

# PAST and FUTURE OF LIQUEFACTION

*Theme T4*

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### **ABSTRACT**

Several developments have taken in the research on liquefaction in past two-three decades which has resulted better understanding the phenomenon of liquefaction. Liquefaction, in the past, was primarily associated with medium to fine grained saturated cohesionless soils and soils with fines were considered non-liquefiable. The authors investigated the liquefaction behavior of silts and silt clay mixers over a range of plasticity values of interest by conducting cyclic triaxial tests on reconstituted samples and their behavior was compared with that of sand. It was found that saturated silts with plastic fines behave differently from sands both with respect to rate of development of pore water pressure and axial deformations with number of load cycles. Plasticity of the silt was found to influence the behavior of the silts tested under cyclic loading in these studies. The results also showed that liquefaction susceptibility of silts shows a marked change with change in the values of plasticity index. For a PI range of 2-4%, the liquefaction resistance of silt was found to decrease with an increase in plasticity. Later it was found by several other investigators that certain soils with fines may be susceptible to liquefaction. Liquefaction was observed in silt deposits in China and some clayey deposits in Taiwan. Some recent investigations have resulted in development of criteria that have tried to look at liquefaction of silts and clays in more rational manner as mentioned below:

The fine grained soils with more than 50 % passing US sieve # 200 can be grouped either into soils that exhibit sand-like stress-strain behavior or soils that exhibit clay like stress-strain behavior during monotonic and cyclic undrained shear loading. It was observed that clay like behavior should be expected for silts (ML and MH) that have  $PI \geq 7$  and for clays (CL and CH). Sand like behavior should be expected if their PI is  $< 7$ . For sand like materials, field test data such as  $N_{60}$  or  $(N_1)_{60}$  values or CPT data may be used for determination of liquefaction potential. For clay like materials laboratory testing may be necessary for ascertaining their behavior during cyclic loading. It has been suggested that both sand-like and clay-like soils can develop excess pore water pressures and significant strains during undrained cyclic loading. Literature has evidence of liquefaction in some soils with  $PI > 7$ . There is, thus considerable confusion in deciding the suitable field and laboratory tests for ascertaining their susceptibility to liquefaction. A detailed discussion will be presented in the paper.