

## 2.6 TENSILE TEST

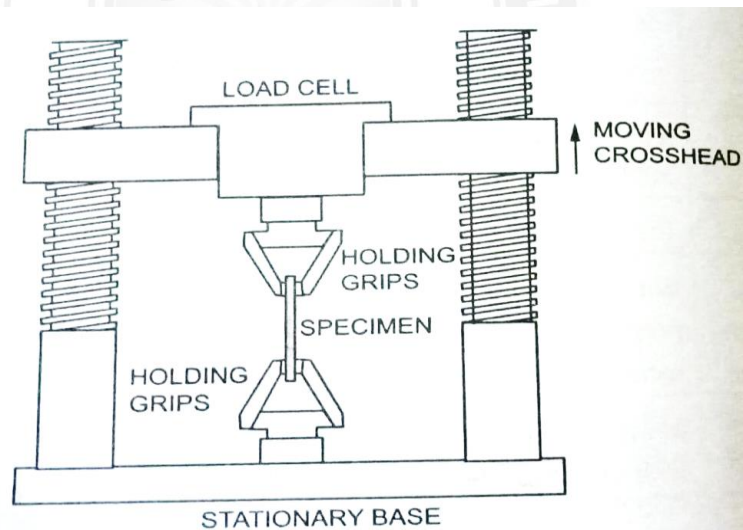
- ❖ Tensile test is a measurement of the ability of a material to withstand forces that tend to pull it apart and to determine to what extent the material stretches before breaking.

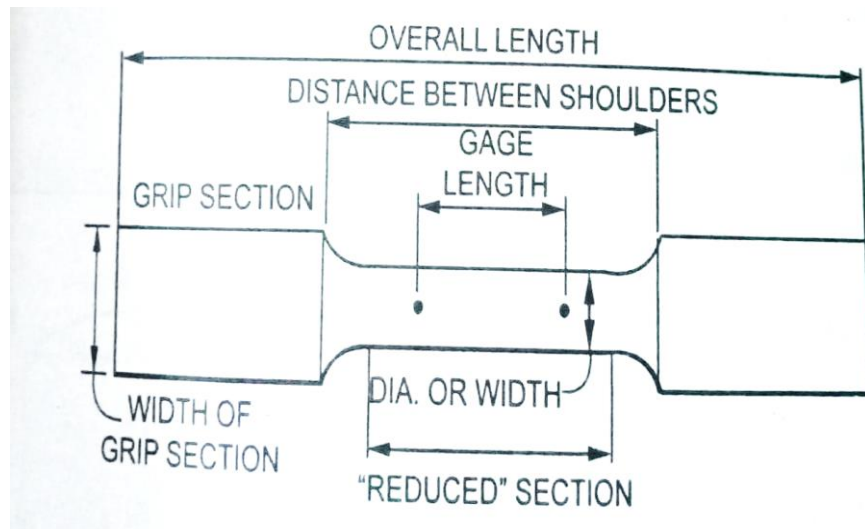
### 1. PRINCIPLE

- ❖ A standardized specimen with a known cross section is loaded uniformly with relatively low increasing force in the longitudinal direction.
- ❖ A uniaxial stress state prevails in the specimen until contraction commences.

### 2. EQUIPMENT

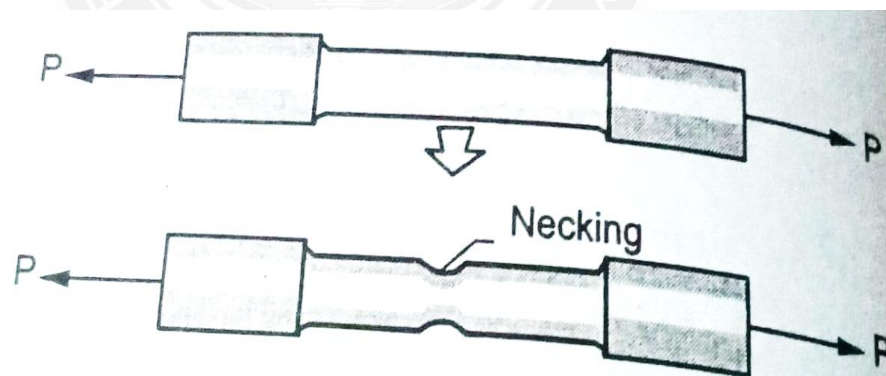
- ❖ Universal testing machine (UTM)
- ❖ Extensometer
- ❖ Scale vernier callipers
- ❖ Punching tools





