

Factor of Safety

Mechanical Engineering

What the number means, what it hides, and what it must be stated against.

Factor of safety is a strength divided by the stress you expect, and it is meaningless without both.

$$n = \text{strength} \div \text{working stress}$$

$S_y = 250$, $\sigma = 100$ MPa

Not on fracture.

$n = 2.5$ on yield

Known load, tested steel

Well characterised.

n of 1.5 to 2

Uncertain load, brittle

Or use tensile.

n of 3 to 4 or more

THE COMMON MISTAKE

× Quoting a factor without saying against what

✓ Name the strength you divided by

Factors against yield, tensile, buckling and fatigue are four different numbers for the same part. A bare number is not a design statement.

Codes and standards set the required factor in practice, and they usually set load factors too. Educational reference.