# Strain Energy Encyclopedia Article

## Strain Energy

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# Strain Energy

The strain **energy** is the **potential energy** stored in a body when that body is *elastically* deformed. It is equal to the amount of work required to produce this deformation. A body deforms elastically until the applied stress reaches some maximum value, beyond which the body exhibits permanent d eformation. The body need not break at this maximum stress; it will simply not return to its original dimensions if stressed any more. As long as the elastic limit is not exceeded, the strain is directly proportional to the stress. Familiar examples of bodies that behave elastically include rubber bands, diving boards, and springs.

If a uniform rod is stretched slowly and elastically, energy will be stored in the rod as elastic energy. The elastic energy stored per unit **volume**, or **strain energy density**, is equal to one-half the stress raised to the second power divided, in general, by the Young's modulus. The Young's modulus is defined as the longitudinal stress divided by the longitudinal strain in the elastic region of deformation; strain is defined as the relative change in dimensions or shape in a body as the result of an applied stress, and is a dimensionless quantity; and stress is the magnitude of the applied force per unit area, usually measured in units of pounds per sq uare inch or pascals.