to his report, showing the width of cracks, using a plastic see-through "crack width gauge". The gauge is his own aid, which allows him to readily measure crack widths. It shows cracks between .6 and 1.5 mm wide, and a 1.5 mm crack at "the short pavement section at the western end" of the slab, running from the corner of the drainage pit there.

(e) Mr Campbell also relies on a diagram[12] that shows a cross section of a surface crack in a concrete slab demonstrating, in his view, that the crack width in the surface of a concrete slab can give little indication of the crack width below, or indeed its depth. The diagram suggests that there will usually be a random pattern of internal cracking below a surface crack,[13] not necessarily being an extension of the surface crack. To the extent that the crack or one of the associated cracks reaches the plane of any reinforcement within the slab, the width of the crack commonly narrows, as the concrete there is under greater restraint there.

(f) Neither Mr Campbell nor Mr Casamento discounts the possibility of a shear crack running right through a slab. There appears to be no evidence of such a crack in this case, although the possibility cannot be excluded.

72 Mr Campbell is critical in his report dated June 2013, of the fact that the engineering drawings failed to nominate the position of the reinforcement within the slab, and that this plays in increasing the width of the cracks. To the extent that the respondent relies on this, I do not accept it. The drawings clearly show the position of the reinforcement in the top half of

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12 Called *Figure 6: Variation of Crack Width With Depth*.

13 Caused, he says, by "aggregate interlock", when the aggregate itself deflects the downwards course of a crack.

the surfacing layer, consistent with clause 8.3 of the GRP. Mr Campbell is also critical of the engineering drawings failing to nominate the required depth of the control joints which, he states, is nominated in the GRP as 30mm minimum depth. I do not accept this, give the evidence as to widespread practice in this respect, such as to be reflected in the GRP. Mr Casamento is also critical of aspects of the engineering design, in particular the design parameters of the slab itself, such as compressive strength, thickness, and reinforcement having regard to the extensive fill on site.[14] These matters have not been taken further by the parties, given the extensive departures by the respondent from the prescribed scope in any event, and so I consider them no further.

Mr Casamento's Report dated 14 November 2013-Response to Mr Campbell's report

73 Mr Casamento disagrees with the view of Mr Campbell that the cause of the cracks is shrinkage, rather than differential movement in the slab caused by those factors described in paragraph 64 above.

74 Mr Casamento is therefore critical, in his report, of any rectification proposal that does not involve the total replacement of the drive.

Straight Edge Level Survey Check of the Slab

75 I find from the evidence that stepping of a slab occurs where a slab has failed at certain points, resulting in differential vertical movement of sections of a slab on either side of a crack ("**stepping**").

76 At the request of Mr Campbell, on 21 March 2014 Dr Mark Wood of Direct Access Services Pty Ltd carried out a straight edge level check survey of the concrete slab. It appears from the photographs attached to his report, that Dr Wood laid a straight edge over existing cracks and contraction joints to determine the extent of any stepping in the surface, as would indicate differential movement as suggested by Mr Casamento as having occurred. Against each of the photographs the observation is made by Dr Woods "Concrete Slab level-No Stepping", or "Concrete Slab Level-No Settlement" which I take to be intended to mean the same thing.

Further Report of Mr Campbell dated 21 March 2014

77 In his report dated 21 March 2014 Mr Campbell concludes from the surface measurements of Dr Wood that "the slab is level at the cracks and joints. The level measurements at the cracks and joints show that there has been no vertical movement in these areas". He also concludes that as there is no stepping at the cracks, they will not open any further due to structural movement. He considers that the cracks will therefore remain the same size, subject to any further thermal expansion and contraction, which is normal for exposed concrete slabs.

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[14] See his reports dated 30 July 2013 and 14 November 2014.

78 I do not attach much weight to the field report of Dr Wood, and Mr Campbell's comments on them, having regard to the issues in dispute. The reason for this is that the weight of the evidence indicates that the placing of reinforcement below the neutral axis of the slab (that is to say, in the zone of tension) and the insertion of the dowel bar at the solitary expansion joint, have the effect of restraining vertical movement that may otherwise occur from compressive forces in the surface of the slab constructed with the defects that I have described. In other words, it is not necessary, in order for me to find that cracking has occurred as a result of compressive forces upon the surface of this slab, caused by the defects, for there also to be evidence of appreciable stepping in the slab.

