SYMPOSIUM ON SOIL DYNAMICS

INTRODUCTION

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The scientific approach to a study of soils as an indispensable engineering material is rather new, and its subdivision into soil statics and soil dynamics is of still newer origin. The symposium on Soil Dynamics held at the 1961 ASTM Annual Meeting is the second symposium on this subject. The first symposium was published as the Symposium on Dynamic Testing of Soils, *STP 156* (1953). While the first symposium covered more the theoretical approach to the numerous unsolved problems in this field, the eight papers in this second symposium discuss many of the current concepts in the area of stress - deformation - time relationships and the test instrumentation and measurement.

In attempting to answer the question, "Why soil dynamics?" it might be useful to recall the history of testing materials other than soil. The study of steel specimens subjected to slowly increasing static loads was followed by the introduction of vibratory or dynamic loads, which led to the discovery of fatigue effects. A cross-fertilization of both methods took place, contributing to a new concept in instrumentation and recently expanding into the field of solid-state physics. Similarly, the investigation of soil dynamics will feed information back into soil statics and result in a better understanding of both areas.

From the practicing engineer's point of view, the impetus to study soil dynamics is due mainly to the increased speeds and loads of present-day vehicles affecting subsoils, the practice of dynamic pre-compaction of subsoils, and the discrimination between subsurface explosions (nuclear) and earthquakes.

From the more theoretical point of view, a determination of basic dynamic soil values, such as modulus of elasticity, energy dissipation, and resonance phenomena, is of fundamental importance. Both the practicing engineer and the theoretician have a stake in answering the difficult question: Can we develop a mathematical model or dynamic analogy that will enable us to predict the behavior of soils subjected to vibratory loads? Much can be learned from the geophysicists, although they deal with large distances (macroseismic problems), whereas the engineer, comparatively speaking, is concerned with phenomena in the vicinity of the disturbing source (microseismic problems).

Of some 25 problems on needed research suggested by the Research Steering Subcommittee of Committee D-18 on Soils for Engineering Purposes, almost 25 per cent fall within the realm of soil dynamics. A host of questions can be raised. For example, what frequency is considered the transition point between slow vibratory loads (dynamic-steady

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and secular, with acceleration effects predominant) and still slower loads (static-repetitive, with weight effects governing), and at what distance between disturbing source and its response in the soil does seismology begin?

To differentiate between soil dynamics and the much older science of seismology, a tentative classification table might be set up which distinguishes between microseismics and macroseismics without detailing the latter, which is represented in skeleton form only (see p. vi).

This table is not only incomplete but also controversial. Nevertheless, it shows the wide scope of unexplored territory as far as soil dynamics is concerned.

The authors of the eight papers, hope that this second discussion on the topic of Soil Dynamics might lead to further investigations of this rather unplowed field.