

UR1975-18

Damage to a house at Ellison Street, Punchbowl, Launceston.

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The house, at 1 Ellison Street, Punchbowl [EQ135108], was constructed during 1974 and has subsequently suffered damage to external brickwork and to the reinforced concrete slab covering the garage floor.

The general conditions have been described by geologist C.J. Knights in a memorandum dated 29 January 1975. Since that time the original cracks have been repaired and the foundation in the area of the cracks underpinned. Damage to the garage floor remains, and further cracking has occurred on the south-west corner of the house.

In order to establish the geological conditions in the area three holes were put down with a Proline power auger to obtain specimens of the material underlying the house and to determine the groundwater conditions.

Hole 1 was sited adjacent to the south-west corner of the house and encountered:

- m
- 0-0.6 Brown sandy clay.
- 0.6-1.5 Damp, orange plastic clay.
- 1.5-4.0 Grey and red plastic clay, some of the grey clay contained open 'sandy' seams. The clay sequence was described as damp.

Hole 2 was sited about mid way along the back of the house and about 3 m from it, it encountered:

- m
- 0-1.0 Sandy soil with some clay.
- 1.0-2.0 Soft damp orange clay.
- 3.0-4.5 Red-grey plastic fissured clay with polished surfaces. Some fine sandy partings of wet material.
- 4.5-6.0 Grey plastic clay.

Hole 3 was drilled adjacent to the north-west front corner of the house, close to where soft wet clay was reported when the foundations were underpinned recently. It encountered:

- m
- 0-0.3 Soil filling.
- 0.3-1.2 Soft to firm brown moist clay.
- 1.2-3.0 Damp stiff grey clay.

The above holes were left open over night in order to assess the groundwater condition. Only Hole 2 made any water (c. 0.3 m over night). The absence of water in Hole 3 is in contrast to the conditions reported by the builder during underpinning and suggests that the water table in that area is now somewhat lower. The water reported previously lying under the house behind the garage, still persists.

Other factors concerning the house are that it is built to normal domestic housing standards, no failure of the foundations can be detected and there is no evidence of movement due to landslips. A cursory examination of some other houses in the area revealed cracked brickwork as a fairly common

feature and the builder reported that he was aware of other newly built houses suffering similar minor damage.

DISCUSSION

The house is built on Tertiary clay which is fissured and in places contains thin 'sandy' layers or lenses which appear to carry groundwater. Drainage around the house has been radically altered in the past year by the diversion of storm water drainage from houses upslope from the block to a properly constructed storm water system. The french drains referred to by Knights should have intercepted surface and near-surface drainage water upslope of the house. The construction of the house and its accompanying paths and driveways has changed the near-surface moisture content of the clays significantly and erratically throughout the block.

A sample of water from under the house was collected by Knights who reported that a partial analysis showed that it was free of bacterial matter, contained 4800 ppm of total dissolved solids, 2450 ppm of Cl and had a pH of 9.2. She interpreted this to indicate that the water was not due to leakage from the sewerage system and that the water was of deep-seated origin, the salt content being due to the leaching of ions from the clay.

A further sample of water from under the house was taken during the present investigation and subjected to a complete analysis. The results are:

	<i>ppm</i>		<i>ppm</i>
pH	10.3	Al	<0.2
CO ₃	9	K	43
HCO ₃	35	Na	1000
Cl	2570	TDS	5170
SO ₄	310	Permanent	1630
Ca	260	Hardness	
Mg	250	Temporary	38
Fe	<0.1	Alkalinity	
		(as CaCO ₃)	43

These figures are slightly higher than those of the previous analysis but generally show the same trend. The higher values may be due to real differences or to evaporation causing some concentration. The water collected in Hole 2 was insufficient for analysis but conductivity measurements indicate it to be roughly similar if slightly lower, in total dissolved solids. The high pH could be the result of groundwater under the house being contaminated by cement and mortar in and around the foundation. The general picture of the groundwater composition is therefore of a moderately saline water contaminated locally, but of deep-seated origin and which owes its salinity to the leaching of salts during its slow infiltration through the clay.

It seems to the writer that the general cause of damage to the house is due to the alteration in soil moisture content of the clay resulting in shrinkage of the drier areas which have set up stresses with the foundations and concrete slabs overlying the clay. It seems reasonable to assume that eventually the soil moisture content will become relatively stable and the house will adjust to the new regime. In the meantime minor 'cosmetic' damage may continue but unless unexpected conditions prevail the house will adjust to the stresses and damage should cease. This appears to be in accord with the damage which is evident in nearby houses.

Damage to the garage floor presents an engineering problem. It suggests the presence of swelling water-saturated clay, possibly fed by a fissure

intersecting a water-bearing 'sandy' horizon at some unspecified depth. A full treatment of this is an engineering problem: the ultimate solution may require the removal of the existing slab, the provision of drainage and the replacement of the slab. This would be a costly and perhaps uncertain course of action in view of our lack of knowledge as to the specific cause of the high water content of the clay under this slab.

It appears to the writer that the most practical approach to the whole problem is to allow the soil moisture conditions to stabilise and accept any minor damage which may occur in the meantime. Whilst the possibility of major structural damage to the house appears remote at this stage, it cannot be entirely discounted. Careful and continuous inspection of the house is recommended and signs of damage which are sufficient to cause structural failure should be rectified without delay.

Finally, the fairly widespread occurrence of 'cosmetic' damage to brick homes in this area should be recognised by the Council. Lightly constructed timber or aluminium clad homes subject to the same stresses would accommodate the small movements involved without displaying such disfiguring damage. Upgrading foundation standards and the specification of reinforced concrete slabs in the area would be desirable and a change of building construction from the traditional brick veneer to the more lightly constructed homes mentioned above would be desirable and would protect home builders to a large extent against the worry involved by damage which occurs so easily and is so noticeable in the present type of home being constructed. It should also be stressed that we are dealing here, and perhaps in many other areas in the municipality, with clays with high linear shrinkage characteristics which are susceptible to soil moisture changes of sufficient magnitude to produce widespread 'cosmetic' damage to the type of home traditionally built in the area.

[21 February 1975]