District Court of New South Wales

Matter Number 2715 of 2006

A V Jennings Properties Limited

(Cross Caimant)

v

DJ Potter and Associates Pty Ltd

(First Cross Defendant)

and

David John Potter

(Second Cross Defendant)

27 November 2008

JUDGMENT
CURTIS J

History of the dispute

1. On 19 October 1998 A V Jennings Properties Limited (Jennings) contracted with a Mr and Mrs Hansford to build a house for them on Lot 1 Sunninghill Ave Burradoo. On the same day Jennings took out a policy of insurance under the *Home Building Act 1989* with HIH Casualty and General Insurance Ltd.

2. Before quoting for the job, Jennings, on 25 August 1998, commissioned DJ Potter and Associates Pty Ltd, consulting civil and structural engineers, to carry out a site assessment and soil classification and to draw an appropriate slab and footing design.

3. Mr Potter, the principle of DJ Potter and Associates, attended upon the site, tested the soil and on 31 August 1998 submitted a soil report and design plan. The house was constructed upon the footings as designed, which without detrimental effect, were extended 1 metre longitudinally.

4. The house was completed on 21 June 1999 and the Hansfords then took up residence.

5. Within four to five months of moving in, the Hansfords noticed cracking in the interior plaster and the external brickwork, separation between joinery and brickwork, and difficulty opening doors.

6. On 19 October 2000, Mr Potter inspected the building. He thought that the cause of the horizontal cracks in the brickwork in the south wall could not be ascertained with any certainty, but he expected those cracks would stabilise. He thought that the gaps in the front doors and windows may be related to differential soil moisture conditions between the front and rear of the house, or shrinkage in the timber framing.

7. On 25 October 2000, Mr Potter wrote to the Hansfords informing them of his opinion and stating that the building would stabilise and that no major action should be taken until this had occurred. He advised that the displacements had not affected the structural integrity of the building.

8. The Hansfords were unhappy with this advice and in February 2001 lodged a complaint with the NSW Department of Fair Trading.

9. On 17 June 2001, Jennings commissioned Mr Barry Syme, a consulting structural engineer, to assess the problem. Mr Syme reported that the dwelling had suffered settlement at the front, in an area of fill. He postulated that the cause may be that the ground bearing at the base of the piers was not good enough, or that the tops or bottoms of the piers were dirty prior to the pouring of concrete. He said that the slab should be underpinned, and that during this work the cause of the settlement would be determined.

10. Mr Potter did not agree with this proposal. On 29 August 2001 he wrote to Jennings suggesting that the company have the design and construction of the house frame inspected by a structural engineer experienced in timber frame construction, and that there be a geotechnical appraisal of the house foundations.

11. Jennings adopted neither suggestion. In September 2001, it commissioned Appleyard Forest, Consulting Engineers, to prepare a further engineering report. On 28 September 2001, Appleyard Forest reported that the cause of the building distress was differential movement between the moist reactive clays and drier reactive clays beneath the slab. They recommended that a sealed pavement abutting the existing northern, eastern and western walls of the building be constructed in order to stabilise the site.

12. Still unhappy, the Hansfords made a claim upon the Building Insurers Guarantee Corporation. Strategic Claims Solutions Pty Ltd were appointed as managers of the claim. On 9 April 2002 Strategic Claims Solutions wrote to Jennings asking to be informed as to the remedy proposed for the site.

13. On 16 April 2002, AV Jennings replied to the effect that a number of engineers had been retained to identify the cause of the problem and the best course of rectification, but that the Hansfords had disagreed with the recommendations.

14. Coincidentally, in April 2002 Jennings had retained Mr David Slack of Davron Engineering to prepare yet another report. On 9 May 2002 Mr Slack reported that *"In summary whilst there appears to be a plethora of information that has been collected, the reason(s) for the settlements and/or movements is still somewhat inconclusive"*. He said that without a monitoring program, the problem could not be categorised as purely related to settlement of the slab on the piers, movements associated with reactive clays and/or a combination of both. He recommended that no remediation works should take place before the cause of the problem was established. Further, he stated that either of the proposed remedial works may cause additional problems if the wrong one was chosen.

15. In May 2002, Strategic Claims Solutions retained Mr Geoff Gleeson of Gleeson Consulting Pty Ltd, yet another civil engineer, to advise on the claim. On 24 May 2002, Mr David Young, Regional Manager Jennings South Coast Region, wrote to Mr Gleeson and identified the problem as soil movement consistent with the slab having been built on reactive soil. Referring to movement between surveys taken on 4 September 2001 and 10 May 2002, Mr Young said that *"Deflection or verticality measurements appear insignificant as defined within clause B3 of AS 2870"*.

16. The remedy that Mr Young proposed was the installation of appropriate mouldings to each side of affected openings, the replacement of broken or cracked bricks and the provision of a control joint to the brickwork. Internally, affected plasterboard was to be patched and repainted, and door hinges adjusted where required.

17. Mr Gleeson replied that the scope of the suggested works was totally unacceptable because it did not propose any form of foundation strengthening to the footings which, he said, *"Are deficient in respect of standards of construction"*.

