Vibrating wire piezometer

General

The vibrating wire piezometer consists of a vibrating wire pressure transducer and signal cable. It can be installed in a borehole, embedded in fill, or suspended in a standpipe. Readings are obtained with a portable readout or a data logger. They are easy to read and very accurate.

The response of the instrument to changes in pore pressure is good in all soils. As the measurement is obtained in terms of frequency it can be transmitted over long cable lengths and the readings can be readily automated. The instruments must be protected from electrical transients.

Applications

Typical applications for the VW piezometer are:

- Monitoring pore water pressures to determine safe rates of fill or excavation.
- Monitoring pore water pressures to determine slope stability.
- Monitoring the effects of dewatering systems used for excavations.
- Monitoring the effects of ground improvement systems such as vertical drains and sand drains.
- Monitoring pore pressures to check the performance of earth fill dams and embankments.
- Monitoring pore pressures to check containment systems at land fills and tailings dams.

Push-In Method: The push-in piezometer is generally pushed into soft, cohesive soil using CPT equipment. The piezometer must be monitored during installation to ensure that it is not over pressured as it is pushed in.

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Sand Filter Method: The borehole is flushed with water and a sand filter is placed around the piezometer, which is positioned at the specified depth. A bentonite plug is formed at the top of the sand filter. The remainder of the borehole is then filled with a bentonite-cement grout.

Grout-In Method: The piezometer is lowered, filter-end up, to the specified depth in the borehole. The borehole is then filled with a bentonite-cement grout. This method is particularly useful when multi point measurements are required in a single borehole.

Operation

The VW piezometer converts water pressure to a frequency signal via a diaphragm, a tensioned steel wire, and an electromagnetic coil. The piezometer is designed so that a change in pressure on the diaphragm causes a change in tension of the wire.

When excited by the electromagnetic coil, the wire vibrates at its natural frequency. The vibration of the wire in the proximity of the coil generates a frequency signal that is transmitted to the readout device. The readout device processes the signal, applies calibration factors, and displays a reading in the required engineering unit.