UR1975_56

Cracking of a house at Youngtown: description and suggested remedial measures.

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The house, at 27 Chestnut Road, Youngtown [EQ142071] is about nine years old. By 1972 cracking was so severe that substantial underpinning to a depth of one metre was undertaken. Since then further cracks have occurred.

At present a wide crack runs down the north side of the house, and is apparently connected to a crack which runs across the concrete driveway and towards a crack in the wall of the neighbouring house. The crack in the neighbours' house is many years old and is not reported to be enlarging. Damage to No. 27 appears to be concentrated in the north-eastern corner and northern wall of the house. Veranda steps are pulled away from the building, and window frames show distortion.

At the time of the first visit (April 1975) the ground around and under the house was hard and dry. Subsequently after wet weather the occupant sent soil and water samples taken from under the house for testing.

The results were as follows:

Red coloured silty clay: LL = 39; PI = 23; LS = 10.5.
Water salinity: 1100 ppm (by conductivity meter).

This water salinity indicates that the water has travelled some distance underground, but is not from a deep spring.

The Atterberg limits are not those of a troublesome clay, so in August 1975 further sampling was done using a hand auger. Two auger holes confirmed that the tested clay was not representative of foundation material. A hole augered to a depth of 0.9 m adjacent to the north-east corner of the house gave the following results:

Depth (m)	*Description*
0-0.25	Pebble garden and sandy soil.
0.25-0.9	Grey-green plastic clay.

The grey-green clay was soft, slightly wetter than its plastic limit, and with moisture showing on fissure planes. Two samples were taken for determination of moisture content.

Approximate depth (m)	*Moisture content (%)*
0.5	44
1.0	45.5

From visual inspection this material is an inorganic, highly plastic clay with a low silt and sand content, and is close to full saturation. Such material is impermeable except through fissures, has a low strength when wet, and is subject to high shrinkage when it is dried.

No free water came into the hole during the following eighteen hours. The clay had an unpleasant smell which may be inherent, or may indicate contamination by sewerage.

The house is now solidly underpinned to a depth of 3 m, so that the load of the house is widely spread and it is unlikely that the clay is actually failing. The damage appears to be in a localised area and is probably

due to excessive clay shrinkage and swell in the region of one or more major fissures. Water travels through fissures, which allows full access to the clay which then expands to its maximum. During the summer, water is evaporated so that the clay dries and shrinkage occurs to a depth of 1-3 m.

REMEDIAL MEASURES

Damage can be restricted by minimising the seasonal wetting and drying and hence the swelling and shrinking of the foundation clay.

(1) An area 1.5-2 m wide around the house can be sealed so that it is completely waterproof. This should be done during the wet months so that the foundation clays will not be able to dry out, and will be maintained at their present saturated condition. Sealing may be accomplished by using the existing concrete driveway combined with heavy duty polythene sheeting around the west, north and east sides of the house. The polythene sheeting must be carefully sealed against the path and the walls. Cracks in the concrete should also be sealed. The polythene should then be covered by a pebble garden or lawn, and care taken not to puncture it by future gardening.

(2) The above method can be combined with drainage to maintain a dry condition. In which case the whole procedure must take place in the dry months. If there is sufficient ground slope to facilitate free drainage then a french drain along the west, north and east sides of the house and below the outer edge of the sheeting would halt near-surface flow and possibly drain the fissures. Drainage would then be combined with the use of polythene. This approach should only be considered if the slope is sufficient to allow free drainage.

CONCLUSION

The clay forming the foundation of the house includes an area which is highly plastic and includes a fissured zone. In wet weather water passing along the fissures causes the clay to become fully saturated so that the house is under stress from seasonal swell and shrinkage.

Water should be tested by the health authorities to ensure that there is no contamination by sewerage.

Where possible ensure that there are no leaking pipes.

Apply remedial measure (1) during winter months or measures (1) and (2) during dry months in order to suppress future seasonal changes.

[20 August 1975]