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POST-TRIGGERING RESPONSE OF LIQUEFIED SAND IN THE FREE FIELD AND NEAR FOUNDATIONS

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ABSTRACT

The paper focuses on the post-triggering behavior of liquefied sand and its implications for evaluations of the engineering effects of liquefaction. While new tools and refinements continue to be developed on the subjects of pore pressure buildup due to earthquake shaking and of liquefaction triggering, these aspects are reasonably well understood and reliable evaluation methods already exist. On the other hand, the response of the liquefied soil after triggering - when most of the engineering effects take place - remains poorly understood. The paper reviews some of the evidence available on post-triggering behavior, with focus on data from the field and from model centrifuge shaking experiments, and discusses implications for the modeling and evaluation of liquefaction. Lateral spreads as well as liquefied sand response near shallow and deep foundations are examined in some detail.

INTRODUCTION

Liquefaction of loose, saturated granular soil during earthquakes is clearly a major hazard to constructed facilities in many regions, and will continue to be so for years to come. There is scarcely a major seismic event affecting an urban or industrial area which does not cause liquefaction including ground failure and significant permanent deformations, with associated and very costly damage to port facilities, bridges, buried pipes, houses and buildings of all types (Table 1 Items 1, 2, 4, 5, and 8). In the last 10-15 years this has happened most notably in earthquakes in Nihonkai-Chubu (1983) and Kobe (1995), Japan; in Central Chile (1985); in Loma Prieta, California (1989); in Luzon, Philippines (1990); and in Limon, Costa Rica (1991).

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