18. Being of the opinion that none of the reports of the engineers retained to that time properly addressed the problems on the site, Mr Gleeson retained SMEC Testing Services Pty Ltd, consulting geotechnical engineers. On January 2003 Mr Laurie Ihnativ, the manager of SMEC, reported to Mr Gleeson that "the single most contributing factor causing the foundation settlement" was the presence of trees to the south of the house removing moisture from the soil, and that the magnitude of the settlement was exacerbated by an undersized foundation system designed for soils which had a lower moisture content than the soil on this site. Mr Ihnativ recommended that the slab perimeter be underpinned by piers to a depth of 2.5 m.

19. In response, Jennings, upon the recommendation of Mr Slack and upon the basis that the site conditions were affected by the trees, proposed on 21 February 2003 that a trench be excavated to a depth of 1.5 m on the southern boundary of the property and that

it be filled with concrete to form an effective barrier against the tree roots.

20. Mr Gleeson found this proposal unacceptable. On 4 March 2003 he wrote to Jennings demanding that an engineering design in accordance with the SMEC recommendations be provided to him within seven days, failing which he would arrange for a suitable engineering plan to be prepared and the works carried out pursuant to an insurance claim.

21. Jennings, through its solicitors, rejected this demand. The works were carried out by others and paid for by the Building Insurers Guarantee Corporation.

22. In consequence, the Building Insurers' Guarantee Corporation sued Jennings for breach of statutory warranty that the building work would be performed in a proper and workmanlike manner, and also sued DJ Potter and Associates Pty Ltd in negligence. Jennings cross claimed against DJ Potter and Associates Pty Ltd, and, because the company has no assets, against Mr Potter personally.

23. On 11 May 2007 a worthless default judgment in a sum of $212,182.13 plus interest in the sum of $51,747.36 in favour of Building Insurers' Guarantee Corporation was entered against DJ Potter and Associates Pty Ltd

24. Jennings has now reached a settlement with the Building Insurers' Guarantee Corporation pursuant to which judgment has been entered against Jennings in the sum of $90,000 plus costs in the sum of $20,000.

The pleading

25. Jennings claims contribution from Mr Potter pursuant to **s5(1)(c)** the *Law Reform (Miscellaneous Provisions) Act 1946* and damages for misleading or deceptive conduct pursuant to **s42** and **s68** of the *Fair Trading Act 1987*. The claim is particularised as follows:

Particulars of Negligence

(a) Failing to correctly classify the soil type as highly reactive or problematic;

(b) Misclassifying the soil type as moderately reactive;

(c) Did not take an adequate number of test holes in order to accurately determine the reactivity of the soil on the property;

(d) Designing footings and a slab that were not suitable to the location;

(e) Approving completed footings and slab that were not suitable for the location; and,

(f) Failing to warn Jennings of the dangers posed by nearby trees.

Particulars of Deceptive and Misleading Conduct

(a) The proper site classification for the Property was "H" or "Highly reactive" soil or class P (problematic).

(b) The slab depicted on the plan was not suitable for the soil type located on the Property and was not adequate to support the structure proposed to be erected on the property.

The substance of the complaint

26. Before submitting his design, Mr Potter assessed the soil and classed the site as Class M within the meaning of Australian Standard 2870-1996 (AS 2870-1996). He drew plans consistent with that Standard, appropriate for a Class M site, but otherwise strengthened with heavier gauge steel reinforcement.

27. Jennings now accepts that the soil samples taken by Mr Potter justified the classification of the site as *Moderately Reactive,* and no longer relies upon the contention that the proper site classification was *Highly Reactive*

28. The complaint made against Mr Potter is that, pursuant to the Standard, he should have classified the site as a Class P (Problematic) site, and designed a site-specific foundation of greater strength than that appropriate for a normal site. The introduction to the Standard specifically states that: "*This Standard does not include design details for Class P sites*", upon which site specific designs are called for.

29. Specifically, Jennings assert that the Standard required that the presence of three mature eucalyptus trees approximately 60 metres in height and some 8 to 10 metres distant from the southern boundary be recognised by Mr Potter as affecting the variable moisture content of the soil, and that the site be classified accordingly as Class P (problematic). Jennings contend that the cause of the cracking and separation on the walls of the Hansford house was severe soil movement caused by the effect of tree roots creating abnormal moisture conditions, and that the slab designed by Mr Potter was not strong enough to resist this soil movement.

Should the site have been classified as Problematic?

30. AS 2870-1996 is expressly limited to the design and construction of footing systems for single dwelling houses erected on "*normal sites*". Clause 1.3.2 defines *normal sites* as those where variations in foundation moisture are caused by seasonal and climatic changes and the effects of the building and subdivision in the presence of normal garden conditions, *without abnormal moisture conditions.*

31. Clause 1.3.3 provides as follows:

> ***Abnormal moisture conditions.*** *Where the following factors are present, the footings will have a higher probability of damage than* [a site not subject to abnormal environmental factors].
>
> *(a) Recent removal of an existing building or structure likely to have significantly modified in the soil moisture conditions under the proposed plan of the building.*
>
> *(b) Unusual moisture conditions caused by drains, channels, ponds, dams or tanks which are to be maintained or removed from the site.*
>
> ***(c) Recent removal of large trees prior to construction.***
>
> ***(d) Growth of trees too close to a footing.***
>
> *(e) Excessive or irregular watering of gardens adjacent to the house.*
>
> *(f) Lack of maintenance of site drainage.*
>
> *(g) Failure to repair the plumbing leaks.* (Emphasis added)

32. The Hansford site is classified within the Standard as a "Reactive Site". That is reactive to moisture. Beneath a thin layer of topsoil, the ground consists of clay which swells on wetting and shrinks on drying. This movement can damage buildings if the footings are not appropriately stiffened.