79 Mr Campbell said in evidence that he disagrees with the proposition that a sub-base is required to assist in the spreading of vertical load through the sub-grade. He considers that the concrete slab is the structural element, and resists the downward forces that are exerted on it, even if it's resting on a soft sub-grade. He considers that the absence of a fine crushed rock sub-base has "nothing to do at all" with the propensity of a slab to crack, and that the load is spread through the slab itself. He said that the slab "spans over", any softness in the sub-grade material beneath the slab.

80 Mr Campbell also relies, for support, on the statement in clause 8.32 of the GPR concerning the purpose of a sub-base:

> A sub-base might be required-
>
> (a) to permit trafficking across the excavated sub-grade;
>
> (b) as a levelling layer to permit uniform concrete thickness
>
> (c) as a means of assisting in the control of reactive subgrade soils

81 Mr Casamento responded during cross-examination to this observation. He considers that the principles applicable to constructing a pavement on fill (as, he says, occurred here), and to constructing a pavement on natural ground, are different. He considers that clause 8.32 relates to the latter situation. If an engineer is designing for a slab to be constructed on fill, he says, the engineer will adopt engineering design principles (which, in this case, require a sub-base to assist in spreading load) in addition to the matters that may be set out in the GRP.

CAUSE OF THE CRACKING IN THE SLAB-FINDINGS

82 Having regard to all the above matters, and the evidence given during the hearing, I make the following findings in respect of the cause of the cracking to the slab:

(a) When a vertical load is applied to the surface of a concrete slab the area from the surface of the slab to the mid-point of the slab goes into compression, and the area between the mid-point of the slab and the base of the slab goes into tension.

(b) Where reinforcement is placed in the lower half of the slab, as occurred here, the slab acts as an unrestrained slab for compression.

(c) The reinforcement in the lower half of the slab controls the tensile cracks that originate in the bottom of the slab. These tensile cracks occur when tension is applied to the bottom half of the slab as a result of compression applied to the surface of the slab.

(d) The control of tensile cracks from the base of a slab is often required in the case of a suspended slab, but is generally not required for a slab forming part of a pavement.

(e) In the case of a slab forming part of a pavement, the control of surface cracking is essential to the serviceability of the slab, and for ensuring that the surface of the slab remains aesthetically pleasing.

(f) The pavement is defectively constructed in a number of respects. This has caused a large number of uncontrolled shrinkage cracks. Inherent weaknesses in the slab caused by its having an underspecified width throughout, no sub-base and an insufficiently compacted sub-grade comprised of fill has resulted in further cracking caused by deflection under load in the slab, caused by the weight of vehicles.

(g) Once a crack occurs in a slab, it creates a weakness, which makes the slab prone to deflection under load, the extent of which is exacerbated by the lack of a sub-base, one function of which is to distribute the load more evenly over the sub-grade, particularly a sub-grade made of uncompacted fill.

(h) A fine crushed rock sub-base also provides for drainage of water away from the sub-grade. Saturation of an insufficiently compacted sub-grade, caused by there being no sub-base, increases the risk of differential movement caused by the consolidation of an insufficiently compacted sub-grade.

(i) The absence of a sub-base does not necessarily mean that a pavement is defective since, in such a case, a suitably compacted sub-grade may allow the slab to withstand bearing pressure for which it is designed, but this was not the case here.

(j) The pavement suffers from differential movement, caused by the differential movement and consolidation in the sub-grade which, in turn, is caused by insufficient compaction.

(k) The Building Permit Soils Report refers to clay found below 0.5 metre being highly reactive. This means that where it is subject to moisture and water, it has a higher propensity to expand and contract.

83 It follows from these findings that I do not accept the submission of the respondent that the cracks to the slab are only random shrinkage cracks caused by the failure of the respondent to provide expansion joints at 12

metre centres and contraction joints at 3 metre centres. The cracks are caused not only by these failures, but also:

(a) the failure to provide a sub-base;

(b) the failure to provide a 125mm deep concrete slab throughout the length of the driveway;

(c) the failure to insert the F72 reinforcement mesh in the top half of the slab; and

(d) the failure to compact a suitable sub-grade.

SPALLING

84 I accept the opinion of Mr Casamento that spalling occurs when pieces of concrete (spalls) have broken off the slab immediately adjacent to an existing crack, with the effect that there is erosion of the concrete slab concrete on both sides of the crack ("**spalling**").

