REPUBLIC OF SOUTH AFRICA

HIGH COURT, SOUTH GAUTENG DIVISION (JOHANNESBURG)

(1) REPORTABLE: No
(2) OF INTEREST TO OTHER JUDGES: No.
(3) REVISED.

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Case No. 13620/2013

In the matter between:

GLYNDEN PROPS 21 (PTY) LTD Plaintiff

And

POWELL BOSWELL & ASSOCIATES First Defendant
PARAGON PROPERTY DEVELOPMENTS (PTY) LTD Second Defendant
GAUTENG PILING (PTY) LTD Third Defendant

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JUDGMENT

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MEYER, J

[1] Mr and Mrs Willcocks, through the plaintiff, Glynden Props 21 (Pty) Ltd (Glynden), as their property holding company, purchased a piece of land on the western

slope of the Boskruin Hill in Randburg, Johannesburg (the site) for the purpose of building a new residence on it with spectacular views. A team of professionals was appointed to attend to the task, which ultimately cost a total of about R20 million. Design errors relating to part of the foundation system were made causing structural defects which now require extensive remedial work to be undertaken, below ground level and to the superstructure. The cost thereof is what Glynden presently seeks to recover, either from the first defendant, Powell Boswell & Associates (a firm of consulting civil and structural engineers), which was appointed as the structural engineer for the project, or from the third defendant, Gauteng Piling (Pty) Ltd, which designed and installed the reinforced concrete piles that form an element of part of the foundation system of the house, or from both.

[2] Mr Allan Willcocks, and the expert witnesses Mr Bryan Tromp (consulting geotechnical engineer) and Mr Antony Ritchie (consulting structural engineer) testified for Glynden. Mr Michael Boswell (consulting structural engineer), the expert witnesses Mr Anthony Butterworth (consulting structural engineer) and Mr Jacobus Crous (geotechnical engineer and piling specialist) testified for Powell Boswell & Associates. Mr Nico Maas (structural engineer), the expert witnesses Dr Peter Day (consulting geotechnical engineer) and Mr Andries Oosthuizen (consulting structural engineer) testified for Gauteng Piling (Pty) Ltd (Gauteng Piling). I refer to these witnesses by their surnames. The expert witnesses prepared reports and they testified on the questions of liability and quantum. Their reports and evidence reflect a large degree of agreement, especially in respect of the cause of the structural damage that occurred, the remedial measures to be taken and the costs thereof.

[3] Due to the topography of the site a level terrace comprising an engineered fill and concrete block retaining wall were constructed upon which the western part of the proposed new residence (a garage on the ground floor and a lounge on the first floor) was to be built. Crous explains that an engineered fill is one that has been constructed under controlled conditions and compacted with a good quality soil. The remainder of the proposed residence was to be built on natural ground or rock into the hillside. The engineered fill and retaining wall were designed, specified, put out to tender and the construction thereof supervised by a firm of civil engineers, FSSE Foundation & Slope Stability Engineering (FSSE), represented by its professional geotechnical engineer, Mr Johan Joubert (Joubert). Kalode Construction (Pty) Ltd (Kalode) was appointed to construct the engineered fill and retaining wall, which works were completed during late July or early August 2003.

[4] Tromp explains that the site is on the side of a granite 'koppie' or hill which slopes down on the western side. The terrace is cut into the natural hill and built-up of engineered fill that is compacted to a level of about 7 – 8 metres at the lower part of the slope and retained by a concrete block wall that is reinforced with a geo-synthetic membrane installed immediately behind the concrete block wall. This type of retaining wall is known as a 'Löffenstein wall' (the retaining wall). The geo-synthetic fabric retains or limits the outward movement of the soil. It is designed to a tensile strain value which determines the anticipated deflection or movement of the overall structure on completion of construction and for some time thereafter. The expected and anticipated movement of the retaining wall in this instance as designed is in the order of about 75 millimetres.

[5] The expert witnesses agree that it is common knowledge that fabric reinforced concrete retaining block walls, such as the one constructed in this instance, and the fills they retain, undergo horizontal and vertical movements. They agree that these movements normally continue for a period of years after construction. It is also undisputed that the unusual and critical terrain parameters due to the engineered fill and the retaining wall required special structural and geotechnical engineering solutions for the design of an appropriate foundation system. Firstly, the terrain is a complex topographic site. Secondly, there will be horizontal and vertical movement of the retaining wall and the fill. Thirdly, there is a potential of vertical settlement of the fill due to its own weight. Fourthly, there is a potential of vertical settlement of the soils underlying the fill due to the weight of the fill that is above it. Fifthly, there is a potential of differential settlement (vertical displacement) between the *in situ* ground and the engineered fill, because each has a different parameter of compressibility. Sixthly, there is potential differential settlement or compressibility within the engineered fill because its depth varies between one or two and seven or eight metres. These founding conditions on site are referred to as critical terrain conditions or parameters.

[6] Mr Dirk Maat of Integrated Building Services (Maat) represented the plaintiff as project manager or principal agent during the initial stages of the project. Glynden appointed Mr Pellegrino of TPC Architects (Pellegrino) as the architect for the proposed residence and the second defendant, Paragon Property Development (Pty) Ltd (Paragon), as the main contractor. Glynden initially appointed Hofmeyer Design Services as the structural engineer to design all structural aspects of the proposed new residence. But Mr Hofmeyer passed away and Glynden, on 18 June 2003, on the

recommendation of Pellegrino, appointed Mr Boswell of Powell Boswell & Associates (Boswell) as the structural engineer in his stead.

[7] It is common cause that Boswell's provision of professional services in terms of the agreement that was concluded between Powell Boswell & Associates and Glynden on 18 June 2003 (the structural agreement) included, inter alia, the design, detailing and supervision of all the structural elements of the proposed residence. Boswell accepts Willcocks' evidence that he undertook to provide 'a complete engineering solution' in respect of the structural aspects of the project. It is common cause that Boswell was responsible for the scope of work related to the structural engineering. It is undisputed that the structural envelope which a structural engineer designs includes reinforced concrete slabs, beams, columns, load bearing brick work (in some instances) and foundations to support the structure.

[8] Willcocks testified that he was concerned about the complexity of constructing part of the house on engineered fill and part of it on natural ground and he brought this fact to the attention of Boswell at a meeting which they had on site at the time of Boswell's appointment. Boswell assured him-

'…that he was a professional engineer, he had an excellent history, and he was more than capable of doing the job of this magnitude, and he would take ownership of the entire project.'

Willcocks further testified as follows about this meeting:

'At the time I had stressed to Mr Boswell that I thought his fee was expensive in comparison to the other quotation and he assured me that it was value for money and it was a difficult job and it involved extensive engineering service and I said well if that is the case then we accept it for

what it is but we would like to have peace of mind that we have a professional engineer on board and we have a professional service.'

Boswell has no recollection of this meeting.

[9] Initially the plan was to found the entire house on conventional spread footing foundations. Boswell testified that once the architectural structure had been finalised and he had a look at the loads that were going to be placed on the engineered fill, he felt uncomfortable to put conventional spread footing foundations on the terrace. In this regard he testified:

'. . . My gut feel was that we would have undue settlements and the alternative was to go the piling route. … I discussed this with Johan [Joubert] and hence our suggestion that maybe the piling route is the best route for that portion of the structure that fell within the engineered fill. It gave me a little bit of comfort to know that my decision to go the piling route was correct, when the very man who designed the engineered fill agreed with me and agreed that there could be unacceptable settlements. … I was never party to the control of that engineered fill. You can look at the drawings and you can see that it is done in 150 or 200 millimetre layers right from the bottom built-up layer by layer with a G4 and G5 material. The G4 is a classification of a type of material. G4 has been a better material than a G8. But I was never given any report to say that it had all been built according to the specification. Not being an expert in engineered fills, I just felt, a gut feel is what we had, that it should not be put onto spread footings. It is also related to what happens at the back of the house, which was by then we had established essentially on very good material and rock, which means that if you support structure on rock and the front portion is on a softer material, you are going to get differential movements. Whereas if you put in a pile that it would go straight down to bedrock and therefore your differential movements would be limited to acceptable conditions.'

[10] On 11 August 2003 Boswell addressed an email to Maat in which he advised as follows:

'Following discussions with Johan Joubert we both express our reluctance to found the residence on conventional spread footings considering the differential compressabilities of the un-situ (sic) ground and engineered fill. The stepped nature of the structure and the positions of the cut fill line also make articulations of the structure difficult and would adversely affect rigid finishes.

We suggest we ask for prices from a few piling contractors to supply say 600 [millimeter in diameter] piles only where required. This one-off size should also be capable of drilling past any small to medium rock floaters. . . . Please confirm how we should proceed.'

Boswell explained when he testified that from his-

'… observations on previous jobs where there had been piling, there was often resistance by rock to a small pile diameter, whereas the bigger piles, the 600's and 500's, could quite often take out a floater of that sort of size'.

Mart conveyed the recommendation of Boswell to Willcocks and, because it was a recommendation from the structural engineer of the project, Willcocks accepted it without question. Boswell testified that Maat confirmed to him

'. . . yes you can go out and get a couple of prices'.

