**Strain Energy due to Direct Load**



Let us assume a member with uniform cross section A and of length L, be subjected to external axial load W as shown in the figure.

As the load is gradually applied the load is increased from 0 to W, due to which the member is gradually extended by Δ.

Work done due to load is given by the product of average load and the displacement Δ.

    Work done = 1/2 \* W \* Δ

Let the tension developed in the member be T, @ Equilibrium W = T

   Tensile stress (ƒ) = T/A

   Tensile strain (e) = ƒ/E = T/AE

   Δ = eL = T/AE \*L]

Strain Energy Stored = Work Done = 1/2\*W\*Δ = 1/2\*T\*TL/AE = **T2L/2AE**