TITLE: TENSION TEST

AIM: To determine the tensile strength of specimen

Specimen and equipments

Universal testing machine (fig1.a)

Specimen as shown in the(fig1.b)

Of different ferrous and non ferrous materials

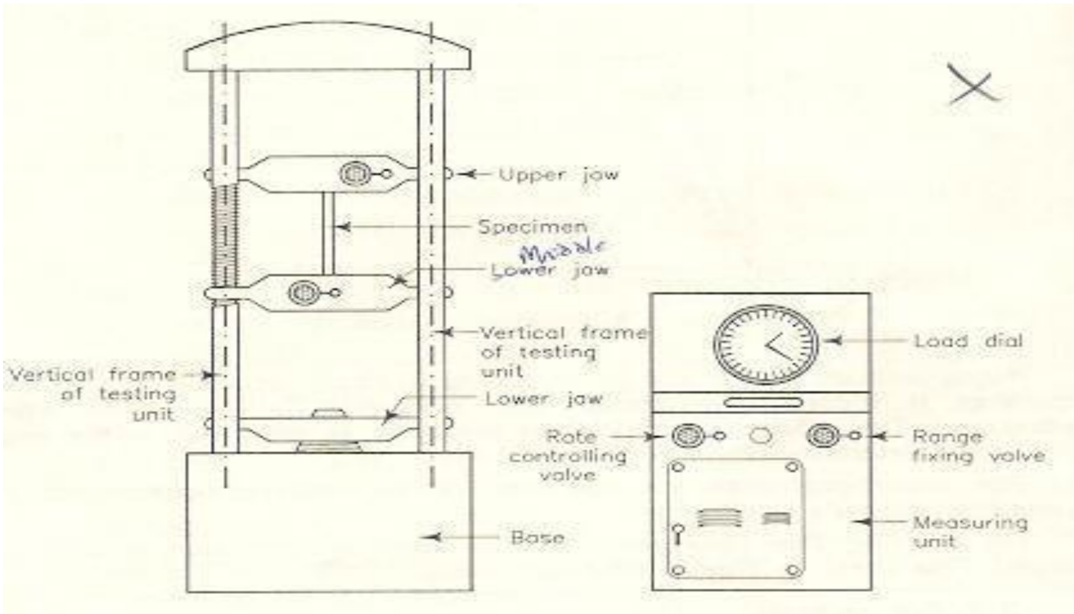


Fig.1(a)

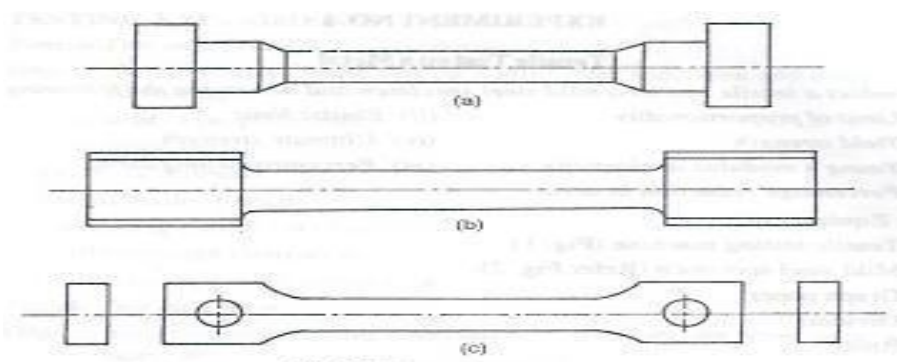
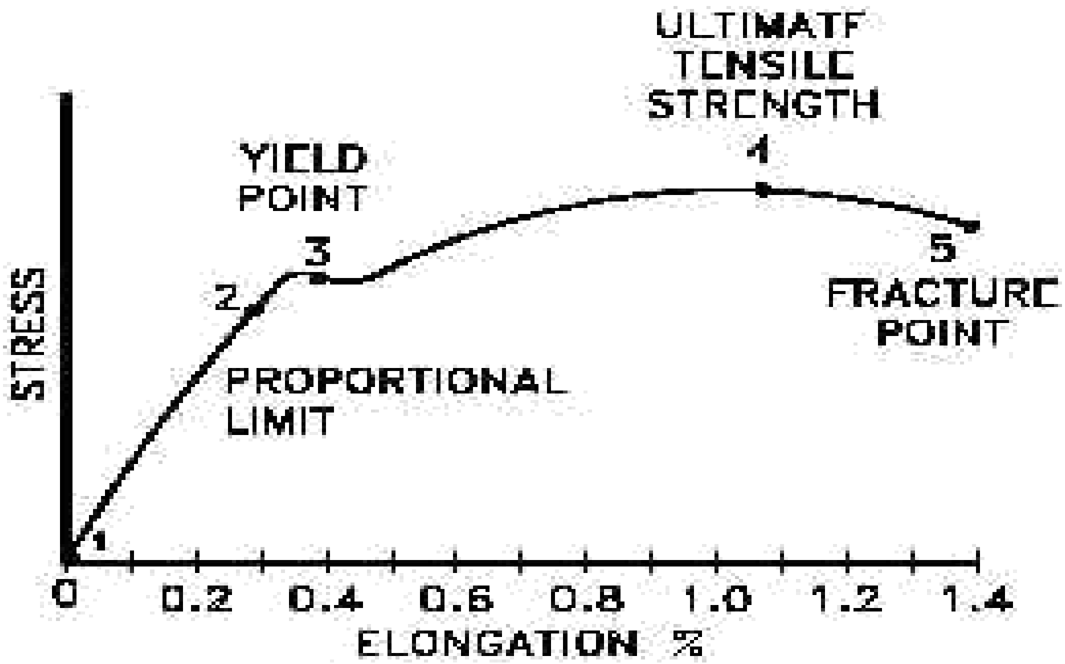