[11] A site meeting took place on 12 August 2003. Boswell and Willcocks were amongst those who attended the meeting. It is recorded in the minutes of the meeting that-

'… the engineer proposed that the building in the filled areas is piled in view of the potential settlement. A meeting is to be arranged with Gauteng Piling to agree on the extent and to obtain a price.'

[12] The meeting to be arranged was one between Boswell and Maas, who was Gauteng Piling's managing director at the time and presently its chairman. Boswell testified that-

'an order of magnitude costing' was needed 'in order to present it to the client to see whether it was acceptable or outrageously expensive which should have required redesigning the house or moving it'.

Maas and Boswell had a good working relationship and played golf together. The services of Gauteng piling were engaged in numerous projects in which Boswell was involved in the past. Boswell testified that-

'[t]hey were always called in to give a design and supply a pile to suit the vertical loads that we would have supplied'.

[13] On 14 August 2003 Boswell spoke to Maas telephonically. Maas made a contemporaneous note of the conversation. That is his usual practice. From the note it appears that Boswell told Maas that there was a 'monstrous' house of 1350 square metres to be constructed on the side of the hill in Boskruin that requires piling. Maas recorded the name of the company which constructed the fill and retaining wall. It is, therefore, safe to assume that Boswell advised him of the engineered fill that is present on the site although Maas testified that he has no recollection of Boswell mentioning or alerting him to the terrace. Maas recorded pile diameters of 600 mm and of 400 mm. He testified that the 600 mm pile diameter was probably mentioned by Boswell as one that could dislodge floaters or small boulders and that the 400 mm pile diameter was probably suggested by Maas as an alternative diameter. Boswell does not have a recollection of this discussion. He testified that because it was 'not a very big job' they

probably would have discussed it briefly telephonically and that he would have asked Maas 'for his range of pile sizes to withstand certain vertical loads'.

[14] On 18 August 2003 Boswell, Maas and a foreman employed by Gauteng Piling, a certain Alston who died about five years ago, met on site in order for Boswell to show them the site. Maas testified that the purpose of the site visit was to establish that Gauteng Piling could get its piling equipment onto site and that the piling platform was firm and level for the drilling machinery. Maas testified that Boswell did not point out anything specifically to them and that they accepted that some of the piles would be in the filled area. Nothing on site appeared unusual to Maas. Although the retaining wall is a large construction and, in the words of Butterworth, 'for all to see', Maas testified that he did not notice it. He testified that he did not gain access to the property from its western side from where the retaining wall is visible. What retains the fill, Maas added, was in any event of no concern to Gauteng Piling. Boswell has no recollection of this site meeting but does not dispute that it took place.

[15] Boswell and Maas spoke telephonically on 25 August 2003. Maas made one of his contemporaneous notes of this conversation. Boswell advised him that 27 piles were required, that the applicable loads ranged from 150 to 500 kilonewton and that there was a 'pile layout'. On 26 August 2003, Maas on behalf of Gauteng Piling, addressed a written tender to Boswell for the design and installation of 27 augered piles of different diameters to carry the vertical loads supplied by Boswell (150 to 500 kilonewton). Gauteng Piling proposed the use of augered piles and it furnished the different diameters suitable to carry the various specified vertical pile loads. It is recorded in the minutes of a meeting that was held on 21 October 2010 and attended by

a representative of the architect, Maat and Boswell that the structural engineer '… obtained a price for the piling' and that '… the employer confirmed that this work is to be undertaken early next year'.

[16] On 30 March 2004, Gauteng Piling, this time represented by its general manager, Mr Hennie Bester (Bester), addressed a second tender for piling to the main contractor, Paragon, for the design and installation of 33 augered piles of 300 millimeter diameter each to carry the specified categories of vertical loads. And on 10 May 2004 Gauteng Piling, again represented by Bester, addressed a third and final tender to Paragon, this time for the design and installation of 37 augered piles of 300 millimeter diameter each to carry the specified vertical loads. Boswell testified that there were many architectural revisions during the design development. The changes to the number of piles required and the vertical loads they were required to withstand as reflected in the three tenders were according to Boswell probably brought about by design developments.

[17] Apart from different prices and schedules of quantities the terms of each tender were identical. Gauteng Piling's third and final tender was accepted by Paragon in terms of its order dated 30 June 2004 wherein Gauteng Piling was requested to proceed with the order for the 37 augered piles as per the third tender document (the piling subcontract). It is stated in the opening paragraph of the third tender that-

'[f]urther to your enquiry and based on the information received, we have pleasure in submitting our tender for the piling for the above, based on the attached conditions, in the amount of … R87 552 including V.A.T.'

The tender is 'based' on the SABS 1200F specification and one of its terms is that no retention money is to be withheld since any defects are covered under Gauteng Piling's 'products guarantee', which reads as follows:

'The piles are warranted to be capable of safely withstanding the loads as specified in the piling contract. Our liability is limited to in following respects:

(a) To making good any piles which fail due to our default and the consequent damage to the structure erected on our piles, including consequential loss.

(b) Our Liability under this guarantee and the piling contract cumulatively shall not exceed R2 million (Two Million Rand).

(c) We shall have no liability in respect of any claim which has not been made against us in writing within three years from the date of completion of the piling works or any section thereof, whichever shall occur first.

(d) We are not responsible for the adequacy of the joint between the piles and any structure erected thereon.

(e) We will not be responsible for any settlement or defect caused by existing underground workings, cavities and the like or by the presence of acids or other destructive matter in the ground or ground water.

(f) This warranty replaces and supersedes all other warranties, whether express or implied'.

[18] The written building contract was concluded between Glynden and Paragon on 14 May 2004 (the building contract). Reliance is placed on clause 8.3 of the building contract for the appointment by the contractor, Paragon, of the subcontractor, Gauteng Piling. Powell Boswell and Associates, in terms its plea, admits the appointment of Gauteng Piling as a specialist piling subcontractor and it avers that Gauteng Piling was appointed inter alia 'to establish the site and ground conditions and thereafter to design

the pile system'. It is further averred that in terms of the structural agreement concluded on 18 June 2003 between Powell Boswell and Associates and Glynden the scope of duties of Powell Boswell and Associates included, inter alia, the provision of a calculation of the structural loads and the preparation of a pile layout drawing for the foundations. Clause 8.3 of the building contract, however, recognises the right of Paragon to appoint any subcontractor 'to execute the whole or portions of the works', which in terms of clause 1.1.2 read with clause 18 and clause 6.e of annexure A to the building contract is '[t]he construction work to be done and the materials to be used in erecting a dwelling house and outbuildings on the property' including the piling. The building contract does not provide for the appointment of a subcontractor to fulfill any design function nor does it entitle Paragon to relieve Boswell of any part of his scope of work as the structural engineer for the project that was agreed upon between Powell Boswell and Associates and the owner, Glynden.

[19] Willcocks and Boswell are ad idem that the extent of Boswell's scope of work as consulting structural engineer in terms of the structural agreement that was concluded on 18 June 2003, was to provide a structure for the architectural envelope shown on the architect's drawing, which responsibility included the foundations for the whole house. It is common cause that the contractual responsibility of Boswell *vis-à-vis* Glynden regarding the design and specification of the foundations, or any other aspect of his scope of work, was not in any way limited or excluded in terms of the structural agreement nor in terms of any subsequent agreement reached between them.

[20] Boswell, however, contends that in instances where a piling contractor is subcontracted on a design and install basis, the structural engineer is not responsible

for the design of the piling and the piling contractor assumes responsibility for any deficiency in the design of the piles. The mere appointment of Gauteng Piling as piling subcontractor on a design and install basis, Boswell testified, reduced his scope of foundation work and he thereafter remained responsible only for the conventional foundations. Boswell testified that as far as the piled foundations are concerned his scope of duty was then limited to providing a calculation of the structural loads and the preparation of a pile layout drawing indicating the positions of the piles. Glynden, on the other hand, contends that Boswell's mandate was never changed and no part of his responsibility was ever excluded. This is not a case in which a structural engineer recommended to his client that another specialist engineer be appointed to undertake a specialist aspect of the structural work and such other specialist is then indeed appointed. It is clear on the undisputed evidence that Boswell merely recommended to Glynden via Maat that piles be used on the fill instead of conventional spread footings and that prices be obtained for piles of about 600 millimetre in diameter. It is this recommendation which Glynden accepted. The view that I take of this matter, however, makes it unnecessary for me to decide the issue relating to an amendment of Boswell's initially agreed upon scope of work in relation to the design of the piles. I return to the nature of Gauteng Piling's design function.

