Chapter 6: Scales

The proportion by which we either reduce or increase the actual size of the object on a drawing is known as scale.
It is not possible always to make drawings of an object to its actual size as the extent of drawing paper is limited and also sometimes the objects are too small to make it clearly understandable by drawing its actual size in drawing paper. Scale is the technique by which one can represent an object comfortably as well as precisely within the extent of drawing paper.
In other words, a scale is a measuring stick, graduated with different divisions to represent the corresponding actual distance according to some proportion. Numerically scales indicate the relation between the Dimensions on drawing and actual dimensions of the objects.

Uses of scale
- To prepare reduced or enlarged size drawings.
- To set off dimensions.
- To measure distances directly.

Sizes of Scales
- Full size scale
- Reducing scale
- Enlarging scale

Full Size Scale
The scale in which the actual measurements of the object are drawn to the same size on the drawing is known as full size scale. It is represented as 1:1 scale. If possible, drawing should be done in full scale.

Reducing Scale
The scale in which the actual measurements of the object are reduced to some proportion is known as reducing scale. The standard formats of reducing proportions are:
1:2 - drawing made to one-half of the actual size
1:5 - drawing made to one-fifth of the actual size
1:10 - drawing made to one-tenth of the actual size
1:50 - drawing made to one-fiftieth of the actual size
1:100 - drawing made to one-hundredth of the actual size

Enlarging Scale
The scale in which the actual measurements of the object are increased to some proportion is known as reducing scale. The standard formats of enlarging proportions are:
2:1 - drawing made to twice the actual size
5:1 - drawing made to five times the actual size
10: - drawing made to ten times the actual size

The Representative Fraction (R.F.) or Scale Factor (S.F.)
The ratio of the distance on drawing paper of an object to the corresponding actual distance of the object is known as the representative fraction (R.F.) or the scale factor (S.F.). It is to be remembered that for finding RF thedistances used for calculation must be in same unit. And being a ratio of same units, R.F. itself has no unit.
Mathematically,

R.F= Measurement of object on Drawing sheet/ Actual measurement of the object

Construction of Diagonal Scales
Following are the steps for constructing a plain scale
- Find out the R.F., if not given directly.
- Find out the length of scale

[Note: If data is not available take the length of scale about 15 cm or 6 inches]

- Draw a straight line, preferably horizontal, of required length as found in previous step.
- Divide the line into a number of divisions relating to the length of object and maximum length to be measured such that one segment represents one major unit.
- Place mark 0 at the end of 1st main division and mark the other divisions sequentially toward right as 1,2,3….. etc.
- Divide the 1st main division into a number of divisions such that each of these sub-divisions represents one 1st sub-unit. For instance if the scale need to measure in yards, feet and inches, number of horizontal sub-divisions will be 3. On the other hand if the scale is to measure in decimeter, centimeters and millimeters or in meters, 1/10th of meter and 1/100th of meter number of horizontal sub-divisions will be 10.
- Mark the sub-unit sequentially toward left as 1, 2, 3…… etc. or 0.1, 0.2, 0.3……. etc. If space is limited they can be marked after every 2 division like 0, 2,4,….. etc.
- Draw a perpendicular of suitable length at the left end and complete the rectangle considering the two mutually perpendiculars lines as length of two sides.
- Divide the vertical line at left end into a number of divisions such that each of one sub-division represents one 2nd sub-unit. For instance if the scale need to measure in yards, feet and inches, number of vertical sub-divisions will be 12. On the other hand if the scale is to measure in decimeter, centimeters and millimeters or in meters, 1/10th of meter and 1/100th of meter number of vertical subdivisions will be 10.
- At each vertical sub-division point draw a line parallel to the baseline.
- Draw a diagonal line by joining left-top corner point and the horizontal sub-division point immediately before the left-bottom corner. At every horizontal sub-division point draw a parallel line to this diagonal line.
- Mention the R.F. of the scale below the figure.
- Mention the name of main unit and sub-units either at below or at the respective ends of the scale.