

Determination of hydraulic conductivity of saturated soil below the water table by augerhole method

The inverted auger hole method is used to measure hydraulic conductivity in situ above the water table. A hole is bored using an auger to a certain depth. Before the test is undertaken, the bore is filled with water to create near saturated conditions around the bore. Water is again filled in the hole to a certain level and the fall in water level at different times and its rate is recorded (Fig. 10.1).

$$k = 1.15 r \frac{\log\left(h(t_1) + \frac{r}{2}\right) - \log\left(h(t_n) + \frac{r}{2}\right)}{t_n - t_1}$$
$$= 1.15 r \tan \alpha$$

Where, r = radius of auger hole; cm:

$h(t)$ = Water level in the hole at time t cm

Requirements

1. Auger
2. Steel tape for measurement of water level
3. Float
4. Water

Procedure

1. Drill a bore hole with an auger up to a certain depth;
2. Fill water in the hole 2-3 times and leave it for 2-3 hours to create near saturated conditions in and around the hole;
3. After obtaining saturated conditions, record the falling water levels in bore hole at different time intervals;
4. Plot $\left[h(t) + \frac{r}{2}\right]$ against time 't' on semi-log paper and read the value of tangent α (Fig. I 0.2); and using equation 10.1, compute the value of hydraulic conductivity.

Observations and Calculations

Example

Compute hydraulic conductivity of a soil using inverted auger hole. The diameter of hole was 5 cm and depth of hole from reference level was 100 cm (Fig.10.1). $r = 2.5$ cm $D = 100$ cm

i	t i, sec	h' (t), cm	h (t), cm	h (t.) + r12, cm
1	0	80	20	21.25
2	30	82	18	19.25
3	60	84	16	17.25
4	120	86	14	15.25
5	220	88	12	13.25
6	400	90	10	11.25
7	520	92	8	9.25
8	720	94	6	7.25
9	920	96	4	5.25

$$\text{Solution: } \tan \alpha = \frac{\log 66 - \log 5}{1000}$$

$$= \frac{1.82 - 0.698}{1000}$$

$$= \frac{1.12}{1000} = 0.00112$$

$$K = 1.15 \times r \times \tan \alpha$$

$$= 1.15 \times 2.5 \times 0.00112$$

$$= 0.00322 \text{ cm/sec}$$

$$= \frac{0.00302}{100} \times 3600 \times 24 = 2.78 \text{ m/day}$$

Results:

Hydraulic conductivity = _____m day

Precautions:

- Bore hole should be straight to facilitate the movement of float and tape
- In order to measure fairly accurate value of hydraulic conductivity near saturated conditions need to be obtained.

Conclusion

Signature of Faculty In-charge