[21] On 29 March 2004 Boswell issued a pile layout drawing 'for approval'. This initial drawing was not issued to Gauteng Piling. On 25 June 2004 Boswell issued a pile layout drawing 'for construction'. This drawing was received by Gauteng Piling before it commenced with the construction of the piles. The pile layout drawing indicates the position of each pile and it contains certain instructions applicable to the installation of

the piles. It contains three columns setting out each pile number as depicted on the layout drawing, pile load, and pile diameter. There is disagreement between Tromp, Ritchie and Oosthuizen on the one hand and Boswell, Butterworth and Crous on the other about whether Boswell's specification of the pile diameters on his pile layout drawing means that he thereby adopted Gauteng Piling's diameter design and accordingly involved himself in the design function relating to the piles. I also do not need to decide this issue in the light of the view that I take of this matter. I accept that Gauteng Piling's design function included pile diameter, concrete strength, reinforcement and length or founding depths. Tromp agrees with the views of Boswell, Butterworth and Crous that when a subcontract for piling is awarded on a design and construct basis, the structural engineer is responsible for the calculation of the structural loads and preparation of a pile layout drawing. I return to the issue whether the structural engineer is also enjoined to provide the piling contractor with loads other than structural loads.

[22] Gauteng Piling installed the piles on 6 and 10 July 2004. It increased the diameter of all the piles from 300 to 350 millimetres. Maas testified that the main reasons for increasing the pile diameter were that some of the piles specified on the pile layout drawing had a 400 kilonewton load, which is more than Gauteng Piling allows for a 300 millimetre diameter pile as well as the variable depths that were encountered on site (some of the augered holes drilled were deep and others shallow). It was then decided to drill all the holes to a 350 millimeter diameter in order not to have to use different auger drills. Gauteng Piling completed pile report sheets (that were also furnished to Boswell) showing that it installed 31 piles. It appears that six piles could

not be installed due to too shallow refusal rock. All but two piles (numbers 27 and 15) were drilled to refusal. Drill to refusal, Tromp explains, means the auger drill could not advance any further: it refuses to drill deeper.

[23] The construction of the rest of the house followed. Its 'structural system', Oosthuizen explains, is 'from the top of the roof to the bottom of the lowest element of the foundations . . . it has a roof at the top and at the bottom the lowest elements are the pile feet'. The 'foundation system', it is common cause amongst the expert witnesses, is the system used to transfer the various loads of the structure to ground level. It includes the spread footings and the piles below the western section of the building. The 'piling system', the expert witnesses agree, consists of three elements: piles, pile caps and ground beams. Each pile is integrally connected to a pile cap above it and the pile cap with a ground beam that spans between the pile caps, and these three elements are embedded in the fill. The vertical loads supplied by Boswell are the loads that the superstructure exerts on the piles at a particular point via a column.

[24] A pile, Day explains, is essentially a column which is an element of the structure. It is embedded in the ground and its purpose is to transfer a given load from the top of the pile down into the ground. The pile load is either carried by the length of the pile and shed into the soil surrounding the pile (side friction) or the load is transferred to the bottom end of the pile where it is shed into the underlying material (end-bearing). A pile cap, Ritchie explains, is a block of concrete cast on the top of the pile which provides a connection for the reinforcement in the ground beam and in the pile so that a continuity of reinforcement is provided from the ground beam into the pile. The ground beam is typically on the same level as the pile cap and runs into the pile cap. Ground beams, in

the opinion of Boswell, have two functions: to hold the piles together and thereby stopping them from moving independently and to carry the brick walls constructed on them. Ground beams span from one pile to another and transmit the loads of the walls erected on them into the piles. Butterworth refers to ground beams rather as pile beams because they span between piles.

[25] The piles critical to this action are piles 19A, 19, 20 and 20A below the western side of the garage and to a lesser degree piles 15, 16 and 17 below the eastern side of the garage. Reinforced ground beams span between the pile caps that are on top of each pile. The edges of the garage floor concrete slab are supported by the ground beams around the garage and the rest of that concrete slab is supported by the engineered fill.

[26] Also relevant are piles 18 and 13 on either side of the main entrance door, but eccentric to it. The main entrance inter alia comprises a double volume arch that surrounds the front door. A conventional strip footing below the front door, which is founded on the engineered fill, supports the arch and entrance part of the structure. A ground beam spans between pile caps 8 and 13 and the continuity steel continues from pile cap 13 into the strip footing. A ground beam also spans between pile caps 17 and 18 and the continuity steel continues from pile cap 18 into the strip footing on its other side. The reinforcement of the strip footing ties in with the continuity steel that runs from those pile caps. The ends of the spread footing are accordingly tied to the continuity steel that runs into the pile caps on either side of the main entrance.

[27] Further relevant is an issue of eccentricity. Eccentric forces are structural loads additional to the vertical loads that are exerted on the piles. These are structural loads that were not included in the loads which Boswell furnished to Gauteng Piling. The brick wall which is constructed on the ground beam on the northern side of the garage is off-centre or eccentric in relation to the centre of pile 15. The load of the brick wall is not concentrically exerted onto the pile. There is also eccentricity on piles 19 and 20 below the chimney wall that is constructed on the pile beam between those two piles. The effect of an eccentric load onto a pile is to bend the pile, to place a bending moment into the pile. The bending moment needs to be resisted. The reinforcement in the pile needs to be designed to accommodate the bending. The piles in question were designed with nominal reinforcement and not for bending.

[28] The Willcocks family took occupation of the newly built residence on 13 September 2006. Cracks appeared in the house during or about 2007. They were considered not to be unusual and Paragon attended to them. During February/March 2009 cracking that was considered more serious manifested in the western portion of the residence. Investigations followed in order to determine the cause of the cracking. Boswell, Paragon and Gauteng Piling are amongst those who were drawn into the investigations. The garage and lounge above it that are in close proximity to the retaining wall showed signs of major structural distress. The investigations revealed that the retaining wall had moved about 75 mm laterally and vertically. The movement subjected the piled foundations below the western end of the house in close proximity to the wall to lateral and horizontal forces of about 600 tons which they were not able to

resist. They were only designed to withstand the vertical forces that were calculated by Boswell and furnished to Gauteng Piling.

[29] Ritchie testified, and his opinion in this regard was not challenged, that the visible structural damage is consistent with movement of the ground beams, which support the walls on the western and northern sides of the garage and form part of the foundation system of the house, laterally towards the west. The primary problem is that the ground beams spanning from pile caps 19A to 20A have moved towards the west. The expert witnesses consider it further possible that the ground beam on the northern side of the garage (spanning from pile cap19A to pile cap 15) and the one on the southern side of the garage (spanning from pile cap 20A to 17) have also moved laterally to the west. The movement of the ground beams dragged the walls they support with them separating them from the eastern side of the house.

[30] The expert witnesses are ad idem that the main cause of the deformation and cracking of the building is lateral and vertical movement of the foundation system below the western end of the building. The fill behind the retaining wall, which forms the terrace on which the western end of the building was erected, moved laterally and vertically. Certain of the small diameter vertical piles which form part of the foundation system were unable to resist the combination of vertical and horizontal forces arising from the soil movement and structural loading.

[31] With regard to the remedial work required with regard to the western end of the building, that is the portion supported by the foundations below the walls of the garage, the expert witnesses agree that the integrity of the piles has been compromised by the

deformation they have suffered and there is potential of further vertical and lateral movement of the fill. The remedial measures to be implemented, therefore, must provide vertical support and lateral restraint of the foundation system. Appropriate support needs to be provided to the surround of the front entrance door and the adjacent floor.

[32] As to the performance expectations of the retaining wall and the acceptability of the foundation system used, the expert witnesses agree that it is common knowledge that fabric reinforced retaining walls, such as the one constructed on the western side of the building, and the fill they retain undergo horizontal and vertical movements. These movements normally continue for a period of years after construction. The expert witnesses agree that the piled foundation system adopted was not suitable for a site where ground movements were expected. Had the movement of the fill been anticipated from the outset, a different foundation solution would have been required below the western end of the building.

[33] Some of the expert witnesses, especially Day and Oosthuizen, also consider the eccentricity that occurred on the western and northern sides of the garage a contributing factor to the visible structural distress. Boswell testified that he calculated the eccentric forces and he considered the effect of the eccentric moments on each pile and column above it to be very minor. The twisting effect of the eccentricity is distributed into the pile and into the column above it. In addition the structure is on a designed terrace which was compacted in engineering terms to a 95% compaction level, which, according to Boswell, is a fairly high compaction level and much of the load would be transferred to the ground by the footing the brickwork is sitting on. The eccentric

moments are thus also resisted by the ground bearing pressure of the ground below the footing, which share the moments with the piles, the columns above them and the ground below. Ritchie and Butterworth each calculated the effects of eccentricity, and they also consider them not to be significant and not a cause of the structural damage. Tromp did not make any calculations but he too agrees that the bending moments placed on piles 19 and 20 are not significant and that the eccentric forces might not have been a cause of the damage. Day disagrees. The fill, in his opinion, due to settlement provides a less rigid support than the piles in resisting the eccentric forces. Day did not calculate the effects of the eccentric loads on the piles and he concedes that the proximate cause of the structural damage is the movement of the soil which dragged the ground beams, pile caps and piles with it. The eccentricity of the western wall, in the opinion of Oosthuizen, jeopardizes the structural integrity of the piles as specified and installed. But he too did not calculate the effects of the eccentricity. There is in my view no cogent evidence of the causative effect of the eccentric loads on piles 15, 19 and 20.

