

Date: 9 April 2018

# **AS2870—2011 SCOPE OF REVIEW**

## **1 INTRODUCTION**

1. The current version of AS 2870 was published in January 2011. It is now more than seven years old. A Standard that is so widely used and relied upon, is so economically significant, and very commonly tested in legal proceedings throughout the country, must be reviewed regularly to ensure its suitability and incorporate latest trends and research.
2. I am looking to introduce a project proposal later this year to Standards Australia for review of the Standard.
3. I alone, based on my own, on-going, informal discussions with a wide range of stakeholders, have produced this document. It has no formal status or imprimatur from any organisation; although Standards Australia is aware of, and informally supports, this process.

## **2 MECHANICS OF REVIEW**

### **2.1 Timetable**

4. The next round of project proposals closes in August this year, and I expect to submit the proposal in that round.
5. The earliest amendment of the National Construction Code in which a reviewed AS 2870 can be called up is NCC 2022, which will come into effect midway through 2022. For a reviewed AS 2870 to be included in NCC 2022, it must be published no later than May 2021.
6. So: project proposal approved hopefully late this year, Committee constituted early in 2019, drafting complete no later than October 2020, allowing six months for the public comment and balloting processes. This gives a bit over eighteen months for the actual technical review.

7. Depending on the composition of the Committee and the actual scope of the approval project, it may be beneficial to form a couple of Working Parties, perhaps being a drafting group and specialist geotechnical and structural groups to review different parts of the Standard.

## **2.2 Strictures**

8. Those who were involved in the previous reviews of the Standard will be aware of the restrictions and limitations involved in review of Standards, particularly those called up in the NCC. They were tight last time; they're more so now.
9. The two most significant requirements in the present context are that any proposed change must provide a positive cost benefit, and any planned or expected changes must be approved as part of the project proposal.

### *2.2.1 Positive cost benefit*

10. Changes must be cost-neutral or provide a saving, based on direct and indirect costs.
11. For example, if a large-scale change was proposed, such as to increase the size of a standard footing, thereby increasing both direct and indirect construction costs, there would need to be a cost benefit analysis provided to demonstrate greater savings in some other area, such as the cost of rectification of failures that would be avoided with the proposed change.
12. Also note that a proposed change that was cost-neutral in actual construction cost would need to be justified as well, due to the indirect cost of implementing the change.

### *2.2.2 Approval of proposed changes*

13. The project proposal must include the scope of proposed changes. That is, a proposal that had an open-ended item such as "review size of footings" would probably not be approved. Some basis must be provided to allow consideration of the likely impact of the review with respect to costs and the justification for the review.



14. This is obviously counter-intuitive to some extent: how can it be known what the review will throw up before the review is undertaken? Nonetheless, I don't think it's as difficult as it sounds. Firstly, those who are familiar with the Standard and its application will probably have a good idea of where the problems are and what's required (at least in broad terms). Secondly, if some unexpected important issue is uncovered during the review process, the Committee can seek a review of the project approval to include the new item.
15. Probably the main single purpose of this present communication is to cast the net wide so that important points are not missed in the project proposal.

### **3 SCOPE OF CHANGES**

16. With respect to proposed review areas, I think the following broad observations are in order. I then discuss in more detail some specific areas.
17. Regarding the performance of AS 2870 overall, based on my observations and discussions around the country, I think it's going well. I am aware of no broad discontent with site classifications, standard designs or details, anywhere in Australia. Also, I don't think it would be possible to justify any broad change on a cost benefit analysis, as the vast majority of houses on AS 2870 footings perform well within the performance requirements.
18. An issue of current concern to the QBCC in Queensland is slab edge dampness, apparently resulting from high-level groundwater at the slab edge, wicking up through the footing/slab. The suggestion is that the option to terminate the vapour barrier at the inside top of the footing (which has been accepted practice in Queensland since the seventies, at least) be removed from the Standard. However, the number of reported problem houses (which I understand to be a few dozen or so) is still a very small proportion of houses constructed. Further, the real issue is high groundwater level next to the slab, and a vapour barrier extension is a marginal solution at best, with only informal, anecdotal evidence in support. I see no way that a change to the construction detail or a requirement for damp-proofing membrane could be justified on a cost/benefit analysis.
19. However, I do believe that there are some areas of potential improvement, as follows.



### 3.1 Waffle rafts on dry sites

20. There was much adverse publicity in Victoria a few years ago and following some well-publicised Court cases that resulted in Builders being ordered to pay owners the cost of demolition and re-construction. This arose out of concern about houses built on waffle rafts on sites that were abnormally dry due to drought.
21. Nonetheless, houses built on Code-minimum waffle rafts in western Melbourne at the height of the Millennium drought, with disputed site classifications and the poor site drainage that seems pretty typical in that area, performed better than might be expected. I seem to recall that VBA found that about 5% of those houses had reported defects. (That was still a lot of houses, and sufficient to cause plenty of media attention.)
22. I don't think there's any doubt that use of waffle rafts on desiccated sites is a very vulnerable combination. Firstly, it's unusually sensitive to poor site drainage and even relatively minor drainage flaws can cause edge heave. Secondly, edge heave is difficult to rectify, particularly in the short timeframe that's often necessary to resolve a dispute. (Unlike edge settlement, where simple underpinning can be useful in most cases).
23. If there is a problem in this area, I see two parts to the issue: how to identify a desiccated site, and what to do when you have such a site.
24. Perhaps we could have some simple tests to identify a desiccated site, which becomes Class P. Say, insitu moisture content less than Plastic Limit (or some such) at depth half  $H_s$ , in three spots across the site?? Or, following three years of annual rainfall less than half the long term mean rainfall for the locality??
25. In my experience it is highly likely that a slab with significant edge heave will never completely lose a dished profile. I'd like to see a two-pronged approach to design, with some moisture control measure to slow down moisture penetration beneath the slab edge (to stop that short, sharp heave that tends to cause hysteria in owners) and some extra slab stiffness to ameliorate the effects of the curvature.



