SUBSIDENCE DUE TO CLAY SHRINKAGE

Purpose
To calculate the amount of subsidence that will occur as a result of clay shrinking as it dries up. The shrinkage may be caused by the weight of the house, drought or by trees sucking up water or by man draining water from an adjacent aquifer.
To calculate the change of volume of clay with water loss.

Instructions
1. *Make a slab of clay 10.0cm by 2.0cm by 0.5cm by rolling the clay out on the board between the strips of wood and then cutting it to the exact size with the sharp knife.*

2. *Put your initials on it.*

3. *Weight it, and leave it to dry out slowly for several days.*

4. *Measure it and calculate its new volume. Work out the percentage reduction in volume. This should be the same as the cube of the percentage contraction in length.*

5. *Clay in the ground can, in effect, only contract downwards, not sideways. This is because, providing the clay is still plastic, any gaps that would be produced by horizontal contraction are filled in because the clay is under vertical pressure from the weight of clay above. Horizontal contraction is thus converted to change in thickness. Calculate the subsidence of a house built on clay if the top metre of clay dries out. Example: if a cubic metre shrinks by 2% the new volume is 98x98x98. The new thickness is then $98^3/100^2$ since the area has not changed.*

Teacher's Section

Requirements

Clay dug from the ground or potters' clay.

Balance, rolling pin, two strips of wood 15cm by 2cm by 0.5cm, sharp knife

Paper or board on which to rollout clay

Time

10 minutes initially and then 5 minutes when it is weighed and measured again.

Notes

Subsidence due to drought or trees or pressure is only possible in older buildings with shallow foundations e.g. Leaning Tower of Pisa. Many cities, London, Mexico City, Shanghai, Venice have subsided because of the water table has been lowered by pumping from underlying aquifers but then the clay does not dry out completely.