[34] The expert witnesses are agreed on a technically sound and correct remedial foundation system that should be adopted and constructed below the western end of the house. The system comprises ten percussion board piles of 430 mm diameter in a line below the western side of the garage. The ground beam is to be anchored back into the hillside to restrain the lateral forces that are expected.

[35] I now turn to the main design errors that were made. The piles were specified and designed only to resist the concentric vertical or structural loads which Boswell supplied to Gauteng Piling. The piles on the western end in the area where the deep fill

occurs ought to have been specified and designed not only to carry vertical loads, but to also resist the lateral and horizontal loads imposed upon them as a result of the movement of the retaining wall and fill. The expert witnesses agree that the small diameter vertical piles are incapable of resisting the lateral load or movement to which they were subjected in the area where the deep fill occurs. Oosthuizen expresses his opinion in this regard as follows:

'The element that takes 400 kilonewtons as a pile will never resist the man-made fill. The man-made fill is man enough to move much bigger piles than a 400 kilonewton pile and many of the piles were only 200 kilonewtons. So the man-made fill is a strong, strong force in nature. It will move almost anything that you plant in it'.

[36] The expert witnesses are essentially ad idem on the foundation system below the western end of the house that in terms of accepted standard practice ought to have been adopted at the outset to resist the vertical and horizontal forces. Butterworth prefers not to give a definitive opinion on the issue. But Tromp, Ritchie, Crous and Day are of the opinion that an anchored pile foundation system as opposed to the pile foundation system that was adopted ought to have been designed and constructed below the west end of the garage. The appropriate foundation system required bigger auger piles and tie backs. The required tie backs are, according to Ritchie, typically reinforced bars cast in concrete for corrosion protection and anchored into a block of concrete that is sunk into stable ground. Because it is commonly known that a retaining wall, such as the one constructed in this instance, moves with time, such movement, in the opinion of Ritchie, ought reasonably have been anticipated and steps ought to have been taken to anchor the ground beam spanning from pile cap 19A to 20A against

movement towards the west by means of horizontal anchors to tie it back into the stable ground behind the manmade fill. Ritchie prefers not to comment on the piling portion of the foundation system below the west end of the building that ought to have been chosen in the first place, but he is of the opinion that from a structural point of view the absence of adequate lateral ties, structural ties, is the primary cause of the problem.

[37] Ritchie and Day are of the opinion that the tie-back solution forms part of the structural engineer's responsibility and design function. The single dissenting opinion of Crous that the tie-back solution falls within the design responsibility of the piling subcontractor is not logically defensible and contrary to the undisputed evidence. It is common cause that the foundation system comprises three elements: piles, pile caps and ground beams. Gauteng Piling only assumed the design function of a single element, the piles. The design of the other two elements remained within Boswell's scope of work. It is the ground beam that ought to have been tied back. Furthermore, as Day explains, the three elements of the foundation system are integrally connected and embedded in the fill. The movement of the fill generated lateral and horizontal forces against all three elements and caused them to move.

[38] Tromp, Ritchie and Day are ad idem that the damage to the garage floor, which indisputably was designed by Boswell, was caused by settlement of the fill and is unrelated to the design and performance of the piles. The rest of that part of the structure is founded on piles whereas the garage floor concrete slab is founded on fill. The edges of the garage floor concrete slab are supported by the ground beams around it and the complication of the vertical settlement of the fill was that the middle of the slab sagged. It would, in the opinion of Ritchie, have been prudent of Boswell to have

designed a suspended slab that is supported by the ground beams around it in order to ensure that the slab remains part of the building structure. Because its span would have been excessive a pile in the centre of the garage floor ought to have been considered.

[39] Tromp, Ritchie and Day are also ad idem that the visible structural damage to the main entrance and the deflection of the arch around the front door show that the strip footing that supports the arch, which indisputably also formed part of Boswell's responsibility and design function, settled with the fill material below it and is unrelated to the design and performance of the piles. Ritchie is of the view that settlement of the fill has caused a rotation of that footing which in turn caused the double volume arch around the front door to rotate with it and it is now out of plumb. According to Ritchie, a pile in the middle of that strip footing was required. Day is of the opinion that there is differential settlement below the spread footing part of the structure and the part that is tied to the piles by means of continuity steel. Butterworth is of the opinion that the strip footing foundation was unable to deal with the deep seated settlement in the soil.

[40] Glynden instituted this action against Powell Boswell & Associates (the first defendant), Paragon (the second defendant) and Gauteng Piling (the third defendant). The claim against Paragon was founded on the building contract. Because Paragon was placed under final liquidation before the commencement of this trial, Glynden elected not to pursue the claim against Paragon and it was withdrawn at the outset of these trial proceedings.

[41] The claim against Powell Boswell & Associates is founded on the structural agreement. Essentially, the claim against it is that it breached the structural agreement in that Boswell failed to exercise the required professional skill, care and diligence in the performance of his mandate by failing to ensure that pile foundations used in the construction of the residence were adequate, suitable and appropriate for the purpose for which they were intended. He failed, so it is alleged, inter alia to take the ground conditions into consideration and to specify and design, or approve, the correct pile specification or to ensure that the correct pile specification was used in the construction of the pile foundations.

[42] Powell Boswell & Associates denies that it owed Glynden any contractual obligations in respect of the design and specification of the piles. Boswell maintains that, as far as the piles are concerned, his provision of professional consulting engineering services to Glynden was limited to the calculation of the structural or vertical loads and the provision of a pile layout drawing. It was Gauteng Piling, according to Boswell, which was appointed by Paragon as a specialist piling contractor to design and install piles that were adequate, suitable and appropriate for the purpose for which they were intended. Boswell contends that Gauteng Piling failed to take into consideration in the design and installation of the piles the expected lateral and vertical forces which would occur as a result of the movement of the retaining wall.

[43] The claim against Gauteng Piling is founded in delict. It falls, in my view, within the ambit of pure economic loss. See: *Telematrix (Pty) Ltd v Advertising Standards Authority SA* 2006 (1) SA 461 (SCA) para 1; *Trustees, Two Oceans Aquarium Trust v Kantey and Templer (Pty) ltd* 2006 (3) SA 138 (SCA) para 14 and 145G-146A; and

*Kohler Flexible Packing (Pinetown) (Pty) Ltd v Marianhill Mission Institute and others* 2000 (1) SA 141 (D) at 145F-G. The negligence that caused Glynden's loss is alleged to be Gauteng Piling's failure to have ensured that the pile foundations were built in a proper and workmanlike manner, that appropriate materials and methods were used in the construction and erection thereof, that they were erected and installed according to suitable specifications and that they were able to carry their design load. It is alleged that Gauteng Piling was under a legal duty not to act negligently. In other words the case against Gauteng Piling is that it wrongfully and negligently caused Glynden pure economic loss.

[44] Gauteng Piling denies any negligence on its part. It maintains that it designed the piles in accordance with the design specifications received from Boswell. It was Boswell, according to Gauteng Piling, who negligently failed to advise Gauteng Piling of the relevant terrain parameters and possible consequences thereof on the piles, who failed to assess the long-term stability and integrity of the structural design under his control, and who failed to take into account the likelihood of horizontal and vertical movement of the engineered fill behind the retaining wall, as a result of which the piling specifications were ineffective. Gauteng Piling further denies that it owed Glynden a legal duty in circumstances where Glynden elected to arrange its affairs in regard to the construction of the residence by concluding a building contract with Paragon in terms of which Gauteng Piling was in turn appointed as a subcontractor. If it is found that Gauteng Piling acted negligently and owed Glynden a legal duty, then it contends that its liability cannot be more onerous than stipulated in the piling contract that was

concluded between it and Paragon (see:*Viv's Tippers (Edms) Bpk v Pha Phama Staff Service (Edms) Bpk h/a Pha Phama Security* 2010 (4) SA 455 (SCA)).

[45] The opinions of especially Day and Oosthuizen regarding the appropriateness of the pile design adopted by Gauteng Piling to withstand the relative low loads specified by Boswell and its installation of the piles in a proper and workmanlike manner have in my view not been refuted. They are of the opinion that Gauteng Piling assumed standard and accepted parameters in its design of the piles and that its assumptions were verified and met at the time of the installation of the piles (there were no assumptions made with regard to the engineered fill or the retaining wall in the design of the piles, a matter to which I return later on in this judgment). It is undisputed that the SABS 1200 F specification of the South African National Standards (formerly the South African Bureau of Standards (SANS)) used by Gauteng Piling is a generic specification for piles that is normally followed in South Africa. The pile design and specifications (pile diameter, concrete strength and reinforcement) adopted by Gauteng Piling, in the opinion of Day and Oosthuizen, were appropriate for the relatively low loads specified by Boswell. All the piles were drilled to refusal below the level of the fill and Day is of the opinion that there was adequate penetration into the soil. Day and Oosthuizen are of the opinion that the manner in which the piles were installed and the depths to which they were installed are appropriate. The piles as installed in their opinion are competent to carry their design loads of between 200 to 400 kilonewtons.