33. For the purpose of selecting the appropriate design, Table 2.1 in the Standard, classifies those sites which are not subject to abnormal environmental factors, in accordance with the nature of the subsoil.

Class M describes *"Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes".*

Class H describes *"Highly reactive clay sites, which can experience high ground movement from moisture changes"* and

Class P describes *"Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine substance; collapsing soils; soil subject to erosion;* ***reactive sites subject to abnormal moisture conditions*** *or sites which cannot be classified otherwise".*

34. ~~Mr Lawson contends~~ that the Hansford site was a reactive site subject to abnormal moisture conditions because of the presence of the following factor: ***(d) Growth of trees too close to a footing.*** How close is too close? To answer this question he has recourse to Appendix B of the Standard which deals with *Foundation Maintenance.*

35. This Appendix provides that after construction of a house on a reactive site, that site should be maintained at essentially stable moisture conditions, and extremes of wetting and the drying prevented. To this end, the site must be well-drained, leaks in plumbing repaired promptly, garden beds adjacent to the house avoided, and care taken to avoid overwatering. To reduce, but not eliminate, the possibility of damage on Class M sites, trees should not be planted closer than a distance equal to three quarters of the height of the mature tree. (Appendix B2.3(c))

36. The argument proceeds upon the basis that because the mature trees near the Hansford site were 60 m in height and planted closer than 45 m to the site, the site should have been classified as Class P.

37. I do not think that his argument is persuasive.

38. Clause 2.4.4 of the standard provides as follows:

Class P sites. *A site shall be classified as Class P if:*

(a) the allowable bearing pressure is less than specified in clause 2.3.5;

(b) excessive foundation settlement may occur due to the effects of fill loading on the foundation;

(c) the sites contain uncontrolled fill or certain controlled clay fill as stipulated in clause 2.4.6;

(d) the sites are subject to mine subsidence, landslip, collapse activity or coastal erosion; or

(e) the sites are subject to moisture changes due to extreme site conditions significantly more severe than the reasonable site conditions described in clause 1.3.2.[moisture variations in the foundation caused by seasonal and climatic changes].

39. This clause deals with obviously extreme conditions. Those conditions described as appropriate for the classification of a site as Class P in Tables 2.1 also reflect patent instability. The engineers who have given evidence in this case disagree as to whether the continued presence of a mature tree on the site of otherwise certain stability renders that site *significantly* more on stable

40. It may be accepted that the demands of tree roots for moisture make that part of the soil affected by those roots drier and less reactive than the balance of the site. Nevertheless the engineering consensus in this case is that mature trees create less demand for moisture than growing trees. Mr Potter in his evidence referred to an engineering text by Cameron and Earl *(Trees and Houses, CCA 1982)* who wrote:

Where a building is located near a mature tree without either severing the roots of that tree during excavation works or substantially altering the water supply to the root, the risk of damage may be considered to be negligible.

41. The recent removal of a large tree prior to construction (Clause 1.3.3(c) will obviously alter conditions on a site which were previously in balance. This must be particularly so if the tree stood within the footprint of the foundations. Similarly, the fresh moisture demands of a growing tree adjacent to a site which was

also previously in balance will also alter that balance. (Appendix B2.3(c)).

42. Mr Potter was not told by Jennings that three trees standing within the perimeter of the proposed building were removed from the site after the plans were first prepared and before his site assessment. He saw no evidence of their previous existence when he visited the site for his assessment, nor when he inspected the trenches dug for the footings. Dr Mitchell, the plaintiff's expert, says that it would be unreasonable for Mr Potter to have known of their previous existence unless obvious evidence (such as a tree stump) was present.

43. The word "*Growth*" is usually apt to describe the process of growing or increasing. Growth stops on maturity. Trees may be and are described as *growing* trees or *mature* trees. If the authors of the standard intended that the description of abnormal moisture conditions should include the *presence* or *existence* of mature trees proximate to the site, one would think they would have said so. If the Standard intended that the numerical imperative that a distance of three quarters the height of mature trees be maintained to protect a site from *extreme site conditions* again one would think that the intention would be reflected in the description of Class P sites in Table 2.1, or in Clause 2.4.4 which describes sites which must be classified as Class P rather than in an appendix under the unrelated heading "*Foundation Maintenance*".

44. I am not persuaded that, as a matter of construction, AS 2870-1996 required that this site be classified as Class P.

45. I think it relevant that Mr Ihnativ of SMEC Testing Services, a consulting Geotechnical Engineer upon whose opinion Jennings rely, inspected the site, observed the trees, took into account their propensity to affect soil moisture, yet did not classify the site as class P. Mr Ihnativ was of the opinion that the foundations should have been designed for class H site.

