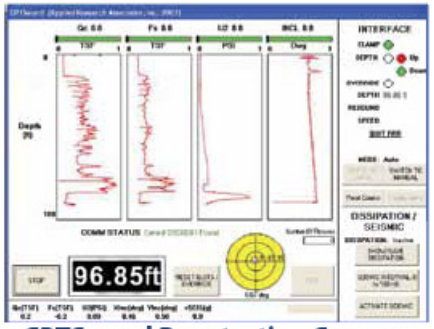
CPT Testing Overview

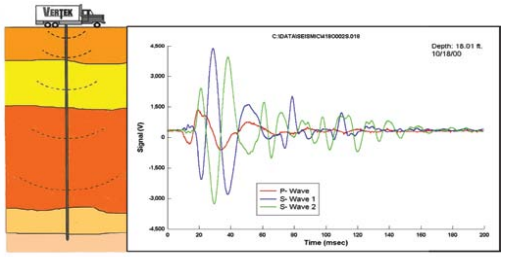
Cone Penetration Testing (CPT) is performed by a cone on the end of a series of rods pushed into the ground at a constant rate (2 cm/s) to obtain continuous measurements of the resistance to penetration of the cone.

Parameters obtained during the CPT test include cone resistance (q_c), sleeve friction (f_s), and piezocone pore pressure (u). These parameters are collected using real-time data logging and presented graphically as the following:



CPTSound Penetration Screen

Results of the CPT penetration tests are interpreted to obtain soil type, water table, and soil parameters for engineering design. Seismic testing can be performed at discrete intervals during the SCPT test to obtain shear wave data:



Exploration Equipment

AMS PowerProbe

The AMS 9500 VTR PowerProbe is a remote controlled rubber track ATV direct push/auger exploration machine capable of remote site access with low ground pressure and is equipped with controlled push for Seismic Cone Penetration Testing (SCPTu).

VERTEK
GEOTECHNICAL & ENVIRONMENTAL ENGINEERING PRODUCTS

The Vertek VTK cone system includes a real-time data logging system with 5 ton and 10 ton SCPTu cones. SCPTu cones are equipped with tri-axial seismic modules to provide both S and P shear wave velocity testing.

SUMMIT
GEOENGINEERING SERVICES

Cone Penetration Testing (CPT)

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Cone Penetration Testing vs. Standard Penetration Testing

The AMS 9500 VTR PowerProbe is equipped to perform standard penetration testing using 2 inch diameter split-spoon samplers (SPT) driven by a 140 lb auto-drop hammer and to perform cone penetration testing using 5 ton and 10 ton CPT cones supplied by Vertek. SPT and CPT testing each has pros and cons and can be most beneficial when combined or match to the encountered subsurface conditions.

Advantages of CPT:

- Continuous data and three-dimensional characterization capabilities
- Rapid testing and more operator independent than SPT
- Capable of delineating discrete low strength layers, easily missed by SPT
- Useful for identifying stratigraphic horizons, discontinuous lenses, soft materials, organic materials, liquefaction potential, and landslide shear zones
- Typically higher exploration production rate than conventional SPT drilling methods for sand and clay deposits
- Smaller explorations resulting in less disturbance and no cuttings or spoils.
- CPT data allows classification of soil layers by undrained shear strength, tip resistance, and differential pore pressure through widely used and accepted soil behavior correlations.
- Seismic cones provide downhole shear wave velocity testing to assist with soil profiling, engineering elasticity parameters, and shear wave profiling for International Building Code (IBC) seismic site classification for design

Disadvantages of CPT:

- No samples collected during CPT push
- Requires skilled operators to evaluate data and calibrations
- Difficulty penetrating gravelly or rocky soil, intact rock, or other obstructions

Advantages of SPT:

- Visual inspection of subgrade through sampling with split spoons
- Generally accepted correlations of SPT-N values to subgrade parameters
- Collection of disturbed samples for laboratory index testing

Disadvantages of SPT:

- Reports high blow counts when rocks are encountered, which may not be indicative of surrounding soil
- Penetration resistance increases with proximity to stiff layer or bedrock, despite actual resistance of layer
- Based on average blow counts per foot and can miss resistance of thin subgrade layers
- Time consuming and slower production rates in sand or clay deposits due to raising and lowering of drill rods for individual SPT spoon tests performed.
- Discrepancy in SPT-N value between various drill rigs with varying hammer types and efficiency.
- Potential for SPT-N value error due to caving or heaving sands, particularly when performed below groundwater.