

## Structures Handout

### Strength

**Strength** in a material is its ability to withstand being deformed by an external force.

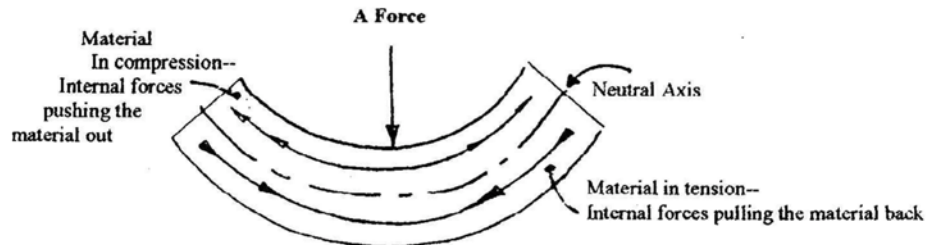
**A) Tensile strength** is the ability of a material to resist being stretched.

Different materials have different tensile strengths. This results from the molecular structure of each. For any material the **larger the cross-sectional area of a solid structural member, the greater its tensile strength will be.**

**B) Compressive strength** is the ability of a material to resist being made smaller by being pushed together from opposite ends.

Different materials have different compressive strengths. The compressive strength of a given material or structural member will increase as its cross-sectional area increases. Cross-sectional shape can also affect the compressive strength of a member. As the distance measured across a round, hollow column increases, its compressive strength decreases.

**C) Strength Against Bending:**



We are all familiar with the term bending. We see it, for example, when we overload a bookshelf as shown above. To understand why structural members bend we need to envision an imaginary line, known as the **neutral axis**, running through the length of the members. As a load is applied to the member, it bends. All the material on the inside curve of a bending member is in compression. All the material on the outside of the curve is in tension. An example a beam in bending is illustrated below.

If the material is strong enough in compression to resist being pushed together (compressed) and strong enough in tension to resist being stretched (by a tensile force) it will not bend.