## TACHEOMETRY

Tacheometry is defined as an optical distance measurement method. Though less accurate, this method of surveying is very rapid and convenient. The other names given to tacheometry are tachymetry or telemetry.

It is particularly suitable for filling in details on topographical maps, preliminary location surveys (e.g., for railways, roadways, canals, reservoirs, etc.) and surveying steep grounds, broken boundaries and water stretches, etc. Also, on surveys of higher accuracy, it may be used to provide a ready check on distances measured with a chain or tape.

A tacheometer is essentially a transit theodolite, the diaphragm of which is furnished with stadia wires in addition to the cross-wire. Observations are made on stadia rod, usually a level staff but with a larger least count (1 cm), and horizontal as well as vertical distances are computed from these observed readings.

INSTRUMENTS USED

Tacheometer

It is a transit theodolite fitted with stadia diaphragm. The stadia diaphragm consists of two stadia hairs at equal distances, one above and the other below the horizontal hair of the cross-hair. Various types of stadia diaphragm are shown in Fig., but usually the arrangement shown in Fig. (a) is provided.
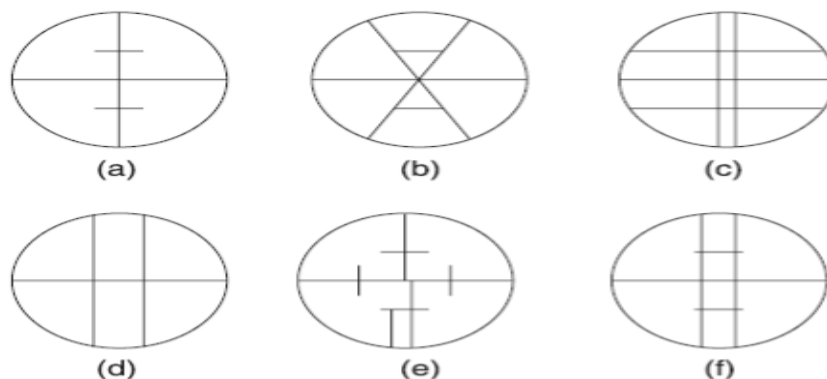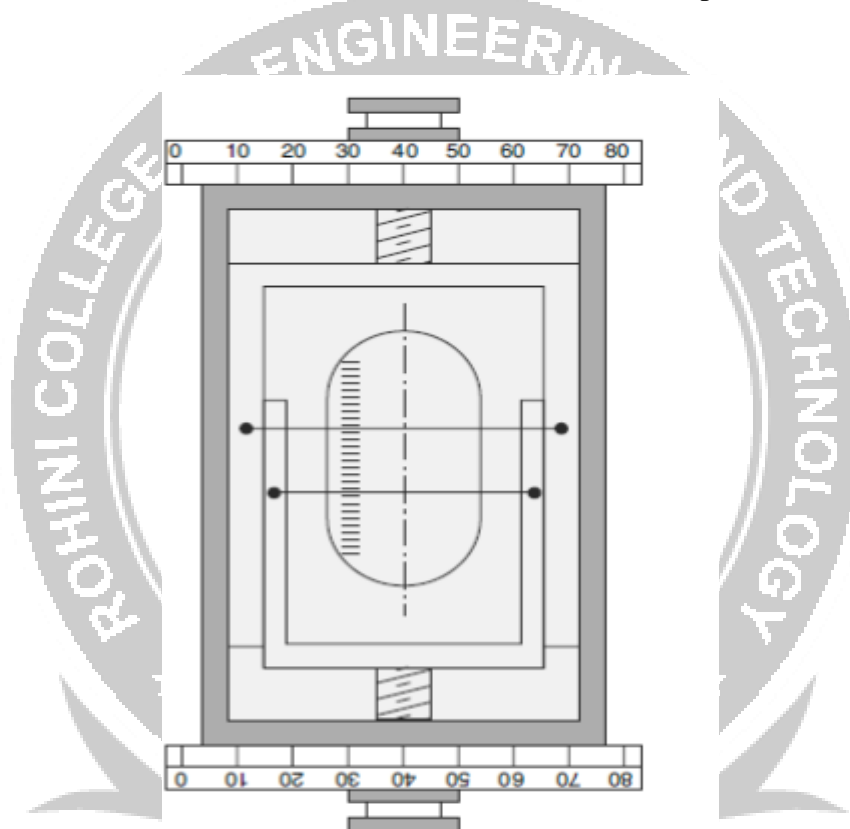

Stadia diaphragm

Essential characteristics:

1. The value of the multiplying constant should be 100.

2. The value of the additive constant should be zero.

3. The telescope should be fitted with an anallactic lens.

4. The magnification of the telescope should be 20 – 80 diameters.

5. Magnifying power of the eyepiece is kept high.

Subtense Theodolite

It is similar to a tacheometer but with a special diaphragm, as shown in Fig. The stadia hairs can be raised or lowered by a micrometre screw. The screw is provided with a milled head and a drum scale. The drum is divided into 100 parts and is read against a fixed index to 0.1 of a division by a vernier. Readings are, therefore, made to 0.001 of the pitch of the screw. A comb scale with teeth of the same pitch as that of the screw is provided to exhibit the number of complete pitches. The distance through which either stadia hair is moved from the middle one is measured by the number of turns made by the micrometre screw, the whole turns being read on the comb scale seen in field of view and the fractional part of a turn on the drum scale.


