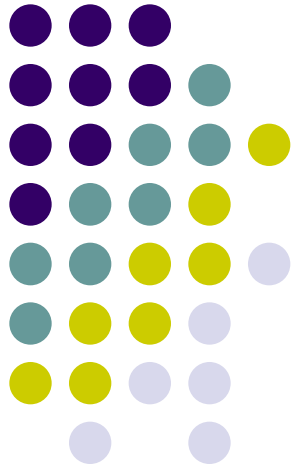
Tension test of Steel Specimen



Objective

- To test a Steel specimen under tensile loading
- To Observe the failure pattern
- To Draw the Stress-strain diagram
- To determine the following mechanical properties

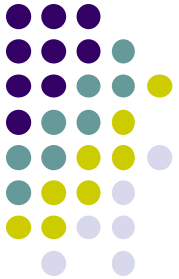
Standard Ref:

ASTM E8 (Tension Testing of Metallic Material)

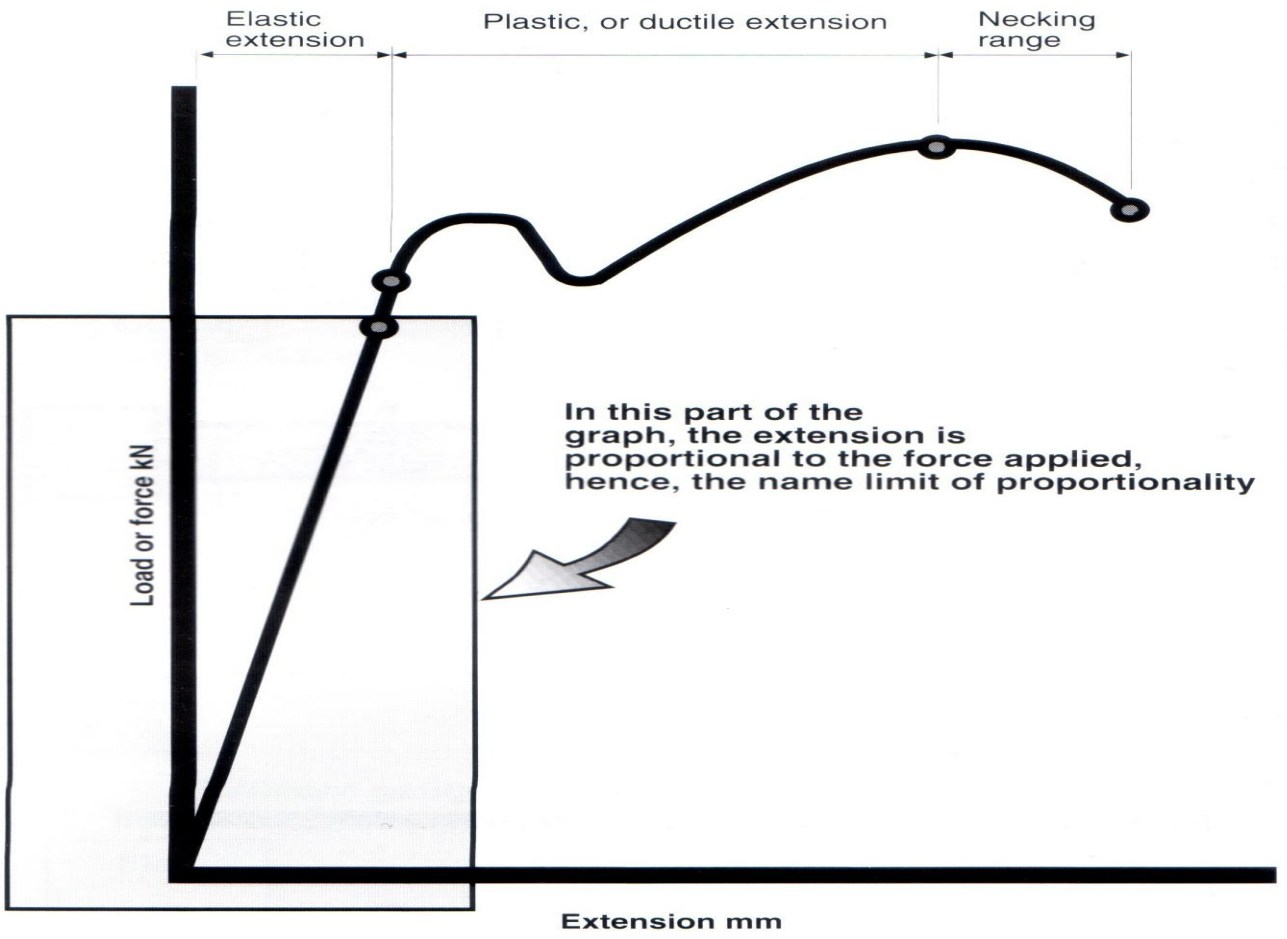
- Nominal Diameter
- Actual Diameter
- Unit Weight
- Strain rate
- Yield/Proof Strength
- Ultimate Strength
- US/YS
- Modulus of Elasticity
- Modulus of Resilience
- Elongation(%)
- Reduction of Area (%)

