

## **Construction By Design**

As a Loss Adjuster practising in the field of construction related insurances, I continually come across losses in which design failure is a major factor. Having established this, the agony of then interpreting the design exclusion to a construction policy then commences.

The purpose of this paper is to discuss the concept of design, to look at the various design exclusions which are commonly used in construction policies and to look at relevant case law which, to date, only goes part of the way to providing clear guidance in relation to such matters.

### **What is Design?**

Design is defined in the Macquarie Dictionary as, amongst other things:  
*"to plan or fashion artistically or skilfully, to intend for a definite purpose; to form or conceive in the mind."*

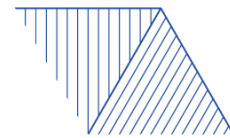
The term 'design' has also been addressed in various legal cases. Arguably, the most definitive of these concluded that design could be defined as *"...something conceived in the mind of man..."*.

Although the above may be definitions of design, they do not provide an insight into the concept of design, which I feel is necessary before a true interpretation of a design exclusion can be considered.

In the context of a construction policy, this paper will concentrate on the design of structures. This can be further divided into two components, being the aesthetic or functional design, and the structural design. Generally, the aesthetic or functional design of a building or structure is one of an architectural nature. Both aesthetic and functional "failures" are generally not associated with physical loss or damage and, therefore, would generally not fall within the province of a construction insurance policy. On this basis, these will not be considered in this paper.

Structural design failure, however, can lead to quite catastrophic physical damage. Such design, although often undertaken by qualified engineers, can also be carried out either knowingly or unknowingly by builders and contractors, sub-contractors, architects or even a principal. Indeed, by selecting a method of construction, a material, or combination of materials, a contractor could, without realising the implications, be responsible for the partial design of a structure.

The principle of structural design considers a series of individual components being combined in a particular fashion such that the components can interact with one another to ensure that the whole performs as required. Accordingly, before a design can be undertaken, the designer must have a clear appreciation of what is to be achieved. This is too often an area where problems occur.



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Complicated design is often an iterative process. For example, in designing a beam, the engineer may be restricted in, say, the depth of the beam which can be used. The depth of the beam, however, is only one component of many which must be considered in the successful design of the beam. Other components can be added and subtracted in relation to one another to the degree where dozens of designs using similar components in different quantities would prove satisfactory. The concept of good engineering design, however, is to select that optimum design which provides the most economic solution for the problem at hand.

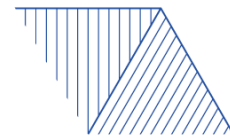
An example of such process could be as simple as the design of a concrete slab on ground. If we assume that the designer has successfully calculated both the dead and live loads to which the slab would be subjected, and the bearing stresses to which the soil can withstand, then the compilation of the various components of the slab can commence. Decisions which would need to be considered would include the strength of the concrete which is to be used, the depth of the concrete, the quantity and location of steel reinforcement, and positioning of expansion/construction joints. The designer can combine these variables in various ways and still achieve a satisfactory result. For instance, if the designer reduces the thickness of the floor slab, however increases the strength of the concrete, then this could well still produce a satisfactory floor slab. Similarly, instead of increasing the concrete depth, the designer may increase the quantity of steel reinforcement, then a satisfactory result may still be achievable.

Accordingly, the successful design of a structural member does not necessarily rely on a specific component, rather the various components working together to achieve the desired result.

What then if a finished floor slab, say, began to crack? As with all professions, should advice on the problem be requested from three engineers, then it is quite possible that three different opinions may be provided. In the above example, did the problem arise due to insufficient steel or incorrectly located steel, lack of expansion joints, or insufficient depth of concrete? It would, in the writer's opinion, be too simplistic to blame one component when another component could just as easily have been changed to provide a satisfactory result. In such a circumstance there is some doubt that a single component "part" can be blamed for a loss. More likely it is an inter-relationship between a number of "parts" that is the problem.