46. Mr Lex Welham of Southern Geotechnics, another Geotechnical Engineer upon whom Jennings rely, also noted the presence of the trees and observed that they may reduce the moisture content of the soil, yet nevertheless stated that "*The site in its original condition would therefore have been classified* ***in accordance with AS 2870*** *as being a Class H site*" (Emphasis added). Mr Welham was retained by Appleyard Forest, Consulting Engineers. The unidentified author of the Appleyard Forest report to Jennings concurred with this classification.

47. Mr Sherson, a consulting engineer with 50 years of experience and specialisation in the Southern Highlands is a past President of the South Coast and Southern Highlands branch of the Association of Civil Engineering Consultants . He is of the opinion that Mr Potter correctly assessed this site as M and that the effect of the trees on the adjacent site was not so significant as to affect this determination.

48. In circumstances where the Standard admits of ambiguity, and four highly qualified professional engineers hold opinions to the contrary, I am not persuaded that AS 2870 required that the Hansford site should be classified as P or problematic, rather than

as M or H. Jennings no longer contend that the classification should have been H rather than M.

If the site was properly to be classified as Class P, Mr Potter's response to the problems identified on the site was nevertheless reasonable.

49. If, because of a Class P classification, no design within the Standard was appropriate, the duty of Mr Potter was to design a slab which was appropriate for the particular site. In the discharge of this duty he was entitled to have regard to the fact that his designs had proved adequate on similar sites for the previous 10 years.

50. Clause 1.1 of the Standard states that: *This Standard shall not be interpreted so as to prevent the use of materials or methods of design not referred to herein. Specifically, this standard shall not be used to prevent the use of locally proven designs, or alternative designs in accordance with engineering principles.*

51. Clause 1.4 .3 declares that: *The design of footing systems shall consider:*

(b) Past satisfactory performance of similar footings on similar sites.

(c) Control, but not prevention of, shrinkage cracking

52. Mr Potter practised as an engineer in the Southern Highlands between 1986 and 2002. Over that time his company undertook site classifications on between 9,000 and 11,000 building sites, many for AV Jennings. Most of this work was carried out by

him. In the three years before his assessment of the Hansford site Mr Potter assessed some 20 sites within a few hundred metres of the Hansford site, and about 250 sites within a radius of 3 km. Of this latter number, 22 sites were assessed for AV Jennings. He says, and I accept, that because of his local experience he is extremely familiar with the soil profiles in most areas of the Southern Highlands, and that the trees which are extremely prevalent on building sites are an integral part of the attraction of the area. He further says that, apart from this instance, no site assessment prepared by him has been challenged.

53. Mr Potter was conscious of the Standard and of the presence of the trees when he prepared his design. He noted that they were mature trees and he did not consider that they would have a significant impact on the area upon which the house was constructed. His classification and design was subject to alteration if tree roots were found when the site was excavated. He inspected the excavation for the slab and found no evidence that tree roots were present. He was informed by the engineering consensus that growing trees take more water from the soil than mature trees, and by the engineering text by *Cameron and Earl* cited above.

54. Mr Potter drew a design that is not a Standard Design within AS 2870-1996. Although the design had elements in common with a design suitable for a Class M site, it specified reinforcing steel substantially stronger than would normally occur in a Class M design, and stronger than required for a slab built on a Class H site. Table 2.3 of the Standard classifies surface movement of 20 mm to 40 mm as class M and surface movement of 40 mm to 70

mm as class H. According to calculations by Dr Mitchell, an expert called by Jennings, Mr Potter's design was adequate to cope with surface movements of 60 mm.

55. If Mr Potter's designs for sites classified by him in accordance with his usual practice as Class M in the presence of mature trees were inadequate, one would have expected that Jennings, for whom he did much work, to have led evidence of failures and warranty claims.

Expert evidence

56. The expert evidence in this case is to be read in conjunction with AS 2870-1996. Table 2.3 of the Standard correlates site classification with the predicted range of surface movement caused by moisture changes from characteristic dry to characteristic wet conditions in the absence of any building. Classification as "M" (moderately reactive) estimates surface movements of between 20 mm and 40 mm. Classification as "H" (highly reactive) estimates movement of between 40 mm and 70 mm.

57. Appendix B3 of the standard states that:

It is acknowledged that minor foundation movements occur on nearly all sites and that it is impossible to design a footing system that will protect the house from movement under all circumstances. The expected performance of footing system designed in accordance with the Standard is defined in terms of the damage classifications in Table C1, Appendix C... For most situations Category 0 or 1 should be the limit. However, under

adverse conditions, Category 2 should be expected although such damage should be rare. Significant damage is defined as Category 3 or worse

58. Table C1 in Appendix C classifies damage to the walls of a building consequent upon foundation movements. Damage Category 1 consists of cracks of width less than 1 mm which do not need repair. Damage Category 2 consists of cracks of less than 5 mm which are noticeable but easily filled, and doors and windows which stick slightly. Damage Category 3 consists of cracks of 5 mm to 15 mm (or a number of cracks 3 mm or more in one group) which cracks can be repaired, with possibly a small amount of wall needing to be replaced, doors and windows which stick, possible rupture of service pipes and the impairment of weather tightness. Table 2.2 of the Standard envisages that Class H sites may experience differential movements of 30 to 50 mm associated, although rarely, with Category 3 damage.

