Stress.

When a force is applied on a body there will be relative displacement of the particles and due to property of elasticity an internal restoring force is developed which tends to restore the body to its original state.

The internal restoring force acting per unit area of cross section of the deformed body is called stress.

At equilibrium, restoring force is equal in magnitude to external force, stress can therefore also be defined as external force per unit area on a body that tends to cause it to deform.

If external force F is applied on the area A of a body then,

$$\text{Stress} = \frac{\text{Force}}{\text{Area}} = \frac{F}{A}$$

Unit: N/m^2 (S.I.), $dyne/cm^2$ (C.G.S.)

Dimension: $[ML^{-1}T^{-2}]$

Stress developed in a body depends upon how the external forces are applied over it.

On this basis there are two types of stresses: Normal and Shear or tangential stress

(1) Normal stress: Here the force is applied normal to the surface.

It is again of two types: Longitudinal and Bulk or volume stress

(i) Longitudinal stress

(a) It occurs only in solids and comes in picture when one of the three dimensions viz. length, breadth, height is much greater than other two.

(b) Deforming force is applied parallel to the length and causes increase in length.

(c) Area taken for calculation of stress is area of cross section.

(d) Longitudinal stress produced due to increase in length of a body under a deforming force is called tensile stress.

(e) Longitudinal stress produced due to decrease in length of a body under a deforming force is called compressional stress.

(ii) Bulk or Volume stress

(a) It occurs in solids, liquids or gases.

(b) In case of fluids only bulk stress can be found.

(c) It produces change in volume and density, shape remaining same.

(d) Deforming force is applied normal to surface at all points.

(e) Area for calculation of stress is the complete surface area perpendicular to the applied forces.

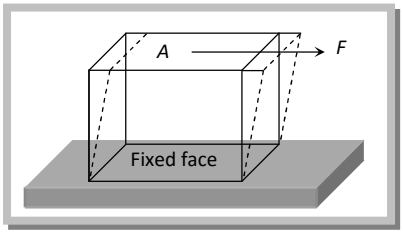
(f) It is equal to change in pressure because change in pressure is responsible for change in volume.

(2) Shear or tangential stress: It comes in picture when successive layers of solid move on each other i.e. when there is a relative displacement between various layers of solid.

(i) Here deforming force is applied tangential to one of the faces.

(ii) Area for calculation is the area of the face on which force is applied.

(iii) It produces change in shape, volume remaining the same.



Difference between Pressure and Stress	
Pressure	Stress
Pressure is always normal to the area.	Stress can be normal or tangential.
Always compressive in nature.	May be compressive or tensile in nature.