### **What is Faulty Design?**

The aspect of faulty design was addressed in the High Court judgement of *Manufacturer's Mutual Insurance Limited -v- the Queensland Government Railways & Anor*. This was a case which was on appeal from the Supreme Court of Queensland. Briefly, the circumstances of the claim related to the design of a bridge over a river, specifically the piers of the bridge. As a result of forces placed on the bridge caused by a flood, the piers failed. The design was apparently undertaken with good engineering practice at that time. The insurance policy contained an exclusion for "*loss or damage arising from faulty design*". Insurers



believed that the failure was a direct cause of the faulty design and subsequently refused to indemnify their insured.

The matter was first of all heard by an arbitrator who ruled that, as the design undertaken by the engineer was in no way negligent, the exclusion would not apply.

On appeal, the High Court ruled that there was a distinction between faulty design and negligent design. It was found that, although the designer was not negligent, the design itself had flaws or deficiencies which resulted in the failure of the structure, and therefore could be described as faulty. In his judgement, Windeyer J. said:

*"But a man may use skill and care, he may do all that in the circumstances could reasonably be expected of him, yet produce something which is faulty because it will not answer the purpose for which it was intended. His products may be faulty although he be free of blame."*

Accordingly, the High Court allowed the appeal and concluded that the exclusion would apply.

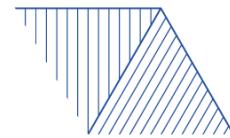
In the above case, the designer had utilised all engineering knowledge and practice that was available at the time and had done so correctly. Notwithstanding, the Court held that the design was faulty.

To this present day, by far the majority of construction insurance policies which are issued exclude, to a lesser or greater extent, loss or damage arising from faulty design. It is arguable that the intention for such exclusion is to exclude those losses which would be more appropriate to fall within the bounds of a professional negligence insurance policy. If the engineer has in no way been negligent or in breach of his professional duty, such as would have appeared to have occurred in the Queensland Railway case, then it would appear that an uninsured exposure exists. Given the unexpected and unintended nature of such consequence, and the fact that no party would appear to be at blame, it could be argued that there is a gap in cover in the vast majority of construction insurance portfolios.

### **Policy Exclusions**

There is no such thing as a standard design exclusion in a Contract Works Policy. Exclusions in which the writer has had experience relate to the complete rejection of all damage to insured property caused by a defect or omission in design, to limiting the exclusion to that part which is defective, or to paying all loss or damage arising out of the defective design other than any improvements.

There are also those policies which do not exclude defective design, rather exclude negligent design. The intention behind this no doubt relates to the *MMI -v- Queensland Railway* case previously discussed in this paper.



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In Australia there are generally three commonly used exclusions, which each have different philosophies behind their intent. The first exclusion, which provides the most restricted cover, excludes the costs of rectifying loss or damage to insured property arising out of a fault, defect, error or omission in design, plan or specification. The intent is quite clearly to not provide cover for loss or damage caused by an error in design. In discussing this with underwriters over the years it would seem that the philosophy behind such exclusion is not to provide cover for a risk which is "more rightly" covered under a Professional Indemnity insurance policy.

Notwithstanding the philosophy behind the Queensland Railways case as discussed before, the above intention does not take into consideration the large proportion of "design" decisions made by contractors, subcontractors, suppliers and indeed principals, many of whom do not have, and are unlikely to obtain, Professional Indemnity insurance.

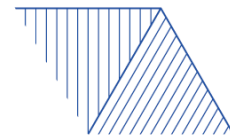
The second common exclusion first of all excludes costs of loss or damage to insured property but then introduces a proviso. The proviso in this case states that the insurer will pay the cost of loss or damage but this will be limited to the actual cost of rectification of the loss or damage to insured property, less those costs which would have been incurred in rectifying the design error immediately prior to the damage occurring.

In theory, in the writer's opinion, this is an equitable exclusion. What it essentially says is that if, using hindsight, the insured was to be made aware of a defect in the design of the structure just prior to failure, then the insured, under his common law duty of care, would have to incur costs to rectify the defect to ensure that the damage did not occur. As at that point the damage had not occurred, then those costs would not be claimable under a construction insurance policy. This would have, therefore, placed the Insured in the position of having to fund such rectification costs themselves (subject to any rights of recovery they had from any other party).

