APPENDIX

Check your report for the list of topics relevant to your inspection

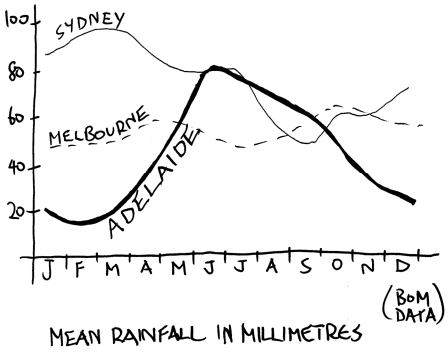
This appendix is a work in progress which has was created in response to requests for further information from clients who were unfamiliar with certain faults and maintenance issues. Because this document covers such a variety of age and type of home, some of the issues discussed may not be relevant now, but may become useful in the future. Friends or family members may have homes where these issues are relevant. Your suggestions for improving this document may be made to the author, David Bodycomb at artekton@bigpond.net.au.

Cracking in buildings

Key words:
Footing –
the part of a structure, generally at its bottom, which transfers the loads of the structure into the foundation
Foundation-
the soil, rock, sand or fill on which the building is supported

Overview

Much of Adelaide's suburbs are built on reactive soils – soils that shrink and swell according to their moisture content. Ideally, if the moisture can be kept unchanged, the building won't crack. In reality this is not possible. Irregular rainfall (see graph) and inadequate footings (usually in older homes) on reactive foundation soil will make cracking inevitable. The problem varies with locality and the type of construction, from nil to very severe. Very severe cracking needs repair every 5-10 years, simply to maintain a tolerable level of comfort and cleanliness in the home, and if the problem is widespread in the building, the accumulating cost and disruption can soon make demolition and redevelopment far preferable. Fortunately, this is rare, but even in a relatively minor case, it is easy to be alarmed and fearful of purchase and persons unfamiliar with the condition, especially from outside Adelaide, can be initially perplexed about how the locals can tolerate it. They may reasonably believe that the building will soon fall down, but this is most unlikely and it is rare even for a single wall to need to be fully rebuilt.

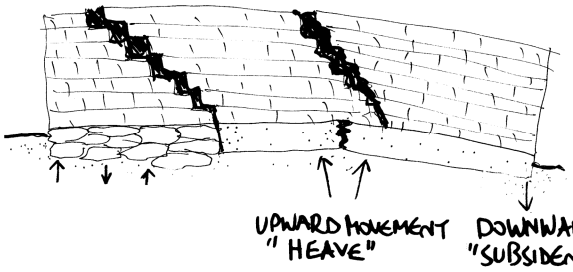


MEAN RAINFALL IN MILLIMETRES

On recently-developed sites, another cause of cracking may exist: subsidence of areas of un-compacted soil, which settle over time, leading to a loss of building support. In this case, underpinning may become necessary, which involves sometimes difficult excavation under or against the footing, followed by concreting of new support piers and/or beams.

Footings and foundations

Many older homes are constructed on footings that have little or no structural value except to occupy the distance between the wall (usually tons of brick or stone) and the ground, slightly below the surface. They have little or no ability to resist movements in the foundation, so all such movements end up being transferred into the building and manifest as cracking. Over the years, repairs accumulate, movement continues, and we can end up with extremely rough and uneven wall surfaces inside and out.

