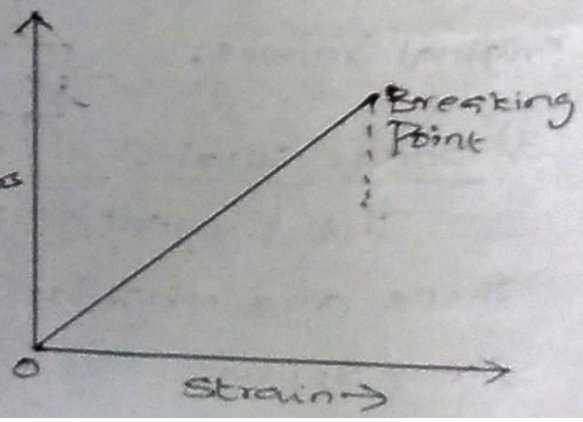
Stress- Strain diagram

A graph between stress and Strain for a ductile material.

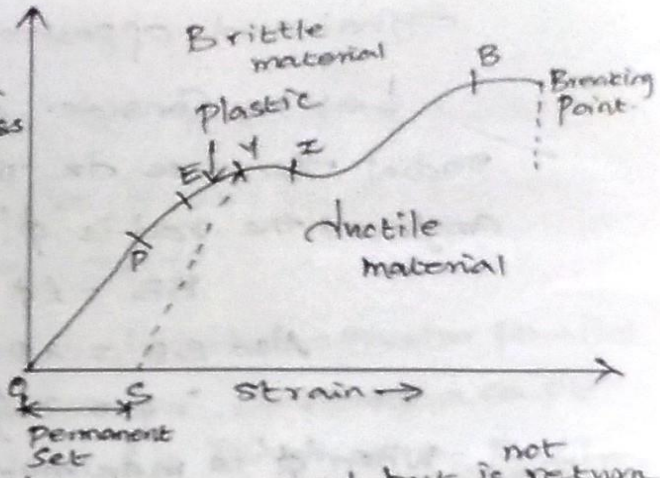
(i) OP is a Straight line in this region Hooke's law is Obeyed.



(ii) P is the limit of proportionality (Stress α Strain)

(iii) E is the elastic limit, Up to E, the load is removed the material returns to it's original length.

(iv) Y is the Yield Point. In between E to Y the material becomes plastic, the load is removed but is not return back it's original Size. it's called Permanent Set (OS).



(v) Z is the Point after which none of the extension is recoverable.

(vi) B is the Breaking Point beyond that at any point it will be break it.

(vii) A large permanent deformation, without fracture (or) rupture is called ductile. ex:- Aluminium.

(viii) The opposite Properties of ductile is called Brittleness. ex:- glass

(ix) The ability to get deformation continuously and permanently, without any rupture. is called plasticity. ex:- pitch.

Factors affecting Elasticity

a) Effect of stress : When a material is subjected to large number of cycles of stresses it loses it's elastic property even within the elastic limit.

b) Effect of Annealing : This process, when the material is heated to a very high temperature and then it's slowly cooled. In this process the material to adopted to increase the softness and ductility.

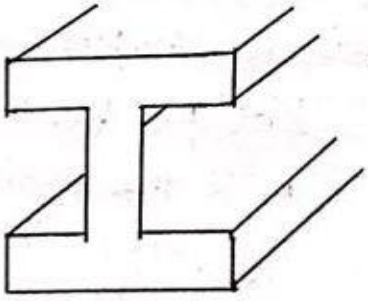
c) Effect of temperature : The elastic property of the materials changes with the temperature. Ex : Carbon filament

d) Effect of impurities : The addition of impurities produces Variation in the elastic property of the materials.
Ex : Potassium is added to gold, the elastic property is increased.

e) Effect of nature of Crystals : The elasticity is depends on the types of the crystal. Whether it's a single Crystal (or) Poly crystals.

I-Shaped girder

The girder is the one in which the upper and lower sections are broadened and the middle section is tapered so that it can withstand heavy loads over it. Since the girder looks like letter 'I' is called as I shaped girder.



Applications of I-Shaped Girders

1) It is used as construction of bridges over the rivers.
2) It is very much useful to the production of iron rails which are employed in railway tracks.
3) More stable, strong and high durability, so it's used in supporting beams for the ceilings in the construction of buildings.

Poission's Ratio (σ)

The ratio of the lateral strain to the longitudinal strain within the elastic limit.

$$\text{Poission's ratio } (\sigma) = \frac{\text{Lateral Strain}}{\text{Longitudinal strain}}$$

$$\sigma = P/\alpha = \text{a constant}$$