The intention of the exclusion, therefore, is to ensure that the Insured will expend those costs which, under their normal duty of care, would have rightly been expended by them in any event.

Let us take for example the situation of a balcony of timber framing over which compressed fibro had been laid, and on which tiles had been glued. As a result of the timber structure being of inadequate design, the floor deflected excessively, causing cracking throughout the tiling. The application of the exclusion could, in the writer's opinion, vary, depending on the circumstances of the layout and design of the balcony.

In applying the exclusion the question must be asked, *"What would the Insured have had to undertake prior to the damage to the tiles occurring in order for the damage to the tiles not to have occurred?"*



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On face value this would appear to be the cost of replacement of the timber framing. The works associated with this would, generally, include the removal of the tiles, the removal of the compressed fibro flooring, and the removal and replacement or the strengthening of the timber framing. What if, however, the strengthening of the flooring could have simply been undertaken prior to the loss or damage occurring by inserting extra timber members from underneath. This would no longer have required the removal of the tiles or the compressed fibro sheeting which, therefore, would not be considered in the calculation for the costs incurred in rectifying the problem prior to the loss or damage occurring. If however space is not available to undertake this work underneath the balcony, then the tiles and compressed fibro would be included in the proviso costs and, therefore, not covered by the insurance policy.

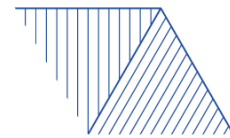
Based on the above example, the equitable nature of the exclusion could be queried.

The third type of exclusion which is common in the Australian market excludes loss or damage directly caused by defective design, but again introduces a proviso. The proviso limits the exclusion to the part which is defective and does not exclude any other "part or parts" lost or damaged in consequence of the defective design.

In the writer's experience the wording of this exclusion has tended to polarise opinion on how the exclusion should be interpreted. By way of example, it may be possible to see how the different interpretations may apply in practice.

For the purpose of this exclusion, let us assume a building with external tiling. The tiles may be of natural stone and adhered to the main structure of the building. As a result of thermal expansion and contraction, the tiles have both cracked and de-bonded from the building, damaging tiles, adhesive, and substrate.

Prior to discussing the application of the exclusion, the aspect of the design must first of all be considered. Although thermal movement is only one of numerous parameters which must be considered by the designer, it is of extreme importance. Simplistically, all materials expand and contract in proportion to the temperature to which they are subjected. Each separate material has its own unique coefficient of thermal expansion, which is known to the designer. In relation to this specific problem, the designer has to specify a system whereby the tile can be successfully attached to the building such that the tile does not become damaged or de-bond from the building itself. In order to do this, the designer must look at the properties of the natural stone tile, the adhesive and the building. In order to design the cladding system, therefore, the designer must look at the properties of the tiles, the building fabric materials and the adhesive, in order to eventually specify a system whereby the tiles can be successfully connected to the building.



Having designed the system, the tiles are attached to the building. At that time the individual components are "combined together" such that they form a facade. In other words, the individual component parts become a single unit.

Now to refer back to the problem at hand, let us assume that as a result of thermal expansion and contraction, the tiling system cracks and de-bonds from the building. What, therefore, is the part which is defective?.

It can be argued that the part which is defective is purely that of the adhesive, as this failed to transmit the forces from the tiles to the building. If this is deemed to be the case, then the part which is defective is the adhesive itself, and the subsequent damage to the tiles would, therefore, not be excluded by the policy. On the other hand, it can be argued it was the interaction between the various components of the facade system which, when put together as a whole, failed. It may not be simply possible to blame the adhesive, as it may well have performed to specification and, indeed, the design error may have been contributed to by the performance of the tiles and/or the fabric of the building. On this basis it is unlikely that an individual component can be blamed for the failure of the system, as it was the system itself that failed, not the individual component.