[46] Tromp's opinion that the reinforcement used does not meet the requirement of the SANS code, his concern about the variability of the founding depths of the piles below the western end of the house (pile 19A (10,5 metres), pile 19 (17,3 metres), pile

20A (11,6 metres) and pile 20 (13,4 metres)) which, according to Tromp, might be indicative that refusal of one or more of these piles occurred on a bolder or a large slab of gravel that could cause differential settlements of these piles, and Crous' concern about the ability of a few short piles to carry their design loads have in my view been addressed by Day's opinions on these aspects.

[47] Gauteng Piling used 4Y12 reinforcement in the piles. Tromp explains that this means that 4 bars high tensile steel (Y) of 12 millimetre in diameter were used. The requirement of the SANS code has not been met. Day explains that reinforcement in piles is a matter not clearly specified in the SABS or SANS codes. Reference is accordingly made to the SANS Code for Columns of Concrete Design which deals with the reinforcement of columns (SANS 0100). That code requires a minimum reinforcement of .4% of the concrete area. The piles in question were designed with a .47% reinforcement of the concrete area. The piles also comply with another 'rule of thumb', which according to Day is typically used in pile design: the reinforcement must exceed .8% of the concrete area that is required to carry the vertical load. The SANS Code for Columns of Concrete Design requires four bars as reinforcement for a square column and six for a circular column. However, the Frankie Pile Handbook stipulates four bars are typically used in a smaller diameter pile. (This text book according to Day's unchallenged opinion is generally regarded as one of the best handbooks on pile installation in South Africa and according to Oosthuizen's unchallenged opinion is an industry standard of good engineering practice for the design function undertaken by piling contractors, such as Gauteng Piling.) Day is accordingly of the opinion that the

four Y12 bars used as reinforcement are appropriate and comply with the norms in the South African piling industry.

[48] Day is of the opinion that the variability of the founding depths of piles 19A, 19, 20 and 20A is not a cause of concern, inter alia because granites which occur in the northern suburbs of Johannesburg 'are notoriously variable' and the west wall of the garage shows no sign of distress (diagonal cracking) as a result of differential founding conditions.

[49] The short piles to which Crous referred, except for two below the eastern side of the garage, are situated away from the area affected by the movement of the fill. They are situated in areas where cracking of the structure has not manifested. The structural damage occurred mainly on the western side of the garage with, according to Day, sympathetic damage on the eastern side of the garage. The cracking only manifested about two to three years after completion of the structure. A load is applied for a maximum of 24 hours when a pile load test is performed. There was accordingly, in the opinion of Day, a period of between two and three years during which the piles proved their adequacy to support the weight of the house. Crous also conceded that the piles have carried their load safely for a number of years .

[50] The evidence, in my view, does not establish on a balance of probabilities that Gauteng Piling did not design the piles according to suitable specifications to carry the vertical loads supplied by Boswell or that the piles were not built in a proper and workmanlike manner using appropriate materials and methods.

[51] Turning to the liability of Powell Boswell & Associates, it is common cause amongst the expert witnesses that vertical and horizontal movements of a retaining wall and fill which it retains and the forces exerted by a fill fall within the expertise of geotechnical experts, such as consulting geotechnical engineers, soil mechanical engineers or engineering geologists. Boswell, by his own admission, is not a specialist in geotechnical issues. As a structural engineer, Boswell, in the opinion of Tromp, would have understood that there would be lateral movement, but he would not have known the exact quantities thereof. Crous holds a similar view. Boswell testified that generally both a structural engineer and a geotechnical engineer would take part in a project if the ground conditions are not favourable. The ground conditions on the site, it is common cause, were not favourable.

[52] It can, on the totality of the evidence presented, not be disputed that the founding conditions of the site were not properly recognised or appreciated, either by Boswell or by Gauteng Piling. It was according to Tromp not properly realised that the fill and retaining wall could result in additional loads being exerted on the piles. The lateral and vertical movement of the foundation system below the western end of the building has resulted mainly from the displacement and deformation of the retaining wall, which, in the opinion of Tromp, ought to have been expected. The movement that occurred, in his opinion, is realistic. The variable site conditions were not fully understood or identified. Neither Boswell nor Gauteng Piling, also in the opinion of Day, foresaw the lateral and horizontal movement of the fill that was going to arise as a result of the movement of the retaining wall. There was, according to Day, not a realization that the fill had the potential to move laterally and horizontally and it was not

taken into account by either of them. The effects of the retaining wall were not realised. Neither Boswell nor Gauteng Piling, in the opinion of Day, realised the implication of the proximity of the piles below the western end of the house to the retaining wall. These views are uncontroverted and similar views were expressed by some of the other expert witnesses.

[53] Boswell testified that at the time he was 'to a certain extent' familiar with the characteristics of a Löffenstein wall. He did not know the extent to which lateral movement of the retaining wall is expected. He was only aware that there would be slight deformation of the wall after construction. He did not anticipate lateral or vertical movement of the soil to the extent that occurred.

[54] Tromp, Ritchie, Day and Oosthuizen share the opinion that in relation to the design of foundations, whether or not the design of piles is within the scope of work of the structural engineer, he is nevertheless required to obtain a geotechnical report on the founding conditions of the applicable structure in question, especially on a complex site such as the one in question. Although the structural engineer invariably does not design the piles he must understand his own function and be aware of the forces that will come down onto his overall system. In the words of Oosthuizen: it is the structural engineer responsible for the design of the foundations of a building who is duty bound to take all relevant considerations into consideration, including the possibility of lateral or other loads that will impact on the piles. Boswell, in the opinion of Tromp, Ritchie, Day and Oosthuizen, reasonably ought to have called for the expertise of a geotechnical consultant, who would have investigated the ground conditions and made recommendations to him on an appropriate foundation system.

[55] The structural engineer does not conduct the investigation, but he needs to bring an appropriately qualified professional on board to conduct the investigation. It is, in the words of Oosthuizen, the 'only tool' at the disposal of the structural engineer that allows him 'to deliver a deformation free building'. A geotechnical foundation investigation would in the opinion of Oosthuizen 'precisely' have revealed the anticipated movement of the retaining wall and fill. It includes the assessment of horizontal stability. It would, according to Oosthuizen, have made recommendations about the piling system and the need for horizontal anchors. It is instructive to refer to further passages of Oosthuizen's evidence in this regard:

'A geotechnical investigation would precisely have revealed that. Because a geotechnical investigation considers all physical attributes of the site. It is an amazingly thorough analysis from the top of the terrace down into mother nature and it is an enormous comprehensive assessment of all the physical attributes on the site and without it I remain in the dark.'

According to Oosthuizen a geotechnical investigation must even be done in a 'mielie' field that is flat and it must especially be done on a complex site. The geotechnical engineer, in his opinion, 'would have scratched his head about the complexity of this site'.

[56] Boswell, Butterworth and Crous are of the opinion that the structural engineer is only responsible for and obliged to furnish the structural loads to a piling contractor. It is the responsibility of the piling contactor, and not that of the structural engineer, to take account of all the other loads to which the piles might be subjected in its design of the piles. The piling contractor as designer of the piles is responsible for determining the other forces that a pile might be subjected to, such as the forces that developed in this

case as a result of the movement and settlement of the fill. The piling contractor in their opinion must conduct its own geotechnical investigation if one had not been undertaken.

[57] I accept the opinions of Tromp, Ritchie, Day and Oosthuizen on these issues. Their views of accepted engineering practice are founded in logic are objectively supported by the South African Bureau of Standards Code of Practice for the Design of Foundations for Buildings (SABS 0161-1980), which code of practice, according to the unchallenged opinion of Day, sets out what is regarded as good practice or a norm within the industry and provides a yardstick against which the design or execution of an engineer's mandate can be judged. SABS 0161, in the opinion of Day, is a codification of processes and standards that have been developed over many years of experience and is regarded as generally accepted good engineering design practice.

[58] SABS 0161, in terms of its clause 1.1,

'… covers the design, in accordance with the National Building Regulations, of foundations for buildings …'.

It is stated in its 'Preface' that the contents of this code of practice have been prepared 'on the following basic assumptions of competence:

'(a) The owner appoints a designer who is suitably qualified by training and experience to execute the design of a particular project in accordance with the design method adopted and whose qualifications and ability are acceptable to the local authority.

(b) Where the designer appoints any person to carry out specialized design work or other functions, the designer must ensure that such appointee is suitably qualified by training and experience to execute such work or functions.

(c) Where the designer does not carry the supervision of the construction work through to completion, the owner is assumed to be responsible for ensuring that the construction

work is carried out in accordance with the design requirements and to the satisfaction of the local authority unless he (the owner) appoints some other person who is suitably qualified to supervise the construction work.'

[59] A 'designer', in terms of clause 2.1, is-

'[i]n relation to the erection of a building or part of a building, a competent person appointed by the owner and approved by the local authority to be responsible for the design of the foundations, shoring, underpinning, earthworks, excavations and other related aspects of such building'.

