Faulty of Engineering and Technology

Civil Engineering Department

Construction Materials Laboratory

ENCE215

Experiment :

" Tension testing of reinforcing steel bars "

Instructors :

Dr. Khalil Qatu

Eng. Nasser

Done by : Mohammad Al-Swaity " 1181136 "

Date of performing the experiment : 12/8/2020

Date of submitting the experiment : 21/8/2020

Introduction :

Steel is the basic material in structure and building operations , so it is treated to many   examinations & tests , these tests determinate its properties about its standard range .

This test one of the important tests for steel , because it's used to find the properties of the steel reinforced bars like yielding strength (σ_y), ultimate strength (σ_u), young's Modulus (E) … etc.

Also this test is used to find the relationship between average normal stress and average normal strain in reinforcing steel .
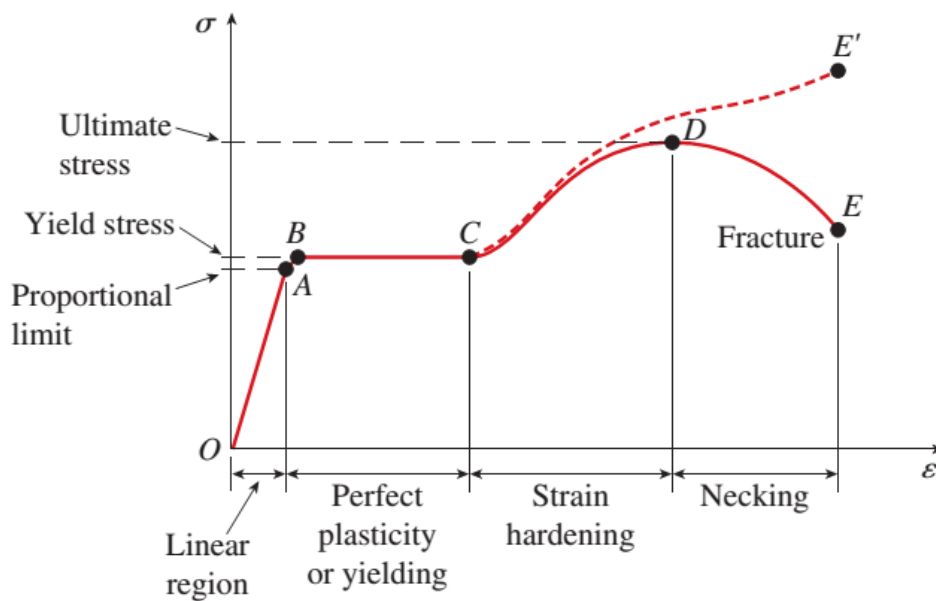

Figure (1)

The load P and the deformation δ is recorded by the machine at frequent intervals. δ is used then to determine the average normal strain in the specimen which is required to draw stress strain curve .

Purpose :

1. Determine the properties of the steel reinforced bars like yielding strength (σy), ultimate strength (σu), young's Modulus (E) … etc
2. Find the relationship between average normal stress and average normal strain in reinforcing steel .
3. Determine the average normal strain in the specimen which is required to draw stress strain curve .

Materials and Equipment's :

Equipment	The name of it :	Equipment	The name of it :
Figure 1	**Steel Rod 16mm**	Figure 2	**Axial Tensile Test Machine**
Figure 3	**Gloves**	Figure 4	**Stick**

" Table 1 "

Procedure :

1. A steel rod of a 16 mm diameter was taken.
2. The length, mass & initial length were measured.
3. The rod was restrained in the axial tension apparatus.
4. A variable axial tension force was applied upon it until it fractured.
5. The stress & strain diagram was plotted on the screen .

Data and Calculations :

Normal Diameter (mm)	16
Length (mm)	601
Weight (gr)	925.9
Unit Weight (kg/m)	1.54
Area (mm^2)	199.8
Equivalent diameter (mm)	15.8
Initial Length (mm)	300
Elongated Length (mm)	355
Ultimate Strain (%)	18.33%
Maximum Force (kN)	111.1
Upper yield stress (MPa)	390.2
Lower yield stress (MPa)	390.2
Ultimate stress (MPa)	566.2
Modulus of elasticity (MPa)	12426.0

Table (2): Data Obtained from Tensile Test Machine

Maximum force the bar can afford = ultimate stress * area

$$= 566.2 * 199.8$$

$$= 113126.76 \text{ N} = 113.13 \text{ KN}$$

Elongation = $L_1 - L_0 = 355 - 300 = 55$ mm

Strain(theoretically)=$(L_1-L_0)/L_0$=((355-300)/300)*100% = 18.33%

Result and Conclusion :

The results obtained from the axial tension test shows that using steel in structural works can be very useful. It prolongs the durability of the structure because of its ability to elongate, undergo tensile loading and bending forces without fracture, which means that steel is a ductile material. The Steel sample showed a very rapid transition between the decreased area and the rest of its length, this is a property of ductile materials which is called necking. And the percent strain of the steel bar is equal to 18.33%.

Sources of errors are due to:

- The weight and the length of the two samples were estimated.
- The steel bar cannot be bent at exactly 90 degrees with the given machines.
- Placing the sample in a wrong way in the tension machine