85 Mr Casamento and Mr Campbell differ on the cause of the spalling.

CAUSE OF THE SPALLING IN THE SLAB-WHAT DOES THE RESPONDENT SAY?

86 In his report dated June 2013 Mr Campbell provided his view in response to a question put by the respondent's solicitors "whether the likelihood of the cracking being attributable to furniture trucks moving up and down the driveway shortly after the concrete was poured". His view was that the spalling "**could be attributed** to early vehicular loading of trucks [emphasis added]".

87 Mr Campbell also stated in his report that "spalling **can also be attributed** to the use of heavily loaded solid wheeled garbage bins [emphasis added]". Elsewhere in the report he stated that the spalling "**could have been caused** by commercial heavy duty traffic or heavy garbage bins with solid wheels [emphasis added]".

88 Mr Campbell stated in his report that AS3600 for Concrete Structures requires 40Mpa compressive strength for non-pneumatic-tyred traffic, and 32Mpa compressive strength for medium or heavy pneumatic tyred traffic (vehicles heavier than 3 tonnes gross mass). He stated in his report, in a paragraph addressing the issue of spalling, that "the concrete strength **may have not been** adequate for loading conditions (emphasis added)".

89 He was subsequently asked by the respondent's solicitors whether the spalling that he earlier suggested could have been caused by early vehicular loading of trucks was "likely or not likely", to which he responded in a "Clarification" section of his June 2013 report "**it is likely** that the spalling of the concrete at the cracks was due to early medium axle loaded vehicles or solid wheeled vehicles. The concrete was specified to achieve [only] 25 Mpa at twenty-eight days after casting [emphasis added]".

90 In his report dated March 2014, Mr Campbell expressed the narrower view that the spalling "**is due** to abrasion by solid wheels [of heavy rubbish bins]

[emphasis added]", and not to the effects of medium axle loaded vehicles. He also stated, apparently in contradiction to his earlier observation that the designed compressive strength of the concrete was insufficient, that "the structural design and construction of the slab is adequate for the loads applied and the sub-base support according to [the GPR]". Later in that report he stated that "the spalling **was caused by traversing of the concrete slab by the solid wheels of the garbage bins** to the medium (sic) strip at the front of the units for the waste to be collected at the kerb side [emphasis added]". He also suggested that the spalling in this manner was likely to have been caused by the solid wheels of the rubbish bins before the concrete strength had reached its 28 day drying strength.

91 Mr Campbell's March 2014 report makes no mention of the other cause of spalling to which he had earlier referred as a likely cause, being the passage of furniture trucks over the slab soon after the concrete was poured, and during the 28 day period after the pour.

CAUSE OF THE SPALLING IN THE SLAB-WHAT DOES THE APPLICANT SAY?

92 In his evidence, Mr Alkemade said that the view of Mr Campbell that the cause of the spalling is the hard wheels of rubbish bins is "just wrong". He considers that the spalling is being caused by deflection by vertical load from vehicles, not by the hard wheels of rubbish bins traversing the crack. He said that what occurs during deflection is that the surface of the slab is pushed together under compression at the crack-the point of weakness-causing spalling.

93 Mr Casamento conceded in his report dated 14 November 2013 that normally spalling "will generally occur as a result of vehicular traffic, and can easily occur with light traffic". He considers it is obvious that "the heavier the traffic, the greater the possibility of more severe spalling".

94 Mr Casamento, in his evidence, elaborated on his comments in his 14 November 2013 report. He confirmed that spalling is normally a consequence of some sort of impact, usually from vehicles, but he went on the say that the spalling results from "the actual [deflection] of the slab under load" caused by the impact. The load "causes compression at the location of the crack, which tends to spall around the crack area". Spalling occurs, he said, because the slab surface has compression [at the crack] and it ruptures. In other words, he says, "spalling is due to flexure or deflection of the actual slab under a wheel load". Mr Casamento illustrated the action upon the slab that he was described by reference to a diagram of a section of slab under load.[15] He also expressed the view that the action of the slab under vehicular load compression, in the manner which he described, occurred both where a crack runs right through the slab and, equally, where a crack travels for only part of the depth of the slab.

