

Università degli Studi di Pavia

Dipartimento di Meccanica Strutturale

On the multiphase approach for reinforced medium with membrane

SEMINARIO

This study deals with materials reinforced by periodically distributed flexible membranes in particular structures where the mechanical properties of the reinforcing material are much higher than those of the unreinforced material, while its volume proportion rarely exceeds a few percents, such as soils strengthened by geosynthetics, geogrids or geomembranes, concrete reinforced with carbon-fiber sheets or rubber bearings strengthened by steel plates.

By considering the reinforced material as the superposition of two mutually interacting continuous media, namely the matrix phase and the reinforcement phase, the macroscopic elastic behaviour of such structures is assessed through a multiphase approach.

The purpose is to develop a macroscopic model to improve homogenization method namely by capturing both scale and boundary effects, which cannot be accounted for in a classical homogenization procedure. Moreover one of the key features of this multiphase model lies in its ability to account for the interactions prevailing between the reinforcing membranes and the soil, and more specifically for a limited adherence at their interface.

Failure conditions being assigned to both matrix and reinforcement phases, as also to their interaction, yield design problems are then formulated for this kind of reinforced soil structures, which can be dealt with by resorting either to the lower bound static or upper bound kinematic method. Referring more particularly to the latter method, the stability of a curvilinear earth retaining wall uniformly reinforced by membranes will be examined. The advantage of using membranes instead of linear reinforcements, as in the classical reinforced earth technique, will finally be highlighted from these results.

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Martedì 8 Luglio 2008 – ore 16.30, Aula MS1

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