ELASTIC CONSTANTS

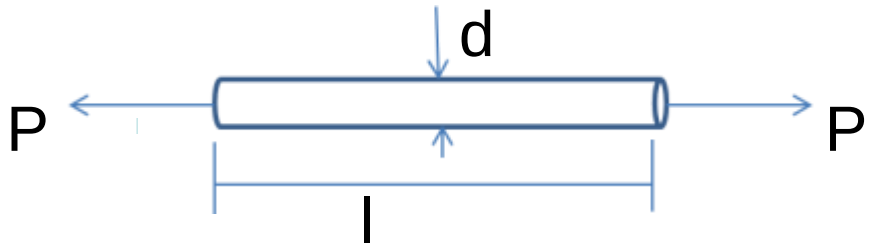
Elastic constants

Modulus Of elasticity:- When a material is under direct stress then the ratio between stress to the strain is called modulus of elasticity or Young's modulus. It is denoted by 'E' and the unit is N/sq.m.

Modulus Of rigidity :- During shear if the material is subjected to a shear stress producing an angular deformation i.e shear strain then the ratio between shear stress to the shear strain is called modulus of rigidity. It is denoted by C or G or N and its unit is N/sq.m.

Elastic constants

Linear strain:-

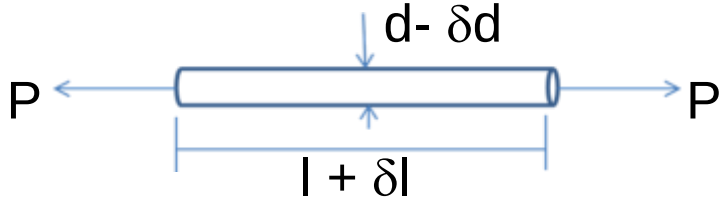


When external force acts on a body it undergoes deformation. The deformation of the body per unit length in the direction of the force is known as primary or linear strain .

Linear strain = $\delta l/l$.

Elastic constants

Lateral strain :- When a circular bar is subjected to a tensile or compressive force the length of the bar is extended or contracted accordingly. Subsequently the diameter of the bar is also decreased or increased .



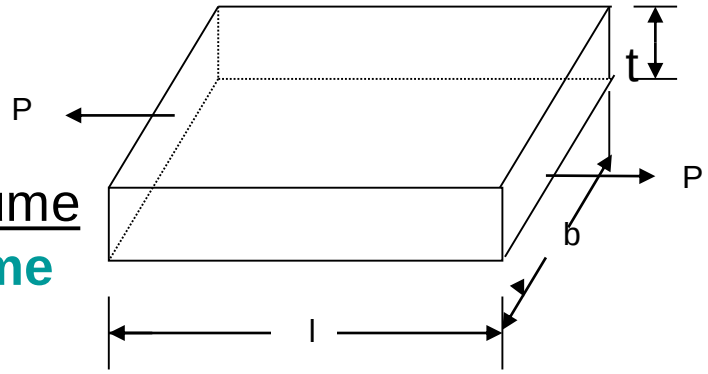
Thus it obvious that every direct stress is always accompanied by a strain in its own direction, and an opposite kind of strain in every direction at right angles to it. This strain is called lateral strain.

Poissons ratio : - If a body is stressed within elastic limit the lateral strain bears a constant ratio to the linear strain. It is called poissons ratio. Denoted by 1/ m or μ.

VOLUMETRIC STRAIN OF A RECTANGULAR SECTION , SUBJECTED TO AN AXIAL LOAD

Volumetric Strain ev = Change in volume / Original volume

$= \delta V/V$



Bulk modulus :- The ratio of the direct stress intensity to the volumetric strain within the elastic limit is known as bulk modulus. It is denoted by 'K'.

$$K = \frac{\sigma}{\delta V/V}$$

Its unit is N/sq.m.

RELATION BETWEEN MODULUS OF ELASTICITY & MODULUS OF RIGIDITY

$$C = \frac{mE}{2(m+1)}$$

Where,

C = Modulus Rigidity

$\frac{1}{m}$ = Poisson's Ratio

E = Modulus of Elasticity

RELATION BETWEEN BULK MODULUS & YOUNG'S MODULUS

$$K = \frac{mE}{3(m-2)}$$

- Where, K = Bulk Modulus

  $\frac{1}{m}$ = Poisson's Ratio

  E = Young's Modulus