

Building Stronger Foundations. Submission in response to government discussion paper.

The discussion paper provides a comprehensive coverage of a wide range of important issues but there appears to be one key area which is overlooked, and that is the issue of construction quality. For brevity, I will focus on concrete construction practices.

One simple fact explains a major cause of problems in concrete construction and it is the fact that there are no mandatory qualification requirements for concrete workers. Tradespeople such as electricians, carpenters and bricklayers are required to hold Certificate III qualifications but there is no such requirement for concrete workers.

There is an old industry joke that to be a concrete worker you only need an old ute and a good dog and you're in business. It's a wonderful joke but the true implication is that we are building parliament houses, opera houses and high-rise buildings using concrete workers with little or no training and using practices which haven't changed or improved in many decades. Worse still, these workers are very frequently supervised by inspectors and engineers who have also had little or no worthwhile training in the essential fundamentals of good concrete practice.

It is an acknowledged fact that three of the most important requirements for good concrete are that it be well mixed, thoroughly compacted (ie vibrated) and adequately cured. It requires less than 15 minutes to demonstrate that a very high proportion of the concrete placed into high-rise projects every day throughout Australia does not satisfy any of these three criteria. (It is also clearly necessary that the concrete mix be satisfactory but, for brevity, I will confine the discussion to site practices.)

Put simply, concrete cannot meet basic requirements for strength, impermeability and durability without good mixing, compaction and curing. It is the careless neglect of aspects such as these which explains much of the premature deterioration in our major structures, including the condition commonly referred to in the media as concrete "cancer".

Noted structural engineer Peter Miller in the 1990s wrote the following in the journal of the Institution of Engineers Australia:

"... concrete technology is an area in which engineers have dropped the level of their game. We have allowed an old and honorable material to be brought into disrepute. The most brilliant design depends for its success on the skill of the craftsmen dealing with the wet concrete. Project managers are severely constrained by cost and timethey no longer afford the time and money to ensure that the formwork, the concrete placing and compaction, and the curing are of the necessary quality. Current knowledge ... is sufficient to ... avoid most of the faults we see."

Sadly, these remarks are even more relevant 30 years later in 2019. The numerous reasons for this are beyond the scope of this submission but the situation can be summarised as follows:

- * concrete crews are rarely trained in good construction practice;
- * their supervisors and managers have higher priorities (typically time and cost) than enforcement of quality standards;
- * clients rarely provide adequate site surveillance, preferring to rely on others to assure the quality;
- * self certification was never likely to be effective and has been shown to be a highly flawed process.

Concrete is the most widely used building material in the World but is a challenging one in terms of having a short "working shelf life" of around one hour. Alternative building products such as timber and steel can sit in stockpile for weeks whilst testing is undertaken to confirm their acceptance and before their incorporation into the works but concrete (like epoxies) involves a relatively rapid chemical reaction during which time the standard of handling and placement will dictate its strength and durability for the remainder of its life.

A loss of strength is relatively easy to measure but builders rarely bother. It is routine practice to mould test cylinders on site but these are very easily "doctored" to give favourable results and, in any case they bear little relationship with the in situ strength because cylinders are moulded using techniques that are detailed in Australian Standards whereas the concrete in the works is placed using completely different practices. In truth, much of the concrete placed every day receives little or no compaction, and in terms of curing, a 2011 report by the Concrete Institute of Australia stated that *"there is not sufficient attention paid on many construction sites and it is often completely ignored, without any consideration given to the consequences"*.

The international literature contains convincing evidence that the combination of poor compaction and curing results in a significant increase in concrete permeability and a resulting substantial reduction in durability, particularly under aggressive conditions such as marine environments, as evidenced by the high incidence of concrete “cancer” in waterfront apartments (and bridges).

Phil Dwyer (Builders Collective of Australia) recently told *The New Daily*, that news of another building scandal was no surprise. *“It’s just another one of many more to come,”* he said, and I know that he would be supported in this claim by a very high proportion of informed industry staff.

In my opinion, the most worrying aspect of concrete durability is that concrete cancer typically doesn’t become apparent until decades after construction and so the current bout of structural problems is only the first “wave” of trouble. When poor construction practices over the past 20 years begin to surface over the next 20-30 years in the form of concrete cancer it will resemble more a tsunami than a wave. There is ample overseas experience of this, including problems with failing apartment balconies in various places such as Scandinavia and the United States.

Phil Dwyer also stated: *“We’re going to see more building failures, because, particularly in the past five years, we’ve noticed an enormous lack of skills in the building industry, with builders and people operating in our space who don’t have the skills needed to be there.”*

To many informed industry personnel, the surprise is not that we are now seeing problems emerging but rather that they have been obvious for so long and that few builders or agencies have been willing to acknowledge or address them. In a 2002 report by the Australian Concrete Repair Association to a Joint Select Committee on the Quality of Buildings, it reported that *“the concrete repair industry in NSW alone is worth some \$100M, half of which would be spent on home unit repairs”*.

The current discussion paper talks about providing property owners with *“more avenues ... to seek redress for defective building .. damages and loss”* but I fail to see how this will apply to an apartment owner faced with structural dangers in a property that is older than (say) 20-30 years because at that age it is unlikely that any owner would be able to demonstrate that *“the loss sustained is not too remote a consequence of the breach of the duty”* despite the irrefutable facts throughout the international literature that the corrosion of reinforcement is invariably a consequence of inadequate concrete cover and/or poor quality of this concrete cover, both issues which are clearly and fully within the builder’s sphere of responsibility.

These are complex problems with far-reaching consequences for our children, but there are proven remedies, albeit challenging ones. It would be easy to confine the review to near-term problems of documentation and certification but if you plan to fix a leaking dyke it would be a waste of time and resources to plug only the closest and most obvious holes. The emphasis in the discussion paper on “building designers” appears to confine the review to just one of several major holes in the building dyke. A resolution of the concerns related to “building designers” alone will address only a small proportion of the total problems with current building standards.

This is a brief submission covering only a few of many relevant issues but I will be happy to elaborate on any aspect at your convenience. I have been involved in concrete construction for over thirty years and I have presented numerous papers on this topic since 1989 at international conferences. In recognition of my work I am an honorary member of both an Australian and an International concrete society.

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