As discussed earlier in this paper, it may have been the interaction between components of the design which has failed, not necessarily an individual component.

If this argument is accepted, then it is the entire facade system which would be excluded by the policy as being the defective part.

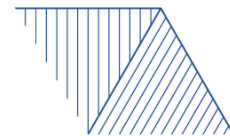
A common mistake in interpreting such exclusion is to confuse defective materials with defective design. The mere fact that the material was manufactured to specification does not mean the specification is not incorrect for the particular application.

### **Case Law**

There are few cases which specifically discuss the construction insurance design exclusions.

In *Chalmers Leask Underwriting Agency -v- Mayne Nickless Ltd* the application of a design and workmanship exclusion clause was considered. The case related to the construction of floodways and channel as a part of flood mitigation works. Associated with the works was a temporary coffer dam which was constructed upstream of the work site. The coffer dam was used by earthmoving machinery for access purposes. As a result, a depression in the top of the coffer dam was formed and it was alleged that this constituted a defect in design or workmanship of the coffer dam. As a result of heavy rain on numerous occasions, flooding occurred in the area, causing damage to the coffer dam and to the works.

The exclusion in the policy reads: "*This clause does not cover.-*



*(iii) "Loss or damage directly caused by defective workmanship, material or design ... but his exclusion shall be limited to the part immediately affected and shall not apply to any other part or parts lost or damaged in consequence thereof;".*

It was found by the Court that the "V"-shaped depression in the top of the coffer dam had little effect in the loss and, therefore, had little bearing on the matter. It was also apparent that the Insured did not claim for any damage to the coffer dam itself, rather was claiming for the resultant damage to the works. The Court found that this was not excluded by the policy and, accordingly, the claim succeeded.

The High Court stated that, at most, *"the part immediately affected"* by the defective workmanship or design was the coffer dam, not the resultant damage to the works downstream. It was, therefore, not necessary for the Courts to enter into discussion on *"the part immediately affected", or "any other part or parts lost or damaged in consequence thereof"*. In *Graham Evans & Co (Old) Pty Ltd -v- Vanguard Insurance Co Ltd and Ors* the Supreme Court of New South Wales were given the opportunity of considering this matter. Unfortunately this did not eventuate.

The circumstances of this matter related to the painting of a multi-storey building. A proprietary painting system was used, which involved the application of three separate coats of paint. The first coat, a cement-based primer, had not been mixed correctly. There were no defects in the second coat, being an undercoat, and the third finishing coat. Having completed the painting, however, the paintwork began to peel off the building in many areas.

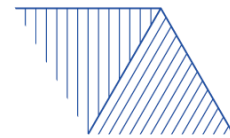
The loss was caused by the incorrect mixing of the primer coat, which prevented it from adhering properly to the building.

In this matter a similar exclusion to that in the *Chalmers Leask -v- Mayne Nickless Ltd* applied. The insurance policy excluded:

*"2(c) Loss or damage directly caused by defective workmanship, construction or design ... but this exclusion shall be limited to the part which is defective and shall not apply to any other part or parts lost or damaged in consequence thereof;".*

The Court first of all considered whether there was loss or damage to the works. Foster J. stated that the insuring clause was *"apt to include coats of paint of considerable magnitude separately applied and composed of different ingredients, as was the situation in the painting of the exterior surfaces of this building."*

Foster J. then went on to say, *"In so holding I have accepted the plaintiff's submission that the rendering was useless and valueless on the second and third coats of paint, and the necessary physical stripping from the building,*



*constitutes relevantly physical loss of or damage to those coats considered as property in the manner I have just indicated."*

In considering the application of the exclusion, Foster J. considered the words "directly caused" appearing in the first part of the exclusion. He concluded that *"Insofar, therefore, as there was damage directly caused by defective workmanship it was caused to the primer coat, in my opinion."*

It would appear from this the Court believed that the damage directly caused by the workmanship was to the primer coat only, which, in turn, was caused by the incorrect mixing.