procedure

Follow Class Lecture



Typical Stress strain diagram



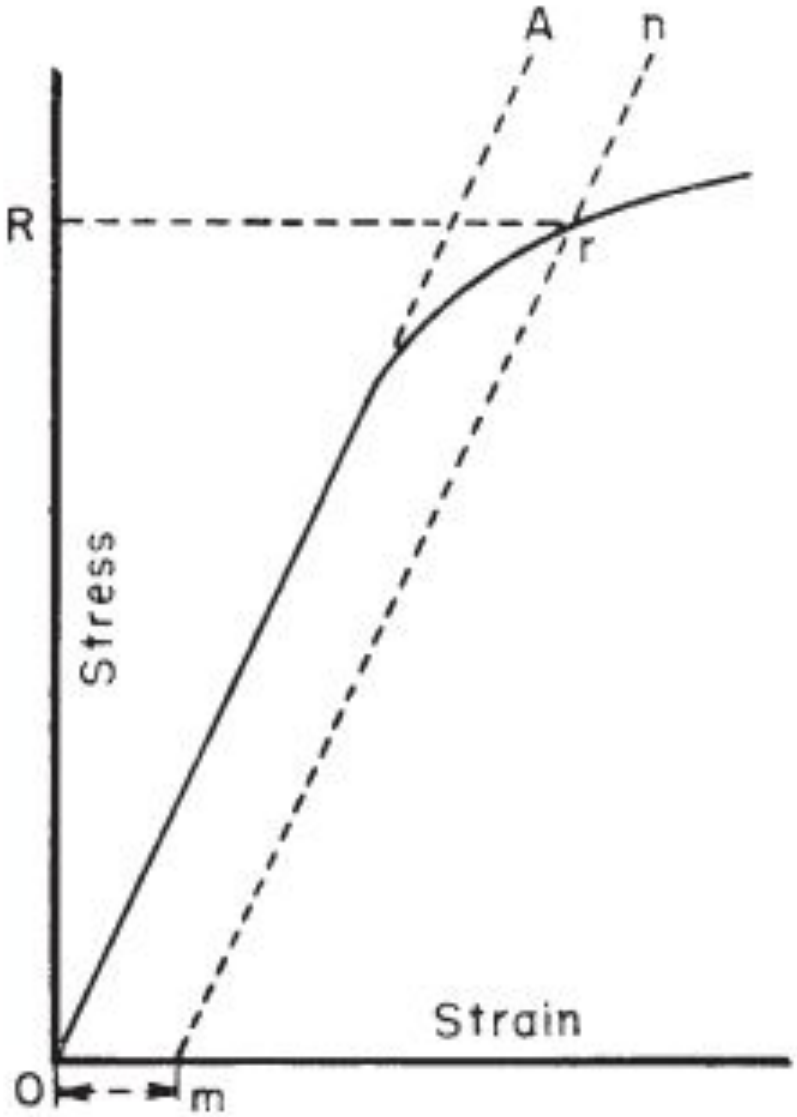
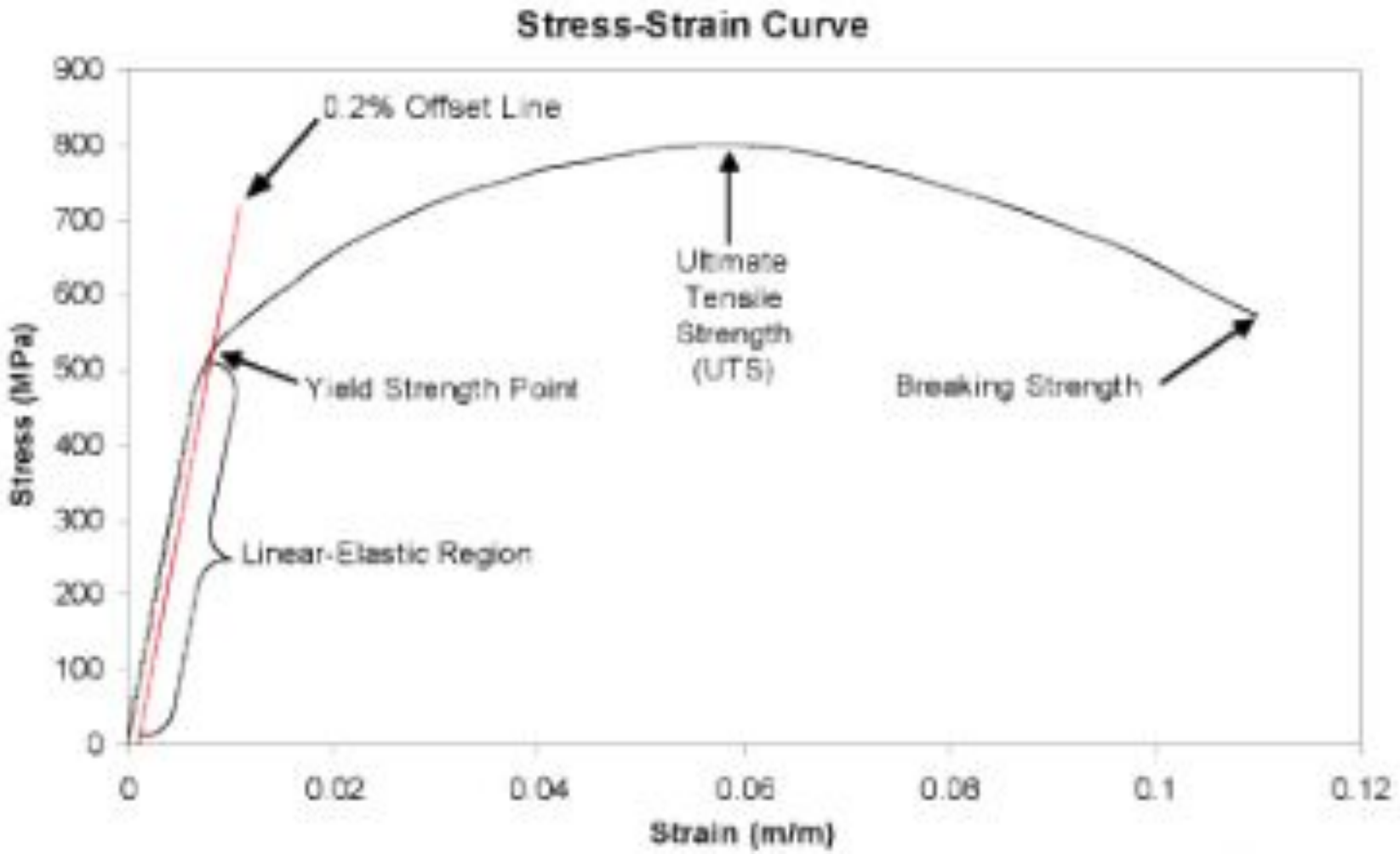


