

# Fall Cone Apparatus



*Geonor fall cone apparatus*

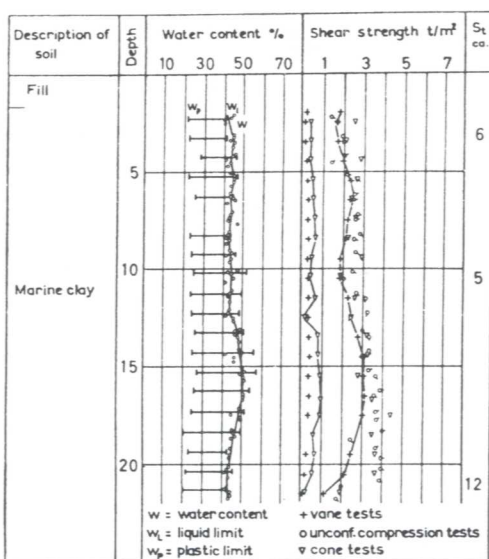
## **FEATURES:**

- Rapid, simple and accurate measurement of:
  - Undrained shear strength
  - Shear strength of remoulded samples and thereby sensitivity
  - Liquid limit  $W_L$
- Testing capacity: Shear strengths of 0.01. to 200 kPa (0.001 to 20t/m<sup>2</sup>)
- Portable and easy to use
- Designed by the Norwegian Geotechnical Institute, NGI

## GEONOR FALL CONE APPARATUS

### APPLICATION

The Fall Cone apparatus, first introduced in 1915, provides a rapid, simple and accurate method for determining empirically the undrained shear strength, the shear strength of remoulded samples and thus the sensitivity of clays. The equipment is also used for determination of liquid limit  $W_L$  (or fineness number  $W_F$ ). Four cones of different weight and apex angle are provided. The diagram shows the relation of shear strengths in undrained and remoulded samples measured by cone test, vane tests and unconfined compression test (Norwegian Geotechnical Institute Publ. 41, Oslo).



### PRINCIPLE

The shear strength of a soil ( $s$ ) is proportional to the weight of the cone ( $Q$ ) and inversely proportional to the square of the penetration ( $h$ ) of the cone into the sample:  $s = K \cdot Q / h^2$  (Hansbo, see reference). The proportional constant ( $K$ ) depends primarily on the angle of the cone and sensitivity of the clay.

The shear strength is measured by placing the sample underneath the cone holder, with the tip of a cone touching the sample. After releasing the cone from the magnet holder and measuring the depth of penetration, the shear strength of the undisturbed or of the remoulded sample is given in tables accompanying the apparatus

### DETERMINATION OF THE LIQUID LIMIT

The standard cone used to determine the liquid limit  $W_L$  (see diagram) has a weight of 60 gr and an angle of  $60^\circ$  (part no. 200400). The upper limit of plasticity corresponding to the liquid limit is defined as the moisture content at which the cone impression is 10 mm (Karlsson, see reference).

### DETERMINATION OF THE SENSITIVITY

The undrained shear strength of an undisturbed sample is first measured. Thereafter, the sample is completely remoulded and the new shear strength is measured with the same water content. The ratio of the undisturbed to remoulded shear strength is defined as the sensitivity ( $S$ , in diagram).

### TECHNICAL SPECIFICATIONS OF CONES

Fall Cone (part. no.)	Weight(gr)	Apex angel (*)	Penetration in mm	Undrained Shear Strength (kPa)
200300	10	60	5.0 - 20.0	1 - 0.063
200400	60	60	5.0 - 15.0	6 - 0.67
200500	100	30	5.0 - 15.0	40 - 4.5
200600	400	30	4.0 - 15.0	250 - 18

### ORDER REFERENCES

Part No.	Equipment	Part No.	Equipment
200100	Fall cone apparatus	200800	Stand for fall cones
200300 to 200600	Fall cones as above	200900	Cup for remoulding samples
		200501	Spare points for 100 and 400 gr cones

### REFERENCES:

- Hansbo, S.(1957):A new approach to the determination of the shear strenght of clay by the fall cone test. Swedish Geot. Inst. Pub. No.14, Stockholm
- Karlsson, R. (1961): Suggested improvements in the liquid limit test, with reference to flow properties of remoulded clays. 5th Int. Conf. on Soil Mech. and Found. Eng., Vol 1.p. 171, Paris.