Structural Steel Design

Quizzam Formula Sheet

stress

units are psi (lb/in^2) or ksi (k/in^2)

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

P: force (lb or kips, k)

A: cross-sectional area (in^2)

strain

units are in/in or %

$$\varepsilon = \frac{\Delta L}{L}$$

ΔL: change in length (in)

L: original length (in)

modulus of elasticity

units are psi (lb/in^2) or ksi (k/in^2)

$$E = \frac{F}{\varepsilon}$$

F: stress

ε: strain

For ASTM A36 steel, F_y = 36 ksi (yield stress) and E = 29.6 x 10^3 ksi.
For ASTM A992 steel, F_y = 50 ksi (yield stress) and E = 29.6 x 10^3 ksi.

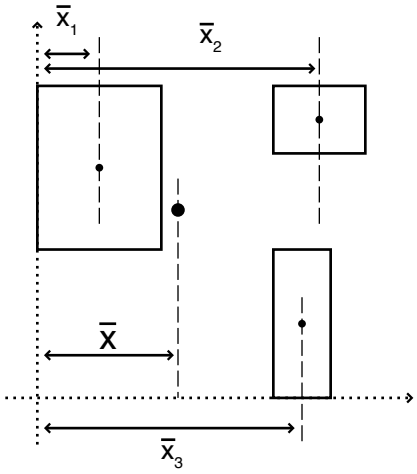
centroids

Centroid location:

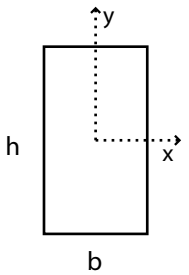
$$\bar{x} = \frac{\sum_{i=1}^{n} \bar{x}_i A_i}{A} \qquad \bar{y} = \frac{\sum_{i=1}^{n} \bar{y}_i A_i}{A}$$

For any set of arbitrary shapes, numbered 1, 2, 3, ... n, the location of the centroid against a fixed set of axes is found by evaluating the above equations.

By example: x_1 is the distance from the centroid of part 1 to the y-axis. A_1 is the area of part 1.



moment of inertia of a rectangular section



base of the rectangle

height of the rectangle

$$I_x = \frac{bd^3}{12}$$

units are in^4

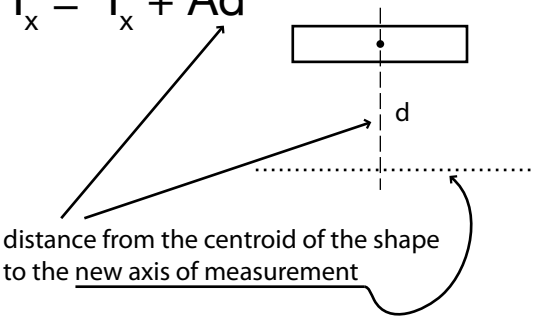
I_x: moment of inertia, about the x-axis

Parallel axis theorem

moment of inertia of the shape about its own x-axis

area of the shape

$$I_x' = I_x + Ad^2$$



distance from the centroid of the shape to the new axis of measurement