

EXPERIMENT-2

CHAIN SURVEYING

AIM: To measure and plot of the given area/ plan using chain and tape

INTRODUCTION:

Chain surveying is the method of land surveying in which only linear measurements are taken. No angular measurements are taken. Chain surveying is used for areas of small extent on open ground having simple details. This is the simplest type of surveying and consists of measuring the lengths of the lines marked out in the field. The process of measuring the horizontal distance between two terminal stations is known as chaining. For measuring the lengths of the lines it is important that the chain should follow as far as possible straight line between the terminal points. But if the line is long or the station at its distant end is not visible, it is necessary to place intermediate ranging rods to maintain the direction. The operation of establishing intermediate points on a straight line between the terminal points is known as ranging.

INSTRUMENTS USED FOR CHAINING AND THEIR USES

Chain or tape, arrows, peg, ranging rods, offset rod, plasterer's laths, whites, plumb bob.

Chain:

The following different types of metric chains are used for linear measurements.

- 1) 30 metre chain
- 2) 20 metre chain

The details of the metric chain are shown in the fig. 1. and details of particular 20m & 30 m chains are also shown in the fig. 2 & fig. 3.

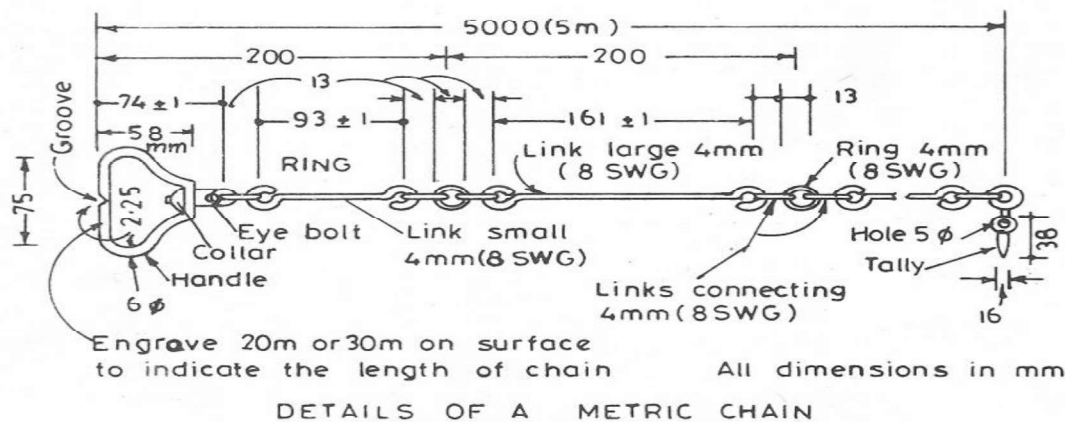


FIG. (1)

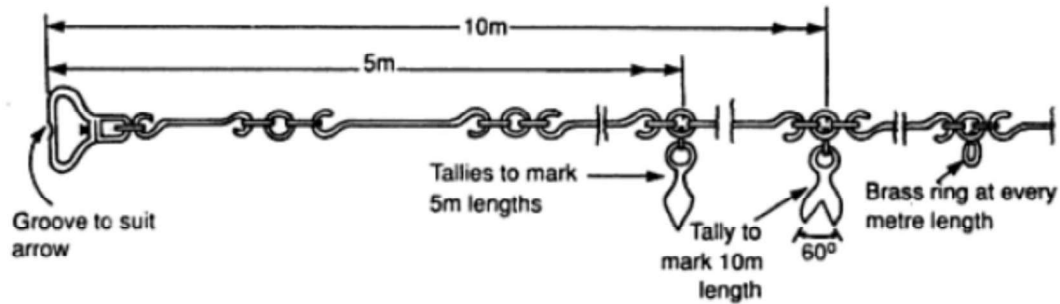


Fig 2 (a) 20-metre chain (100 links)

