Introduction to Engineering Drawing

Part 5- Drawing Scales

At the end of this presentation you will be able to

1. List various standard metric reduction and enlargement scales used on Engineering Drawings.
2. Identify given measurements using specific scales.
3. Convert full size measurements to specific scales.

Drawing Scales

It is obvious that to draw a building full size on paper would be virtually impossible as would trying to draw something that was microscopic. To overcome this problem, drawings are often produced to a standardized Scale. This is a ratio or proper fraction if you like where the full-size measurement is reduced or enlarged proportionally.

There are two (2) types of scales

1. **Reduction** where the full-size measurement is made smaller

Standard Metric Reduction Scales are 1:2, 1:2.5, 1:5, 1:10. Multiples of these are also common: 1:20, 1:250, 1:50, 1:500, 1:100, 1:100 and so on

2. **Enlargement** where the full-size measurement is made bigger

Standard Metric Enlargement scales are 2:1, 5:1, 10:1. Again, multiples of the stated figures are acceptable as standard scales.

A full-size drawing is done at a scale of 1:1 or 1/1 or 1 divided by 1 or actual size.

Using a Reduction Scale, a drawing done to scale 1:2 or ½ or 1 divided by 2 is said to be "half scale."

Enlargement scales are generally used on items where the measurements are too small to be see or drawn accurately.