Expert opinion relied upon by Jennings

Appleyard Forest

59. The report of Appleyard Forest, Consulting Engineers, was commissioned by Jennings. Its author is not identified. Upon inspection of the Hansford house in September 2001, Appleyard Forest noted a significant amount of cracking over the filled area of the site compared with the cut area. The filled area was on the northern side of the house, that is on the side which did not face the trees. Appleyard Forest reported that the northern side of the slab had subsided.

60. Appleyard Forest commissioned Southern Geotechnics to investigate the site and, accepting Southern Geotechnics opinion that the site should have been classified as Class H, concluded that the cause of the subsidence was differential movements between moist reactive clays and drier reactive clays.

61. Appleyard Forest also commissioned Campbell and Anderson Pty Ltd, consulting surveyors, to survey the slab. One survey was carried out in September 2001 and another in late 2002. Appleyard Forest noted the survey of September 2001 measured a deviation along the south side of the house of approximately 1:350 and a deviation on the north side of approximately 1:180 and reported that this equates to Damage Category 1 and Damage Category 3 respectively *in accordance with AS 2870.* I have read AS 2870 and can find no support for this expression of opinion. An expert consulting engineer called by the plaintiff, Mr Warwick Davies, uninformed by *Makita v Sprowles,* points out in his report that Appleyard Forest do not explain how a particular deviation *equates* to damage of a particular category.

62. Mr Davies does not agree that the cracks reported by Appleyard Forest are within the Damage Category 3.

Dr Peter Mitchell

63. Dr Mitchell is a practising Geotechnical Engineer with 36 years experience. He is of the opinion that pursuant to AS 2870-1996, the presence of nearby trees required that the site be classified as P. Dr Mitchell says that the footings as designed by Mr Potter did not possess the strength and stiffness required to cater for the soil movements caused by abnormal moisture changes associated with

tree roots, and that this was the reason for the distortion that occurred

64. Dr Mitchell gave evidence and was cross-examined. I formed the view that, while honest, Dr Mitchell was so far committed to the correctness of his opinion that his objectivity was compromised.

65. Dr Mitchell agreed that his postulation that major soil movements occasioned by the tree roots caused the problem in the Hansford house could have been tested by measurement. He initially said that such measurement was impractical, because the site conditions of the time of construction were unknown, and subsequent testing would involve drilling holes in the interior of the house through the floor slab. When pressed, he agreed that the effect of the trees upon the soil could be gauged by testing other places on the site, outside the house. He did not perform such testing.

66. When questioned about the relevance of tree roots not being found in the Southern Geotechnical test pit dug on the south side of the house (between the house and the trees), Dr Mitchell said that, although there was no direct evidence of tree roots, the analysis of Southern Geotechnical provided indirect evidence that soil roots in that pit affected the soil profile because the soil was drier than a test pit dug at a site north of the house. Dr Mitchell said that the *"only explanation"* for this discrepancy was the presence of the trees. When it was put to him that other explanations may include heavy watering of a garden above the northern test pit, or problems with stormwater drainage to a rubble soak pit to the north of the house, Dr Mitchell agreed. He

then said in explanation that in either case the northern test pit would have been much wetter than that indicated. This explanation is not entirely plausible. Commonsense would indicate that the degree of moisture would depend upon how much the garden was watered.

67. Dr Mitchell said that the foundations *"had a high probability of success in the absence of severe moisture changes"* and agreed that the three large gum trees to the south of the property would not cause subsidence in the slab "*unless you have a marked change in weather pattern"*. He did not however check the rainfall figures in order to test his theory. Mr Slack of Davron Engineering did go to the trouble of obtaining records from the Bureau of Meteorology. The records disclose no marked change in weather pattern. Dr Mitchell's comment that *"I don't think I need to be familiar with the rainfall and evaporation records for the site"* reflects his persistent failure to accept that there may be alternative explanations for the problems in the house.

68. When tested with a suggestion that the problems became manifest within a four-month period, Dr Mitchell said that it was common for the problems to be manifested in such a short time during the periods of January, February, March and April which are periods of rainfall deficiency. He later agreed that if the cracking occurred within four months of the completion of the house in June, that cracking would be *"unusual for tree effects"*.

69. Surveys of the slab were conducted by Campbell and Anderson, surveyors, on September 2001 and May 2002. The surveys reveal relative movements along the southern perimeter of the slab. Dr

Mitchell, in his report of 4 September 2008, said that the observed differential deflections indicated a relative settlement of the central section of this perimeter caused by the presence of trees. The maximum deflection recorded was 15 mm. Dr Mitchell rejected the suggestion put to him in cross-examination that 15 mm over the period September to May was insignificant.

70. Jennings have tendered evidence that Mr David Young, their South Coast Regional Manager, thought this movement *insignificant as defined within clause B3 of AS 2870*, (which clause addresses the performance requirements of foundations).

