Transverse Shear Stress

Mechanical Engineering

Where shear stress peaks in a beam, and why the web carries it.

Shear stress in a beam peaks at the neutral axis, exactly where bending stress is zero.

$$\tau = V\,Q \div (I\,t)$$

Solid rectangle

$\tau_{max} = 1.5\,V \div A$

At the neutral axis.

Solid circle

$\tau_{max} = 1.33\,V \div A$

A factor of 4 ÷ 3.

I-beam

Web takes nearly all V

Flanges take M.

THE COMMON MISTAKE

× Using the flange width as t

✓ t is the width at the cut

Q and t both describe the cut you are taking, not the whole section. In an I-beam the web thickness is the one that matters.

Slender beams fail in bending; short deep beams, welds and glue lines are where shear decides.