CAUSE OF SPALLING IN THE SLAB-FINDINGS

[15] TB 166A

95 I note that spalling, where it has occurred, has often extended for the entire length of a crack. This is inconsistent, I consider, with the proposition that the spalling is caused by the hard wheels of plastic rubbish bins. The courses they take across the slab, as they are taken to the nature strip outside the development, would tend to be more circumscribed.

96 The alternate views expressed by Mr Campbell in his reports as to the cause of the spalling, prior to his coming to a final view that the spalling has been caused by the hard wheels of rubbish bins, make me less confident that I can find on the balance of probabilities that this was the case.

97 Having considered the evidence, I find that the spalling is more likely to have been caused by the deflection of the slab, where a crack has already occurred, under compressive force exerted by the load of vehicles. I therefore find that it is damage caused by deflection at cracks, which exist because of the failures by the respondent to construct the pavement in accordance with the plans and specifications.

RECTIFICATION OF THE DRIVEWAY-DAMAGES CLAIMED BY THE APPLICANT

98 The applicant says that in order for it to be provided with a pavement constructed in accordance with the plans and specifications, the existing pavement will need to be broken up and removed, the sub-grade excavated and disposed of, a 200mm class 3 crushed rock sub-base laid over a compacted sub-grade, and a new slab then placed on top. I accept that this would be required in order to achieve conformity with the contract.

99 The estimated cost of this scope of works is $140,026 including GST.[16]

RECTIFICATION OF THE DRIVEWAY-WHAT DOES THE RESPONDENT SAY?

100 The respondent says that only rectification of the existing cracks needs to be carried out. It relies on the rectification works scope described in a quotation of Vertitech Australia Pty Ltd dated 12 May 2014. The respondent says that this should provide the applicant with a serviceable driveway for its intended design life. The Vertitech quotation is for $11,880 including GST.

HAS THE DAMAGE STABILISED?

101 One of the matters required to be addressed, when determining the amount of damages to which the applicant is entitled, is whether any movement to the slab has now stabilised. If so, the respondent says, the rectification method proposed by it will ensure that the pavement will be serviceable throughout its intended design life. If the respondent satisfies me of this, then it is a matter to which I can have regard when deciding whether it would be unreasonable for me to award damages based on demolition and replacement, as desired by the applicant.

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[16] See report of Mr Casamento dated 2 May 2014.

102 The applicant, relying on the views of Mr Casamento and Mr Alkemade, says that demolition and replacement of the driveway is necessary because movement of the slab, caused by the respondent's breaches of contract, will continue. The applicant says that the existing cracks will cause continuing deflection (and consequential further cracking and spalling) of the slab. Mr Casamento considers that the slab will continue to crack as a result of differential movement caused by those factors described in paragraph 64 above

103 It claims that this will result in the pavement being unserviceable. Mr Casamento says that the cracks at the western end of the driveway are "large", and will get worse over time. For this reason, Mr Casamento concludes that the entire driveway will need to be demolished and reconstructed.

104 The respondent says that all shrinkage cracking has now stabilised. It says that given the passage of time since the date of the Certificate of Occupancy, further extensive cracking is not likely. It relies on the opinion of Mr Campbell who considers that the crack widths have approached their shrinkage limit and should not increase in size, but that unsealed cracks will continue to spall until repaired. Mr Campbell states that the only evidence as to the size of crack widths is submitted with his June 2013 report.

105 He discounts the possibility of differential settlement occurring in the future. He says that there is no evidence of ponding in the slab after rain, which would occur in the event of differential settlement.

106 He points out in his report dated 21 March 2014 that there has been no "deformation survey" provided by the applicant as would show any differential settlement of the slab, or any stepping at the joints or cracks. He also considers that "pumping" at the joints, as would indicate ongoing settlement, is not evident. Pumping is where fine gravel and sediment is forced up through cracks or joints to the surface of the slab as a result of settlement of the slab ("**pumping**"). He concludes from this that the pavement will continue to be adequate for loading.

107 He also refers to the fact that the applicant has shown no subsidence within the meaning of the GRP. This would be shown, he says, by demonstrating a heave or slump in the pavement in excess of 15 mm under a 2m long straight edge.

