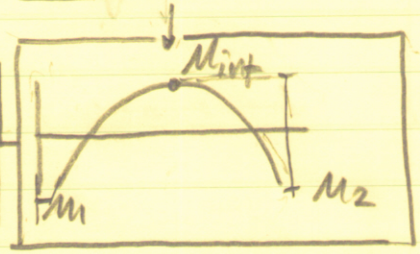
FLOWCHART FOR ALLOWABLE BENDING STRESS IN BEAMS

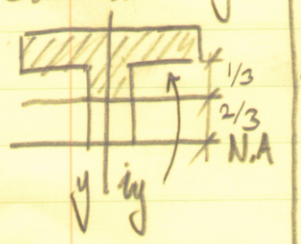
Beam → Compact OR Laterally Supported OR Laterally Unsupported

- Compact: $\sigma_B = 0.66\,\sigma_a$
- Laterally Supported: $\sigma_B = 0.6\,\sigma_a$
- Laterally Unsupported → Draw moment Diagram



- $M_{int} > M_1, M_2$ → $C_b = 1$
- $M_{int} < M_1$ or M_2 → $C_b = 1.75 + 1.05\left(\frac{M_1}{M_2}\right) + 0.3\left(\frac{M_1}{M_2}\right)^2 \leq 2.3$

Calculate i_y



S/i_y ? $\sqrt{\frac{30 e b\, C_b}{\sigma_a}}$

- $\leq$ → $\sigma_{B1} = \left[\frac{2}{3} - \frac{\sigma_a (S/i_y)}{90 e b\, C_b}\right]\sigma_a$
- $>$ → $\sigma_{B1} = \frac{10 e b\, C_b}{(S/i_y)^2}$

$\sigma_{B2} = \frac{840 e3 \cdot C_b}{S \cdot d / F_b}$

$\sigma_B = \min\left(0.6\sigma_a, \max(\sigma_{B1}, \sigma_{B2})\right)$

S: max laterally unsupported area

i_y: radius of gyration for the compression flange (flange + 1/3 web)

d: depth of the beam (from the table)

F_b: area of the compression flange

C_b: a coefficient (the absolute values of the moments are considered during the calculations)

M_{int}: maximum internal moment.

Allowable Shear Stress

$\tau_{em} = \frac{0.6\,\sigma_a}{\sqrt{3}}$ $\quad \tau_{ave} = \frac{V}{dt}$ or $\frac{V}{ht}$ $\quad \tau_{em} > (\tau_v)_{ave}$

preferred (d from the table, can't be calculated)