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Behavior of Materials & Metals

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Abstract: *The materials and metals both are needed in our building construction and fabrication works. Usually the materials are brittle and metals are ductile and their use in making the reinforced cement concrete (RCC) slabs and beams according to compressive zone and tensile zones. Commonly the materials are non conducting to heat & electric current and the metals are conducting to heat & electric current. RCC structures are termite, rust & peel proof. The metals have their maximum use in making appliances, machines motors and wires of different thickness for transmitting electric current. Some plain cement concrete cubes were tested in the compression, testing machine till their elastic range to plastic range. Some metallic bars / rods / thick wires were tested in the tensile testing machine till their elastic range to plastic range and their details are indicated as in their introductions. The Density also plays its good role in contribution of the strength of materials and metals.*

Keywords: *Elastic range & Plastic range and Density in the brittle materials and ductile metals and stretching of wires of ductile metals.*

I. Background, Theory And Explanation

The Materials are usually brittle and used to bear the compressive load or force producing the compressive stress followed by compressive strain. A 15 by 15 cm cube made of plain cement concrete 1: 2 :4 mix was tested by putting it in the compression testing machine in between the fixed base plat and a moving plate and started and started it to function.. In the beginning, it was noted that the Stress and Strain both were increasing within the **elastic range** and they are directly proportional to each other and hence it can be written as a constant :

Sultan = Stress * Strain. (1)

and it was also noted that as the Stress was increasing, the density was constant. It can be observed that the Stress is inversely proportional to the density and hence it can be written as

Constant Jain = Stress / Density (2)
On considering (1) and (2), a third constant :

Sultan Jain modulus = Stress * Strain / Density (3)

The said testing machine still functioning beyond the **elastic range** to the **plastic range** and it was noted that the said cube had shown hair cracks thereby the maximum Stress decreasing and the Strain going on increasing showing Stress and Strain inversely proportional to each other in the **plastic** range, till the said cube cracked down.

The **Young Modulus** = Stress / Strain (4)

indicating the results in **plastic** range to unsafe that is a blunder mistake not acceptable. The Stain unit is a number and its multiplication with the actual Stress shows manifold times value of actual Stress which is hardly of any use and rather than misguiding and confusing the engineers.

The Metals are usually ductile and used to bear the tensile load or force producing the tensile Stress followed by tensile strain. A metallic rod of 2.5 cm diameter. was fixed at its both ends in the grips of clamps of the tensile testing machine and it started to function. In the beginning it was noted that the Stress and Strain both were increasing within the **elastic range** and they are directly proportional to each other and hence it can be written as a constant

Sultan = Stress * Strain. (1)

and it was also noted that as the Stress was increasing, the Density was constant and hence it can be written that the Stress is inversely proportional to the Density and hence it can be written as constant Jain = Stress / Density (2). On considering (1) and (2), a third constant

Sultan Jain Modulus = Stress * Strain / Density (3).

The said testing machine still functioning beyond the **elastic range** to the **plastic range** and it was noted that the said rod had shown hair cracks thereby the maximum Stress decreasing and the Strain going on increasing showing Stress and Strain inversely proportional to each other in the **plastic** range, till the said cube cracked down. The **Young Modulus** = Stress / Strain (4) indicating the results in **plastic range** to unsafe that is a blunder mistake not acceptable..Stress = Load applied / Area of cross section ; Strain = Increase in length / length. The Stress value obtained by **Young Modulus** shows manifold times than the actual Stress value which is hardly of any use and rather than misguiding and confusing the engineers.

II. Advantages

The Density a well known fact plays good role in the strength of Materials and Metal . When the applied load or force is going on increasing, the Density remains constant. It is found that Stress is variable with respect to Density that is Stress is inversely proportional to Density can be written by a constant **Jain** = Stress / Density (2) Wherein constant **Sultan** = Stress * Strain (1) as shown above.

Like we write Stress = Load / Area; wherein load is variable and Area is constant
Self weight = W; Load /force applied =F; Area of cross section =A; Length =l , Increase in length =dl , Volume =V , Hence it is observed that new constant called

Sultan Jain Modulus = Stress * strain / Density (3)
S J Modulus= (Load / Area) * Strain / Density = (F/A*dl/l) * V/ W= F* dl/W (3)

III. How To Make A Thick Wire Into Thin Wire In Elastic Range Only

The said thick wire is stretched through the die drilled thicker to thinner and thinner holes and the die thickness is about one cm. One end of the said thick wire is made slightly thinner in about two cm length was thinned slightly and it is passed through die appropriate hole .and is griped rigidly in a clamp. This clamp is pulled by a suitable force till the entire length of the said wire is stretched out making it thinner. The said process is repeated number of times from thicker to thinner wire passing it through thinner and thinner holes of the said die till the required thinness or thickness is achieved within the elastic range..It is also noted that the increase in length dl is manifold times than its length l..The Stress also being reduced which is directly proportional to the diameter of the wire. . The ratio of the applied load to the self weight gives a fair idea at a glance to ascertain a good estimation to its strength.

In ductile metals ..dl > l.manifold times

Than it length..In the brittle materials dl < l less than 1. Take equal self weights and diameters of the different metallic thick wires or thinnest wires lengths to enabling a better compression at a glance to their strengths.. The die holes are set up to gradually decreasing their holes thickness to bear the stretching force within the elastic range set up..

IV. Conclusions

When the materials and metals are to be used, it is necessary to know their strength based on compressive load and tensile load bearing capacity and density also within the elastic range. The required tests were performed in the compression testing machine and tensile testing machine of high range to absolute authenticity practically. The Young modulus indicated the value in the **plastic** range a blunder mistake. Wherein the genuine value showing tests were performed in materials and metals shown above within the **elastic** range.

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