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DYNAMIC CONE PENETROMETER USE AND OPERATING GUIDELINES

BACKGROUND:

The Standard Penetration Test (SPT) has its roots in the empirical observation of blows per unit measure of driving casing. The SPT method requires mechanized equipment to raise and drop a 140-lb mass 30-in. Numerous methods have been developed to miniaturize the SPT such that hand operated tools could be used at shallow depths where confined spaces or the need for expedience excludes the use of a mechanized SPT device.

The late Prof. George Sowers developed one of the more popular devices in 1959 for field exploration and the evaluation of lightly loaded shallow spread footings during the construction phase. For underlying theory the reader is encouraged to consult the following references: George F. Sowers and Charles S. Hedges, Dynamic Cone for Shallow In-Situ Penetration Testing. Vane shear and Cone Penetration Resistance Testing of In-Situ Soils, ASTM STP 399, American Society Testing and Materials, 1966, pg. 29. Copies can be purchased from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19438 – (610) 832-9500 – Fax: (610) 832-9555. As the item is copyrighted, AMS cannot provide copies.

The Dynamic Cone Penetrometer (DCP) illustrated in Figure 1a, uses a 15-lb steel mass free falling 20-in to strike an anvil to penetrate a 1.5-in diameter 45 degree cone that has been seated in the bottom of a hand augered borehole. The device has been used extensively in the Southeastern region of the USA and calibrated with standard SPT results. The original correlations by Sowers are shown in Figure 1b. Of course, similar correlation could be developed for soils of other regions and of differing geologic derivation.

OPERATING INSTRUCTIONS:

1. The penetration test is performed in the bottom of a hand augered borehole generally 3 to 6-in diameter.
2. Auger to the desired test depth taking care to remove as much of the bottom cuttings as practical. Use the auger cuttings to identify and visually classify the soil.
3. The borehole can be created by using a Borehold Preparation Kit (BPK).
4. The bottom of the borehole can be cleared using a planer auger, included in the BPK.

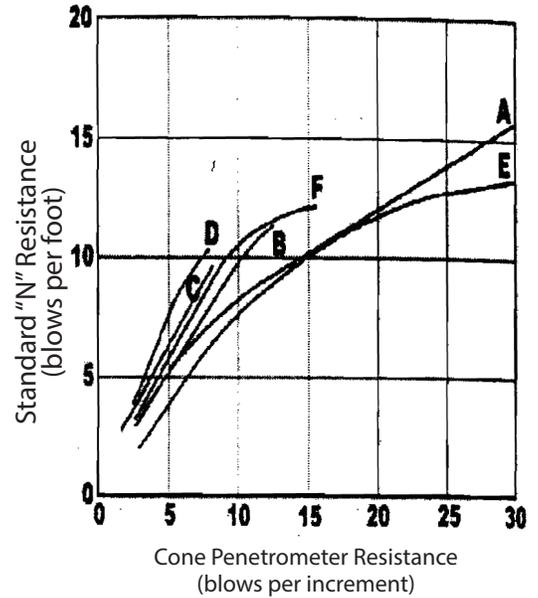
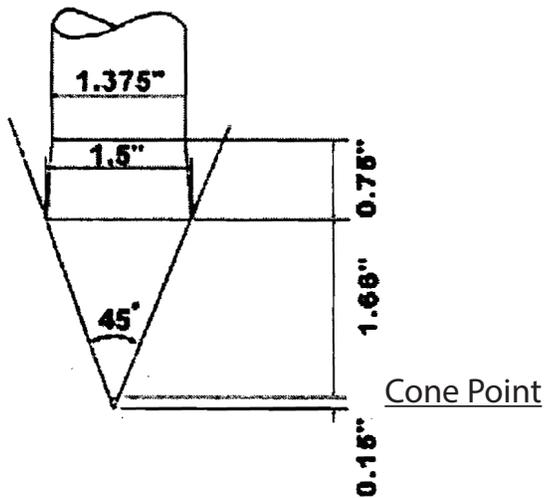
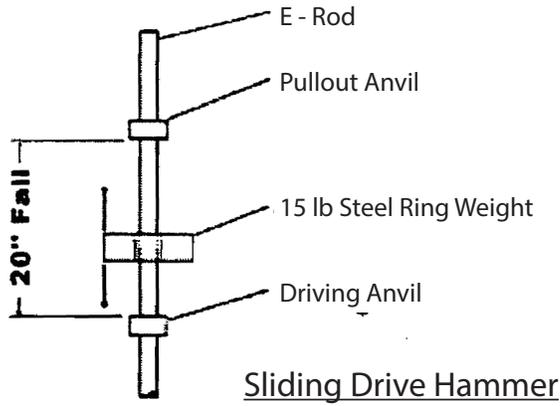
WARNING: Handle the Dynamic Cone Penetrometer with care. Do not grasp the E-rod between the pull out anvil and the driving anvil as the 15-lb sliding weight moves easily along this part of the rod.

5. Gently lower the sliding drive hammer, extension rods and drive point to the bottom of the borehole.
6. Making sure the assembly is plumb set the cone 2-in into the undisturbed bottom of the hole such that the cone is completely embedded.

NOTE: Laying a flat straight edge such as a survey stake across the borehole and marking the beginning reference point will expedite measurements.

7. Maintaining the assembly in a plumb position, drive the cone point 1-3/4-in (44mm) using the ring weight and allowing it to free fall 20-in (bringing the ring weight to the uppermost position against the pullout anvil will assure a 20in drop). Count and record the number of blows required to achieve 1-3/4-in (44mm) penetration.
8. If desired, perform a second and third penetration test by driving the cone additional 1-3/4-in (44mm) increments. Beyond three increments the effect of shaft friction may become apparent.
9. Remove the DCP assembly from the borehole taking care not to place hands between the anvil and keeping clear of the sliding weight.
10. Auger to the next test location and repeat steps 1 through 7.

Experience has show that the DCP can be effectively used in augered boreholes to depths of 15 to 20-ft. Beyond these depths it becomes cumbersome to handle the string of rods by hand. Also, correlations have not been verified for deeper depths where energy losses from thread joints and rod inertia have not been considered.



- Curve A- Virgin Piedmont soils
B- 95% Compacted soil
C- 90% Compacted soil
D- 85% Compacted soil
E- Coastal Plain soils
F- Piedmont alluvium

Borehole Preparation Kit

Improve effectiveness of geotechnical testing and sampling with a pre-bored hole.



Includes: 2 1/4" 5/8" regular auger, 2 1/4" 5/8" planer auger, one (1) 4' 5/8" extension, one (1) 3' 5/8" extension, rubber-coated crosshandle, black poly-canvas bag.

Borehole Preparation Kit

400.78 Borehole Preparation Kit

Replacement Parts

AUGERS

400.08 2 1/4" Regular Auger

400.53 2 1/4" Planer Auger

EXTENSIONS

408.02 3' Extension

408.03 4' Extension

MISCELLANEOUS

406.04 16" Rubber Coated Cross Handle

430.32 4" Signature Poly-Canvas Case