

Borehole seismic surveys are used to determine P and S wave velocities. These methods can be used to characterize the elastic properties of subsurface materials. Borehole surveys are applicable for uses including geotechnical and engineering (soil classification for seismic site effect).

Seismic borehole surveys

I&C Italia offers:

- DOWN-HOLE seismic surveys
- CROSS-HOLE seismic surveys

Down-hole seismic surveys require only a single borehole. Seismic energy is generated on surface at a fixed distance from the top of the borehole.

The travel times of the first-arrival seismic waves are measured at regular intervals down the hole using a single clamped triaxial geophone that is gradually moved down or up the hole.

Sources are used for generating both shear (S wave) and compression (P wave) wave energy.

Cross-hole seismic surveys involve measurement of the travel time of seismic energy transmitted between two boreholes.

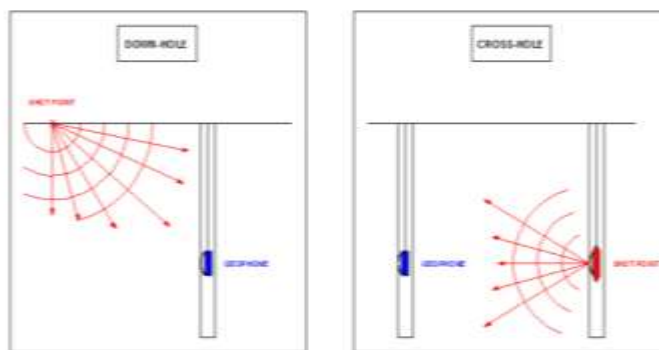
One hole is used to deploy the source whilst the other hole is used to detect (through a triaxial geophone) the arrival of the seismic energy.



APPLICATIONS

Down-hole and cross-hole data may be used for computing:

- ✓ $V_p - V_s$ velocities
- ✓ Poisson's ratio
- ✓ Shear's modulus
- ✓ Young's modulus
- ✓ $V_s 30$



EQUIPMENT

SEISMOGRAPH "GEODE"

Channels	24
Bandwidth	1.75 Hz to 20 kHz
Dynamic range	144 dB
Stacking trigger accuracy	1/32 of sample interval
Distortion	0.0005%
Noise floor	0.20 μ V
Sample interval	0.02 ms to 16 ms
Power	12 V

BOREHOLE GEOPHONE

Triaxial (14 Hz) with compass
With clamping device

ENERGY SOURCES

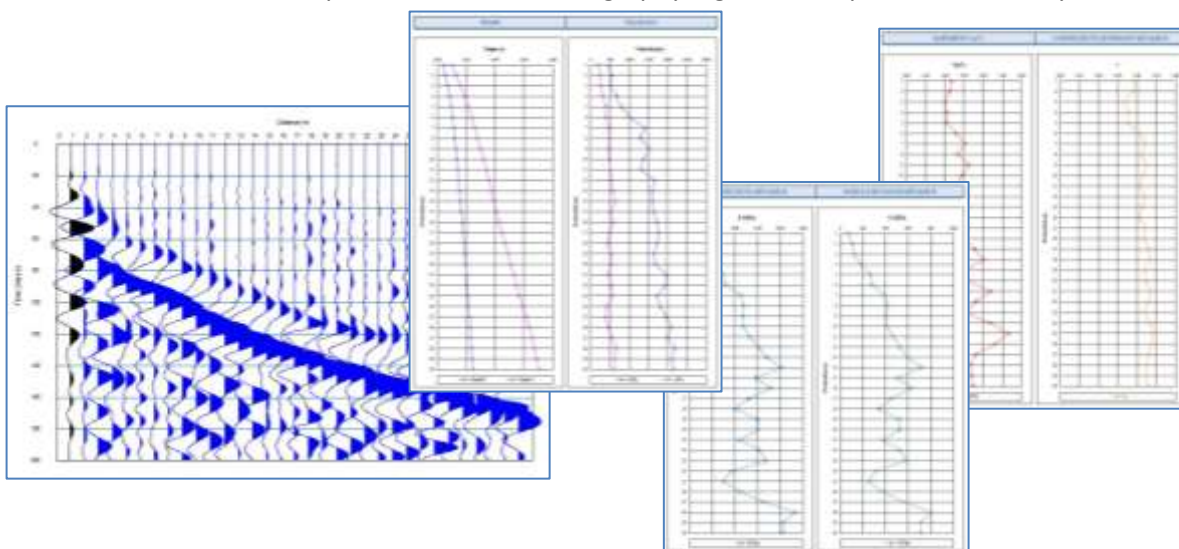
Hammer 8 kg and striker plate
Sparker



DATA PROCESSING

Measuring the first arrival time of the compression and shear wave and the distance between the source and the receiver, the velocities can be calculated to determine the elastic moduli.

The cross-hole data can be processed with a tomography algorithm to produce a velocity cross-section.



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