[60] Clause 3 inter alia deals with site investigations. The following is inter alia stated in clause 3.1.1:

'It is the responsibility of the designer to ensure that, prior to the commencement of any design work for a building proposed to be erected, the site or area as defined by the owner on which such building is to be erected is investigated to ascertain the subsoil conditions, the geological structure, flood lines in low-lying areas, and the underground water conditions, in order to

(i) assess the suitability of the site for the building proposed to be erected;

(ii) …

(iii) foresee and provide against difficulties that may arise during construction because of ground and other local conditions;

(iv) determine the extent to which the design of the excavation works, the foundations, and any earthworks will be affected by or will affect such conditions.

. . .

Where site conditions are unknown or where special circumstances apply, the site investigation will be carried out in accordance with 3.1.2.

. . .

It is considered essential that there should be, for even the simplest building, thorough knowledge of the soil and groundwater conditions on the proposed site in order to minimize or eliminate the possibility of differential movement.

. . .

All site investigations must be systematically carried out and must be as comprehensive as the site development project warrants …'

[61] Clause 3.1.2 deals with a detailed site investigation. It reads inter alia as follows:

'A detailed site investigation must be carried out on any site where a building is to be erected and where

(a) the soil conditions are unknown, or

(b) expansive or collapsing soils are present . . .'.

…

The designer will appoint a person responsible for conducting such investigation. Such person shall specialize in geotechnical work, shall be acceptable to the local authority, and shall be competent in the particular field of investigation undertaken.

The person conducting the site investigation must ensure that a report is prepared and lodged with the designer. Such report must contain an adequate description of soil profiles, information on groundwater conditions, the results of soil tests, information on the presence of expansive or collapsing soils and the possibility of the formation of sink-holes, and recommendations regarding the type and design of the foundations and any special measures required during construction, together with any additional information that may be deemed necessary.'

[62] The following is inter alia stated in clause 3.1.3:

'Because of the wide variety of soil types and conditions that can be encountered, it is essential that a site investigation be carried out prior to the commencement of design work, regardless of the type of building to be erected.'

[63] Clause 5.5.2 reads as follows:

'Ground Subject to Movement: Where the site investigation required in 3.1, or previous experience in the area concerned, indicates that the subsoil consists of made-up ground, expansive soils, or collapsing soils or is dolomitic or contains undesirable excavations or cavities, or is affected by other conditions liable to cause excessive movement, it is the responsibility of the designer to ensure that a report is prepared detailing the conditions encountered, the extent of the movement likely to be experienced, and the measure to be taken to accommodate such movement.'

[64] Tromp, Maas, Day and Oosthuizen are ad idem that SABS 0161 applied to Boswell as the structural engineer, who was the designer within the contemplation of its provisions. Ritchie, Butterworth and Crous are of the view that the provisions of SABS are also applicable to Gauteng Piling insofar as the design of the piling is concerned. Boswell is of the view that SABS 0161 only applied to him in respect of the conventional foundations that he designed, namely the spread footings and strip footings, and to Gauteng Piling in respect of the piles it designed.

[65] The plain wording of the relevant provisions of SABS 0161 as well as the undisputed facts of this case support the view of Tromp, Maas, Day and Oosthuizen with which I agree. It is common cause that Boswell was the only engineer appointed by Glynden in respect of the erection of the building and that he was responsible for the design of the foundations of the building. Boswell was the only competent person appointed by the owner and approved by the local authority to be responsible for the design of the foundations. Gauteng Piling was not appointed by the owner, Glynden, it was not approved by the local authority and it did not design the foundations. It only

designed one of the three elements of the piling foundation system that was chosen by Boswell.

[66] Section 3.1.1 of SABS 0160 requires that a site investigation be carried out prior to the commencement of design work at the commencement of the project. I agree with Day that this requirement pertains to the planning and conceptualising phase and not the implementation phase of the project. Gauteng Piling can discharge its obligations to investigate the subsoil conditions, confirm its assumptions and ensure that the subsoil is capable of supporting the piles during the implementation stage.

[67] It is undisputed that given the existence of the retaining wall and fill 'special circumstances' applied to the site within the contemplation of clause 3.1.1, which required a detailed investigation in accordance with clause 3.1.2. The person to be appointed by the designer in this instance would, according to Tromp, be a geotechnical engineer or an engineering geologist competent in foundation investigations and the ground and topographical conditions encountered at the site. Boswell agrees that the person envisaged to undertake the investigation would typically be a geotechnical engineer.

[68] Boswell, therefore, ought to have appointed a competent person specialising in geotechnical work to undertake the detailed site investigation envisaged in SABS 0161 prior to the commencement of any design work. This, it is common cause, he failed to do.

[69] Boswell, however, maintains that he was only duty bound to conduct a site investigation in relation to his design of the strip footings and spread footings, which site

investigation, he says, falls outside the engineered fill. A geotechnical investigation, he contends, was not required for the foundations for which he was responsible. He testified that he undertook the site investigation required of him: he had regard to the FSSE document (the specification issued for tenders prior to construction of the fill and retaining wall) and he assumed that the design specifications of the fill and retaining wall had been met during construction because it would have been senseless to investigate what a geotechnical engineer designed; the rock was visible from the surface; and a few test holes were drilled outside the fill area. Boswell's view is supported by Butterworth, who is also of the opinion that Boswell's scope of work did not require a detailed site investigation. The investigation, in his opinion, could only have shown that there was rock on the one side and an engineered fill on the other side. I find these contentions untenable in the light of my earlier findings and for the reasons that follow.

[70] Boswell's evidence about his assumption that the design specifications of the engineered fill had been met is in conflict with his evidence that one of the factors that prompted him to recommend piling is that he had never been given any report to the effect that the engineered fill had been built according to the specification. Within that context he testified that he 'was more concerned with the fact that he had not been given any information as to how the fill was compacted and he therefore did not wish to take the risk and piling solution seemed more applicable and Joubert agreed'. Tromp is of the opinion that although the FSSE specification provides geotechnical information on the nature of the fill and the specified materials of the fill and of the design of the wall, it does not inform what was eventually used and is not necessarily an indication of what

was actually achieved during construction. One cannot, in his opinion, by having regard to that document make any assumptions as to what had actually been achieved during construction. A geotechnical investigation is required. Butterworth also says that the FSSE document is a specification for tenderers and no indication of what had actually been achieved during the construction of the retaining wall and engineered fill. Crous also says that verification is required as to whether the FSSE specification has been met. It, in my view, follows logically.

[71] Moreover, the FSSE specification did not alert or advise Boswell of the anticipated extent of the movement of the retaining wall and of the soil it retains and of the measures required to resist the resultant forces, as it is undisputed that the investigation prescribed in terms of SABS 0160 in all probability would have revealed. As Oosthuizen said:

'The need of a foundation investigation to determine the parameters of foundation design is completely a different investigation to what was constructed or the project specification for the construction. It is not the same thing, it is comparing apples with pears'.

[72] Boswell was also not only responsible for the design of foundations outside the fill area as he would have it. He was also responsible for the design of two of the three elements of the pile foundation system within the fill area, namely the ground beams and the pile caps, and he was responsible for the design of the strip footing below the front entrance and of the garage concrete slab, also within the fill area. He, on his own version, also relied on the density of the fill to counter the eccentric forces on piles 19, 20 and 15.

[73] Boswell testified that he did not tie back the ground beam below the western end of the structure into the natural hill or rock because he did not anticipate the lateral movement that occurred as a result of the movement of the retaining wall that dragged the piles laterally. He expected the fill material and the retaining wall to be sufficient to cater for horizontal movements. Boswell considered his design of the strip footing below the front door to have been adequate and he assumed that no dramatic movement of the fill material would occur. He also did not expect significant settlement in the area below the garage concrete slab. He made the assumption that the terrace was adequately designed with high compaction requirements, which would, according to his assumption, not have settled more than any surface bed of any garage or any ground floor slab of a building or home. Had Boswell fulfilled his professional duty that he in terms of the structural agreement owed to his client by having appointed a competent person specialising in geotechnical work to undertake the detailed site investigation envisaged in SABS 0161, his expectations and assumptions would on a balance of probabilities have been proved wrong and he would have been advised of the expected soil movements and settlements and resultant forces and loads.

[74] Furthermore, the ineluctable inference is that Boswell's failure to have appointed a duly qualified geotechnical engineer to undertake the prescribed detailed site investigation and his resultant failure to have fully appreciated the effect of the retaining wall and the implication of the proximity of the piles below the western end of the structure to the retaining wall, resulted in Boswell not furnishing Gauteng Piling with adequate and appropriate project specifications, either on his pile layout drawing or in writing or in discussion with Gauteng Piling. Crous describes Boswell as the principal

design consultant. It was, in the unchallenged opinion of Crous, within the responsibility of Boswell as the structural engineer of the project to prepare a 'design brief' for Gauteng Piling.

[75] Tromp, Ritchie, Day and Oosthuizen share the opinion that given the terrain parameters the information provided by Boswell to Gauteng Piling was inadequate. Gauteng Piling, in the opinion of Tromp, was not called upon to provide lateral support. The norm in the engineering profession, according to Tromp, is for the structural engineer to provide a geotechnical report to the specialist piling contractor. Boswell, in the opinion of Tromp, was remiss in not at least having forewarned Gauteng Piling of the potential for other loads and by not instructing it to request geotechnical input.

