UNIAXIAL CREEP AND COMPRESSION OF SOILS

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Two elementary processes – uniaxial compression and creep – were chosen to demonstrate some structural effects in the mechanical behaviour of particulate materials. Six aspects of it – density, grain crushing, angularity, water effect, diffusion and garlandlike creep – were dealt with using firstly theoretical hypotheses and verifying them afterwards by laboratory experiments. Granular clay, silica gel, sand and oat flakes were experimented with. It was shown that the effect of density can be masked by other factors, granulometrical curve may change – due to grain crushing – its shape from Gauss-Laplace to concave form, angularity may radically modify the stress-strain curves, water may initiate hydrocollapses, dry granular material if loaded may be subjected to diffusion and creep may acquire a hybrid form (mixture of diffusion and garlandlike varieties). Various species of nonstandard behaviour have been described.

Key words : *compression, diffusion, S-creep, G-creep, granulated clay, silica gel, grain crushing, angularity*

1. Introduction

Due to their widespread occurrence, soils are more studied than other particulate materials. In addition, their broad variety offers the oportunity to explore deeply the behaviour of these materials, so important from the engineering point of view. Such investigation may help to find some general features of the mechanical behaviour of particulate materials representing either standard or nonstandard response.

Though the present author will mostly deal with the uniaxial creep and compression (oedometer tests), he believes to be able to throw some light on the structural roots of the nonstandard behaviour and to propose a synthetic picture of the particulate behaviour. The importance of the nonstandard behaviour lies in the fact that nonstandard behaviour makes it more difficult to formulate the constitutive relations and thus the solution of the boundary value problems by numerical modelling. The deviations from the reality by using various simplifications may, in the case of nonstandard behaviour, often be unacceptable. Initial (constitutive) and boundary conditions (e.g. geostatic stressing) if not properly identified may even well posed solution render useless.

The author's approach starts with the theoretical considerations of the structural changes through the deformation process. Since the matter is treated on a macromechanical level, structural transformations are dealt with on an axiomatic basis (e.g. densification of a particulate material in the course of uniaxial loading is selfevident). Theoretical considerations, often qualitatively formulated, will be confronted with the experimental evidence (laboratory

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