Introduction to Engineering Drawing
Part 5- Drawing Scales

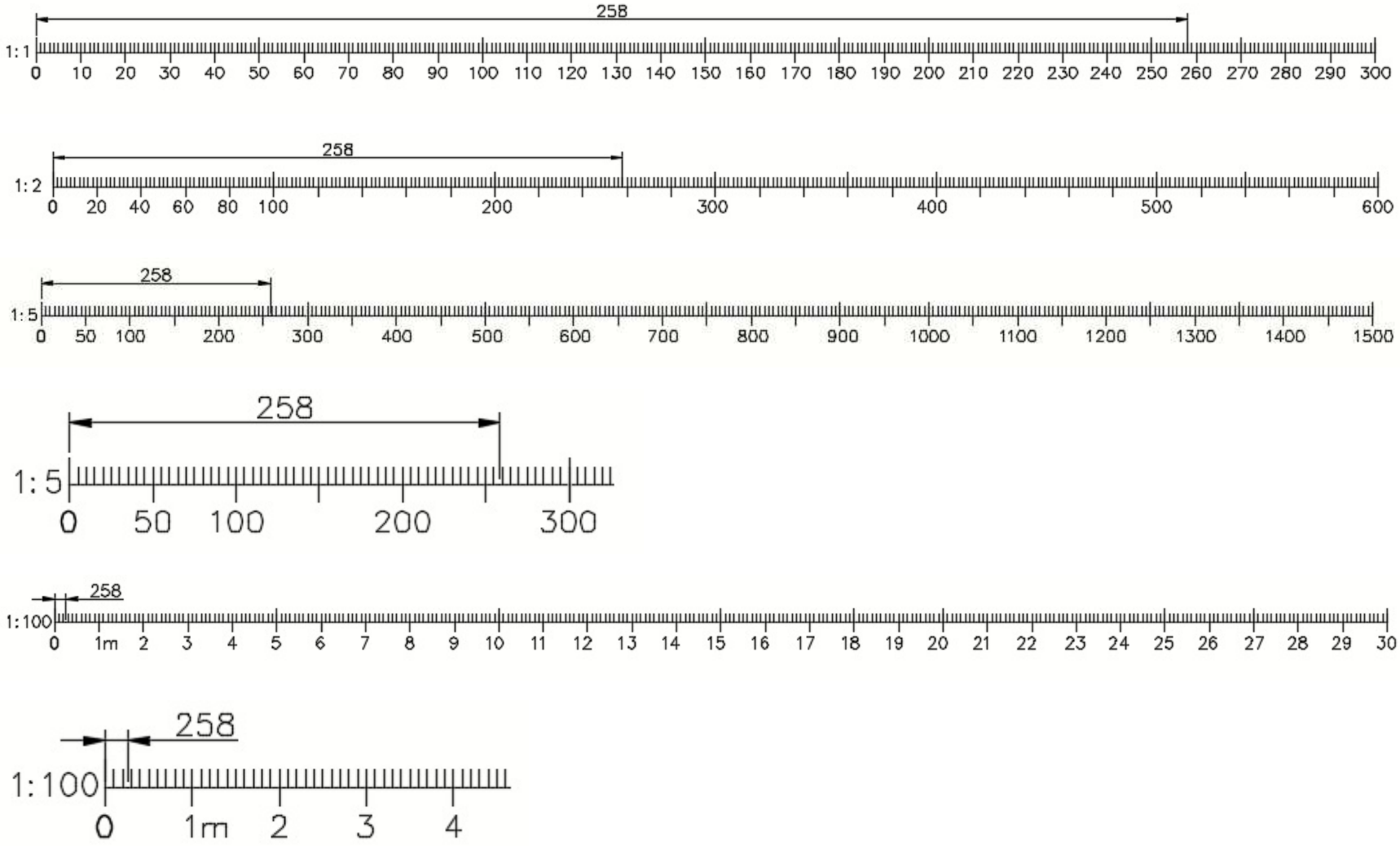
Using a Scale Rule

Scale rules are common. Usually they are tapered face rules with four or eight different scales or a three-sided triangular shape with six different scales indicated.

On a metric scale rule, each division is usually 1mm, but to scale, the 1mm increment is actually representing the second number in the scale. At 1:50, each millimeter is representing 50mm. So, where you see the 1 on the rule above, at a scale of 1:50 that would be 1000. Many scale rules will have the letter "m" next to the 1 to indicate 1 metre or 1000mm.

Introduction to Engineering Drawing
Part 5- Drawing Scales

Examples of measurements to scale.



Introduction to Engineering Drawing
Part 5 Drawing Scales

Conversion to Scaled Measurement

If you do not have a scale rule, it is easy to convert a full-size (1:1) measurement into a scale measurement which you can then measure onto your drawing using a conventional graduated rule. Dimensions are in millimetres in this case.

Reduction scale. ***Divide*** the full-size measurement by the scale factor

- 258 to a scale of 1:2 = 258 / 2 = 129mm
- 258 to a scale of 1:5 = 258 / 5 = 51.6mm
- 258 to a scale of 1:100 = 258 / 100 = 2.58mm

Enlargement Scale. ***Multiply*** the full-size measurement by the scale factor. *This is only an example for consistency. Enlargement scales are used on small measurements.*

- 258 to a scale of 2:1 = 2 x 258 = 516mm
- 258 to a scale of 5:1 = 5 x 258 = 1290mm
- 258 to a scale of 10:1= 10 x 258 = 2580mm

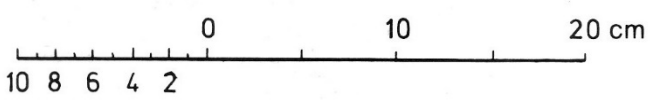
Indication of Scale on a drawing.

- Drawing scale should be indicated in the Title Block if the scale is the same throughout the drawing.
- The use of multiple scales on the same drawing should be kept to a minimum
- If more than one scale is used, indication of scale should be noted close to the part drawn to a different scale. Title block noted "*Scales as shown"*
- Where there is no scale used such as in a pictorial drawing, it should be indicated in the Tile Block with the words:"*Scale: None*" or *"N.T.S."* or *"Not to Scale"*
- Where a non- standard scale has been used, "*N.T.S*." or *"Not to Scale"* should be indicated in the Title Block or close to the associated view.
- Where multiple scales are used, for example where the cross members of a truss are drawn to a larger scale than the centre lines or skeleton frame, this should be indicated again close to the view containing those scales.

  Scales: Skeleton Frame 1:25

  Member Details 1:5

A scale can also be shown as an accurate diagram such as commonly seen on maps, but this is not so common in the Engineering industry.



General

- It is not advised to scale measurements from a drawing.
- If you measure inaccurately, you error will be multiplied by the scale factor.
- Most drawings have an advisory statement such as *"Do Not Scale"* or *"Do Not Scale From Drawing"* in the Title Block or elsewhere within the drawing frame.
- During reproduction of a drawing, heat is applied to the paper and therefore the copy may undergo some distortion. Like metals, paper expands and contracts.
- Ambient temperature, heat or cold and humidity in the environment can also become a factor.

Remember, at a scale of 1:100, 1mm represents 100mm, so one quarter of a millimeter, a small error, becomes an error of 25mm as a full-size measurement.