

Main Difference – Tensile vs Compressive Stress

Tensile and compressive stresses are two types of stresses a material can undergo. The type of the stress is determined by the force being applied on the material. If it is a tensile (stretching) force, the material experiences a tensile stress. If it is a compressive (squeezing) force, the material experiences a compressive stress. The **main difference** between tensile and compressive stress is that **tensile stress results in elongation whereas compressive stress results in shortening**. Some materials are strong under tensile stresses but weak under compressive stresses. However, materials such as concrete are weak under tensile stresses but strong under compressive stresses. So, these two quantities are very important when choosing suitable materials for applications. The importance of the quantity depends on the application. Some applications require materials that are strong under tensile stresses. But some applications require materials that are strong under compressive stresses, especially in structural engineering.

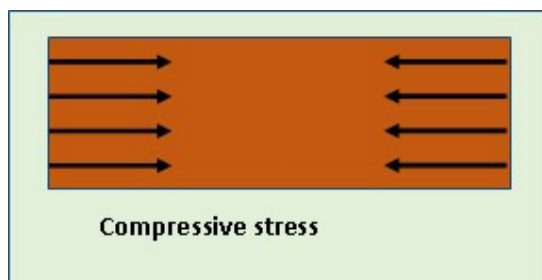
What is Tensile Stress

Tensile stress is a quantity associated with stretching or tensile forces. Usually, tensile stress is defined as the force per unit area and denoted by the symbol σ . The tensile stress (σ) that develops when an external stretching force (F) is applied on an object is given by $\sigma = F/A$ where A is the cross sectional area of the object. Therefore, the SI unit of measuring tensile stress is Nm^{-2} or Pa. Higher the load or tensile force, higher the tensile stress. The tensile stress corresponding to the [force](#) applied on an object is inversely proportional to the cross sectional area of the object. An object is elongated when a stretching force is applied on the object.



What is Compressive Stress

Compressive stress is the opposite of tensile stress. An object experiences a compressive stress when a squeezing force is applied on the object. So, an object subjected to a compressive stress is shortened. Compressive stress is also defined as the force per unit area and denoted by the symbol σ . The compressive stress (σ) that develops when an external compressive or squeezing force (F) is applied on an object is given by $\sigma = F/A$. Higher the compressive force, higher the compressive stress.



Difference Between Tensile and Compressive Stress

Physical result:

Tensile stress: Tensile stress results in elongation.

Compressive stress: Compressive stress results in shortening.

Caused by:

Tensile stress: Tensile stress is caused by stretching forces.

Compressive stress: Compressive stress is caused by compressive forces.

Objects under stresses:

Tensile stress: Cable of a crane, threads, ropes, nails, etc. undergo tensile stress.

Compressive stress: Concrete pillars undergo compressive stress.

Strong materials

Tensile stress: Steel is strong under tensile stress.

Compressive stress: Steel and concrete are strong under compressive stress.

TENSILE STRESS VERSUS COMPRESSIVE STRESS

Results in elongation	Results in shortening
Caused by stretching forces	Caused by compressive forces
Cable of a crane, threads, ropes, nails, etc. undergo tensile stress	Concrete pillars undergo compressive stress
Steel is strong under tensile stress.	Steel and concrete are strong under compressive stress.
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Tensile Test

