

Geotechnical Engineering Laboratory
CIVIL ENGINEERING VIRTUAL LABORATORY

Experiment no 6

Vane shear test

OBJECTIVE

To find the shear strength of a given soil specimen.

NEED AND SCOPE

The structural strength of soil is basically a problem of shear strength. Vane shear test is a useful method of measuring the shear strength of clay. It is a cheaper and quicker method. The test can also be conducted in the laboratory. The laboratory vane shear test for the measurement of shear strength of cohesive soils, is useful for soils of low shear strength (less than 0.3 kg/cm^2) for which triaxial or unconfined tests can not be performed. The test gives the undrained strength of the soil. The undisturbed and remoulded strength obtained are useful for evaluating the sensitivity of soil.

APPARATUS USED

1.Vane shear apparatus.



2.Specimen.

3.Specimen container.

4.Callipers.

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THEORY

The vane shear test is an in-situ geotechnical testing methods used to estimate the undrained shear strength of fully saturated clays without disturbance. The test is relatively simple, quick, and provides a cost-effective way of estimating the soil shear strength.

PROCEDURE

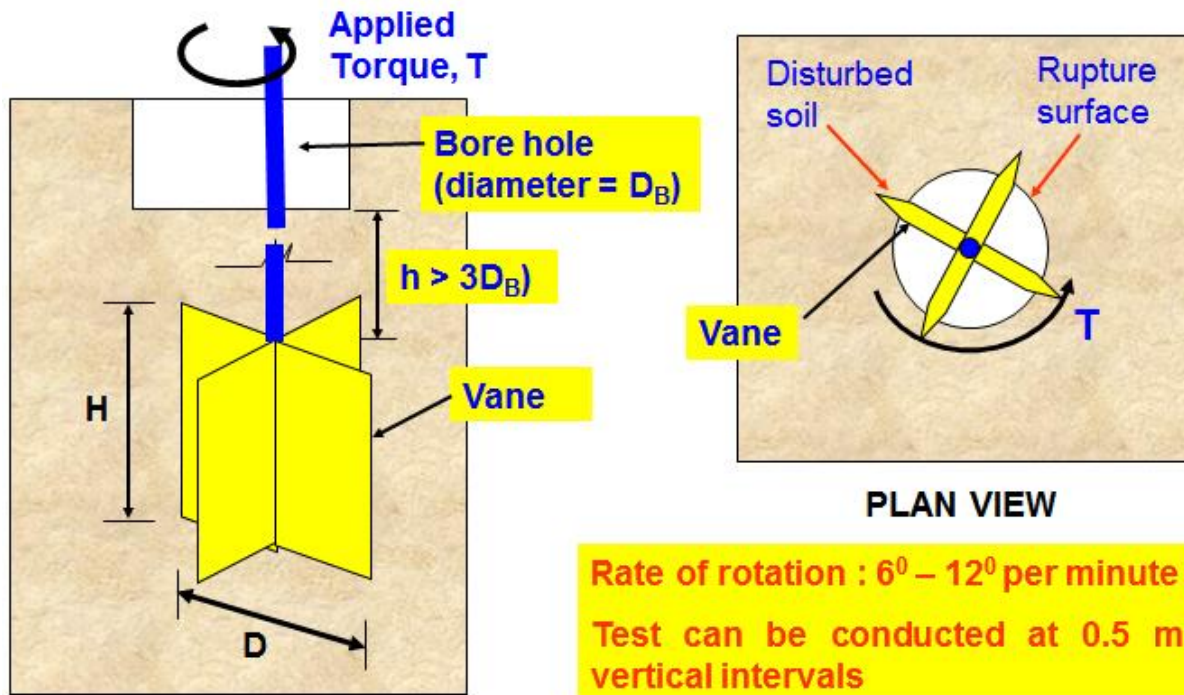
- 1) Prepare two or three specimens of the soil sample of dimensions of at least 37.5 mm diameter and 75 mm length in specimen. (L/D ratio 2 or 3).
- 2). Mount the specimen container with the specimen on the base of the vane shear apparatus. If the specimen container is closed at one end, it should be provided with a hole of about 1 mm diameter at the bottom.
3. Gently lower the shear vanes into the specimen to their full length without disturbing the soil specimen. The top of the vanes should be atleast 10 mm below the top of the specimen. Note the readings of the angle of twist.
4. Rotate the vanes at an uniform rate say $0.1^{\circ}/s$ by suitable operating the torque application handle until the specimen fails.
5. Note the final reading of the angle of twist.
6. Find the value of blade height in cm.
7. Find the value of blade width in cm.

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OBSERVATIONS AND CALCULATIONS

S.No	Initial Reading (Deg)	Final Reading (Deg.)	Difference (Deg.)	T=Spring Difference Kg-cm	Constant/180x $G = 1/ \pi (D^2 H / 2 + D^3 / 6)$	S=T _x G Kg/cm ²	Average 'S' Kg/cm ²	Spring Constant Kg-cm

Calculations:

Shear strength,

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$$C_u = \frac{T}{\pi \left(\frac{d^2 h}{2} + \frac{d^3}{6} \right)}$$

Where C= Shear strength in Kg/cm²
 T=Torque in cm-Kg
 d=Overall diameter of vane in cm
 h=Height of vane in cm

PRECAUTIONS

- 1) It is important that the dimensions of the vane are checked periodically to ensure that the vane is not distorted or worn.
- 2) The vanes should be frequently checked for straightness.
- 3) The apparatus should be checked and calibrated as and when required.

REFERENCES

<http://theconstructor.org/geotechnical/vane-shear-test-on-soil/3435/>

QUIZ

- 1) What does Vane shear test measure?
- 2) What is the principle of Vane Shear Test?
- 3) What is the rate of rotation of Vane during testing?

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