

criteria in Table 2, the range of upheaval deformation of ground is larger than the deformation range of ground from very low to high site classification. Thus, if a site is only assessed by upheaval deformation of ground, the site can be classified as very low, low, medium, or high, depending on the position and thickness of expansive soil layers in the site. Hence, it is necessary to consider the position and thickness of expansive soil layers in assessment of site including expansive soil layers.

**Table 2 Deformation criteria for assessment of site including expansive soil layers<sup>[13]</sup>**

Deformation, $S$ / mm	Classification
$\geq 70$	High
$35 \leq S < 70$	Medium
$15 \leq S < 35$	Low
$< 15$	Very Low

## 6 Conclusions

From the above study the following conclusions are drawn:

(1) Upheaval deformations induced by expansive soils can be formulated on the basis of soil softening model.

(2) Upheaval deformations are greatly influenced by the position and thickness of expansive soil layers, which decrease with deeper positions, and increase with the increasing thickness of expansive soil layers.

(3) The method of computation of upheaval deformation can be used to calculate the swell part of ground deformation of the criterion in Table 2.

(4) Qualitative and quantitative assessment of the free level site including expansive soil layers is considerably changed from high to medium, low, and very low because of the influence of position and thickness of expansive soil layers.

## References:

- [1] Nelson J D and Miller D J. Expansive soils: problems and practice in foundation and pavement engineering [M]. New York, John Wiley and Sons Inc. 1992.
- [2] Howard A K. Laboratory classification of soils—Unified Soil Classification System. Earth Sciences Training Manual No. 4, U. S. Bureau of Reclamation, Denver 56 pp. 1977.
- [3] Holtz, W G, Gibbs H J. Engineering properties of expansive clays [J], Transact. ASCE, 1956, 121: 641– 677.
- [4] Altmeyer W T. Discussion of engineering properties of expansive clays [A]. Proceedings ASCE [C]. 1955, Vol. 81, Separate No. 658.
- [5] Chen F H. The use of piers to prevent the uplifting of lightly loaded structures founded on expansive soils [A]. Engineering Effects of Moisture Change in Soils, Concluding Proceedings International Research and engineering Conference on Expansive Clay Soils [C]. Texas A & M Press. 1965.
- [6] Chen F H. Foundations on expansive soils [D]. American Elsevier Science Pub, New York. 1988.
- [7] Hamberg D J. A simplified method for predicting heave in expansive soils [D]. M S thesis, Colorado State University, Fort Collins, Co. 1985.
- [8] Jennings J E B, Firtu R A, Ralf T K, Nagar N. An improved method for predicting heave using oedometer test [A]. Proc. 3rd Int. Conf [C]. Expansive soils, Haifa, 1973, 2: 149– 154.
- [9] Porter A A, Nelson J D. Strain controlled testing of soils [A]. Proc 4th Int. Conf. Expansive Soils, ASCE and Int Soc Soil Mech Found Eng [C]. Denver, 1980. June: 34– 44.
- [10] McKeen R G. Design of airport pavements for expansive soils [M]. U S Dept of Transportation, Federal Aviation Administration, Rep No DO / FAA / RD– 81/25, 1981.
- [11] McKeen R G, Nielsen J P. Characterization of expansive soils for airport pavement design [M]. U S Dept. of Transportation, Federal Aviation Administration, Rept No FAA – 120– 78– 59. 1978.
- [12] Seed H B, Woodward R J, Jr., and Lundgren R. Prediction of swelling potential for compacted clays [J]. J Soil Mech Found Div, ASCE, 88( SM3) 1962: 53– 87.
- [13] GBJ112-87, Building Technology Code for Expansive Soils Area in China [S] (in Chinese).

## 关于举行《'04 全国建筑基桩检测技术高级研讨班》的通知(第 1 号)

由中国科学院武汉岩土力学研究所、铁道第二勘察设计院工程测试中心、湖北·武汉无损检测学会联合发起与组织的《'04 全国建筑基桩检测技术高级研讨班》拟于 2004 年 9 月 28 日~ 10 月 4 日在成都举行。内容包括: ①基桩高、低应变的测试技术; ②《建筑基桩

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