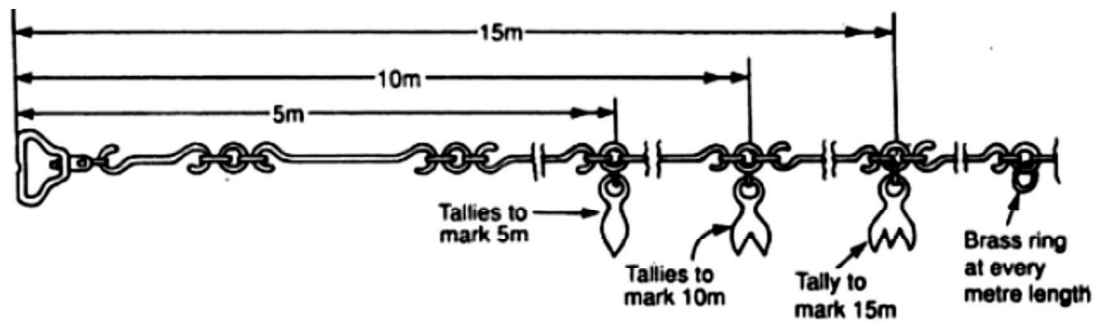
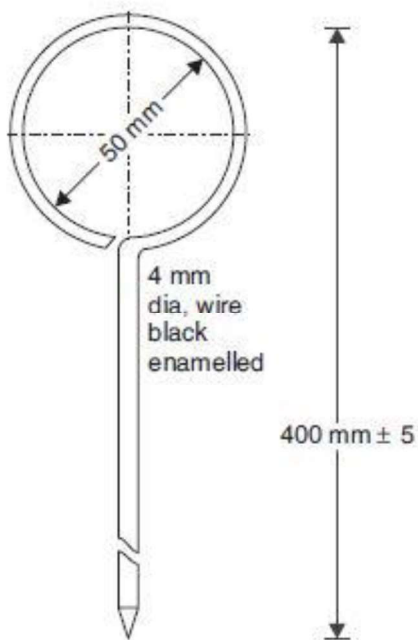


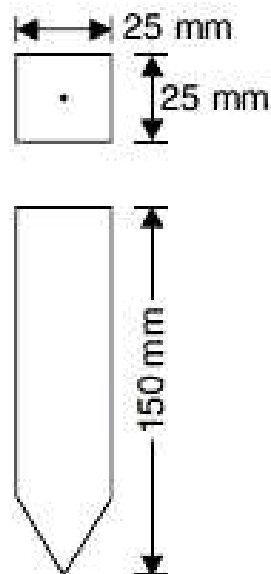
Fig 3 (b) 30-metre chain (150 links)

Arrows:

To mark the end of the chain length, the arrow is inserted in to the ground, but when the ground is hard a scratch may be made with the pointed end.



Pegs Arrow -Fig 4



Wooden Peg -Fig 5

Pegs are made of hard timber and are tapered at one end. They are usually 2.5cm square and 15cm long. It is used to mark the positions of the stations.

Peg details have been shown in the fig. 5.

Ranging rods:

Used for ranging the line.

Fig. 6 shows the details.

Offset rods:

It has two short narrow vertical slots passing through the centre of the section at right angles to one another and set at about the eye level. Refer fig. 7

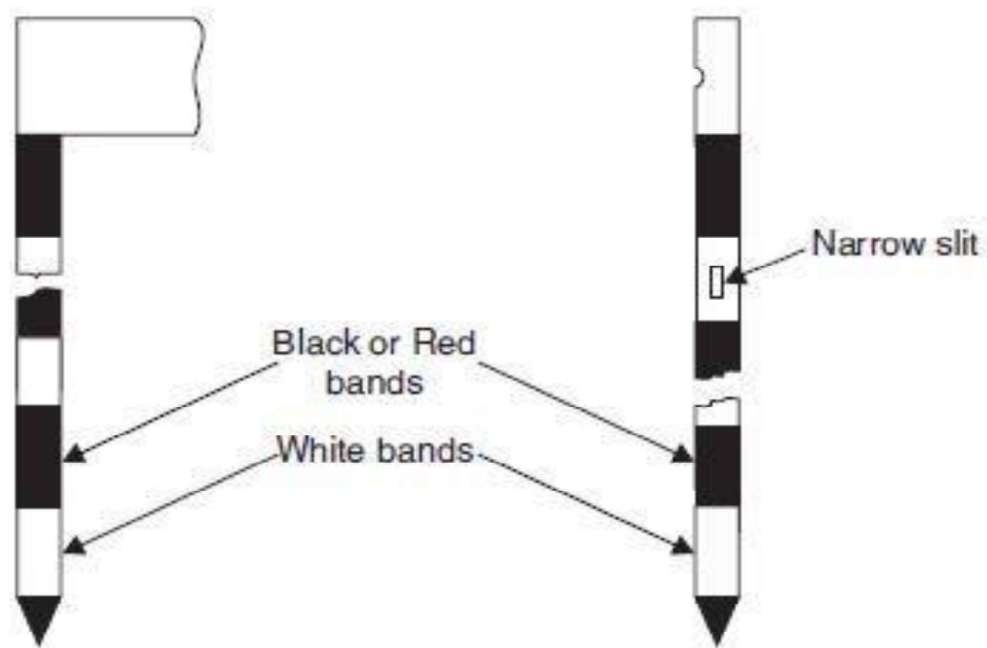
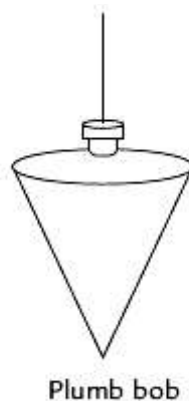