71. Dr Mitchell prepared graphs to illustrate this deflection, attached to his report as Appendix B. In cross examination he initially maintained that movements of a scale indicated on his graphs were not seen in the absence of trees, even on class H soil. He later gave this evidence:

Q. Those graphs are not incompatible or inconsistent with tree roots having nothing to do with it. I appreciate your view they do...

A. Provided it's a class H, D type soil profile.

A CSIRO Information Sheet attached to the report of Appleyard Forest states that "*A masonry veneer house with articulation joints is designed for a movement limit of 30 mm... If the vertical differential movement is less than the prescribed limit the footing system has performed up to standard*". The Hansford house was fully articulated.

72. When he first expressed his opinion that the trees had caused the damage to the Hansford house, Dr Mitchell believed that the cracks had not occurred until the summer months of the following year. In re-examination he confirmed that it was unusual for tree roots to have an effect between June and October, the period of low evaporation. He expected the trees to have an effect in the coming summer. He then gave this evidence:

Q. Does that cast the slightest doubt upon your mind?

A. No - because what happened in those first few months must be some readjustment to the soil moisture which would be normal changes, just the trees have had an effect at a later stage than the first few months after construction.

Q. So you have no doubt at all that this is caused by the tree root, no possible doubt?

A. I've got no doubt your honour, yes

73. This exchange confirmed my view that the evidence of Dr Mitchell was not objective. Before preparing his reports Dr Mitchell was provided with the report of Davron Engineering dated 9 May 2002 prepared by Mr Slack. In that report Mr Slack said:

Without the hindsight of any earlier visits we have the Appleyard Forest photographs taken in September 2001 which have been included within the Structural Investigation Report and the verbal advice from the A V Jennings and maintenance supervisor that the cracks and observed settlements do not appear to have

significantly moved from when they were first observed approximately 6 months after the dwelling was completed.

The September 2001 photographs also show that there has been no observable changes within the cracks and/or other building element movements over the last six months.

74. This evidence establishes that the appearance of the cracks, which appeared before October 1999, did not significantly change in the two and a half years which elapsed before Mr Slack's inspection in May 2002. Mr Ihnativ of SMEC Testing Services reported that his inspection in December 2002 established that there was still no appreciable change in the appearance of the cracks. The SMEC report had also been provided to Dr Mitchell.

75. The period September 2001 to May 2002 is a period which encompasses the months of January to April in which, according to Dr Mitchell, soil movement associated with the presence of trees is likely to be at its maximum. It was during the whole of this period that the measured movement did not exceed 15 mm.

76. The explanation offered by Dr Mitchell to reconcile the inconsistency between his conviction that the trees caused the problem and the fact that the problem appeared in winter, not summer as he had thought, is implausible. It is also incompatible with information provided to him in order that he may form an objective opinion consistent with the known facts.

Mr Laurie Ihnativ

77. Mr Ihnativ, who holds the degrees of Bachelor of Engineering and Master of Engineering Science, is the manager of SMEC Testing

Services. He carried out testing of a site for Gleeson Consulting and formed the view that "*The tree/s to the south of the house removing moisture from the soil is the single most contributing factor causing the foundation settlement that has occurred*"

78. Mr Ihnativ conducted laboratory tests upon a sample taken from a borehole dug some distance from the house, classified the site as *highly reactive (H),* and said that the *moderately reactive (M) classification* adopted for the foundation design by Mr Potter was *"incorrect".* That conclusion, expressed in his report of January 2003, is to my mind unfair. Mr Potter had the advantage of having assessed a soil sample taken from directly beneath the proposed foundation.

79. Earlier in the report, Mr Ihnativ had observed the possibility that variations may occur between test locations and that no subsurface exploration program, no matter how comprehensive, could reveal all subsurface details and anomalies. Dr Mitchell gave evidence that it was difficult to distinguish the border between M and H which is arbitrarily set at 40 mm. He said that one engineer may assess soil at 35 mm and another the same soil at 45 mm, "*both equally confident and both right because that type of range is typical*"

80. Mr Lawson for Jennings has, correctly in my view, specifically disavowed advancing any case that the appropriate soil classification was class H.

81. Mr Ihnativ based his opinion that cause of the foundation settlement was the presence of trees, upon a survey showing spot levels on the floor slab. He says that the contours clearly showed

a definite pattern of settlement with the greatest settlement in the middle of the southern side of the slab. He said that *"the differential settlements are 25 mm to 30 mm between the centre and the eastern and western ends, and 25 to 30 mm between the northern and southern ends"*.

82. If that was the extent of movement, then the footing system had performed up to the standard referred to in the CSIRO Information Sheet. Although some readings on the survey indicated differences of 40 mm, that data is suspect because of inherent difficulties in measuring differential levels within a house. Mr Sherson said that internal levels are not reliable as they do not take into account variations in floor finishes. Dr Mitchell said that floor coverings influence interior level survey results and that *"you have to be very careful in interpreting the data. It is still useful provided the reader clearly understands the uncertainties regarding the measurements"*.

83. A further problem with drawing conclusions from this survey is that it proceeds upon the assumption that when the concrete for the slab was poured it formed a perfectly flat surface. That assumption is challenged by some of the experts. Mr Potter gave evidence that a 25mm difference in height within a slab is consistent with construction tolerances.