He proceeded to state that *"It is my view that the exclusion clause does not apply to the loss or damage claim under the insuring clause in this case, that loss or damage occurring of course to the second or third coats as I have found."*

Accordingly the Court found that there was only a casual connection between the defective workmanship (the incorrect mixing of the primer coat) and the damage to the second and third coats of the paintwork and that, therefore, these would not be excluded by the policy. It has often been mistaken that the *Graham Evans -v- Vanguard* case related to an interpretation of the *"part which was immediately defective"*, and the *"part or parts lost or damaged in consequence thereof."* Indeed, Foster J. specifically stated that it was unnecessary for him, in his opinion, to consider the qualification to the exclusion.

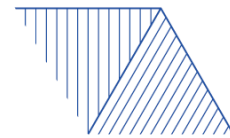
In *Walker Civil Engineering Pty Ltd -v- Sun Alliance and London Insurance PLC and Ors*, the Supreme Court of New South Wales again considered the application of a similar exclusion.

The circumstances of this matter related to the construction of a sewer rising main and associated intermediate pumping stations. The pumping stations were situated below ground level, and constructed of pre-fabricated fibreglass tanks. Concrete was poured between the tank and the excavation.

After the tanks had been installed it was found that the fibreglass tank was faulty in design and/or workmanship and/or materials, and required replacement. After considering various options it was eventually decided to replace the fibreglass tanks, which required the removal of both the fibreglass and concrete.

The exclusion clause in the insurance policy stated:

*"This insurance does not cover loss or damage directly caused by defective workmanship, construction or design ... but this exclusion shall be limited to the part which is defective and shall not apply to any other part or parts lost or damaged in consequence thereof. "*



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The Judge found that the purpose for the installation of the concrete had been to resist hydrostatic uplift pressure from ground water on the fibreglass tanks which was experienced in the area from time to time. On this basis he found that the concrete formed an integral part of each tank once it had been poured. It was acknowledged by the contractor that the fibreglass tanks did not form part of their claim, however in undertaking the work of rectification they caused damage to various other sections of the work, including the concrete between the tank and the excavation.

The Court found that the concrete, being an integral part of the tank, did not constitute *"any other part or parts"*.

The Court found that the removal of the concrete was not in consequence of the defective fibreglass, rather required removal in order to undertake the replacement of fibreglass tank due to the defects therein. Rolfe J. stated he considered that included in the *"loss or damage directly caused by the defective workmanship, construction or design"*, was the cost of rectification.

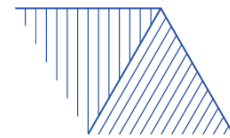
Accordingly, the exclusion was found to apply.

It would seem to the writer that the application of the exclusion in this case was somewhat different to that in the *Graham Evans -v- Vanguard* case. In his deliberations of the Walker Civil case, Rolfe J, considered the *Graham Evans -v- Vanguard* case which was described earlier in this paper. It is interesting that Rolfe J, commenting on the *Graham Evans -v- Vanguard* judgement, stated:

*"Insofar as his Honour found the casual connection was indirect rather than direct I would respectfully disagree. I find it impossible to conclude that the damage to the second and third coats did not arise directly from the failure of the first coat or, to put it as his Honour did, that there was indirect causation ... In my respectful opinion the proper approach to that case, .... was whether it could be said, on a proper construction of that clause, that the second and third coats were 'other part or parts'."*

The Walker Civil case went to the Court of Appeal and the appeal was dismissed. In their deliberations, the three judges confirmed certain points. Shepard stated:

*"Here the parts which were defective were the fibreglass tanks. No other part was defective. The defectiveness, for which it is acknowledged no claim can be made, led to the need, not only to replace the tanks, but also to remove the complex of equipment installed within them and to break up much of the concrete placed around the tanks in order to keep them stable. Some of the parts which were recovered were stored, in some cases after cleaning, and reused in the new tanks. Others – gaskets provide an example – could not be reused and had to be replaced. Other incidental work had to be done, including the restoration of landscaping which had to be disturbed when the tanks were removed."*