26. With respect to groundwater control, personally I'd like to see a 150 thick, 900 deep vertical reinforced concrete barrier beneath the outside of the footing, with vertical dowels into the base of the edge footing. There remain various problems, such as drainage penetrations and the cost of construction. The obvious alternative, being a concrete perimeter slab, is relatively simple, but in my experience will always give serviceability problems on a dry site as the external slab rises relative to the house and has a backwards slope. There are also issues where there are small boundary clearances.
27. I'd like to see some extra stiffness in the slab, but I don't think it'd be practical to completely eliminate dishing, and you'd probably still have slope. Perhaps a slab one classification heavier?

### **3.2 Slab edge dampness**

28. This is not a very common problem, but can be difficult to rectify. As before, ideally we'd give advice on identification of potentially-problematic sites, and then some advice on how to address the issue.
29. I don't really have much in the way of suggestions for problem site identification, but perhaps others do.
30. I think the present advice of the Standard with respect to getting water away from the slab remains good, but needs amplification and clarification. With respect to protection against water penetration, I personally remain unconvinced about the long-term efficacy of wrapping the footing. I'd like to see a more positive structural approach, such as low permeability concrete used around the perimeter.

### **3.3 Site classification**

31. I am not aware of serious concerns about the present classification system, but I think we might be able to give assistance to provide more flexibility in site investigation and lab testing. For example, are we yet at a point where we can provide useful advice Australia-wide based on geology? Is there any role for Atterbergs? What about  $I_{ps}$  derived from disturbed samples?



32. I believe we could give more advice regarding application of geotechnical engineering principles. It seems strange that we don't have site classification/characterisation based on engineering principles, when we have it for design. At the moment, you can have the best geotechnical investigation and testing, but still end up with the simple soil tester model.
33. What if you want to use large-scale reactive soil removal and replacement, which apparently is very popular these days in the US? It seems to me that it could be very popular with large developers and project home companies where large developments are involved, and yet it's not even contemplated in the Standard.

### **3.4 Class P sites**

34. I think it's rather concerning that there appears to be a large trend towards Class P sites, and yet the Standard gives almost no advice for design. I'd like to think we could put something in the Standard, at least for the most common P sites. Perhaps advice re piercing of standard designs on filled sites or where vegetation is a threat?

### **3.5 Thornthwaite Moisture Index**

35. I'm concerned we're getting too hung up on TMI maps, particularly as the relationship between TMI and  $H_s$  is tenuous and TMI itself is volatile.
36. The on-going interest in this area by researchers and lack of consistency re actual mathematical models used reinforce, in my view, the idea that the maps should not be in the Standard. (Indeed, I'd like to get the Victoria one out if politically possible, to allow practitioners to utilize the latest data.) Rather, I think the Standard should state the requirements for use of TMI and then rely on researchers to continually publish maps in *Australian Geomechanics* and the like.



37. Many researchers appear to be using the 25-year minimum period for their work, and generating maps of whole states or major areas on this basis. I think 25 years is OK for an individual site, as was the original intention, but I'm concerned where its being used to characterise whole regions. From my own research I know that TMI has great fluctuations, and is pretty sensitive to the actual 25-year period used in the calculations. I'm surprised that I haven't heard of practitioners calculating TMI for an actual site, and searching the whole data record to find the most favourable 25-year TMI value. It'd be pretty easy to do, and could well validate a significantly lower site classification or slab design.
38. I think we should tighten up the stated criteria for use of TMI, such that either the entire data record is used (if 25 years or more) or the most recent 25-year period, with the former if done for regional mapping purposes.

### **3.6 Design for trees**

39. Does anyone have any feedback yet on Appendix H? I haven't heard of any problems, although it's still early days. We need to have another drought, I suppose. My main concerns relate to the building control side of it, e.g. under what circumstances should design for trees be required?

### **3.7 Deemed-to-comply Class E slabs**

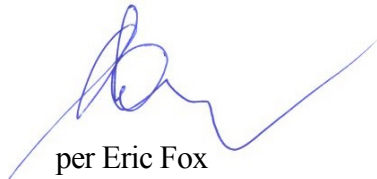
40. I'm aware of suggestions that the Standard should re-introduce standard designs for Class E sites. You may recall that they were in the 1988 Part 1, but were dropped from the 1996 revision because the Committee felt that the Standard should not allow slab specification on an extremely reactive site without engineer involvement. The Standard was (and is) not able to specify the involvement of an engineer and thus the only way for this to be achieved was by removing the standard design.
41. I'm not aware of any broadly-held concerns with the standard designs that previously were provided for Class E sites, and I know that many engineers still specify those designs. I'm also aware of other engineers who believe that the old Class E deemed-to-comply designs were inadequate. This will be an area that will need to be considered by the Committee.



42. I see no cost benefit concern with the re-introduction of the designs, as there's no reason to expect resultant slabs overall would be any more expensive than the ones presently specified by engineers.

### **3.8 Corrections and clarifications**

43. There were some errors that managed to make it into the current Standard, and these should be addressed.
44. There are some provisions of the Standard that are often misunderstood by users of the Standard, and I think some clarification of those aspects in the Commentary is warranted.



per Eric Fox