[76] It is in the opinion of Ritchie no excuse for a structural engineer to say that he did not include lateral loads on his pile layout drawing because he is not a geotechnical expert or an expert in soil conditions. The structural engineer should have consulted an expert who could have provided him with that information. A structural engineer, in the opinion of Ritchie, ought to discuss the site parameters and the potential effect of lateral forces with the pile designer. A geotechnical engineer, if appointed, ought to be involved in the discussion.

[77] It is according to Day the norm within the industry to express project specifications explicitly. Boswell was obliged to impart information on which the tender needs to be based. Day is of the opinion that if a structural engineer, such as Boswell, who has provided a vertical load table on his pile layout drawing, wishes a piling contractor, such as Gauteng Piling, to take responsibility for determining additional

loads in the form of horizontal loads and down drag on piles, then he ought to have specified the requirement expressly. It was, in the opinion of Day, Boswell's obligation to ensure that loads additional to those which he specified, were taken into account by Gauteng Piling. He should have informed Gauteng Piling that down drag and horizontal loads should be taken into account. That, in Day's opinion, 'would be the trigger' for a piling contractor, such as Gauteng Piling, which does not have its own design office, to actually employ a geotechnical consultant.

[78] Oosthuizen is also of the opinion that it is accepted standard practice that when a structural engineer calls on a piling contractor to design piles, he should provide the piling contractor with comprehensive specifications. The piling specification provided by Boswell was, in Oosthuizen's opinion, fully defective in terms of the terrain requirements. No project specification other than vertical loads was provided to Gauteng Piling. No specification relating to horizontal and lateral loads was given. There is, according to Oosthuizen, an onus on the structural engineer to communicate all physical attributes upward to the project manager and downwards to the piler. A piling contractor, such as Gauteng Piling, is in the opinion of Oosthuizen-

'… simply a calculator of the area of concrete required to withstand the given load. He has not the ability to do anything else. That is all that he is going to do. If I am the structural engineer and I give him that load that is all he is going to do for me. I cannot expect him to do more. If I needed him to do more, I had to instruct him to do more by way of the project specification. He cannot do more out of his own.'

[79] It is in my view no answer to the views expressed by Tromp, Ritchie, Day and Oosthuizen to say, as Boswell, Butterworth and Crous do, that site parameters and the

likelihood of loads other than vertical loads are not specified on a pile layout drawing by a structural engineer or even discussed with the piling contractor because the structural engineer is not an expert in geotechnical matters. It was Boswell's failure to have complied with his responsibility of calling for the required geotechnical investigation prior to the commencement of his design work that resulted in him not adequately specifying or notifying Gauteng Piling of all the parameters it needed to take into account in its design of the piles. This also, in my view, resulted in Boswell not being in a position to adequately scrutinize Gauteng Piling's design proposal.

[80] Tromp is of the opinion that Boswell had the responsibility to subject the design provided to him by Gauteng Piling to a high level scrutiny before the contract was signed. Day is also of the opinion that Boswell, as the person who is responsible for integrating those piles into the remainder of his design, ought to have applied his mind and considered whether the other loads had been taken into account by the pile designer. Day is further of the opinion that a simple calculation, which any structural engineer is able to make, would have informed Boswell that the piles as tendered with or without tie backs into the natural hill would not resist the lateral loading. The dissenting opinion that a structural engineer is no expert in geotechnical matters and not equipped to scrutinize the work of another expert who has been appointed, does in my view not refute the opinions of Tromp and Day relating to the structural engineer's obligation in this regard. Had the appropriate geotechnical investigation been undertaken prior to the commencement of any design work, Boswell would on the probabilities have been advised of the other loads and received recommendations regarding the type and design of appropriate foundations. When integrating these small

diameter piles into the remainder of his design he probably then would have realised how shockingly inappropriate they were to withstand all the applicable loads. Boswell concedes that as a professional consulting engineer he is duty bound to protect his employer's interests.

[81] Powell Boswell and Associates, therefore, breached the structural agreement in that it failed to exercise the required professional skill, care and diligence in the performance of its mandate as a result of which Glynden suffered the damages to which I return.

[82] I now return to the question of negligence on the part of Gauteng Piling. Tromp is of the opinion that there also rested an obligation on Gauteng Piling to have obtained a geotechnical investigation report from the structural engineer or to have undertaken or requested the undertaking of an appropriate geotechnical investigation, in the absence of one having been undertaken. Boswell, Butterworth and Crous are of the opinion that such obligation was the primary obligation of Gauteng Piling and not of Boswell. Gauteng Piling, in their opinion, was obliged to take the expected lateral and vertical forces which would occur as a result of the movement of the retaining wall and fill into consideration in the design of the piles. Tromp and some of the other expert witnesses are further of the opinion that the topography, fill and retaining wall should have set off warning bells for Gauteng Piling. It is common cause that Gauteng Piling did not recognize the problems associated with the retaining wall and fill, especially the implication of the proximity of the piles below the western end of the house to the retaining wall.

[83] Given the responsibility of a structural engineer to require the undertaking of an appropriate site investigation of a complex site such as the one in question prior to the commencement of any design work being undertaken, his responsibility to provide the piling contractor with comprehensive specifications, that a structural engineer's design can take the horizontal loads back into the remainder of the structure instead of into the piles, the different services rendered by different piling companies, the nature of the design function that Gauteng Piling was instructed to undertake, and the more limited site investigation that Gauteng Piling needed to undertake to fulfill that mandate, lead me to the conclusion that the evidence in all the circumstances does not establish that Gauteng Piling's conduct did not conform to the legally required standard of care. I am of the view that upon the facts of this case Gauteng Piling cannot reasonably be expected to have taken precautionary steps when it was confronted with the close proximity of the western end piles to the retaining wall.

[84] It appears from the evidence of Day that piling companies do not all offer the same design services. Some piling companies have design offices and employ professional design engineers. Others, such as Gauteng Piling, do not have a design office and the design they undertake is a narrow form of design, which in the words of Day is a 'simple process' of 'determining the size of the pile which is required to resist the specified load and that is the process of looking at the structural integrity of the pile and the means by which it sheds its load to the soil' and in the words of Oosthuizen '… a very narrow function of fleshing out the cross-section of concrete required to resist a pile load, of inserting the minimum reinforcement, and of choosing the type of pile'. Gauteng Piling, in the opinion of Day and Oosthuizen, does not offer a service beyond

that. Gauteng Piling is a company with limited liability conducting the business of a pile designer and installer. Its appointment by Paragon as a subcontractor was not an appointment of a professional consulting engineer. Oosthuizen testified that he is only aware of one piling contractor that truly offers the service of the design of foundations for buildings. A design office that will comply with all the relevant codes of practice is needed to offer such design function. It is also clear from the evidence of Crous and Maas that the specialist piling company in which Crous is involved renders a much broader design service than Gauteng Piling. Oosthuizen is of the opinion that in terms of accepted standards Gauteng Piling is not required to offer such an expansive service.

[85] Maas testified that Gauteng Piling is not a geotechnical specialist. It holds itself out as a specialist contractor and specialises in piling construction and only provides a pile to take the load as provided to Gauteng Piling. Its duty is to ensure that the piles it installs carry the given loads safely. The design function undertaken by Gauteng Piling '… can be done by someone with a matric, it does not have to be an engineer.' Gauteng Piling, according to Maas, does '…not do difficult designs'. Maas says that Gauteng Piling is simply a contractor that designs and installs piles to accommodate the loads specified by the structural engineer. Gauteng Piling, according to Maas, was called upon to design and install the piles in accordance with the loads supplied by Boswell. The vertical loads supplied by Boswell conveyed to Maas that those are the only loads that Gauteng Piling needs to allow for in designing the piles. Its design, accordingly, only catered for the vertical loads as specified by Boswell.

[86] Maas testified that it is assumed that the structural engineer had taken all loads into account in the rest of his structural design if they are not specified. Horizontal

loads, according to Maas, can either be transferred into the piles or into the rest of the structure through, for example, tie back beams. Maas testified that if Gauteng piling had been given information of the Löffelstein wall, that piles would go through 6 metres of engineered fill and that the structure does not cater for taking the horizontal loads out of the piles he would have recommended to the structural engineer that a geotechnical expert be employed. Designing piles to cater for the horizontal and vertical forces is beyond Gauteng Piling's scope of capability.

[87] It is common cause that Gauteng Piling was not privy to the ground beam layout which Boswell designed. Day is of the opinion that the mere fact that horizontal loads have not been specified by Boswell could also be interpreted to mean that the structural engineer had taken care of them in some other way, such as by tying the ground beam above the piles below the west side of the house back to the remainder of the structure which is founded on solid ground. The horizontal loads are then taken back to the remainder of the structure instead of taking them down into the piles. The piling company, in the opinion of Oosthuizen, has no idea what the structural engineer has designed on top of his pile to resist the load path of his building. Engineers, according to Oosthuizen, have regularly introduced at the top of the pile a strong structural system that will cater for the balance of the loads that the pile is not catering for. The top of the pile is well below the terrace level. There are pile caps and ground beams and the piler has no idea what the structural engineer's load path detail is.