Subtense diaphragm

STADIA ROD

It is also known as vertical stave. It is a rod (Fig.) 5 - 15 m long, graduated in decimals of a metre. For small distances, say up to 100 m, an ordinary levelling staff may be used but beyond this stadia rod is used, since the graduations of an ordinary levelling staff become indistinct. There is a great variety of stadia rod patterns in common use. But, irrespective of the patterns, an observer should be able to read easily and accurately the staff intercepts through the telescope. The staff can be held either vertical or normal to the line of sight.
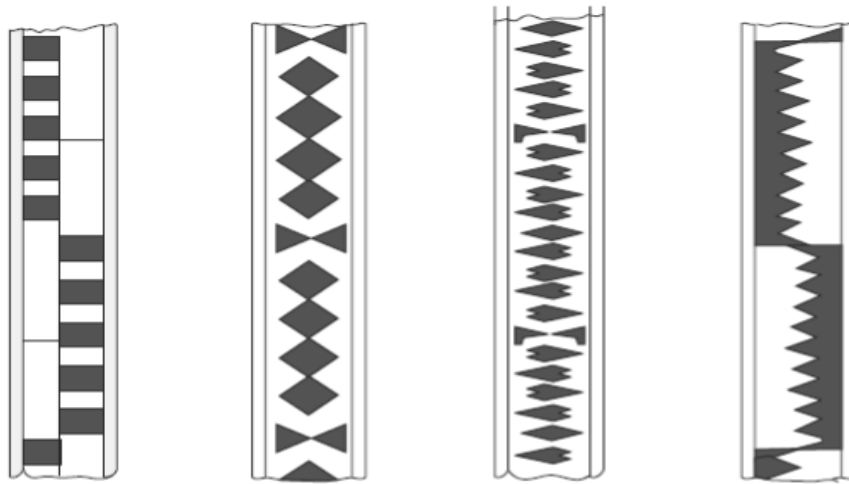
Stadia rods

SUBTENSE BAR

It is also known as horizontal stave. It is used for measuring both the horizontal as well as the vertical distances in places where chaining is impossible because of undulations and rough country. It is used to determine short distances of up to 200 m.
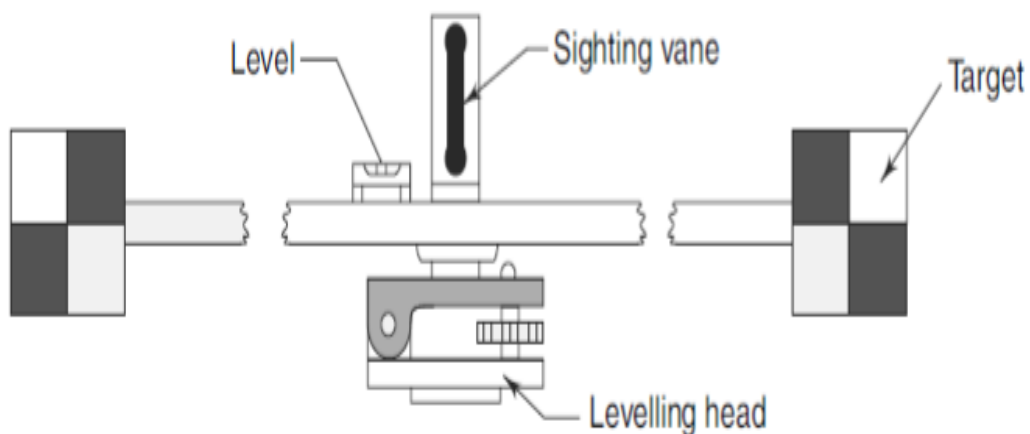
Subtense bar

It is a horizontal metal bar to which two targets are fixed at a known distance of 0.3 – 3.0 m apart. In India, the subtense bars are usually 3.5 m long. It is mounted on a tripod. A small spirit level is provided to level it. The alidade provides a line of sight perpendicular to the bar, which is thereby set normal to the line of measurement. After aligning and levelling the bar, it is clamped by the screw underneath the tripod top. The targets are usually 20 cm in diameter and are painted half red and half white with a 7.5 cm black centre. Sometimes targets are made square as shown in Fig. The targets are set apart at a known distance and the horizontal angle between them is read by a theodolite. The vertical angle to the bar is also read. Then the horizontal and vertical distances are computed.