Fig. 2. Mild steel specimens.

THEORY

The tensile test is most applied one, of all mechanical tests. In this test ends of a test piece are fixed into grips connected to a straining device and to a load measuring device. If the applied load is small enough, the deformation of any solid body is entirely elastic. An elastically deformed solid will return to its original position as soon as load is removed. However, if the load is too large, the material can be deformed permanently. The initial part of the tension curve (fig.2), which is recoverable immediately after unloading, is termed as elastic and rest of the curve, which represents the manner in which solid undergoes plastic deformation is termed plastic. The stress below which the deformation is essentially entirely elastic is known as the yield strength of material. In some materials (like mild steel) the onset of plastic deformation is denoted by a sudden drop in load indicating both an upper and lower yield point. However, some materials do not exhibit a sharp yield point. During plastic deformation, at larger extensions strain hardening cannot compensate for the decrease in section and thus the load passes through a

Maximum and then begins to decrease. As this stage the' Ultimate strength ', which is defined as the ratio of the specimen to original cross –sectional area, reaches a maximum value. Further loading will eventually cause 'neck' formation and rupture. Usually a tension test is conducted at room temperature and the tensile load is applied slowly. During this test either round or flat specimens (fig.1) may be used. The round specimens may have smooth, shouldered or threaded ends. The load on the specimen is applied mechanically or hydraulically depending on the type of testing machine.



Stress strain Diagram

PROCEDURE

1. Measure the dimensions of a specimen Diameter =d= ,

Total length of a specimen, Cross sectional area = Ao= ,

Mark gage length (Lo) at three different portions on the specimen,

Covering effective length of a specimen.(this is required so that necked portion will remain between any two points of gage length on the specimen.)

2. Grip the specimen in the fixed head of a machine. (Portion of the specimen has to be gripped as shown in the fig.

3. Fix the extensometer within the gauge length marked on the specimen.

Adjust the dial of extensometer at zero.

4. Adjust the dial of a machine to zero, to read load applied.

5. Select suitable increments of loads to be applied so that corresponding elongation can be measured from dial gauge.

6. Keep speed of machine uniform. Record yield point, maximum load point, point of breaking of specimen.

7. Remove the specimen from machine and study the fracture observes type of fracture.

8. Measure dimensions of tested specimen. Fit the broken parts together and measure reduced diameter and final gage length.

OBSERVATIONS

Specimen prepared from M.S bar/CI/Al

1. Diameter = d = mm

2. Gage length (lo)= 5Xd= mm

3. Original cross sectional area of the specimen = Ao = mm^2

4. Final gage length obtained= Lo'=

5. Final diameter obtained = mm

OBSERVATION TABLE 1

Sl. No.	Load applied (N) (P)	Area of a specimen (Ao)	Stress (N/mm ^{2})	Modulus of elasticity (E) N/mm^2

OBSERVATION TABLE 2.

Sl. No	Contraction in diameter (dd) (mm)	Deformation in length (mm)	Lateral strain	Linear strain	Poisson ratio

Note:

1. Use vernier caliper to measure diameter, gage length etc. for the specimen.
2. If C.I. specimen is to be tested only one observation will be taken at failure.

RESULTS

1. Calculate stress and strain for every interval of applied load.

Draw stress strain curve as shown in the Fig.

2. Compute the following;

A. Modulus of elasticity

Hook's law states that stress is always proportional to strain within elastic limit. The ratio of stress and strain is constant, called modulus of elasticity or young's modulus (E)

E= Stress/strain

B. Yield stress (fy);

The point, at which strain increases without increase in stress, is known as Yield point. Stress measured at yield point is called yield stress.