[88] The narrow pile design function undertaken by Gauteng Piling, in the opinion of Maas, Day and Oosthuizen, enjoined it to undertake an investigation of subsoil conditions that was limited to confirming its assumptions and ensuring that the subsoil

was capable of supporting the piles during the implementation stage. Maas testified that a soil investigation undertaken by Gauteng Piling is limited and merely aimed at establishing the types and consistency of soils, the depth of the rock and the location of the water-table to be encountered in the area where the piles are to be installed. It is undisputed that certain types of soil and soil conditions are predictable for certain areas and that it is acceptable for a piling contractor, such as Gauteng Piling, to make assumptions provided the assumptions are verified at the latest when the piles are installed. Being presented with an engineered fill, Maas testified, means that it is well constructed and generally probably medium dense material. There was no need for Gauteng Piling to anticipate movement of the fill and if the structural engineer was aware of such a possibility Maas would have expected him to inform Gauteng Piling thereof.

[89] Butterworth explains that each hole drilled during installation amounts to a soil investigation the piling contractor. The first hole drilled by Gauteng Piling during installation, according to Butterworth, was a test hole that would have given it the exact site parameters. It drilled 37 test holes on the site prior to concreting. Day is of the opinion that the geotechnical aspect of the limited form of pile design that Gauteng Piling was called upon to undertake entails a consideration of the sheer strength of the soil around the side of the pile to determine whether the pile would be able to transfer the load either into the soil around the pile or below the base of the pile. Oosthuizen is of the view that a piling contractor, such as Gauteng Piling, is not interested in the ground conditions in terms of the performance of the piles. It does not inspect a site to determine the load carrying capacity of a pile or whether the terrain will accept the pile.

It is the structural engineer who has taken the ground conditions into consideration in deciding on piling. The structural engineer has made the call that his structure will be stable if a pile of his specified load is used. The piling contractor, in the opinion of Oosthuizen, takes the terrain into consideration in terms of the founding depth of the piles: what it will cost the piling contractor to 'answer the call of the structural engineer'.

[90] Given the fact that Gauteng Piling was not called upon to take loads other than the vertical loads supplied by Boswell into account in its pile design or to undertake a geotechnical investigation, its design function, in my view, indeed became a narrow one and its soil investigation much more limited than the detailed investigation required of Boswell. Gauteng Piling's scope of work, accordingly, did not enjoin it to recognize or to apply its mind to the problems associated with the retaining wall and fill or the close proximity of the piles below the western end of the house to the retaining wall. It was in my view perfectly reasonable of Gauteng Piling to accept that loads other than vertical loads would have been taken care of in the structural engineer's design of the structure.

[91] The piling subcontract between the building contractor, Paragon, and its subcontractor, Gauteng Piling provides that Gauteng Piling's tender is based upon the SABS 1200F specification. Clause 5.1.7.1 of the SABS 1200F specification reads as follows:

'If it is found during the course of piling that the subsurface soil conditions differ materially from those given in the project specifications as shown on the tender drawings the contractor shall immediately notify the engineer'.

[92] Glynden contends that the subsurface soil conditions found during the course of piling differed materially from those given in the project specification for the piling or as

shown on the tender drawing, Boswell's pile layout drawing. The existence of the retaining wall and fill and the close proximity of piles 19, 19A, 20 and 20A to the retaining wall were not given in the project specification or tender drawings. Glynden contends that Gauteng Piling acted negligently in not immediately notifying the engineer thereof. There is in my view no merit in this contention.

[93] Boswell, it is common cause, was fully aware of the existence of the retaining wall, the fill and the close proximity of the critical piles to the retaining wall and that these parameters were not given in the project specification for the piling or shown on the pile layout drawing. As was explained by Day, clause 5.1.7.1 of SABS 1200F is concerned with the obligation of a contractor to notify the engineer if an event arises that could give rise to a claim by the contractor, in this instance Gauteng Piling.

[94] Maas testified that had Gauteng Piling encountered huge boulders, very shallow depth, water or a major collapse while drilling on site it would have informed the engineer of that. The conditions on site, however, were no different from what Gauteng piling expected to get. I have mentioned Oosthuizen's opinion that the unusual and critical terrain parameters made no difference to the installation of the piles. Gauteng Piling, accordingly, had nothing unusual to report. It is common cause that it is accepted standard practice that a level surface would be available to a piling contractor and that is what was found when Gauteng Piling arrived on site to install the piles. Its primary assumption of an average founding depth of 6 to 8 metres per pile was proved correct. As Oosthuizen said, it is Gauteng Piling's business to install piles right up to and even over the edge of a precipice. The existence of the fill in itself, also in the opinion of Day, is not something untoward from Gauteng Piling's point of view that

would have warranted reporting to the engineer. If a situation had arisen where the piles could not be installed through the fill into stable material below or into in situ material below then the design assumptions would not have been fulfilled and reporting of the fill to the engineer may have been warranted. The retaining wall did not concern Gauteng Piling.

[95] No negligence on the part of Gauteng has been proved. This finding makes it unnecessary for me to consider the questions whether there was a legal duty imposed upon Gauteng Piling to prevent Glynden (a non-contracting party to the piling subcontract) from suffering pure economic loss and whether its exposure to pay damages could be more onerous than provided for in the piling subcontract that brought about its engagement as designer and installer of the piles.

[96] Turning to the question of the amount of Glynden's loss, there has been agreement amongst the expert witnesses in relation to the costs of the remedial works, above and below ground, except for four items concerning the below ground remedial works. The agreed costing for the above ground remedial works is the sum of R507 168.90. Crous and Day, on behalf of Powell Boswell & Associates and Gauteng Piling respectively, disagree with the assessment of Tromp on behalf of Glynden on the following items in respect of the below ground remedial works: (a) allowance for provisional and general costs in respect of the piling and anchoring; (b) additional construction work required by Tromp; (c) additional construction monitoring required by Tromp; and (d) the rate of the contingency allowance.

[97] Tromp proposes an amount of R640 000 in respect of the piling and anchoring establishment and provisional and general costs and Day an amount of R406 000. Their proposed amounts include an amount of R140 000 in respect of establishment costs, which amount is not in dispute. Crous proposes that no provision be made for provisional and general costs since some piling contractors do not charge such costs. The disagreement between Tromp and Day relates to the time period that should be allowed for the execution of the below ground remedial work below the west end of the house. I am of the view that provision should be made for provisional and general costs. Tromp's proposal is based on an actual price received from a piling contractor and the below ground remedial works also include the construction of a ground beam and anchoring. Day's estimate of four weeks is fully motivated and can, on the evidence presented, not be faulted. I am accordingly of the view that the amount proposed by Day should be allowed in respect of this disputed item. I further agree with the submission of Boswell's counsel that there is nothing to suggest that either the evidence of Day or that of Crous in relation to the other disputed items is anything other than a fair assessment of the costs involved.

[98] The amount of R266 000.00 in respect of the allowance for provisional and general costs should accordingly be added to the agreed costing for the below ground remedial works in the sum of R1 672 437. Agreement in relation to the costs of the below ground remedial works, excluding the sum of R266 000 in respect of the allowance for provisional and general costs, was reached on 21 May 2014 and in relation to the above ground remedial works on 27 May 2014. I agree with the submission of Gauteng Piling in which Powell Boswell & Associates concur that interest

should run from the respective dates upon which the agreements were reached and in respect of the disputed items from the date of judgment.

[99] Finally, the matter of costs. I am not persuaded that the circumstances of this case warrant a deviation from the general principle that costs should follow the event, both in respect of Glynden's claim against Boswell and its claim against Gauteng Piling, or that there is any proper case made out for the granting of a punitive costs order against Powell Boswell & Associates. I consider it just to award costs on the usual party and party scale.

[100] In the result the following order is made:

1. The plaintiff's claim against the third defendant is dismissed with costs, including the costs relating to the expert witnesses employed.
2. Judgment is granted against the first defendant in favour of the plaintiff for:

2.1 Payment of the sum of R2 445 605.90;

2.2 Interest on the amount of R1 672 437 at the rate of 9.00% per annum *a tempore morae* from 21 May 2014 until date of payment, on the amount of R507 168.90 at the rate of 9.00% per annum *a tempore morae* from 27 May 2014 until date of payment and on the amount of R266 000 at the rate of 9.00% per annum *a tempore morae* from 27 January 2015 until date of payment.

2.3 Costs of suit, including the costs relating to the expert witnesses employed.

P.A. MEYER
JUDGE OF THE HIGH COURT

27 January 2015

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| Dates of hearing: | 16 May – 6 June and 15 – 16 July 2014 |
| Date of judgment: | 27 January 2015 |
| Plaintiff's counsel: | Adv JF Steyn |
| Plaintiff's attorneys: | Norton Rose Fulbright South Africa |
| First defendant's counsel: | Adv J Joyner SC |
| First defendant's attorneys: | Andrew Miller & Associates |
| Third defendant's counsel: | Adv MJ Sawyer |
| Third defendant's attorneys: | Webber Wentzel Attorneys |