FIG. 21 Stress-Strain Diagram for Determination of Yield Strength by the Offset Method

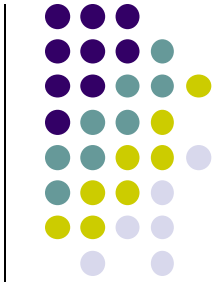

Stress-Strain Curve
0.2% Offset Line
Ultimate Tensile Strength (UTS)
Yield Strength Point
Breaking Strength
Linear-Elastic Region
Stress (MPa)
Strain (m/m)
900
800
700
600
500
400
300
200
100
0
0
0.02
0.04
0.06
0.08
0.1
0.12

Failure pattern

Proof Stress

- If yield point is not found on graph
- **Proof stress** is the point at which a particular degree of permanent deformation occurs in test sample.
- For **steel stress** to produce 0.2% elongation
- It can be found by drawing a line parallel to the straight part of the graph.
- The value taken from the vertical axis is called proof strength

Calculation



- Actual Diameter (mm)

$$\frac{\text{Weight of sample}}{\frac{\pi d^2 L}{4}} = 480 \text{ lb/ft}^3$$

- Strain rate (mm/mm/min): Calculate total strain and corresponding test time
- Unit Weight (kg/m)= weight /sample length
- % Elongation = $\frac{L_f - l_i}{L_i} * 100\%$
- yield & ultimate strength, Modulus of Elasticity, Modulus of Resilience from graph

- Actual Diameter (mm)

$$\frac{\text{Weight of sample}}{\frac{\pi d^2 L}{4}} = 480 \text{ lb/ft}^3$$

- Strain rate (mm/mm/min): Calculate total strain and corresponding test time
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