

Geotechnical Engineering Laboratory
CIVIL ENGINEERING VIRTUAL LABORATORY

Experiment no 8

Standard Penetration Test

OBJECTIVE

To determine the Bearing Capacity of the soils.

SCOPE

This method describes the standard penetration test using the split-spoon sampler to obtain the resistance of soil to penetration (N-value), using a 63.5 kg hammer falling .76 m; and to obtain representative samples for identification and laboratory tests.

The method is applicable to all soil types. It is most often used in granular materials but also in other materials when simple in-place bearing strengths are required. It is also used when samples cannot easily be recovered by other means.

THEORY

The number of blows for first 15 cm penetration are considered as seating drive and are discarded. The total blows for the next and third 15 cm penetration are recorded and termed as the penetration resistance (N- value).

If the sampler is driven less than 45 cm (total), then the blows for the last 30 cm penetration shall be termed as penetration resistance (N-value). If less than 30 cm is penetrated, enter the number of blows and the depth penetration in the bore log.

If at any time the entire sampler sinks under its own weight in case of very soft sub-soil stratum, it may not be required to give any blow to the sampler, the SPT value (N-value) should be taken as Zero.

APPARATUS USED

Drilling equipment - any drilling equipment is acceptable that provides a reasonably clean hole, which is at least 5 mm larger than the sampler or sampling rods, and less than 170 mm diameter.

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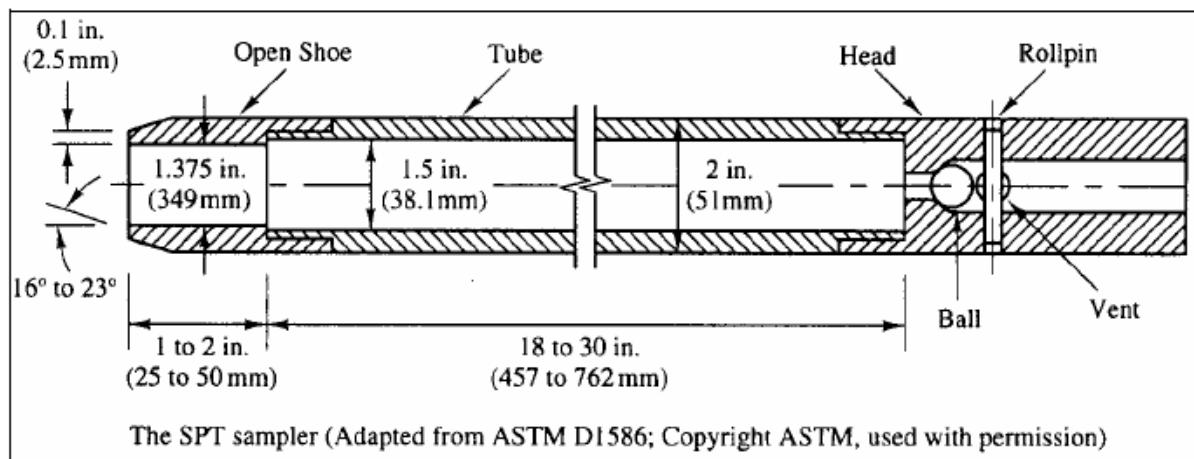
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Sampling rods - steel A-rod is used to connect the sampler to the drive weight assembly. A-rod should be used unless otherwise directed.

Split-barrel sampler - consists of 3 main parts; head, split-barrel and shoe. A core catcher should be installed to prevent loss of sample. Shoes which have been damaged should be replaced or repaired.



Drive-weight assembly - consisting of a 63.5 kg weight (hammer), a driving head (anvil) and a guide permitting free fall of 0.76 m and an over lift capability of at least 100 mm.

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Cathead operating at approximately 100 rpm, equipped with suitable rope and overhead sheave for lifting drive-weight.

PROCEDURE

Test Procedure

Test Hole

Drill the hole to the desired sampling depth and clean out all disturbed material.

If a wet drill is used, flush out all cuttings.

2) Assembling Equipment

Attach the split-barrel sampler to the A-rod and lower into the hole until it is sitting on the undisturbed material.

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Attach the drive weight assembly.

Lift the 63.5 kg hammer approximately 0.76 m and allow it to fall on the anvil delivering one seating blow.

Mark the drill rod in 3 successive 15 m increments to observe penetration.

