



The finer a soil or rock, the higher the proportion of adsorbed water. Molecular forces of attraction exert a high level of pressure on adsorbed water. If a piezometer is inserted in such material, the water will rise in the monitoring tube to a level corresponding to the pressure of the porewater between the soil grains.

If the volume of water in a piezometer rising tube is disproportionately large compared with the minimum reliable yield from the surrounding soil or rock, a rising tube will be unsuitable for determining changes of water pressure. In such cases it is advisable to use a porewater pressure transducer, which has the additional advantage of being able to measure vacuum. Fig 1 shows cases where piezometers and porewater pressure transducers produce different results.

Special types of porewater pressure transducers are suitable for pressing into cohesive soils. Porewater pressure transducers work according to the following principle: A ceramic or sintered metal filter is installed at the measuring location, with a small chamber filled with low-surface-tension water providing protection from contamination. If the water pressure in the soil or rock changes, the pressure of liquid in the chamber behind the filter will change by an equivalent amount. This change of pressure can be measured, for example, with a Glötzl valve transducer (see Fig 2). With this method, the air or oil pressure p_2 is increased via a valve pressure line (c) until the valve membrane (b) frees the return line (d). In this state, the air or oil pressure p_2 equals the liquid pressure p_1 in the chamber (e) behind the filter (a), and hence is equal to the water pressure in the rock.

An example of a measurement taken with four porewater pressure transducers is illustrated in Fig 2. To conduct the measurement you need connection and distribution boxes in which the pressure and return lines of the various porewater pressure transducers are connected. An air quantity regulator with matching precision manometers is required as a measuring instrument to determine the air pressure in the valve transducer; it is connected to the connection and distribution box with a quick-action coupling. The electric pressure sensor Type PWE may also be used instead of the pneumatic valve transducer.

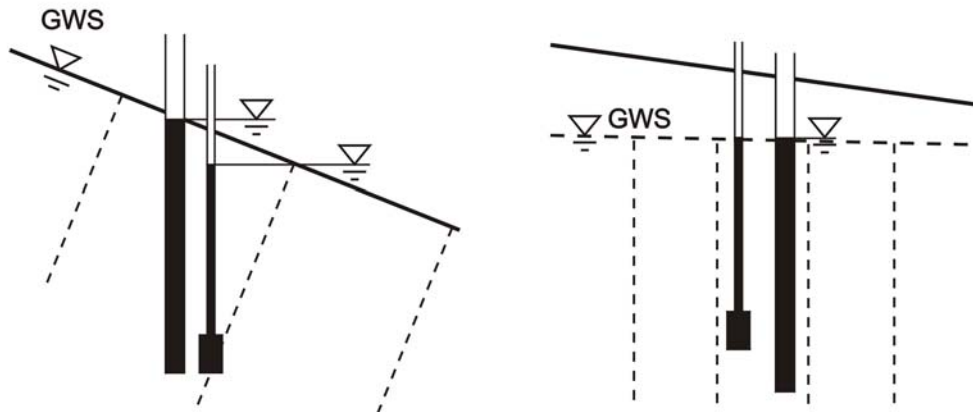


Fig 1 Typical reading of a piezometer installed in a water-saturated clayey skid slope and a porewater pressure transducer (left); Typical ground water level in a sandy soil with identical readings of the two instruments (right).

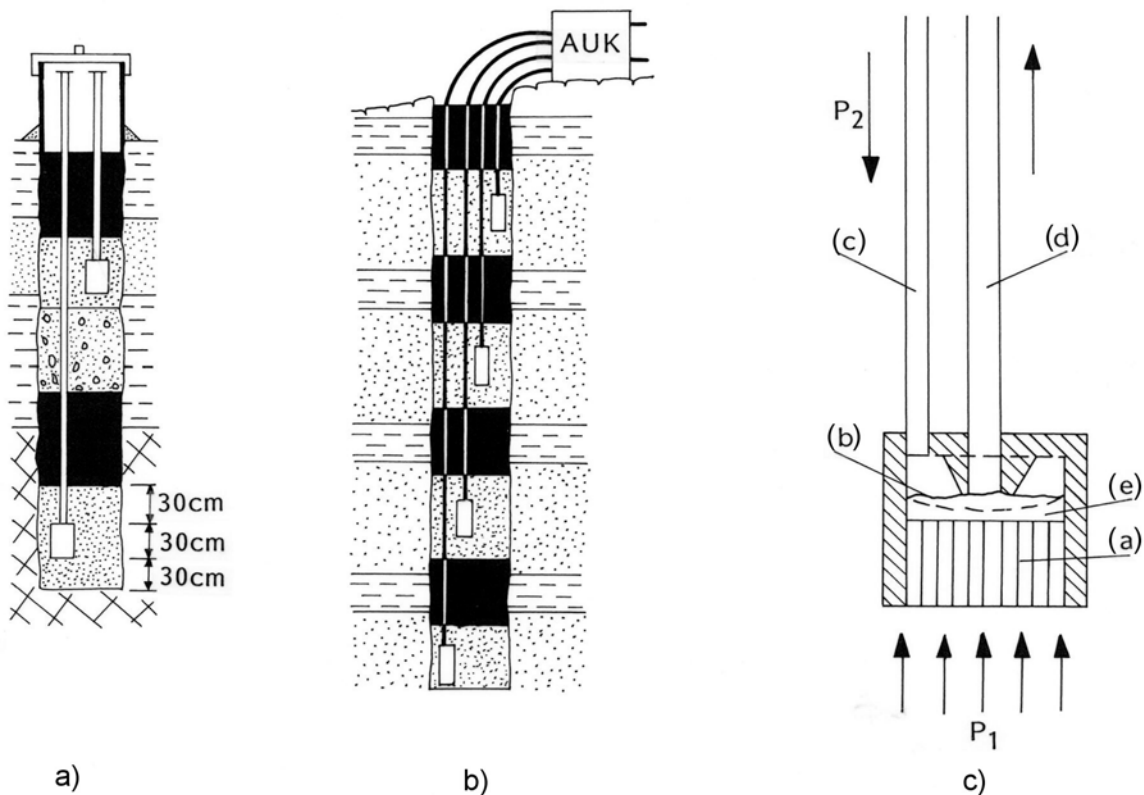


Fig 2 Measurement of water pressures in various aquifers
 a) With rising tube
 b) With porewater pressure transducers system Glötzl
 c) Glötzl valve transducer (see text for explanations)