

6 SITE CLASSIFICATION

6.1 GENERAL

Australian Standard AS 2870-2011 [1] establishes performance requirements and specific designs for common foundation conditions as well as providing guidance on the design of footing systems using engineering principles. Site classes as defined on Table 2.1 and 2.3 of AS 2870 are presented on Table 3 below.

Table 3 - General Definition of Site Classes

Site Class	Foundation	Characteristic Surface Movement
A	Most sand and rock sites with little or no ground movement from moisture changes	
S	Slightly reactive clay sites, which may experience only slight ground movement from moisture changes	0 - 20mm
M	Moderately reactive clay or silt sites, which may experience moderate ground movement from moisture changes	20 - 40mm
H1	Highly reactive clay sites, which may experience high ground movement from moisture changes	40 - 60mm
H2	Highly reactive clay sites, which may experience very high ground movement from moisture changes	60 - 75mm
E	Extremely reactive sites, which may experience extreme ground movement from moisture changes	> 75mm
P	Sites which include filled sites (refer to AS 2870 2.4.6), soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise.	

Reactive sites are sites consisting of clay soils that swell on wetting and shrink on drying, resulting in ground movements that can damage lightly loaded structures. The amount of ground movement is related to the physical properties of the clay and environmental factors such as climate, vegetation and watering. A higher probability of damage can occur on reactive sites where abnormal moisture conditions occur, as defined in AS 2870, due to factors such as:

- Presence of trees on the building site or adjacent site, removal of trees prior to or after construction, and the growth of trees too close to a footing. The proximity of mature trees and their effect on foundations should be considered when determining building areas within each allotment (refer to AS 2870);
- Failure to provide adequate site drainage or lack of maintenance of site drainage, failure to repair plumbing leaks and excessive or irregular watering of gardens;

- Unusual moisture conditions caused by removal of structures, ground covers (such as pavements), drains, dams, swimming pools, tanks etc.

In regard to the performance of footings systems, AS 2870 states “footing systems designed and constructed in accordance with this Standard on a normal site (see Clause 1.3.2) [1] that is:

- (a) not subject to abnormal moisture conditions; and
- (b) maintained such that the original site classification remains valid and abnormal moisture conditions do not develop;

are expected to experience usually no damage, a low incidence of damage category 1 and an occasional incidence of damage category 2.”

Damage categories are defined in Appendix C of AS 2870, which is reproduced in CSIRO Information Sheet BTF 18, *Foundation Maintenance and Footing Performance: A Homeowner’s Guide*.

6.2 LOT CLASSIFICATIONS

The results of the laboratory shrink swell tests summarised in Table 2 indicate that the tested sandy clay and silty clay soils are moderately reactive to highly reactive.

Based on the soil profiles encountered in the test pits, and in accordance with AS 2870-2011, the lots in their existing condition would be classified as Class M Moderately Reactive to Class H1 Highly Reactive, provided that all footings are founded below any topsoil or fill. A characteristic surface movement in the range of 25mm to 45mm has been calculated for the lots in their existing condition.

The lot classifications summarised in Table 4 below are recommended for lots in their existing condition and in the absence of abnormal moisture conditions.

Table 4 - Recommended Site Classifications

Lot Numbers (inclusive)	Site Classification
Lots 208-212	Class H1, Highly Reactive
Lots 213-216	Class M, Moderately Reactive

Footing design should take into consideration of the effect of recent removal and planting trees in the vicinity of the development on soil moisture conditions. If recent removal of trees within the building area and surrounding area has been conducted, sufficient time for the soil moisture to re-equilibrate should be allowed, or specific engineering assessment and input would be required for foundation design.

Appendix B of AS 2870-2011 indicates that to reduce but not eliminate the possibility of damage, trees should be restricted to a distance from the building $\frac{3}{4} \times$ the mature height for Class M sites and equivalent to the mature height of the trees for Class H1 sites. Where rows or groups of trees are present the distance from the building should be increased.

The classification assumes that all footings (edge beams, internal beams and load support thickenings) are founded below any topsoil, slopewash, fill or other deleterious material.

The above site classifications and footing recommendations are for the site conditions present at the time of fieldwork and consequently the site classification may need to be reviewed with consideration of any site works that may be undertaken subsequent to the investigation and this report.

Site works may include:

- Changes to the existing soil profile by cutting and filling;
- Landscaping, including trees removed or planted in the general building area; and
- Drainage and watering systems.

Designs and design methods presented in AS 2870-2011 [1] are based on the performance requirement that significant damage can be avoided provided that site conditions are properly maintained. Performance requirements and foundation maintenance are outlined in Appendix B of AS 2870. The above site classification assumes that the performance requirements as set out in Appendix B of AS 2870 are acceptable and that site foundation maintenance is undertaken to avoid extremes of wetting and drying.

Details on appropriate site and foundation maintenance practices are presented in Appendix B of AS 2870-2011 and in CSIRO Information Sheet BTF 18, *Foundation Maintenance and Footing Performance: A Homeowner's Guide* [3], which is attached as Appendix D.

Adherence to the detailing requirement outlined in Section 5 of AS 2870-2011 [1] is essential, in particular Section 5.6 *Additional requirements for Classes M, H1, H2 and E sites*, including architectural restrictions, plumbing and drainage requirements.

6.3 FOOTINGS

All foundations should be designed and constructed in accordance with AS 2870-2011, *Residential Slabs and Footings* [1], with consideration to the site classifications presented in Section 6.2. Inspection of high level or pier footings excavations should be undertaken to confirm the founding conditions and the base should be cleared of fall-in prior to the formation of the footing.

All footings should be founded in stiff or better clay or weathered rock, below any topsoil, slopewash, deleterious soils or uncontrolled fill. All footings for the same structure should be founded on strata of similar stiffness and reactivity to minimise the risk of differential movements, with articulation provided where appropriate.

High-level footing alternatives could be expected to comprise slabs on ground with edge beams or pad footings for the support of concentrated loads. Such footings designed in accordance with engineering principles and founded in stiff or better natural clay may be proportioned on an allowable bearing capacity of 100kPa.

Piered footings are considered as an alternative to deep edge beams or high level footings. It is suggested that piered footings, founded in the weathered rock, could be proportioned on an end bearing pressure of 500kPa.

If foundations for proposed structures are located within the zone of influence of any service trenching or test pits the structure should be supported by pier footings. The depth of the pier footing should be extended below the zone of influence ignoring shaft adhesion. A structural engineer should be consulted for detailing.

Where piered footing are utilised, the potential for volume change in the subsurface profile should be taken into considered by the designer.