



# Cone Penetration Testing – Procedure & Methods

## What is a Cone Penetration Test?

A Cone Penetration Test (also called a Cone Penetrometer Test or CPT) is a method used to determine the geotechnical properties of soil – and the variations at ground depth – and can be deployed in a range of different configurations to suit even the most challenging of projects.

A CPT is commonly used in ground investigation projects as it provides a quick and efficient solution to determining the sub-surface stratigraphy, and provides an interpretation of the materials encountered.

The advantages of CPT compared to conventional soil sampling methods are high production, minimal soil disturbance and reduced costs.

## What is the procedure for a Cone Penetration Test?

A CPT involves pushing a cone vertically into the ground using hydraulic pressure via a four or six-wheeled CPT Rig – or a track-mounted crawler or fixed rams for difficult or tight access projects.

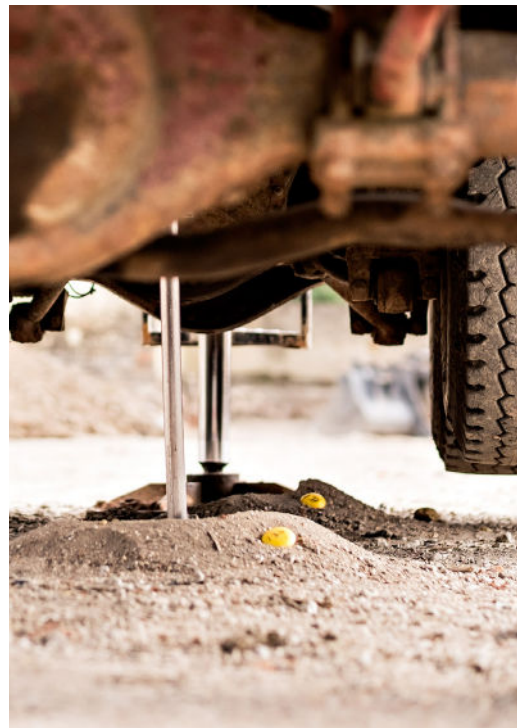
The cone penetrates into the soil at a constant rate of 20mm per second and measurements of the cone resistance are recorded during penetration.

For example – the side friction against the shaft and in the case of the Piezocone test – and the pore water pressure generated by the cone penetrating into the ground.

Measurements are recorded using an electric current and the frequencies of the readings are displayed of the variation of the measured parameters as the cone penetrates at depth.

At the heart of the measurement system is the CPT-Logger, which supports both digital and analog measurement instruments and synchronises the data in real-time as the cone penetrates at depth.

*Useful information: a CPT does not provide a physical ground sample of the soil – for this you will require a Mostap sampler (which is a 1m tube of samples collected in a protective sock) – and the device can be added to the CPT rods during testing.*



## Ground Testing Methods

### Soil type & Stratification

Tests that use the standard Piezocone and Gamma Cone – often combined with laboratory testing of samples using the Mostap sampler – enable the identification of ground layers and soil types on your project.

This approach is widely used to estimate map ground variability at depth and soil type on both Land and Marine projects.

### Geotechnical & Dynamic properties

Testing using the In-situ Vane and Seismic Cone enables a range of ground engineering properties to be measured and calculated including:

- Undrained shear strength
- Soil shear modulus
- Effective horizontal stress
- Effective overburden pressure
- In-situ horizontal stress
- Friction angle
- Bearing capacity
- Relative density
- Soil deformation

### Geoenvironmental

Tests using the Ultraviolet Optical Screening Tool (UVOST®), Membrane Interface Probe (MIP) and Laser and X-ray Fluorescence enable us to investigate contamination in soil and groundwater – and includes the identification and mapping of:

- Hydrocarbons
- Organic compounds
- Chlorinated solvents
- Heavy metals

### Hydraulic behaviour

The Electrical Conductivity Cone collects valuable information about groundwater quality and ground permeability to identify:

- Water composition
- Temperature
- Thermal conductivity
- Ion concentration, type and activity
- Freshwater / Saltwater interfaces

### Obstruction & Unexploded Ordnance (UXO) Surveys

We use a Magcone to map subsurface ferrous objects such as UXO and Unexploded Bombs (UXB), and when combining the Magcone and Piezocone tests together it is possible to investigate UXO and ground geotechnical engineering properties simultaneously.

Our tests include:

- Detection of UXO
- Detection of metallic structures
- Measurement of sheet pile foundation depth

