



What is crosshole geophysical testing?

Crosshole geophysical testing determines the shear wave velocity of soils which provides an indication of its stiffness. Until recently this method has not been commonly used for liquefaction assessment and is relatively specialised.

How is it useful and is it required on my site?

Using shear wave velocity measurements from this test, the composite stiffness of the soil – combined stiffness of the soil and ground improvement – can be determined. This is particularly useful for some ground improvement methods, such as Rammed Aggregate Piers, which increase the composite stiffness of the soil to improve the performance of the ground.

Crosshole geophysical testing is useful in two key ways:

- It can be used very soon after ground improvement construction
- It assesses soil properties that are not determined from cone penetration testing. This data is complementary to cone penetration test data and is particularly useful when assessing the effectiveness of the ground improvement construction.

Owing to the high cost of this test, the cone penetration test method is generally used. However, crosshole geophysical testing may show that the ground has been suitably improved in some cases where cone penetration tests are unable to demonstrate an equivalent level of improvement. In addition, it may be used to verify variations of commonly accepted designs, which can save construction time and costs.

How is a crosshole geophysical test performed?

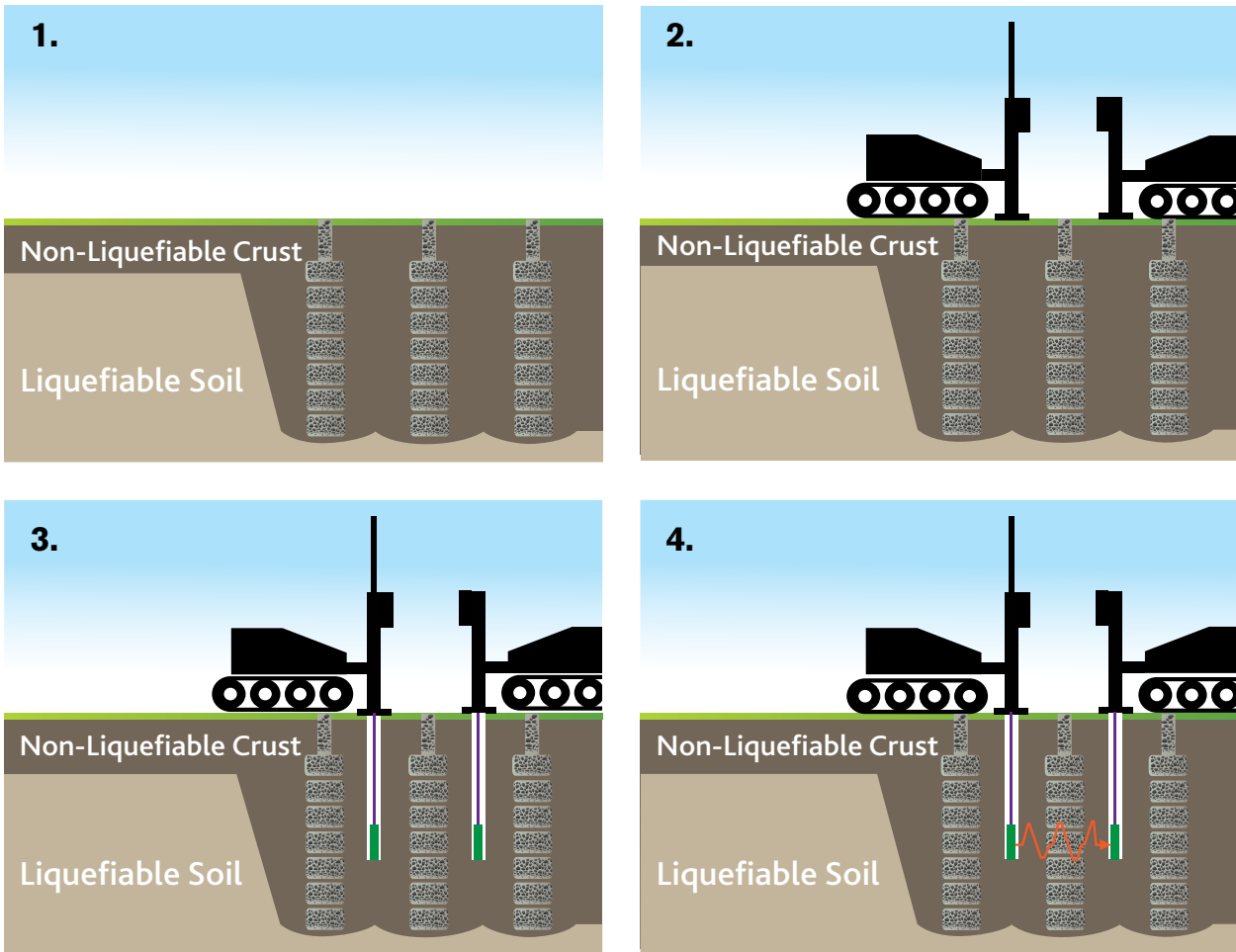
A crosshole geophysical test is performed using two special probes that are pushed into the soil using small machines with hydraulic rams. Both probes are pushed in vertically and parallel approximately 1.5m apart and in small depth increments. The probes are mounted at the tip of a rod string and measure the shear wave velocity between the two probes. Shear waves are generated by striking the push rods (attached to the probes in the ground) with hammers. One probe acts as an emitter of the shear waves, the other as the receiver of the waves generated in the first probe.



Equipment used push probes into the ground



Crosshole probe sensor



Crosshole geophysical testing of Rammed Aggregate Piers. Number represents testing sequencing

Who can do these tests?

Currently, there is limited capability to do this testing in New Zealand. A small group of local contractors, consultants and academics have been trained to do this

test by academic staff from the University of Texas at Austin. Capability is likely to expand if this test method is more frequently used.

Crosshole geophysical testing can determine the composite stiffness of ground improvement and the surrounding soils to assess the effectiveness of construction