108 Mr Alkemade said in evidence that the slab has "deteriorated significantly in the five years…since it has been constructed and there is a likelihood that it will continue to deteriorate". He considers that by reason of the various failures by the respondent to construct the slab according to the plans and specifications, "it is going to deteriorate faster than it [would do] otherwise". Under cross-examination, he stated that he attached particular significance to the CBR ratios being 28% maximum, rather than 70% which he would have expected to have found. On the other hand, he also conceded during cross-examination:

(a) that he would not be able to discount, given the timing and nature of his own investigations, that the cracking and spalling which were evident to him, occurred during the first 12-18 months of the life of the pavement (at a time that the majority of shrinkage cracking can be taken to have occurred);

(b) that he had no way of knowing the extent of the cracking during the first 12-18 months of the life of the pavement, and therefore whether the cracks had become worse since that period;

(c) that he had no way of knowing the extent of the spalling during the first 12-18 months of the life of the pavement, and therefore whether the spalling had become worse since that period;

(d) that he had no way of knowing whether the slab will deteriorate in the future, or the way in which it may deteriorate;

(e) that it is possible that the rate of deterioration will slow, but that it is equally possible, he added, that the rate of deterioration will increase;

(f) that given that the reinforcing was placed in the zone of tension (and not in the zone of compression for the purpose of controlling shrinking) and that there insufficient number of expansion and contraction joints and control joints, it is probable that the initial cracking was caused by shrinkage and not by vertical loading; and

(g) that had the reinforcement been placed in the top half of the slab, it would have had no effect on the resistance of the slab to vertical load.

109 Under cross-examination, Mr Alkemade was not, however, prepared to concede that his view concerning the likelihood of deterioration was only a "suspicion". It was a suspicion, he said, "based on the fact that [the slab] hadn't been constructed correctly to start with". He reasserted his view that once the concrete has cracked in the way that the surface of the slab has cracked, it develops a weakness to vertical loading at that point, and is more likely to deteriorate at those locations over a period of time.

110 In his report dated 14 November 2013 Mr Casamento stated that his principal objection to the rectification method proposed by Mr Campbell is that it presupposes, contrary to his own view, that the driveway "has not suffered differential movement", and "that the slab will not move any further". Mr Casamento stated in his report that "in [his] opinion the rubble fill material will continue to settle over time, particularly due to vehicular traffic loading. With on-going settlement occurring, the concrete slab will continue to move causing further distress to the slab with cracks potentially opening up further".

111 Importantly, therefore, Mr Casamento holds the view that the sub-grade will continue to settle over time, which will exacerbate the cracking, spalling and differential settlement. This, he also says in his report, may cause damage to underground pipes and ducts, alteration of drainage falls and consequential ponding and possible damage to vehicle tyres. He

considers that although the eastern end of the driveway has suffered only minor cracking, he considers that it is highly likely that it will, over time, suffer the same distress as the western end. He says that this is because of the uncompacted fill lying below the entire length of the drive from west to east, combined with the other factors described above.

112 In evidence Mr Casamento said that he cannot accept Mr Campbell's assumption that whatever consolidation to which the sub-grade is subject has already taken place. Mr Casamento believes that the sub-grade has not consolidated to the extent that it is going to, and that the cracking will get worse. His evidence for this, he says, is "visual observation" of further cracking to the eastern end of the slab during his second visit to the development on 27 April 2014.

113 His report, which followed that second visit, is dated 2 May 2014. It states that the purpose of that visit was to inspect the slab again to determine whether there had been any change in condition since his inspection on 28 March 2013.

114 In it he concludes that "the eastern end of the driveway had deteriorated markedly [since his] earlier inspection. He considers that a number of cracks had appeared at the eastern end of the slab, and are between 1-2mm wide. He considered that this supports his earlier conclusion that "the east end of the driveway will suffer the same distress as the western end, and that the slab will deteriorate further over time".

115 Mr Casamento annexed to the report a plan of the development, in which he had plotted the extent of cracking to the slab and to the pathway. It also shows the single expansion joint and saw cut contraction joints (numbering 12 on my review) to which I have referred. He said in evidence that the plan shows in green circles 3 new cracks at the eastern end of the driveway that he says are "new cracks". Some cracks at the eastern end had also opened up on his inspection, but these were not indicated in the plan tendered. Given that the slab was over 5 years old at the time of his inspection, he discounts the cause of these being cracks being attributable to shrinkage, but are in his view caused by the compression of the sub-grade under load, together with the possibility of thermal expansion and contraction.

