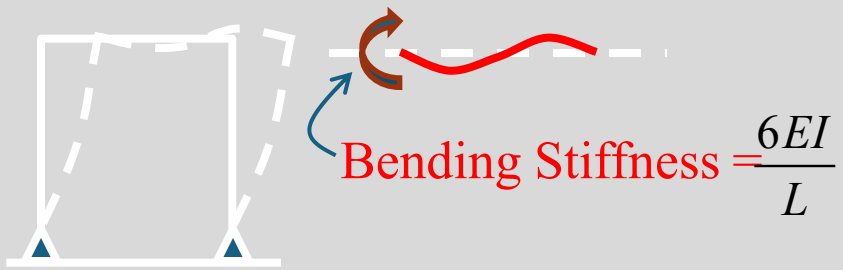
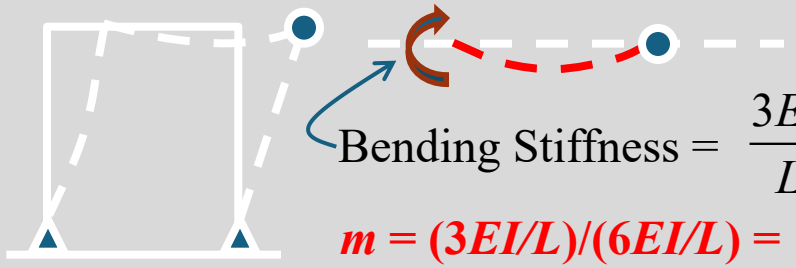
Alignment Charts

http://www.ecs.umass.edu/cee542/

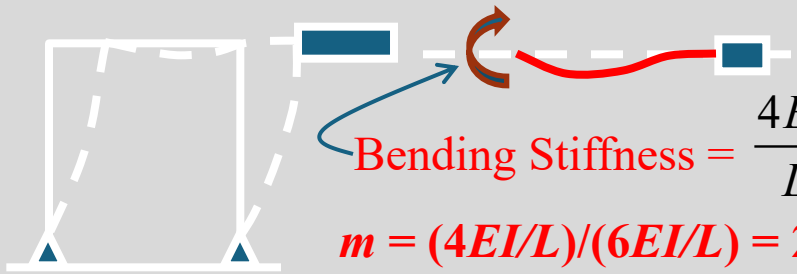


Sidesway Uninhibited (Sway)
Assumption: reverse curvature bending of girder.