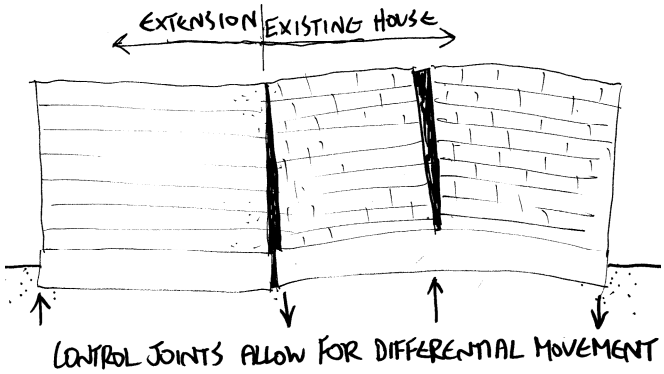


OLD-TYPE STONE FOOTING: LITTLE RESISTANCE TO FOUNDATION MOVEMENTS

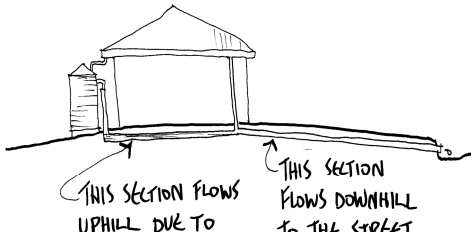
CONCRETE FOOTING: UNABLE TO RESIST FOUNDATION MOVEMENTS WHICH EXCEED ITS STIFFNESS

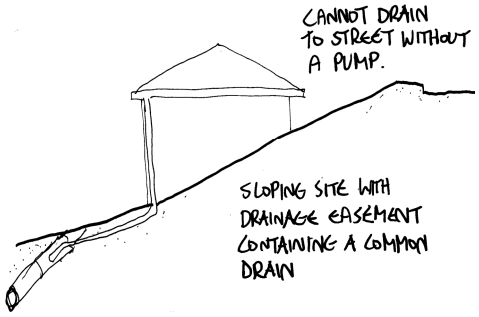
Construction during recent decades has largely overcome problems of cracking by developments in soil science and engineering, giving us footings that resist or accommodate the effect of foundation movements. Generally, footings are designed to be strong enough to support part or all of the building without bending or breaking. Where this is not feasible, the footing may be articulated – that is, made in sections which are connected with a flexible joint, with the building above likewise jointed. Buildings whose footings are unable to resist the consequent foundation movements will always experience cracking unless the walls have

adequate flexibility (eg are fully framed) or if they are built of rigid units (eg bricks) then they must have adequate control joints. Control joints are simply strategically-placed gaps in the rigid parts of a building's structure – usually seen in brickwork as a vertical slot about 15mm wide or as a complete pause in the brickwork at each door and window, with any walling above or below the window being simply a panelled infill. Prior to about 1970, homes typically did not have control joints, so movement will show up as cracking. In this sense, a crack which opens and closes seasonally might be regarded as an ad hoc control joint. In this case it may be appropriate to repair the crack well then form a proper control joint, involving cutting through the wall then closing the gap with flexible sealant. This work should only be done be under the guidance of a builder, architect or engineer.



Modern footings are designed by an engineer using established knowledge of the particular soil type at the site. Samples are taken from the site, usually to a depth of several metres, using a drill or push-tube. This information, added to knowledge of steel and concrete structures, assists the engineer in designing a footing to support a particular building for a particular site, so as to resist or accommodate the likely movement of that site together with other loads imposed upon the structure. Despite the vast accumulation of knowledge on the subject of footing design, there are numerous opportunities for footing to fail, allowing the building to crack. These include excessive wetting or drying of the foundation beyond that anticipated by the engineer (common causes discussed below), mistakes in the footing design, or poor building work.



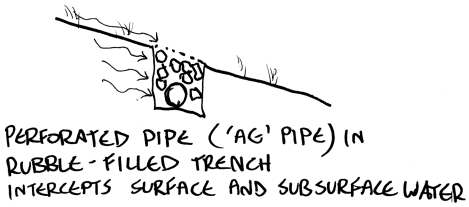


What can I do about it?

With changes in soil moisture being the most common cause of cracking in houses, the management of water, on the surface and below, deserves close attention as discussed below.

Drainage from hard surfaces

Drainage from hard surfaces (paving and concrete) should be directed to a location where it will not cause overwetting of the building foundation. Poorly-graded surfaces can allow ponding to occur which can become slippery and hazardous.



Drainage to and from from sloping sites

Most house sites in Adelaide are fairly flat and drainage is easily managed, with excess stormwater being directed out to the street water table (see sketch). Sites that are not sloping towards the street can present issues of potential damage caused by drainage onto, or from, neighbouring sites. Roof water can be sent uphill to the street, up to a metre or so, using sealed underground pipework. Because it will always contain some 'dead water' and