116 He did not observe any further cracking at the western end, however he stated that "there [had] been some deterioration to some of the crack widths". He thought that there was no obvious evidence that the slab is continuing to settle at the western end, however he believes it is difficult to assess this without long term survey results.

117 Mr Casamento considers that the slab at the western end, having already cracked as a result of settlement to date, "cannot be salvaged".

118 Under cross-examination, Mr Casamento said that during his first visit to the site he:

(a) recorded the widths of cracks over 1.5mm. These measurements are recorded in his field notes, which he did not have with him at the hearing;

(b) did not measure or plot the incidence of spalling; and

(c) did not record the extent of cracking by photographs attached to his report.

119 Mr Casamento was cross-examined extensively about the reliability of his "visual survey" technique. He was challenged about his claimed ability to note an alleged additional crack at the eastern end of the drive, resulting in a cracking formation in a "Y" shape. He was also challenged about his claim to have noted on his second inspection three other cracks at the eastern end of the drive, and his further claim that, without undertaking further measuring, cracks at the western end had opened up since his first inspection.

120 I accept the evidence of Mr Casamento that the extent of the cracking he noticed on his first visit to the development had observably increased when he visited on the second occasion. I have concluded from the evidence that the multiple failures by the respondent to construct the slab in accordance with the plans and specifications means that, on the balance of probabilities, the pavement will continue to move differentially as the uncompacted fill forming the sub-grade incurs differential consolidation. This will result in further cracking beyond that which has occurred to date.

THE APPLICANT'S RECTIFICATION PROPOSALS

121 Given his view that the cracking to the slab is uncontrolled shrinkage cracking, Mr Campbell's June 2013 report recommended a rectification method involving the saw cutting of cracks wider than 1.5mm wide, excavating the concrete to a 25mm depth between saw cuts, and filling the excavated crack with epoxy, using a gravity technique. This proposed method has now been revised by the respondent, to that proposed by Vertitech Australia Pty Ltd. It involves using a diamond faced grinder which is capable of "chasing" each of the affected cracks (taken to be 20 lineal metres) to form a "v" groove to a depth of 12-15mm, and filling the resultant voids with a high strength epoxy resin paste to the original profile upon which concrete dust is sprinkled.

122 Mr Casamento does not agree that this method of rectification will be suitable. He considers that the top half of the slab will continue to perform as unreinforced mass concrete, and that in the absence of dowels being inserted in the cracks, which would require a deeper groove, the epoxy will fail. Mr Campbell said in evidence that the bond strength of the epoxy to the concrete would be about 20 MPa, and that the compressive strength would be between 65 MPa and 110 MPa. He disagreed with Mr Casamento's proposition that in the absence of dowels being inserted in the cracks, the epoxy would "pop out".

123 During his evidence, Mr Campbell was asked to comment on these observations of Mr Casamento. He said that the carrying out of the Vertitech proposals would ensure that it would perform in accordance with the typical performance characteristics of a slab of this nature, and that the design performance life of the pavement was 40-60 years. During cross-examination, he indicated that construction being undertaken in accordance with the approved drawings is most important. So much so, he indicated, that he would be unlikely to accept a role as superintendent (and therefore be involved in approving works and payments) if he has not also supervised the construction. The applicant submits that this does not sit comfortably with Mr Campbell's proffering an opinion that the pavement will survive its expected design life notwithstanding the numerous and significant departures by the respondent from the engineering drawings. I accept this submission.

124 Most importantly, however, in Mr Casamento's view, the rectification proposal of the respondent does not address the issue of "why it's cracked". The cracking, he considers, is the consequence of the issues concerning the sub-grade, which are not being addressed by a solution involving the filling of cracks by epoxy.

THE APPLICABLE LAW

125 I have found that the respondent is in breach of the implied warranty it has provided to the respondent to the effect that the pavement was constructed in accordance with the plans and specifications.

126 The ruling principle in *Robinson v Harman*[17] with respect to damages at common law for breach of contract is that "where a party sustains a loss by reason of a breach of contract, he is, so far as money can do it, to be placed in the same situation, with respect to damages, as if the contract had been performed".

127 This is measured by ascertaining the amount required to rectify the defects complained of, and so give an owner the equivalent of a structure that is substantially in accordance with the contract (the "**cost of rectification**").[18]

128 In this case, the applicant is entitled to be put in the position it would have been had the pavement the subject of the implied warranty given by the respondent in fact been constructed in accordance with the plans and specifications.

