D09

Liquefaction Behavior of Saturated Fiber-Reinforced Sand in Undrained Ring-shear Tests

○Jin LIU, Gonghui WANG, Toshitaka KAMAI, Bin SHI

1. Introduction

Soil liquefaction following earthquake can result in landslides, subsidence of foundations, damage to earth structures, lateral movement of structures resting on soil, disruption of services. At present, the methods most commonly adopted to prevent liquefaction are densification, draining and soil reinforcement. In this study, a new method for understanding the liquefaction behavior of fiber reinforced sand using ring shear apparatus (DPRI-Ver.5) is presented.

2. Materials

In this study, Silica sand No.6 (S6) was selected as the sample. Its specific gravity is 2.64. The maximum and minimum dry densities are 1.58 and 1.25 g/cm3, respectively. S6 has a mean grain size 0.30mm, coefficient of uniformity, Cu=2.29. The short polypropylene fibers (12 mm long) have been used.

3. Test results and discussions

As seen in Fig.1, the presence of fiber clearly affected the change tendency of pore pressure and shear resistance. The peak shear resistance increased with the increasing of fiber content. It is also seen that the test on sand showed continues decreasing in shear resistance after failure, while those treated with fiber showed some times of fluctuation even after the shear failure.The distributed fibers might act as a spatial three-dimensional network to inter lock soil grains, help grains to form a unitary coherent matrix. And the inter lock effect increase with the content of fiber. So the peak value of samples increased with the fiber content.

The fiber orientation might leads to the volume expanding, pore pressure decreasing and the shear resistance increasing. The full orientation of more fiber might needs the higher frequency. So the fluctuation in shear resistance occurred more frequently when fiber content increased (Fig.2b, c, d).

4. Conclusions

The results of undrained ring shear tests on the fiber reinforced sand indicate that the presence of fiber changes the tendency of pore pressure and shear resistance and increases the peak value of shear resistance. The fiber can also enhance the shear resistance even after failure occurred.

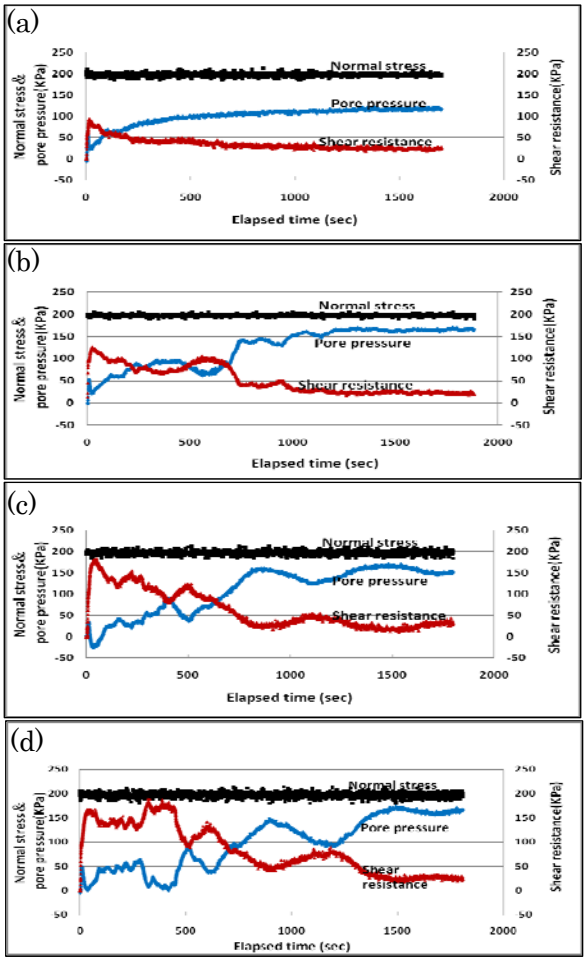

Fig.1 Time series data of normal stress, pore pressure and shear resistance. (a) Sand; (b) sand with 0.2% of fiber; (c) sand with 0.4% of Fiber; (d) sand with 0.6% fiber.