MODELING OF SOIL DYNAMIC BEHAVIOR USING THE ENERGY PARAMETERS

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Stability of soils on the slopes under dynamic loads is influenced by the patterns of loading. Vibrations caused by construction activities, industrial processes, traffic, offshore and military activities may vary in strain level up to 3-4 orders of magnitude. Earthquake shocks and ocean waves spectra are difficult to reproduce in soil testing. The practical way out is the development of a general model of soil instability appropriate for all soils and for arbitrary dynamic loading. Dynamic instability of any soil or rock is based on the accumulation from cycle to cycle of a certain part of the energy to be dissipated, resulting in the increase of the internal energy of the material and in the alteration of its strength. Using this energy approach it is possible to analyze the transformations of energy in soil during dynamic loading. Several energy criteria can be proposed to use for the development of analytical models of soil dynamic behavior. The prospective ones are unit activation and unit dissipated energies. Their values can be calculated from the experimental data, providing the acquisition is quick and accurate enough. The paper discusses a new model relating maximum accumulated strain with the normalized number of cycles and incorporating two energy-based parameters, in their turn related to the cumulative value of internal energy and to the rate of its accumulation. Very good agreement between the experimental and calculated strain values has been obtained. This research is supported by INTAS under the project # 97-1493.