129 I have found that it is only by demolition of the pavement and its total replacement, in accordance with the costings of Mr Casamento, that the applicant will be provided with a pavement that is in accordance with the plans and specifications.

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17 (1848) 1 Exch 850 at 855. See also *Tabcorp Holdings Ltd v Bowen Investments Pty Ltd* [2009] HCA 8

18 See *Bellgrove v Eldridge* (1954) 90 CLR 613 at 617 (per Dixon CJ, Webb and Taylor JJ).

130 There is a qualification to the cost of rectification principle: not only must the work be necessary to produce conformity with the contract, but it must also be a reasonable course to adopt.[19] The respondent says that demolition and replacement of the pavement is not a reasonable course to adopt.

131 The High Court in *Tabcorp Holdings Ltd v Bowen Investments Pty Ltd*[20] stated that the example given in *Bellgrove* of what may constitute unreasonableness[21] tends to indicate that the test of "unreasonableness" is only to be satisfied by "fairly exceptional circumstances".[22]

132 Reasonableness is a question of fact.[23] The onus of proving unreasonableness, so as to displace the cost of rectification approach to damages that I have described, is upon the builder.[24]

133 In *Clarendon Homes Vic Pty Ltd v Zalega*[25] Senior Member Walker set out some matters that he considered might be taken into account when considering whether it would be unreasonable to award the cost of rectification. He described them as follows:

> …In considering whether it would be unreasonable to award the cost of rectification, the tribunal should consider all the circumstances of the case before it The nature and significance of the breach should be looked at in terms of the bargain the parties had and the relative importance of the breach within the context of the contract as a whole…[Other considerations are:]
>
> (i) Whether and to what extent the work, although not in conformity with the contract, is nonetheless serviceable;
>
> (ii) Whether and to what extent the defect has affected the value of the work or the building as a whole;
>
> (iii) The cost of rectification, the proportion that the breach bears to the cost of rectification and whether the cost of rectification would be wholly disproportionate to the real damage suffered by reason of it.
>
> (iv) The likelihood that, if rectification cost is awarded, the sum so ordered will actually be spent on rectification. Obviously, a successful plaintiff can spend his damages as he sees fit but this may be a useful indicator of whether the amount sought is greater than the real loss suffered.

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19 See *Bellgrove v Eldridge* (supra) at p 618.

20 [2009] HCA 8 (12 February 2009).

21 Where, for example, an owner requires a wall to be re-constructed in second-hand bricks, as stipulated by the contract, where the contractor has mistakenly constructed the wall with new bricks.

22 *Tabcorp* (supra) at [17].

23 *Bellgrove* at 619.

24 *Bowen Investments Pty Ltd v Tabcorp Holdings Ltd* [2008] FCAFC 38 (13 March 2008) at [110]-[119] per Rares J.

25 [2010] VCAT 1202

134 I respectfully adopt Senior Member Walker's summary of the principles, and apply them to the facts of this case as follows:

(a) *The nature and significance of the breach in terms of the bargain the parties had and the relative importance of the breach within the context of the contract as a whole*:

The respects in which the pavement was not constructed in accordance with the engineering drawings were numerous and significant. I accept the submission of the applicant that one could reasonably conclude that the respondent had had no regard to the engineering drawings when constructing the pavement. I also accept the applicant's submissions that the dimensions of the driveway are such that it covers a large area, over which the owners of 18 of the 19 townhouses access their units on a daily basis. The exposed aggregate finish prescribed for the surface of the slab was clearly intended to make the driveway an attractive feature of the development.

(b) *Whether and to what extent the work, although not in conformity with the contract, is nonetheless serviceable*

For the reasons I have given, I accept the submission of the applicant that given the nature and extent of the departures from the plans and specifications, it is more probable than not that further damage will occur during the 40-60 year intended design life of the pavement. I conclude, therefore, that the carrying out of rectification in accordance with the proposal of the respondent (the durability of which method remains in issue) will not ensure, on the balance of probabilities, that the pavement will be serviceable throughout its design life.