Fig 6 Ranging rod

Fig 7 Offset rod

Plumb bob: Plumb bob is required when measuring distances along slopes in a hilly country in order to transfer the points to the ground as in the method of stepping and also for testing the verticality of the ranging poles.



Plumb bob

Summary

It can be summarised here that, chain surveying requires only simple instruments like chain, tape and few ranging rods, which can be used by a beginner in the field of surveying. This method of surveying is quite simple and has general applications. However chain surveying is not suitable for large areas having many details.

Procedure:

- 1) To begin with, the ranging rods should be erected vertically behind each end of line say at A & B.
- 2) To range a rod in line, surveyor stands about 2m behind the ranging rod at the beginning of the line, while the assistant holds the ranging rod vertically at arm's length at the point where it is desired to establish the intermediate station.
- 3) The ranging rod should be held tightly by the thumb and the forefinger and roughly in line.
- 4) The surveyor then directs the assistant to move the rod to right or left until the three ranging rods appear to be exactly in a straight line.
- 5) Surveyor finally checks by sighting over the lower ends of the rods in order to avoid errors due to non verticality of the rods.
- 6) Using cross staff line chainage BC on the ground will be perpendicular to BA.
- 7) Same procedure is adopted for the line BC, CD and DA. (FIG-1)
- 8) .Sketch is plotted in the drawing sheet with a suitable scale.

EXPERIMENT-3

COMPASS SURVEYING

Aim: To measure and plot of the given area using prismatic compass.

Introduction:

Chain surveying can be used when the area to be surveyed is comparatively small and is fairly flat. However when large areas are involved, methods of chain surveying are not sufficient and convenient. In such cases, it becomes essential to use some sort of instrument which enables angles or direction of the survey lines to be observed. In Engineering practice, following are the instruments used for such measurements.

- i) Surveyor's compass.
- ii) Prismatic compass.

Bearings and Angles:

The direction of survey line can either be established (a) with relation to each other or (b) with relation to any meridian. The first will give the angle between the two lines while the second will give the bearing of the line.

Designation of Bearings:

1. Whole Circle Bearing System (W.C.B.) or Azimuthal System.

In this system, the bearing of a line is measured from magnetic north (or south) in clockwise direction. The value of the bearing thus varies from 0° to 360° . Prismatic compass is graduated in this system.

Fore and Back Bearings:

If the bearing of line AB is measured from A towards B, it is known as forward bearing or fore bearing (FB).

If the bearing of the line AB is measured from B towards A, it is known as backward bearing or back bearing (BB), since it is measured in backward direction.