*It is important, I think, to reach a conclusion on the meaning of the words 'part' and 'any other part or parts' where used in the limitation to the exclusion clause. In my opinion 'part' is not a reference to a part such as a tank or a gasket; it is a reference to part of the work being carried out by the appellant. There is no mention of 'part' or 'parts' in the operative part of the exclusion clause. The words appear only in the limitation to it.... In my opinion the loss or damage suffered by the appellant as a result of having to remove the tanks because of their defectiveness was all 'directly caused' by the need to replace them.*

*The question then arises as to what the part of the work which was defective involves. In my opinion it was the part of the works which involved the construction of the three sewerage pumping stations. It is perfectly true that the complex of equipment installed within the tanks was not defective but the entirety of that part of the work was of no use once it was found that the tanks were admitting water. That made the whole of that part of the work defective."*

Further, Sheller JA, which Mason P agreed, said

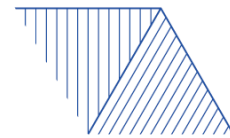
*"In my opinion, the appellant's claim is properly characterised as a claim to be indemnified under the policy for the cost of reinstating the defective part, namely the fibreglass tanks. So characterised, it was not a claim in respect of any other part or parts lost or damaged in consequence of defective workmanship, construction or design, any more than would be a claim for the cost of stripping off the second and third coats of paint in Graham Evans if they had remained intact and undamaged but had to be removed in order to reinstate the primer coat."* Unfortunately, the above cases do not define how such exclusions can be applied, in other than those cases which were considered. It would seem to the writer that the interpretation of the proviso to the above exclusions is still open to interpretation, which will no doubt occur in the following years.

### **The Future**

The concept of design is not, in the writer's opinion, as simple as the concept of defective workmanship or materials. In relation to a defective material it is much easier to determine which is the defective part and, therefore, the interpretation of exclusions relating to defective materials in the construction insurance policy is more simple.

The interpretation of defective workmanship has its own specific problems which will not be discussed here.

I suspect that the judgement of the *Graham Evans –v- Vanguard* case will be used less in the future. The apparent flaws in the judgement are, I believe, now being realised. It is ironic, however, that if the Court proceeded to discuss the aspect of *"the defective part"* in relation to the workmanship/materials question which formed the basis of that case, then it is possible that the same conclusion may well have been reached. I have doubts, however, that the same conclusion



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would have been reached if the problem related to a defect in the design of the painting system.

It is questionable whether the insurance industry should be continuing with exclusions such as discussed in this paper which can provide such wide variance in interpretation. This leads to continual argument and sometimes ill-will between insurers, insureds, brokers and adjusters.

One thing seems clear. Unless a change in philosophy in the cover provided for design defects is simplified, disputes on interpretation of exclusions will continue. Perhaps the concept of why such exclusions exist should be revisited and a change in philosophy, to mirror the changing responsibilities of Insureds, considered.

Design problems in the future will not simply disappear. Indeed, it is likely they will increase. As competition continues to strengthen, and principals and their representatives become more experienced in contracting to maximise their advantage, the aspect of design will become more important. More and more design and construct contracts are being undertaken than previously. Some of these relate to novated design and construct contracts, which by themselves, provide inherent risks for underwriters.

The advent of quality assurance and ISO 9000 requirements has increased pressure on contractors to perform. Ironically this has been interpreted by many to provide good documentation on how a mistake was made, rather than ensuring that the mistake was not made in the first place. It has also led to responsibilities for activities like design decisions for such things as temporary structures to be borne by builders and sub-contractors, who may not be "qualified" to accept such responsibility.

Design failures will continue. Disputes on design exclusions as they currently stand will also continue. The system as it exists either excludes such losses, or ironically, provides indemnity to the insured for occurrences involving design defects but only for the resultant damage and not the design defect itself. I say ironic as in doing so underwriters admit that they are prepared to underwrite the risk of faulty design, which under many circumstances could result in the payment of the bulk of a claim. It seems there is a reluctance to underwrite the entire risk, however.

It's a lot like being, as the old saying goes, a little bit pregnant.