$m = (3EI/L)/(6EI/L) = 1/2$

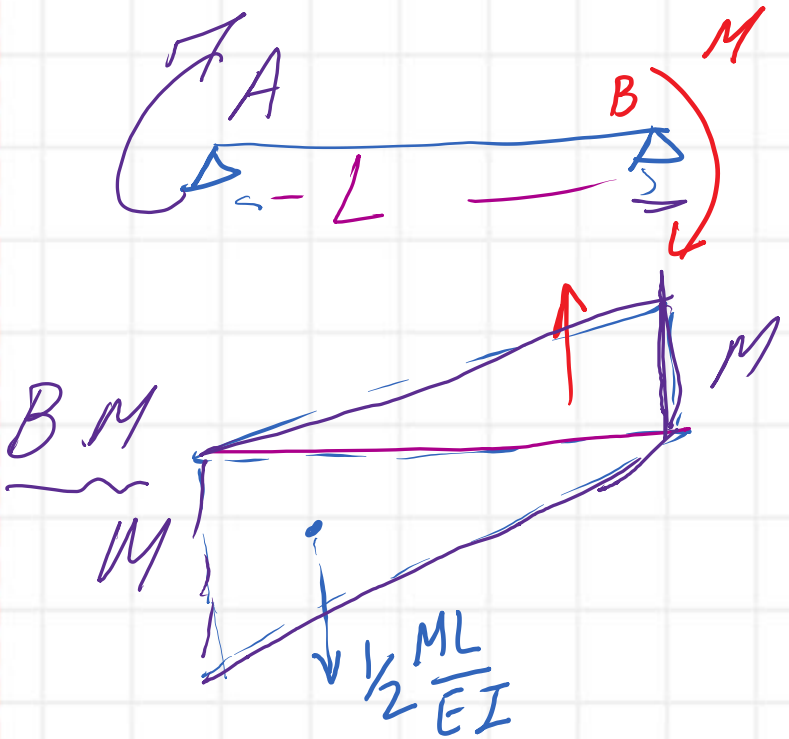
Far end pinned



$m = (4EI/L)/(6EI/L) = 2/3$

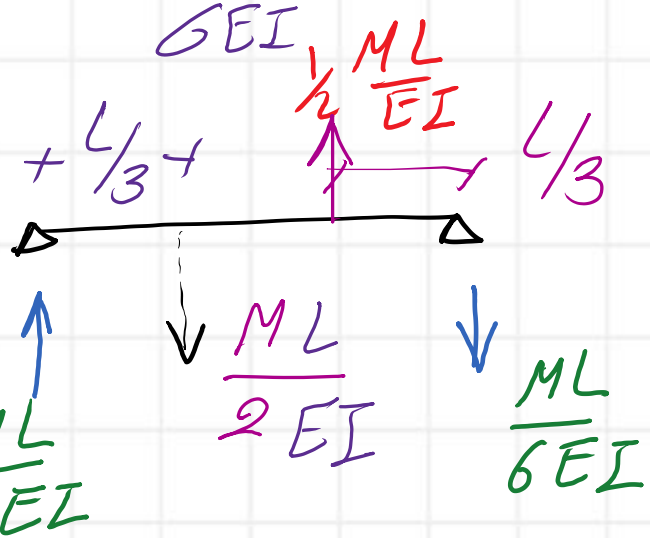
Far end fixed

Normal Case Double Curvature



$\alpha_A = \frac{ML}{6EI}$ $\Rightarrow$ $K \cdot \alpha = M$

K: bending stiffness

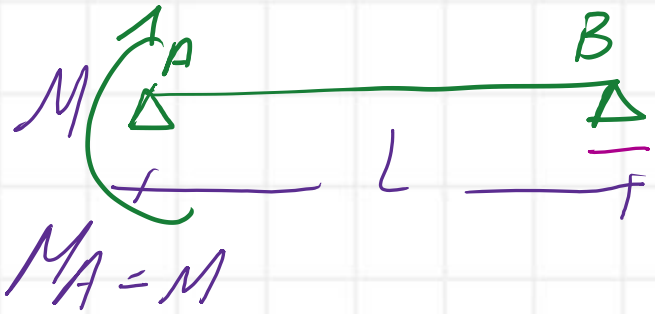


$K = \frac{M}{\alpha} = \frac{M}{ML/6EI}$

$K = \frac{6EI}{L}$

At A

Case of Double Curvature (reverse Curvation)



