

Bending Stress

Civil Engineering

Turning bending moment into stress.

Bending stress varies linearly through the depth: zero at the neutral axis, greatest at the extreme fibre.

$$\sigma = My/I \cdot \sigma_{\max} = M/Z \cdot Z = I/c$$

M 40 kNm, Z $5 \times 10^5 \text{ mm}^3$
 $40 \times 10^6 \div 5 \times 10^5$.

$\sigma = 80 \text{ N/mm}^2$

Double the depth

Z $\propto d^2$ rectangle.

Z rises about 4 times

Where is stress zero?

Through the centroid.

At the neutral axis

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✗ **Measuring y over the full depth**

✓ **Measure from the neutral axis**

y runs from the neutral axis to the extreme fibre. For a symmetric section that is $d/2$, not d , so using d halves the stress you calculate.

Educational reference. Elastic theory, symmetric section, bending about a principal axis. Design follows the code.