THE EFFECT OF BASE VOIDS ON THE SWELLING CHARACTERISTICS OF A SHALLOW FOUNDATION ON AN EXPANSIVE SOIL

L.C. KURUKULASURIYA AND H.N. SENEVIRATNE

Department of Civil Engineering, Faculty of Engineering, University of Peradeniya

Expansive soils may cause the heave of foundations of low-rise buildings as a result of swelling upon absorption of water. In most instances, the presence of clay mineral montmorillonite has been identified as the main reason for large volume changes associated with such swelling. In order to alleviate the detrimental effects of heave caused by expansive soils on footings, procedures such as prewetting, use of chemical additives, soil replacement with compaction control, moisture control, or surcharge loading may be adopted

As an alternative to the above methods, the performance of a shallow foundation on an expansive soil when voids are provided in the base, with respect to its swelling characteristics is examined by carrying out two types of laboratory tests; 1) Swelling pressure tests using a plate with voids, and 2) Model tests on a strip footing with voids.

The behaviour of an expansive soil upon saturation was initially studied on an expansive soil obtained from Digana area, in a swelling pressure testing apparatus by allowing the swelling soil to accommodate in the voids provided under the upper plate. A series of tests using the swelling pressure apparatus was carried out by increasing the volume of the voids under the top plate gradually up to a volume that will occupy all the swollen soil without any external vertical pressure. The analysis of the data has shown that the provision of voids has significantly reduced the surface swell (Fig.1). It also shows that the volume of voids under the top plate has no effect on the maximum pressure developed under the plate computed based on an effective contact area.

Model tests of a strip footing were carried out to examine the effectiveness of this method to reduce the surface swell, by providing voids under a model strip footing. A reduction of surface swell is achieved in the model foundation though the intensity of reduction is less when compared with the observations in the swelling pressure testing apparatus (Fig.2).

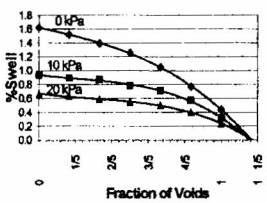

Fig.1

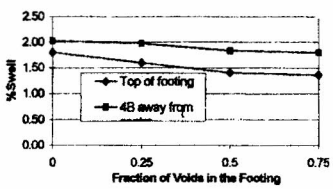

Fig.2

The experimental work carried out by Premanand M.R., Thusyenthiran S., Thuvarakan M., Dhanapala I.T., Seneviratne C.A.E. and Wickramarachchi P.N. for their undergraduate project work is acknowledged.