1. **SCOPE**

1.1. **Description of Test**

This method describes the standard penetration test using the split-barrel 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.

2. **APPARATUS AND MATERIALS**

2.1. **Equipment Required**

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.

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, as shown in Figure 240-6-1. 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 overlift capability of at least 100 mm as shown in Figure 240-6-2.

Cathead operating at approximately 100 rpm, equipped with suitable rope and overhead sheave for lifting drive-weight.
Section: FOUNDATION INVESTIGATION
Subject: PENETRATION TEST AND SPLIT-BARREL SAMPLING

FIGURE 240-6-1
SPLIT BARREL SAMPLER

FIGURE 240-6-2
63.5kg DRIVE WEIGHT ASSEMBLY
3. **PROCEDURE**

3.1. **Test Procedure**

3.1.1. **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.

3.1.2. **Assembling Equipment**

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

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.

3.1.3. **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.

3.1.4. 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.

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.

4. RESULTS AND CALCULATIONS

4.1. Reporting Results

Prepare a log of the borehole, in the field, on the "FIELD BOREHOLE LOG" report form and show:

Name and location of job.

Date, start and finish.

Hole number.

Elevation and stationing.

Sample number and depth.

Drilling method and type of bit.

Description of soil.

Number of blows for each .15 m penetration or partial increment.

Type of drilling equipment.
Names of drilling crew.

Other remarks should be included where applicable such as:

Casing size if used.
Changes in material within sample.

Loss or gain of water in borehole.

Change of drill bits if required for different conditions.

5. **ADDED INFORMATION**

5.1. **References**

ASTM D 1586-67
Catalogue #615, Mobile Drilling Inc.

5.2. **General**

This method is under active review by ASTM and useful modification may be provided in the future. Some of the changes being considered are: automatic control of hammer drop, style and shape of hammer and sample rod size other than A-rod. Experiments have shown that N-rod provides equivalent results to a depth of 100 feet.

The test, in granular materials, was previously considered to provide a measure of relative density; this has been discounted of late. N-values can be used to predict engineering behaviour for earthwork or foundation design but should be carefully interpreted on the basis of previous experience.

Tests are usually performed on a continuous depth basis. If required because of cost, the sampling interval may be increased to not more than 1 1/2 m.
APPROVAL SHEET

New _ Revision X_ Date of Previous Document 82-04-01

Effective Date: ___-___

Description of Revision (Reason for Revision):

_Format of test procedure updated._

Review/Implementation Process:
_Reviewed by the Materials Section of the Technical Standards and Policies Branch._

Other Manuals/Policies Affected:
_Nil_

Follow Up/Training Required:
_Nil_

Comments/Concerns/Implications (Budget/Environment/Stakeholders):

Prepared and Recommended by D. MacLeod ____________ 94-01-10
Materials Standards Engineer Date

Approval Recommended by R.A. Widger ____________ - -
Senior Materials Engineer Date

Approval Recommended by A.R. Gerbrandt ____________ - -
Dir., Technical Standards & Policies Br. Date

Approved by D.G. Metz ____________ - -
Assistant Deputy Minister, Infrastructure Date

Electronic File Updated - -
Update Mailed - -