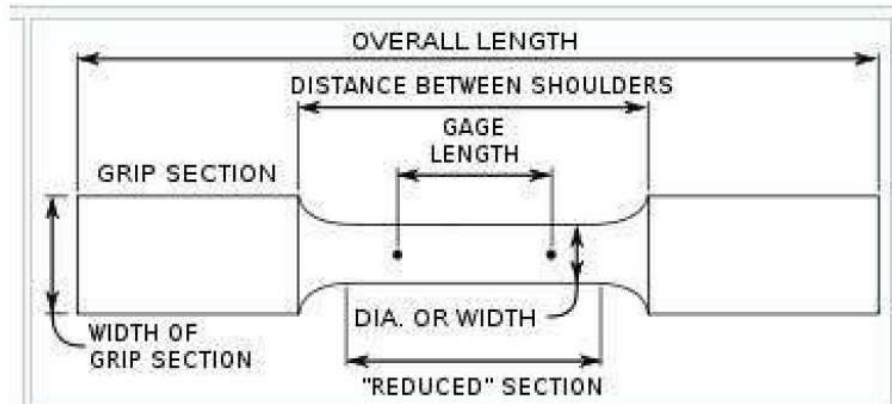


- A tensile test of a material is performed on ductile materials to determine tensile properties such as ,
 - Yield point
 - Maximum tensile strength
 - Breaking strength
 - Percentage elongation
 - Percentage reduction in area
- The tensile test is usually carried out with the help of a “universal Testing Machine”(UTM)



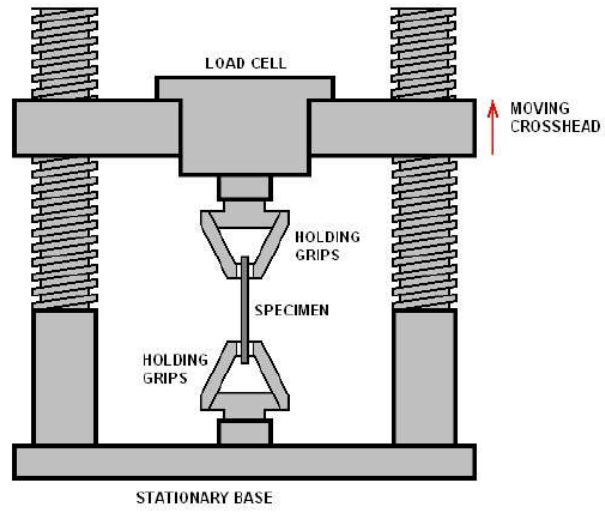


Tensile Test- Specimen





Tensile Test-UTM



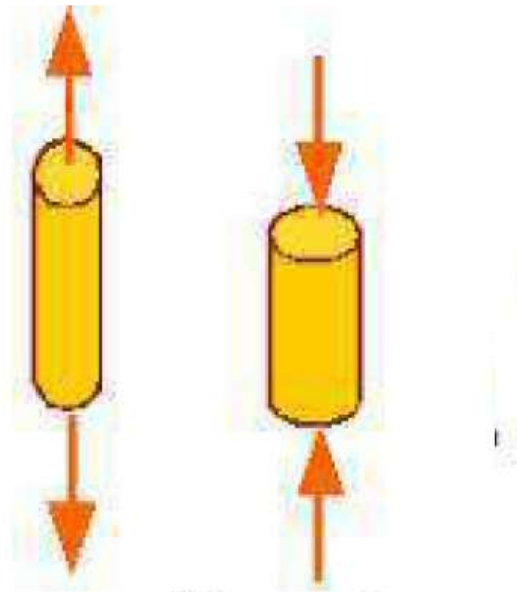
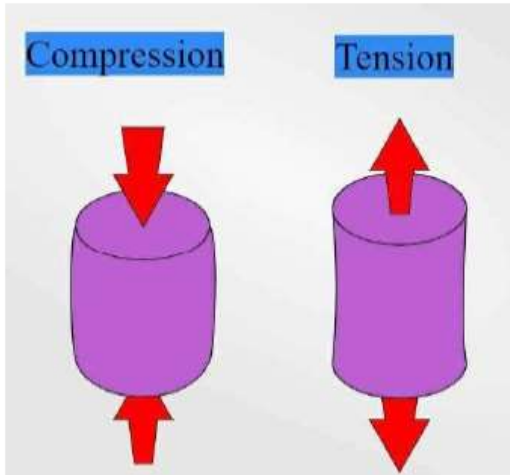


Compression Test



- The compression test is conducted in a manner similar to the tensile test, except that the force is compressive
- Since brittle materials are unsuitable for tension test, therefore they are tested for compression
- Brittle material such as cast iron, concrete, brick are commonly tested in compression
- The compression test is also conducted on a Universal Testing Machine





Tension

Compression