(c) *The cost of rectification, the proportion that the breach bears to the cost of rectification and whether the cost of rectification would be wholly disproportionate to the real damage suffered by reason of it*

I accept the applicant's submission that the claimed cost for rectification of the driveway of about $140,000 represents about $7,700 per unit, or about 5%of the cost of construction based on the amount of $2,800,000 referred to in the building permit dated 28 March 2007. Given this analysis, I do not consider that the claimed cost is wholly disproportionate to the real damage suffered by the applicant.

(d) *The likelihood that, if rectification cost is awarded, the sum so ordered will actually be spent on rectification*.

There is no suggestion here that any amount so ordered will not be spent on rectification. I note that section 4 of the *Owners Corporation Act 2006* also imposes an obligation on the applicant to repair and maintain the common property.

Other Matters

135 I also accept the evidence of Mr Casamento that double diagonal cross-bars were not used at the corners of the drainage pits to prevent cracking outwards from those corners. Mr Casamento is of the view, from what he has seen of the cracking from the corners of the drainage pits that none of the 45 degree bars were installed.

136 The applicant also says that a dark paint applied by the respondent to the surface of the driveway is deteriorating and is unsightly. It says that the plans did not provide for the surface to be finished in this manner. Rather, it says, the respondent was obliged by the plans forming part of the planning permit to provide an "exposed aggregate finish" to the driveway. It claims $6,820 (including GST) rectification costs.[26]

137 Mr Casamento also notes that the surface pigment that has been brushed on, as opposed to being physically mixed with the concrete, has broken down. I find that this resulted in the slab presenting an unsightly appearance, unlike the appearance that would have been achieved by finishing the slab in an exposed aggregate as specified. Mr Furman conceded in evidence that the builder saved between $4,347 and $6,210 by choosing to depart from the specified exposed aggregate finish.

138 In respect of the claim for the driveway, there will be an order that the respondent pay $146,846 (comprising $140,026 including GST for demolition and reconstruction[27]) in respect of the driveway and $6,820 including GST being the cost of an exposed aggregate finish.

OTHER CLAIMS MADE BY THE APPLICANT

Pedestrian Path

139 I am satisfied that the pathway has cracked and there has been surface colour deterioration. It claims $8,416 (including GST) rectification costs.[28]

140 Mr Casamento considers that the path has cracked, and that "differential movement has occurred in some sections". The path is also laid on uncompacted fill.

141 I accept Mr Casamento opinion that there are no expansion joints or contraction joints in the pathway, and that they should have been if good construction practice was being followed.

142 Mr Casamento considers that there has been some increase in crack widths in the pathway between his inspection on 28 March 2013 and his second inspection on 27 April 2014. Mr Casamento considers, however, that because the pathway is not subject to vehicular loading, it is "highly likely that [the path] will continue to move and subside as a result of the fill [but]

[26] Casamento evidence TB p 400.
[27] Casamento report dated 2 May 2014.
[28] Casamento report dated 14 November 2013.

most likely not as quickly as the driveway slab". He therefore recommends a method of rectification that does not involve its removal and replacement.[29] I accept this. There will be an order that the respondent pay $8,416 including GST in respect of the pathway.

Timber Paling Boundary Fence

143 The applicant also claims that a timber paling boundary fence running along the western edge of the development has leaned over (and indeed suffered a partial collapse on 25 June 2014) as a result of being inadequately supported at the base. The applicant claims **$11,085** (including GST).[30]

144 Mr Casamento is of the view that the fenceposts were not anchored firmly enough into the ground, and that the rails were not properly fixed to the posts. They were fixed by nails that were also of insufficient length, rather than screws.

145 Mr Casamento considers that having regard to the screening supported by the fence, the fenceposts must be between 1 and 1.2 metres deep, and encased in concrete. He disagrees with the opinion of Mr Poon to the effect that 600mm is sufficiently deep. I accept that this fence is defectively constructed. I also accept the costings of $11,085 including GST, and there will be an order that this amount is also paid by the respondent to the applicant.

Rendered Brick Piers

146 The applicant also claims the costs that will be incurred in repairing rendered brick piers at the western and southern entrances to the development. $3,763 (including GST) is claimed.

147 I accept the evidence of Mr Casamento that the render has been applied too thinly, and that reinforcement mesh should have been inserted in the splash coat. It has since cracked through thermal expansion and contraction.

148 I accept the costings of $3,763 including GST.

149 I make the Orders attached.

Member A T KINCAID

[29] Casamento report dated 14 November 2013.
[30] Casamento report dated 5 June 2013