84. Mr Ihnativ agreed that only three cracks fell into Damage Category 3 within the classification of the Australian Standard. It follows that all of the other cracks were either fine cracks which did not need repair or cracks which were noticeable, but easily filled. He further agreed that in that respect the slab had

performed within the accepted parameters of a Class H site. No case is made that, if the site was a class H site, Mr Potter was negligent in classifying it as a Class M site.

Mr David Slack

85. Mr Slack was not required for cross-examination. He prepared the report of Davron Engineering dated 9 May 2002 which was tendered by Jennings. Mr Slack is of the opinion that there is insufficient evidence to categorise the problem as caused by settlement of the slab on the piers, movements associated with reactive clays, or a combination of both.

Barry Syme

86. Mr Syme, a Consulting Structural Engineer retained by Jennings, inspected the site on 7 June 2001. He observed that the dwelling had suffered settlement to the front of the building within the filled areas. He reported that this can happen from time to time due to the ground bearing at the base of the piers being not good enough, or the tops or bottoms of the piers being dirty prior to pouring concrete. Mr Syme recommended that the house be underpinned, and said that the cause of the settlement could be ascertained in the course of this work.

Expert opinion relied upon by Mr Potter

Mr Potter

87. I have already described Mr Potter's qualifications and experience and touched upon parts of his evidence. He says he correctly assessed the site as a Class M site, and that the slab which he

designed has performed acceptably within the limits for a class M site design. The Standard accepts that, regardless of footing stiffness but concomitant with ground movement, there may always be some damage to slabs and walls.

88. Mr Potter points out that the distress in the building was mostly evidenced by separation of windows and frames from the surrounding brickwork. The Appleyard Forest report noted one brickwork crack of 8mm width, one of 5mm width and no other greater than 1.8mm width. This gives little or no support to the contention that the footings were not behaving satisfactorily.

89. In his letter of 25 October 2000 to the Hansfords, Mr Potter expressed the opinion that the gaps or cracks at the front of the house may have been caused by shrinkage in the roof or wall framing and particularly differential movement between the wall framing of the roof trusses and window.

90. In the letter of 29 August 2001 to Jennings, Mr Potter recommended that they seek an inspection of the design and construction of a house frame by a structural engineer experienced in timber frame construction to determine whether there were any structural deficiencies.

91. Mr Potter said that he was called to the site by a Mr Bunter, Jennings' building supervisor, some time in 2000 to look at the cracking. He said to Mr Bunter at the time *"What do you think it's due to?"*. Mr Bunter replied "*Well I suppose frame*". Mr Potter said in evidence that neither he nor Mr Bunting thought it was a footing problem, because the cracking occurred so soon after

construction, and the pattern of cracks was not typical of that caused by footing problems.

92. Mr Potter gave this evidence:

Q. How is it then that there were cracks, what's the explanation for the cracks in your opinion?

A. Perhaps I should say I wish I knew. The horizontal crack along the south wall which has got nothing to do with articulation, I think the most obvious thing is brick growth, as I mentioned earlier. Most of the other movement is not cracks in brickwork but internal movement showing up in damage to plasterwork, movements around doors and windows, and movement around doors and windows is wholly consistent with articulation, that's what articulation is meant to accommodate.

Q. So the slab has moved?

A. No. That's not necessarily the case.

Q. What's the articulation to prevent?

A. The articulation is there to accommodate slab movement but if the frame is defective in some fashion in its construction...

Q. It accommodates that as well?

A. That will also show up at those points.

In context, this last answer refers to the observed points of separation or cracking. The effect of the articulation is that if the timber frame is faulty, this will cause movement, revealing itself as separations at the points of articulation.

93. Mr Lawson for Jennings submits that I should not accept any opinion evidence from Mr Potter because of his obvious interest in the outcome of the litigation. I am prepared to discount the opinions of Mr Potter on this score but not disregard them entirely. With the exception of his evidence in relation to the possibility of the defects being caused by the timber frame, (not addressed by other experts) Mr Potter's opinions are supported by highly qualified experts who have particular experience in the locality of the Hansford house.

94. Dr Mitchell, consistently with Mr Potter's opinion, conceded that the movement of wall frames could cause cracking or separation, although he did not think that it had occurred in this case. Mr Davies said that the separations up to 8 mm in width could have been caused by the use of unseasoned timber in the walls.

Mr Warwick Davies

95. Mr Davies has worked continuously as a Geotechnical Engineer and Engineering Geologist within Australia for the past 42 years. He is familiar with the Bowral, Mittagong and Moss Vale areas.

96. Mr Davies believes that the site should have been classified as P because of:

The presence of the trees on the property adjoining the southern side..., the and

The possibility that changes to those trees (their continued presence and/or growth patterns) could occur outside the control of the owners of the building site.

97. Notwithstanding this conclusion, Mr Davies thinks it "*Most unlikely that the slab design has contributed to the building damage. It is more plausible that the slab was not constructed in accordance with the design.*" He points out that there is no data to confirm any soil moisture changes that may have occurred between the time of the building completion and the occurrence of the damage, and says that, in the absence of such data, any opinion as to the actual soil behaviour, and the corresponding response of the footing system is pure speculation.