Mark the drive weight assembly to indicate a 0.76 m hammer lift.

3) Penetration Testing

Raise and drop the hammer 0.76 m successively by means of the rope and cathead, using no more than 2 1/4 wraps around the cathead. The hammer should be operated between 40 and 60 blows per minute and should drop freely.

Continue the driving until either 0.45 m has been penetrated or 100 blows has been applied.

Record the number of blows for each .15 m of the penetration. The first 0.15 m increment is the "seating" drive. The sum of the blows for second and third increment of 0.15 m penetration is termed "penetration resistance or "N-value".

If the blow count exceeds 100 in total, terminate the test and record the number of blows for the last 0.30 m of penetration as the N-value.

If less than 0.30 m is penetrated in 100 blows, record the depth penetrated and the blow count. If the sampler advances below the bottom of the hole under its own weight, note this condition on the log.

4) Handling Sample

Bring the sampler to the surface and open it. Remove any obvious contamination from the ends or sides and drain excess water. Carefully scrape or slice along one side to expose fresh material and any stratification.

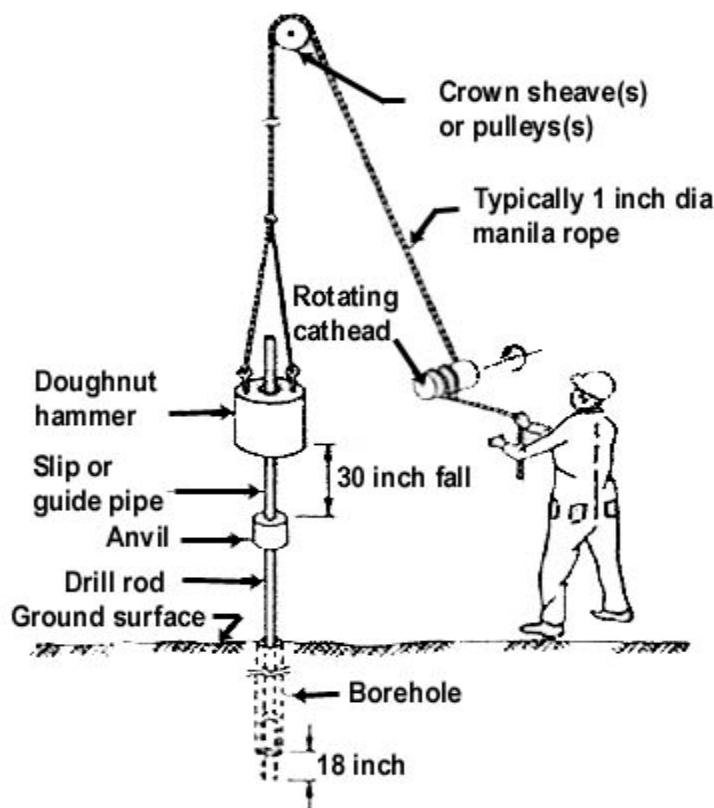
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Record the length, composition, colour, stratification and condition of sample.

Remove sample and wrap it or seal in a plastic bag to retain moisture. If the sample can be removed relatively intact, wrap it in several layers of plastic to strengthen it and seal ends with tape. Mark the sample "top" and "bottom" if applicable and label it with an identification number.



OBSERVATIONS

Blows required for each 15 cm penetration should be noted.

The following information should be recorded after lowering the sampler to the bottom of the borehole, prior to the start of the test:

Depth of bore-hole(test level) below the ground level.....

Depth of bottom of casing(if used) below ground level.....

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Penetration of the sampler into the soil under the self-weight of sampler and A-rods.....

Water level in the borehole.....

PRECAUTIONS

- 1) Care should be taken that bore-hole remains straight, perpendicular to the ground surface.
- 2) The samples should not be placed in sun.
- 3) For depths of exploration more than 10m, care should be taken to maintain the rod vertical by using stiffer rods (N-rods).

REFERENCES

ASTM D 1586-67
Catalogue #615, Mobile Drilling Inc.
Soils and Engineering, R.H. Karol, Prentiss Hall Inc. 1960.

QUIZ

- 1) Why there is a need of Standard Penetration Test?
- 2) What is the scope of Standard Penetration Test?
- 3) What is the SPT value (N-value) for a sample, if it sinks under its own weight?
- 4) What does SPT value of a sample tell?