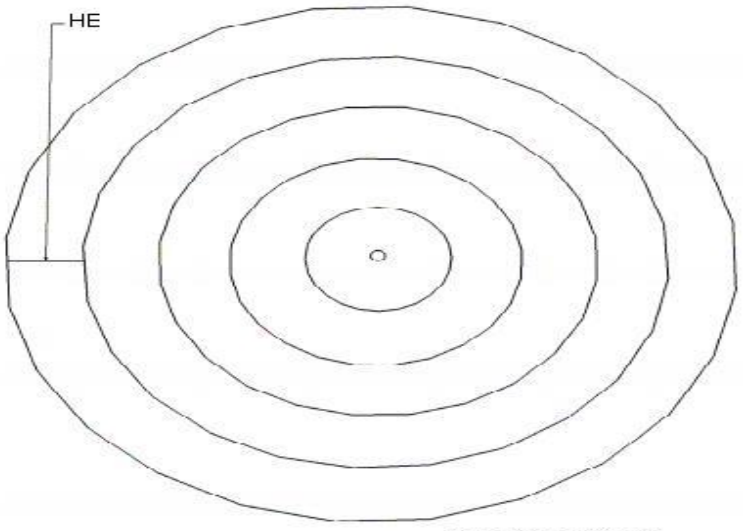
Contour line: A Contour line is an imaginary outline of the terrain obtained by joining its points of equal elevation. In our example of the cone, each circle is a contour line joining points of same level.

Contour interval : Contour interval is the difference between the levels of consecutive contour lines on a map. The contour interval is a constant in a given map. In our example, the contour interval is 1m.

Horizontal Equivalent : Horizontal equivalent is the horizontal distance between two consecutive contour lines measured to the scale of the map.



Horizontal equivalent
FIGURE-3

Gradient

Gradient represents the ascending or descending slope of the terrain between two consecutive contour lines. The slope or gradient is usually stated in the format 1 in S, where 1 represents the vertical component of the slope and S its corresponding horizontal component measured in the same unit.

The gradient between two consecutive contour lines can also be expressed in terms of Tan Q(theta) as follows:
Tan Q (theta) = CI / HE … both measured in the same unit.

What is difference between contour interval and horizontal equivalent:

There are three main differences between contour interval and horizontal equivalent as follows:

S.No	Contour Interval	Horizontal Equivalent
1	It is based on vertical levels	Represents horizontal distance
2	No measurement or scaling is required since the contour levels are indicated on the contour lines	The distance must be measured on the map and converted to actual distance by multiplying with the scale of the map
3	In a given map the	The horizontal equivalent

	contour interval is a constant	varies with slope. Closer distance indicates steep slope and wider distance gentle slope

Factor Affectiong Selection of Contour Interval :

The survey leader has to decide an appropriate contour interval for his project before start of survey work. The following factors govern the selection of contour interval for a project:

S.No	Factor	Select High CI like 1m, 2m, 5m or more	Select Low CI like 0.5m, 0.25m, 0.1m or less
1	Nature of ground	If the ground has large variation in levels, for instance, hills and ponds	If the terrain is fairly level
2	Scale of the map	For small scale maps covering a wide area of varying terrain	For large scale maps showing details of a small area
3	Extent of survey	For rough topographical map meant for initial assessment only	For preparation of detailed map for execution of work
4	Time and resources available	If less time and resources are available	If more time and resources are available

Characteristics of contour :

Contours show distinct characteristic features of the terrain as follows:

i) All points on a contour line are of the same elevation.

ii) No two contour lines can meet or cross each other except in the rare case of an overhanging vertical cliff or wall
iii) Closely spaced contour lines indicate steep slope
iv) Widely spaced contour lines indicate gentle slope

v) Equally spaced contour lines indicate uniform slope

vi) Closed contour lines with higher elevation towards the centre indicate hills

vii) Closed contour lines with reducing levels towards the centre indicate pond or other depression.

viii) Contour lines of ridge show higher elevation within the loop of the contours. Contour lines cross ridge at right angles.

ix) Contour lines of valley show reducing elevation within the loop of the contours. Contour lines cross valley at right angles.

x) All contour lines must close either within the map boundary or outside.

Uses of contour:

Contour maps are very useful since they provide valuable information about the terrain. Some of the uses are as follows:

i) The nature of the ground and its slope can be estimated

ii) Earth work can be estimated for civil engineering projects like road works, railway, canals, dams etc.

iii) It is possible to identify suitable site for any project from the contour map of the region.

iv) Inter-visibility of points can be ascertained using contour maps. This is most useful for locating communication towers.

v) Military uses contour maps for strategic planning.

Method of contouring:

Two methods of contouring :

1. Direct method
2. Indirect method

Direct method : In direct method, the points of equal elevation on the terrain are physically located and then

plotted on map. This is a very tedious process and requires more time and resources than the indirect method.

Indirect method :

1. Cross section method
2. Square method
3. tacheometer method

Cross section method :

Steps:

i) The centre line of the strip of land is first marked

ii) Lines perpendicular to the longitudinal strip are marked dividing the strip into equal sections

iii) The perpendicular lines are divided into equally spaced divisions, thus forming rectangular grids.

iv) Levels are taken at the intersection of the grid lines to obtain the cross-section profile of the strip of land.

v) Contour map is plotted in the office by interpolating points of equal elevation based on the levels taken at site.

Square method :

Steps:

i) Mark square grids on the land to be surveyed. The grid size would depend on the extent of survey.

Generally a 1m x 1m grid is selected for small works and a larger grid size for large works

ii) Levels are taken at all the corners of the square and the intersection of the diagonal.

iii) Levels taken on the intersection of diagonals is used for verification of the interpolation.

vi) Contour map is plotted in the office by interpolating points of equal elevation based on the levels taken on the corners of the square

Tacheometer method :

Steps:
i) Set up the tacheometer at the top of the steep hill. Tacheometer is a theodolite fitted with stadia diaphragm. The stadia diaphragm has three horizontal parallel hairs instead of one as found in a conventional cross hair diaphragm.
ii) With the help of a tacheometer it is possible to determine the horizontal distance of the point from the telescope as well its vertical level.

iii) The steep hill is surveyed at three levels – the base of the hill, the mid-level of the hill and the top level of the hill.

iv) Using the tacheometer reading are taken all around the hill at equal angular intervals on all these three levels.

v) The radial plot thus obtained is worked in the office to interpolate points of equal elevation for contour mapping.

Compare between direct and indirect contouring :

The Comparison of Direct and Indirect Contouring Methods is shown below in tabular form

S No	Direct Method	Indirect Method
1	Very tedious	Not tedious
2	Accurate	Less accurate
3	Slow	Fast
4	Requires more resources	Requires less resources
5	Suitable for contouring of small area.	Suitable for large areas
6	Points are physically located on the ground	Points are interpolated in the office

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