STUDY OF INSTRUMENT

The Prismatic Compass: (fig. 13)

Prismatic compass is the most convenient and portable form of magnetic compass which can either be used as a hand instrument or can be fitted on a tripod. The main parts of the prismatic compass are:

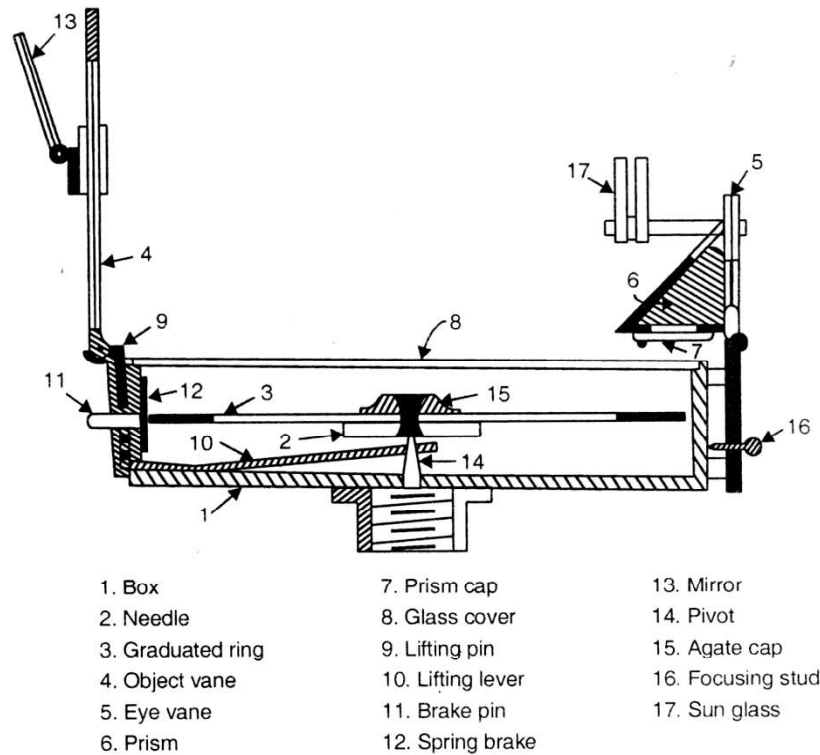


Fig 13

1. Magnetic needle:

Which is attached to the circular ring or compass cord made up of aluminium, a non-magnetic substance. When the needle is on the pivot it will orient itself in the magnetic meridian and therefore the N and S ends of the rings will be in this direction.

2. Sighting vane, eye slit and prism unit:

The line of sight is defined by the sighting vane and the eye slit both attached to compass box. The sighting vane consists of a vertical hair attached to a suitable frame. The eye slit consists of a vertical slit cut into the upper assembly of the prism unit, both, being hinged to the box. When an object is sighted, the sight vanes will rotate the N.S. end of ring through an angle which the line makes with the magnetic meridian.

A triangular prism is fitted below the eye slit, having suitable arrangement for focusing to suit different eye sights. The prism has both horizontal and vertical faces convex, so that a magnified image of the ring graduation is formed.

A metal cover fits over the circular box, when not in use. To sight the objects which are too high or too low directly, a hinged mirror capable of sliding over the sighting vane is provided and the object sighted by reflection. When bright objects are sighted, dark glasses may be interposed into the line of sight.

Temporary Adjustments:

i) Centering:

Centering is the process of keeping the instrument exactly over the station. The centering is invariably done by adjusting or manipulating the legs of the tripod. A plumb bob may be used to judge the centering and if it is not available it may be judged by dropping a pebble from the centre of the bottom of the instrument.

ii) Levelling:

A tripod is provided with ball and socket arrangement with the help of which the top of the box can be leveled.

Focusing the prism:

The prism attachment is slid up or down for focusing till the readings are seen to be sharp and clear.

Procedure:

- 1) Fix up the positions of stations A,B,C and D.by fixing ranging rods in such a way that adjacent stations are intervisible to each other.
- 2) Locate the position A by taking measurements and bearing to atleast three prominent objects like tree, electric pole etc.
- 3) Centre the compass on the station A and level it.
- 4) Take fore bearing of AB and measure the length using chain or tape.
- 5) Shift the compass to B and take back bearing of AB.
- 6) Take fore bearing of BC and measure the length BC.
- 7) Procedure is continued until the last point is reached.
- 8) Knowing the bearing and length, boundary is plotted in a drawing sheet to some suitable scale

Instrument Station No	Sighted to point	Line	Distance in m	Fore Bearing	Back Bearing	Remarks