Engineering maths

Maths

Calculating Stress

To calculate the Stress on a material you need to:

Firstly work out the area of the piece using $3.142 \times (R \times R) =$ if the piece is circular or by using Area = Length x Width if the piece is square or rectangular in shape.

E7: Stress

(See section 4.1 for information on the conversion of load/extension to stress/strain and the formulae used.)

Question

A tensile test was carried out on a piece of metal. The test piece had a square section, with each side 10 mm. The force applied when the material started to yield was 24500 newtons. Calculate the yield stress of the metal.

Solution

Stress =
$$\frac{\text{force}}{\text{cross-sectional area}}$$

 $\sigma = \frac{F}{A}$

Given force F = 24500 N and cross-sectional area A = $10 \times 10 = 100$ mm²

$$\sigma = \frac{F}{A}$$
$$= \frac{24500}{100}$$

 $= 245 \text{ N mm}^{-2}$

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Engineering Maths

Calculating Stress questions

1, A test piece had a square section with each side 4mm. The force applied when the material started to yield was 5,000 Newtons (show all working)

2, A test piece had a rectangular section section with one side measuring 4mm and the other 8mm.. The force applied when the material started to yield was 6,000 Newtons (show all working)

3, A test piece had a cylindrical section with a radius of 2mm. The force applied when the material started to yield was 2000 Newtons (show all working)

4, A test piece had a cylindrical section with a radius of 4mm. The force applied when the material started to yield was 3500 Newtons (show all working)

5, A test piece had a cylindrical section with a radius of 5.5mm. The force applied when the material started to yield was 4750 Newtons (show all working)

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Maths

Engineering maths

Maths

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Calculating Strain

To Calculate Strain you need to:

Firstly work out the change in length by: subtracting the extended length by the original length.

Then you can divide the change in length by the original length, the answer should be very small.

MATHEMATICAL UNDERSTANDING

E8: Strain

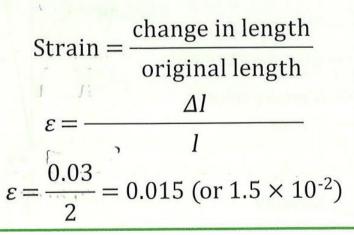
(See section 4.1 for information on the conversion of load/extension to stress/strain and the formulae used.)

Question

A metal bar is being used as part of the lifting gear in a crane. When there is no load, the bar is 2 m long. When the crane lifts the maximum load, the bar extends to a length of 2.03 m.

Calculate the strain in the bar at the maximum load.

Solution



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Engineering Maths

Calculating Strain

Calculate the yield stress of the following metals

1, when there is no load the bar is 0.2m long. When the load is applied the bar extends to a length of 0.22m. (show all workings)

2, when there is no load the bar is 0.7m long. When the load is applied the bar extends to a length of 0.71m. (show all workings)

3, when there is no load the bar is 0.85m long. When the load is applied the bar extends to a length of 0.87m. (show all workings)

4, when there is no load the bar is 0.6m long. When the load is applied the bar extends to a length of 0.62m. (show all workings)

5, when there is no load the bar is 0.92m long. When the load is applied the bar extends to a length of 0.95m. (show all workings)

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