



INSTRUCTION MANUAL
FIELD INSPECTION VANE TESTER
Model H-60

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1 APPLICATIONS

The inspection vane borer is used to measure in situ undrained shear strength in clays. It is primarily intended for use in trenches and excavations at a depth not influenced by drying and excavation procedure.

When different sizes of vanes are used, the instrument range is from 0 to 260 kPa. The accuracy of the instrument should be within 10% of the reading.



Figure 1: H-60 vanes in three different sizes

2 PRODUCT

2.1 DESCRIPTION

The vane tester consists in two parts: the vane with its shaft and the measurement part with its handle.

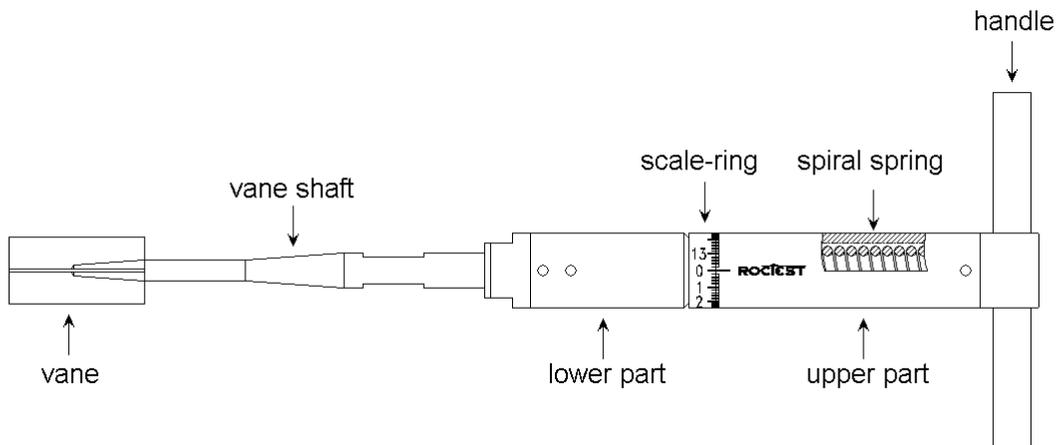


Figure 2: H-60 vane borer

The scale-ring is graduated from 0 to 130 kPa.

Four sizes of four-bladed vanes can be used:

- 16 x 32mm
- 20 x 40mm (standard)
- 25.4 x 50.8mm
- 50.8 x 101.5mm

They make it possible to measure shear strength of 0 to 260, 0 to 130, 0 to 65, and 0 to 8.125 kPa respectively.

2.2 OPERATION PRINCIPLE

The measurement part of the instrument is a spiral spring. When the handle is turned, the spring deforms. The upper part and the lower part of the instrument get a mutual angular displacement which depends on the torque applied. The shear strength of the soil is obtained by means of a scale-ring.

The lower and upper halves of the instrument are connected by means of threads. The scale is also supplied with threads and follows the upper part of the instrument by means of two lugs. The zero-point is indicated by a line on the upper part. When torque is applied, the scale-ring follows the upper part of the instrument, and when failure in the soil is obtained, the scale-ring will remain in its position due to the friction in the threads.

3 OPERATION AND READING PROCEDURES

3.1 GENERALITIES

The vane blades are soldered to a shaft which again is extended by one or more 49-cm long rods. The connection between the shaft-rods and the instrument is made by threads. To make the connections as straight as possible, the rods have to be screwed tight together and threads cleaned for dirt.

In clays with shear strength of 260 kPa, a force of about 40 to 50 kilos is required to press the vane down into the soil. The shaft is designed to take this force, but if extension rods are used, precautions against buckling are required.

3.2 GENERAL PROCEDURES

1. Connect required vane and extension rods to the inspection vane instrument.

Note: While screwing vane or rods to instrument, hold onto lower part.

2. Push vane into the ground to the required position.

Note: Do not twist inspection vane during penetration.

3. Make sure that the scale-ring is set to zero-position.

4. Turn handle clockwise.

Note: Turn as slowly as possible with constant speed.