98. Mr Davies rejected the proposition that the presence of trees caused movement in the slab. He said that mature trees reach an "equilibrium" or "plateau" with the soil moisture regime. It was very significant in his opinion that the damage occurred within such a short time frame as four or five months after completion of this house because it is most unlikely that any measurable change could have occurred in the soil conditions over that time.

99. Further, Mr Davies observed that the calculations of Mr Mitchell establish that the slab/footing design of Mr Potter was adequate to cater for reactive soil movements of up to 60 mm, and there is no evidence that any soil movement occurred at all in the time between completion of the building and the first reported occurrence of damage, let alone movements in excess of 60 mm.

100. Mr Davies also said that because the accuracy of the surveys conducted on September 2001 and May 2002 was plus or minus 5 to 10 mm it was not possible to be sure that the slab moved at all during that period, let alone 15 mm. If it had moved 15 mm that

was well within the tolerance of the Standard, which accepts a ground movement of 40 mm within a Class M design.

101. If differential soil movement did occur then, in Mr Davies opinion, that was because of:

1. Inadequate compaction of fill beneath the slab,

2. Inadequate founding of the slab perimeter beams, internal stiffening or pier extensions to the footings,

3. Different behaviour of the filled area of the building footprint compared with the cut area, in terms of soil moisture adjustments following disturbance to the site through the building construction,

4. Leaking services (water and/or sewer) beneath or beside the slab, causing wetting of the soil.

5. Anomalous soil conditions, for example the presence of a weathered volcanic dyke that has produced an extremely highly reactive soil locally.

102. If soil movement had occurred in response to any of these circumstances, Mr Davies was of the opinion that the slab designed by Mr Potter had accommodated that movement within the tolerances accepted by the Standard.

Mr D R Sherson

103. Mr Sherson's qualifications and experience are stated above. He is of the opinion that the cracking in the house is most probably related to differential settlement of the floor slab of up to 35 mm.

While he agrees this is above the 30 mm division between M and H sites, he comments that the tolerance of the method by which the surveyors reached that figure may exceed 10 mm. Implicit in his evidence is an unstated premise that this movement is within the tolerances accepted by the Standard.

104. Mr Sherson says that Mr Potter, consistently with the methods dictated by the standard, correctly assessed the site as Class M. He further says that the slab design prepared by Mr Potter appropriately took into account the presence of the trees by including a beam 600 mm deep on the southern perimeter which would guard against the intrusion of tree roots.

105. Mr Davies and Mr Sherson were impressive witnesses. They each have particular experience in the localitiy of the Hansford house. They each demonstrated objectivity in making concessions and admitting alternative possibilities to the conclusions which they thought more probable. Where their evidence is in conflict with that of Dr Mitchell, I prefer the evidence of Mr Davies and Mr Sherson.

Conclusion

106. The evidence establishes the following propositions. Differential soil movement as a result of severe moisture changes caused by the presence of tree roots does not occur unless there is a marked change in weather pattern. The cracks and separations in the Hansford house occurred in the winter months between June and October of 1999, when abnormal moisture conditions causing soil movement were least likely to be present. Meteorological records establish that there was no marked change in weather pattern in

that period. There was no appreciable change in the extent of the cracking and separation over the following three years. Monitoring of the slab between September 2001 and May 2002 demonstrated insignificant movement. This period included the summer months of January to April 2002 when abnormal moisture conditions caused by tree roots, if that was the cause of the problem, were most likely to occur.

107. I am unpersuaded that the cause of the cracking and separation on the walls of the Hansford house was severe soil movement caused by the effect of tree roots creating abnormal moisture conditions. Further I am unpersuaded that the slab designed by Mr Potter was inadequate to cope with the geophysical demands of the site.

108. On 18 March 2003, Jennings through their solicitors, Sutton and Co, wrote to Gleeson Consulting asserting that there was *nothing to suggest that Mr Potter erred in his design.* The letter went on to state: *In all the circumstances an impartial approach to the totality of expert evidence available suggests that you have exaggerated the problem and judged the probable cause based on incomplete geotechnical evidence.*

109. This letter was written at a time when Jennings were in possession of the Appleyard Forest report, the Southern Geotechnics report, the surveys of Campbell and Anderson, the SMEC report of Mr Ihnativ, the Davron Engineering report of Mr Slack, and the report of Mr Barry Syme. Jennings also had the benefit of the opinions held by their employees Mr Young and Mr Bunter, neither of whom are called in this trial. I think that the letter fairly summed up the evidence then available. The only

additional material upon which Jennings now rely is the opinion of Dr Mitchell. For reasons which I have already expressed, I do not accept this opinion.

Orders

110. Judgment for the cross defendants.

Cross claimant to pay the costs of the cross defendants.

Mr M Lawson instructed by Atkinson Vinden Heazlewoods appeared for the cross claimant
Mr R W Seton SC instructed by Peter A Collins and Associates appeared for the cross defendants

110 I certify that the previous paragraphs are the Reasons for Judgement of His Honour Judge Curtis.

Associate.