Review of AS2870-2011 Residential Slabs and Footings

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A fully revised version of Australian Standard 2870 governing residential slabs and footings has been published following an extensive review. Originally published in 1996, the new revised version will be adopted by the Building Code of Australia on 1st May 2012. This report provides a summary and analysis of implications for site classification, footing design parameters, site drainage and plumbing design as well as other changes in the new code.

Executive Summary

1. These changes must be adopted as of the 1st May 2012;

2. Highly reactive sites are now divided into 2 new classes (Class H to become H1 and H2) in recogition of climate changes, ex. Greater occurence of low sustained rainfalls (drought);

3. Slab footing design revisions - mesh upgrades for slab lengths exceeding 20m external beam continuity at re-entrant corners, additional top reinforcement;

4. Greater emphasis on description and specification of the design and contruction requiremnents necessary to limit the occurence of abnormal moisture conditions;
   - Drainage requirements
   - Flexible joints in plumbing

5. Extensive advice on design and construction to minimize the effects of aggresive soils, including highly saline soils and acid sulphate soils;

6. Extended to include "informative" appendices on deep footing systems and design for particular tree effects.

Set for adoption on 1st May 2012, at which point compliance will become compulsory, many engineering firms including Intrax are taking the proactive step of beginning to classify and design sites to AS2870-2011 in preparation for the changeover. Taking this step presents some unique engineering challenges as it creates an interim period whereby engineering designs to AS2870-2011 do not strictly conform to the current standard AS2870-1996. To manage the changeover and ensure proper compliance whilst reaping the benefits of the new standard, current engineering classification and designs to the new standard must be sure to fulfil and exceed the present standard requirements.

1.0 Site Classification

The drying effects due to the prolonged drought followed by higher than average rainfalls highlighted

"Costs for slab footing construction are set to increase"

the need in the highly reactive soil range to split class H into two new classes, H1 and H2. the classifications for the Melbourne Metropolitan region which have been summarised in figure 1.1.
The standard designs for class H2 are stiffer than those for the previous class H.

Intrax has carried out a preliminary assessment of the impact of the changes to, these figures are a guide only based on expectations.

Fig 1.1 - Expected Site Classification - Guide Only	
"Old Classification"	Percentage of Sites Expected to Alter to "New Classification"
M	M: 75% H1: 25%
M-D	M-D: 60% H1-D: 40%
H	H1: 10% H2: 85% E: 5%
H-D	H1-D: 15% H2-D: 75% E: 10%

Note that it is expected the majority of existing 'H' zones will now be "H2" classified; therefore costs for slab footing construction are set to increase.

Site classification based on chracteristic surface movement (Ys) Laboratory testing will now be required for 1 in 50 sites minimum. The revised table for site classification by characteristic surface movement is now as follows:

Fig 1.1 Classification by Characteristic Surface Movement (Ys)	
Characteristic Surface Movement (Ys) mm	Site Classification
$0 < Ys \leq 20$	S
$20 < Ys \leq 40$	M
$40 < Ys \leq 60$	H1
$60 < Ys \leq 75$	H2
$Ys < 75$	E

2.0 Footing Design

A summary of the main changes to structural design of footings is as follows:

a) Slab on Ground: Use of N12 diameter bars placed at the top of all external and internal ribs for class H1 and H2 sites.

b) Waffle Slabs: For Class H2 Sites

i. Bottom reinforcement now specified as N16 diameter bars (previously N12 diameter bars)

ii. Increase top mesh reinforcement for slab lengths greater than 20.0m (previously 25.0m)

iii. Need to maintain external beam continuity (stiffness) at re-entrant corners (pre viously only applicable to slab-on-ground footings).

3.0 Site Drainage Design and Plumbing

The revised standard has more emphasis on description and specification of the design and construction requirements necessary to limit the occurrence of abnormal moisture conditions.

A great deal of discussion has resulted from these changes. The emphasis is now on drainage systems to be documented and to form part of the footing slab design documents. The new standard is also clear to say that "sub-surface drains shall not be used within 1.5m of the building unless designed in accordance with engineering principles", refer to clause 5.6.3 (d). Furthermore, site drainage design requirements will now apply to class M sites in addition to class H and E sites as previously required.

It is worth noting that our colleagues in South Australia and Brisbane are already completing drainage designs to accompany their footing designs.

It appears inevitable that most sites will need to be 'engineer designed'

4.0 Drainage Design Requirements:

Following a review of the new Australian standard and after consultations with leading Building Surveyors in Victoria, we advise that drainage designs must accompany footing designs. However, such designs need not necessarily be conducted by an engineer unless otherwise specified in clause 5.6.3(d). Given the current trend for "smaller" lot sizes this means locating sub-surface drains away from buildings at a distance greater than 1.5 meters will be unlikely. Accordingly, it appears inevitable that most sites (particularly in the Melbourne Metro region) will need to be "engineer designed".

Furthermore, as per the advice of the Building Surveyors, where the design of the drainage system is not conducted by a design engineer, the footing design engineer must reference the drainage design document on their footing design plan in the same way geotechnical reports are currently referenced. This is aimed at ensuring proper control of design and documentation is maintained.

To accommodate drainage design control for buildings/walls constructed on boundary, the best solution may be to place a core drain or similar along every footing supporting a wall located on a boundary line and incorporate that drain within the slab footing. Care will need to be taken to ensure the drain and slab is separated by polythene (or similar).

Inspection requirements for drainage design:

Any underground works such as sub-surface drains or flexible joints for drains will need a statement of compliance to be issued from the builder and/or plumber. These works will need to be in accordance with AS2870-2011 and AS3500.

All works above the surface such as soil gradation, pavement works and garden beds will be inspected and approved by the relevant building surveyor; this will form part of their final inspection.

Other drainage requirements:

The new standard incorporates new requirements as detailed as follows:

i. The new standard clause 5.6.4(b) requires flexible joints to be designed to varying 'ys' values. Currently no design parameters are given and only a brief comment is stated.

ii. The new standard now includes drainage design and construction requirements for class M sites as well as H1, H2 and E. The current code drainage requirement is for class H and E sites only.

iii. A new clause, 5.6.3(c) has been inserted into the code outlining various design recommendations for service trenches passing under slab footings, i.e. clay backfill or plastic membrane barriers to prevent moisture ingress.

4.0 Other Changes and Conclusion

Finally, the revised standard now includes extensive advice on design and construction to minimize the effects of aggressive soils, including saline soils and acid sulphate soils. In addition, the standard has been extended to include "informative" appendices on deep footing systems and design for particular tree effects

In summary the revision of AS2870 should significantly improve the performance of the housing stock.

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