Be careful not to turn the handle over 360°, otherwise the spring inside the instrument may be permanently damaged.

5. When the lower part follows the upper part around or even falls back, failure and maximum shear strength is obtained in the soil at the vane.
6. Holding handle firmly, allow it to return to zero-position.

Note: Do not allow the handle to spring back uncontrolled.

7. Note the reading on the graduated scale.

Note: Do not touch or in any way disturb the position of the graduated ring until the reading is taken.

8. Write down the reading together with position of hole and depth.
9. Turn the graduated scale anti-clockwise back to zero-position.
10. To determine the remoulded shear strength, the following procedure is used:
 - Turn the vane quickly at least 25 revolutions. Do not turn using handle. Turn using wrenches provided.
 - Zero the scale and take at least two measurements by turning the instrument as slowly as possible.
 - The minimum value is considered the correct one.
11. Push the vane down to next position. If necessary, screw on another extension rod.
12. Repeat the above measurement procedure (steps 3 to 10).
13. When the last reading is taken, pull the vane up. If soil is comparatively soft, this can be done by hand, gripping the handle. In harder soils, some mechanical device might be necessary. It is then advisable to connect this device directly to the connection rods (not to the instrument).

3.3 SPECIAL PROCEDURES

When measuring the shear strength at greater depths, the friction between soil and extension rods can be appreciable, and must be taken into consideration.

To measure the friction, extension rods and a vane-shaft without vane (dummy) are pushed into the ground to the depths required for shear force measurements. The torque due to friction is then measured in the same way as when using vanes (steps above from 3 to 9). The friction torque thus obtained is used to evaluate the actual shear strength from the measured shear strength.

To penetrate through firm layers a pre-boring using a rod with the same diameter as the vane may be helpful.

4 CONVERSION OF READINGS

The shear strength depends on the size of vane the instrument is used with. Multiply the reading of the scale-ring by the correct factor in the table below.

$$\text{Shear strength (kPa)} = \alpha \cdot \text{Reading}$$

Vane size in mm	Multiplicative factor α
16 x 32	2
20 x 40	1
25.4 x 50.8	0.5
50.8 x 101.6	0.0625

Table 1: Factors to use for conversions

Note: If a correction on the shear strength should be applied because of friction on the shafts, do the correction on the reading before applying the vane coefficient by subtracting the torque friction. Please refer to the ASTM standard D2573 (volume 04.08) for more information.

5 MAINTENANCE

The H-60 vane borer is simply designed, and does not require much attention. But it is most important to keep it as clean as possible. Periodically, the instrument should be sent back to factory for verification.

6 CONVERSION FACTORS

	To Convert From	To	Multiply By
LENGTH	Microns	Inches	3.94E-05
	Millimetres	Inches	0.0394
	Meters	Feet	3.2808
AREA	Square millimetres	Square inches	0.0016
	Square meters	Square feet	10.7643
VOLUME	Cubic centimetres	Cubic inches	0.06101
	Cubic meters	Cubic feet	35.3357
	Litres	U.S. gallon	0.26420
	Litres	Can-Br gallon	0.21997
MASS	Kilograms	Pounds	2.20459
	Kilograms	Short tons	0.00110
	Kilograms	Long tons	0.00098
FORCE	Newtons	Pounds-force	0.22482
	Newtons	Kilograms-force	0.10197
	Newtons	Kips	0.00023
PRESSURE AND STRESS	Kilopascals	Psi	0.14503
	Bars	Psi	14.4928
	Inches head of water*	Psi	0.03606
	Inches head of Hg	Psi	0.49116
	Pascal	Newton / square meter	1
	Kilopascals	Atmospheres	0.00987
	Kilopascals	Bars	0.01
Kilopascals	Meters head of water*	0.10197	
TEMPERATURE	Temp. in °F = (1.8 x Temp. in °C) + 32 Temp. in °C = (Temp. in °F - 32) / 1.8		

* at 4 °C

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Table 2: Conversion factors