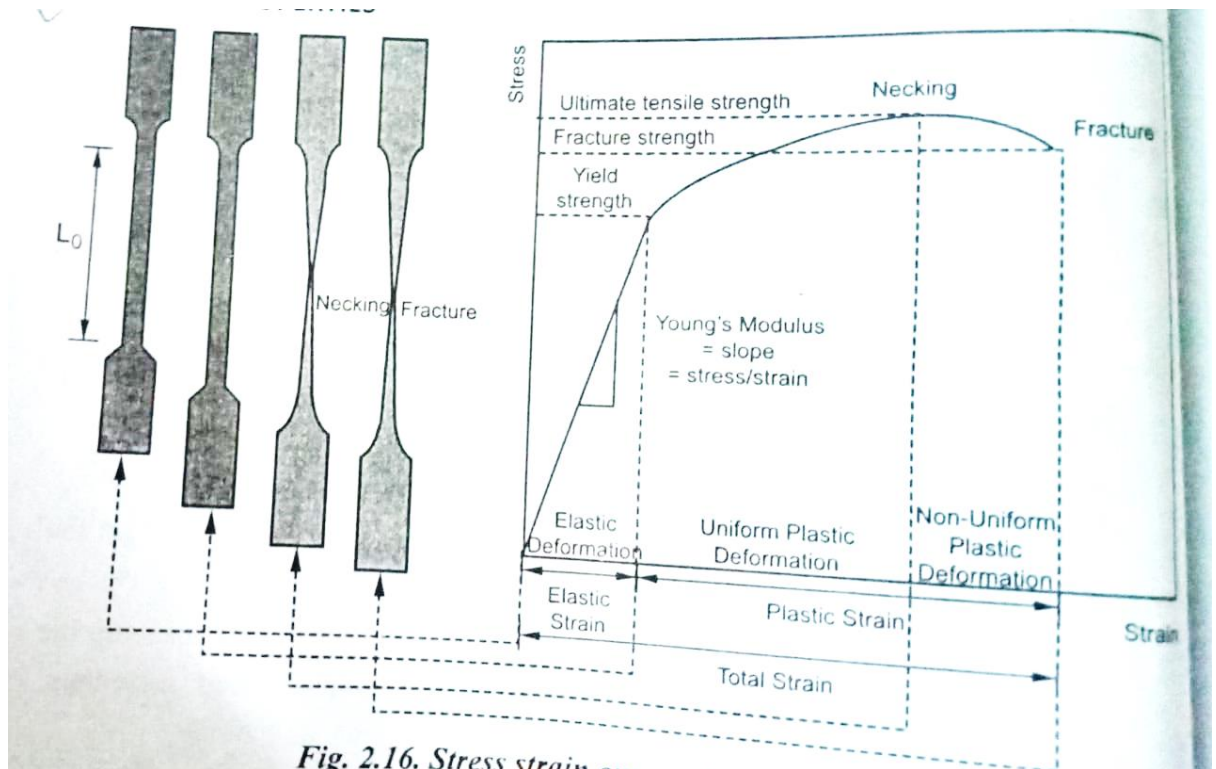
### 3. WORKING

- ❖ Initially, the steel rod specimen is cleaned and gauge length is marked on it. The ultimate load range to be fixed.
- ❖ Once the specimen is placed, the jaws are locked.
- ❖ Fix the extensometer on the specimen and set the reading to zero.
- ❖ When the specimen is under load, slowly unclamp the locking handle. Note the extension at a convenient load increment.



- ❖ Necking is a large reduction caused in the cross-sectional area of the steel rod. Measure the diameter of the specimen at the neck.

#### 4. DERIVED PROPERTIES



- ❖ **Proportional Limit:** The material is capable of sustaining the applied load without any deviation, it is defined as proportionality of stress to strain within elastic limit (Hooke's Law).
- ❖ **Elastic Limit:** The lowest stress at which permanent deformation can be measured.
- ❖ **Engineering stress:** Stress is defined as the ratio of the applied load to the original cross-sectional area of the specimen.

$$\text{Stress } (\sigma) = \text{Applied load} / \text{Original cross-sectional area}$$

- ❖ **Engineering strain:** Strain is defined as change in length to original length.

$$\text{Strain } (\epsilon) = \text{Change in length} / \text{Original length}$$

#### 5. FACTORS AFFECTING TENSILE TESTING

- ❖ Specimen preparation and specimen size
- ❖ Rate of straining
- ❖ Temperature
- ❖ Hydrostatic pressure effects
- ❖ Radiation effects

## **6. VARIES FORMS OF TENSILE TEST**

- Tensile adhesion
- Tensile shear
- Tensile grab
- Tensile pulling
- Tension fatigue
- Tensile creep

## **7. ADVANTAGES**

- ❖ Used for selecting materials for an application based.
- ❖ It provides safety and integrity of materials.
- ❖ It determines batch quality.

## **8. DISADVANTAGES**

- ❖ It does not provide information about the material at different temperatures.
- ❖ It does not identify the strength of the material at differing strain rates.
- ❖ It does not identify any possible asymmetry in the material strength.
- ❖ It is done under constant strain rate and constant temperature.