C. **Tensile strength**:

Maximum carrying capacity of a material in tension is called tensile strength

Tensile strength= maximum tensile load/ original cross sectional Area.

D. **Percentage elongation**:

The extension produced in a gage length, expressed as a percentage of its original value (LO)

% Elongation= [(LO' – Lo)/Lo] X 100

Where Lo' is final gage length after fracture.

E. Percentage reduction in area:

= [(AoAo')/Ao] X100

Where Ao' is final reduced cross sectional area after fracture.

TITLE: COMPRESSION TEST

AIM: To find the compressive strength of given specimen.

MATERIAL AND EQUIPMENT

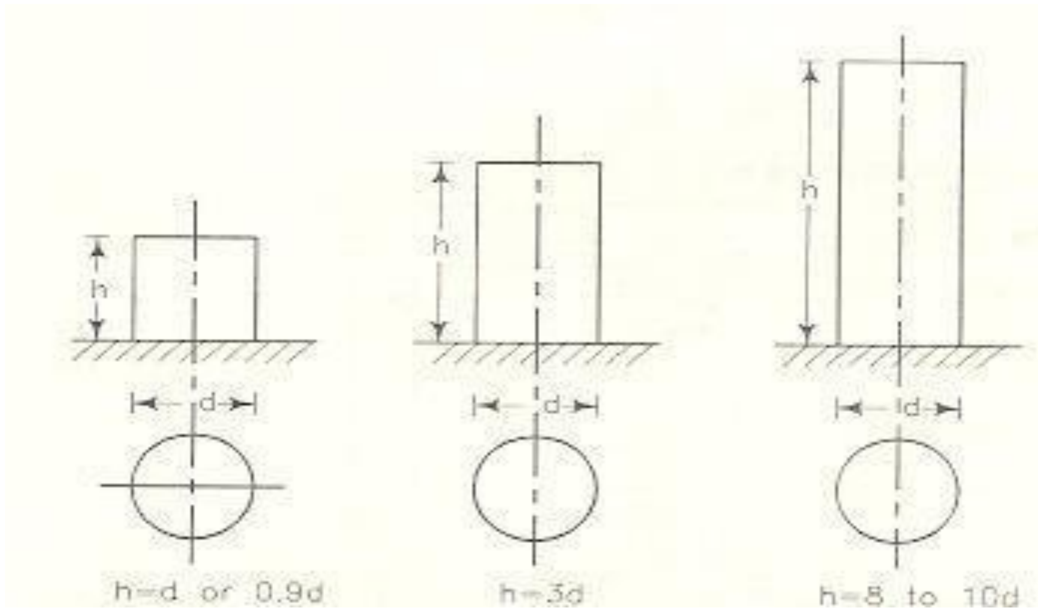
Universal testing machine,

Compression pads,

Given specimen

THEORY

This is the test to know strength of a material under compression. Generally compression test is carried out to know either simple compression characteristics of material or column action of structural members. It has been observed that for varying height of member, keeping cross-sectional and the load applied constant, there is an increased tendency towards bending of a member. Member under compression usually bends along minor axis, i.e, along least lateral dimension. According to column theory slenderness ratio has more functional value. If this ratio goes on increasing, axial compressive stress goes on decreasing and member buckles more and more. End conditions at the time of test have a pronounced effect on compressive strength of materials. Effective length must be taken according to end conditions assumed, at the time of the test. As the ends of the member is made plain and fit between two jaws of the machine, fixed end is assumed for calculation of effective length. Effective length is taken as0.5 L where L is actual length of a specimen



OBSERVATION

Cross sectional area of the specimen perpendicular to the load=A=……mm 2

Load taken by the specimen at the time of failure, W=. ……(N)

Strength of the pin against shearing (s) = [W/A] N/mm 2

PROCEDURE

1. Place the specimen in position between the compression pads.
2. Switch on the UTM
3. Bring the drag indicator in contact with the main indicator.
4. Select the suitable range of loads and space the corresponding weight in the pendulum and balance it if necessary with the help of small balancing weights
5. Operate (push) the button for driving the motor to drive the pump.
6. Gradually move the head control ever in left hand direction till the specimen fails.
7. Note down the load at which the specimen shears
8. Stop the machine and remove the specimen.
9. Repeat the experiment with other specimens.

PRECAUTIONS

1. Place the specimen at center of compression pads,
2. Stop the UTM as soon as the specimen fails.
3. Cross sectional area of specimen for compression test should be kept large as compared to the specimen for tension test: to obtain the proper degree of stability.

RESULT

Compressive strength of the specimen ………N/mm