

Vertical circle:

The vertical circle is graduated and is attached to the horizontal axis of the telescope and thus it rotates with the telescope. The circle is graduated either continuous from 0° to 90°. By means of vertical clamp and tangential screw, the telescope can be set accurately at any position in vertical plane.

1.1.8 Levelling

Levelling may be defined as the art of determining the relative height or elevations of points or objects on the earth's surface.

Instruments used for leveling:

- ✓ Level
- ✓ Levelling Staff

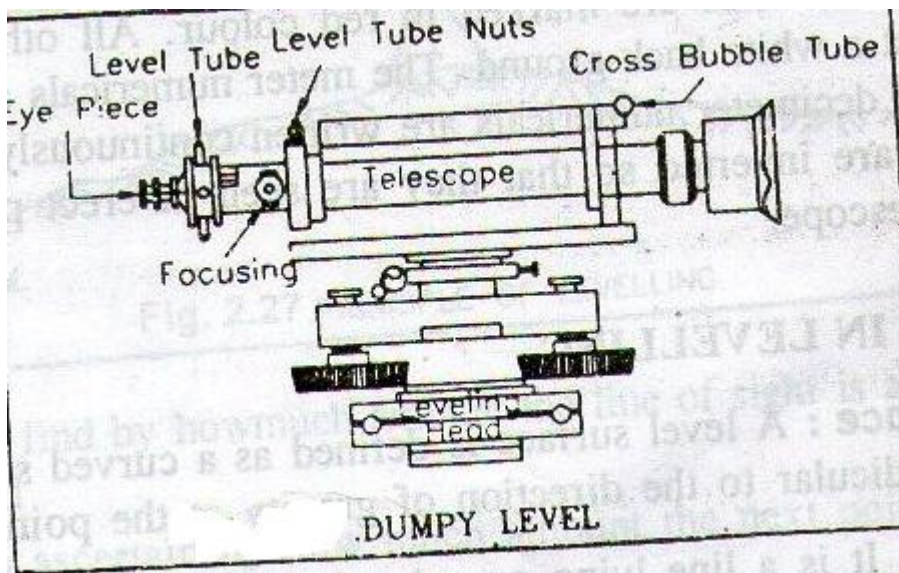
Level: The purpose of a level is to provide a horizontal line of sight.

Parts:

- ✓ A telescope to provide line of sight
- ✓ A level tube to make the line of sight horizontal
- ✓ A leveling head to bring the bubble in its centre of run
- ✓ A tripod to support the instrument

Dumpy level:

The telescope is rigidly fixed with the support and therefore, can neither be rotated about the longitudinal axis, nor can it be removed from its support. A long bubble tube is attached to the top of the telescope. The leveling head generally consists of two parallel plates with either three foot screws or four foot screws. The upper plate is known as tribrach and the lower plate is known as trivet which can be screwed on a tripod



Levelling staff:

A leveling Staff is a straight rectangular rod having graduations, the foot of the staff representing zero reading. There are various type of graduated staff available and only one type is described here.

Folding type of 4m Levelling Staff:

It consists of two wooden pieces each of 2m of length with the joint assembly. The thickness and width of staff are respectively 18mm and 75mm. The folding joint is of the detachable type with locking device at the back.

Hence the staff can be made into two parts for easy handling. When two pieces are locked together, the two pieces form a straight rigid leveling staff of length equal to 4m.

1.1.8.1 Principle of leveling

When the level is set up correctly and leveled the line of collimation will be horizontal telescope is rotated about its vertical axis it will revolve in a horizontal plane known as the plane of collimation and therefore, all staff readings taken with the will be the vertical measurements made downwards from this plane.

To find by how much amount the line of sight is above the bench mark and To ascertain by how much amount the next point is below or above the

line sight. Height of instrument = Elevation of B.M + Back sight

Elevation of pt B = Height of instrument – Foresight

1.1.8.2 reduction level

Height of instrument method

In this method, the height of instrument is calculated for each setting of instrument, and then the elevation or reduced level of the turning point is calculated with respect to the height of instrument

Rise and fall method:

In rise and fall method the difference of level between consecutive point is found comparing staff readings on the two points of same setting of the instrument

1.1.9 Plane table survey

Plane table survey is that type of survey in which the measurement of survey lines of the transverse and their plotting to a suitable scale are done simultaneously on the field. It consists of:

- ✓ Drawing Board mounted on a tripod
- ✓ Alidade

Drawing board:

The drawing board is made of well seasoned wood such as teak and its size varies from 400mm x 300mm to 750mm x 600 mm. the board is mounted on a tripod with ball and socket arrangement which allow the board to be leveled and rotated about the vertical axis.

Alidades:

The open sight alidade

The telescope alidade

The open slight alidade consists of a flat rectangular piece of wood of about, 25mm width, 12.5mm thickness and length varying from 200 to 500 mm. The leveled edge of the alidade is called fiducial edge. Its edge is graduated and serves as a scale. Vertical sight vanes are mounted at both ends. One of the sight vanes is provided with a narrow slit and the other with a central vertical wire. The line of sight is in the same vertical plane as the fiducial edge. The telescope alidade consists of a telescope mounted on a horizontal axis the ends of which are supported on standards. A circular level or two spirit levels are attached to the base of the telescope to level the plane table.

Working operations

- ✓ Fixing
- ✓ Setting
- ✓ Levelling
- ✓ Orientation

Fixing

Fixing the table to the tripod stand

Setting

The table is set up at a convenient height say 1m above ground. The legs of the stand are spread apart and firmly fixed into the ground. The table is then centered. This means that the point plotted on the sheet corresponding to the station occupied should be exactly above the station on the ground. This is done by means of the plumbing fork.

Levelling

The table is then leveled either by ordinarily tilting the board or by ball and socket arrangement.

Orientation:

Orientation is the process of putting the plane table into some fixed direction so that line representing a certain direction on the drawing sheet is parallel to that direction on the ground.

Two methods adopted:

Orientation by magnetic needle

Orientation by back sighting

1.1.9.1 Methods of plane table survey

- ✓ Radiation
- ✓ Intersection
- ✓ Traversing
- ✓ Resection

1.1.10 Stones

Stones, bricks, cement, lime and timber are the traditional materials used for civil engineering constructions for several centuries. In this chapter types, properties, tests and uses of these materials is explained.

Stone is a 'naturally available building material' which has been used from the early age of civilization. It is available in the form of rocks, which is cut to required size and shape and used as building block. It has been used to construct small residential buildings to large palaces and temples all over the world. Red Fort, Taj Mahal, Vidhan Sabha at Bangalore and several palaces of medieval age all over India are the famous stone buildings.