Far end Bend

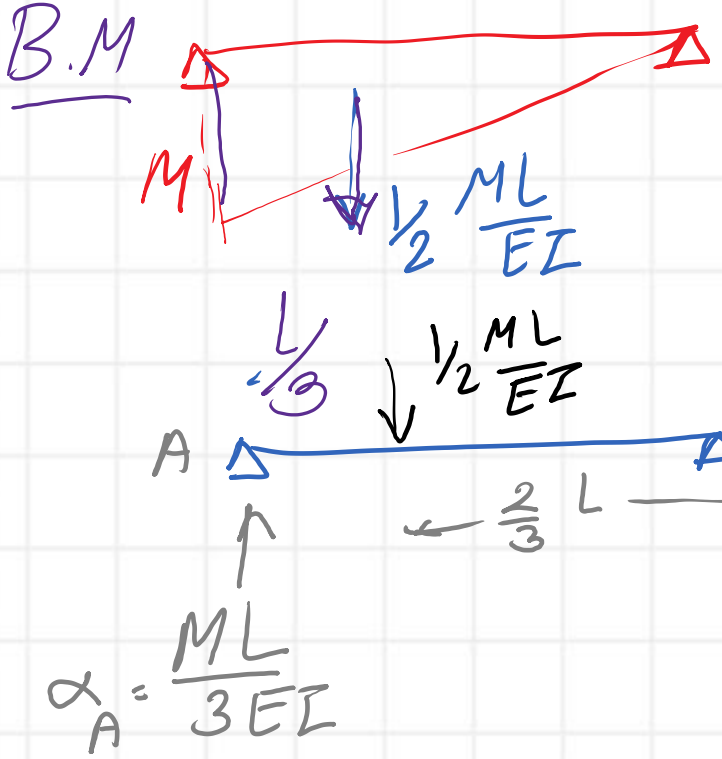
$M_B = 0$

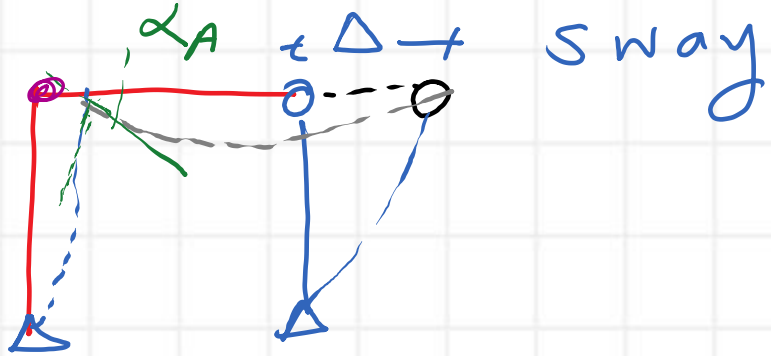
K: Bending stiffness

$$K_2 = \frac{M}{\alpha} = \frac{M}{\left(\frac{ML}{3EI}\right)} = \frac{3EI}{L}$$

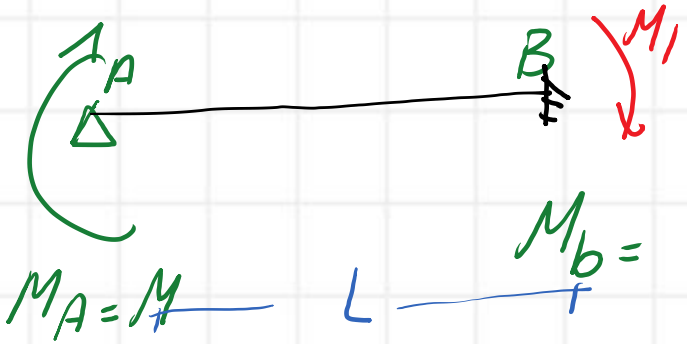
$$K_2 = \frac{3EI}{L}$$

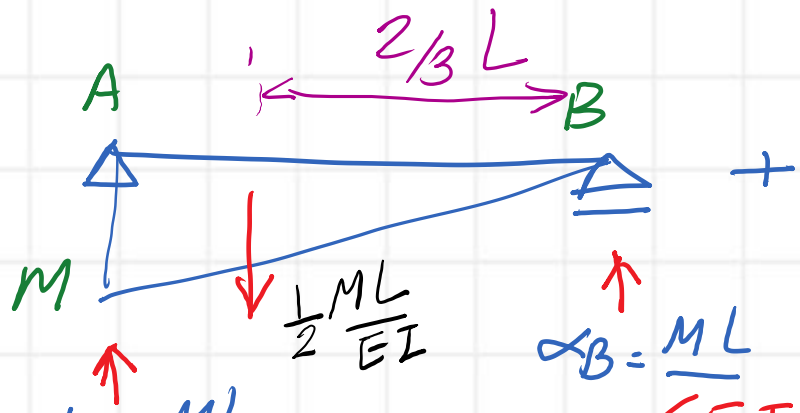
at A





For End Fixed

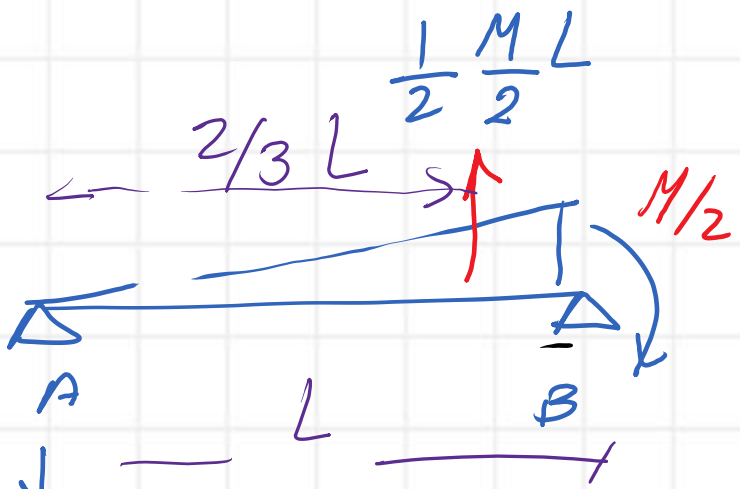




$\alpha_A = \frac{ML}{3EI}$

$\alpha_B = \frac{ML}{6EI}$

+



$\alpha_A = \frac{ML}{12EI}$

$\alpha_{AF} = \frac{ML}{3EI} - \frac{ML}{12EI} = \frac{3ML}{12EI}$

B.M

$K = \frac{M_3}{\alpha} = \frac{4EI \cdot \alpha}{L\alpha}$

For A $\Rightarrow$ $K = \frac{4EI}{L}$

Next Post #20

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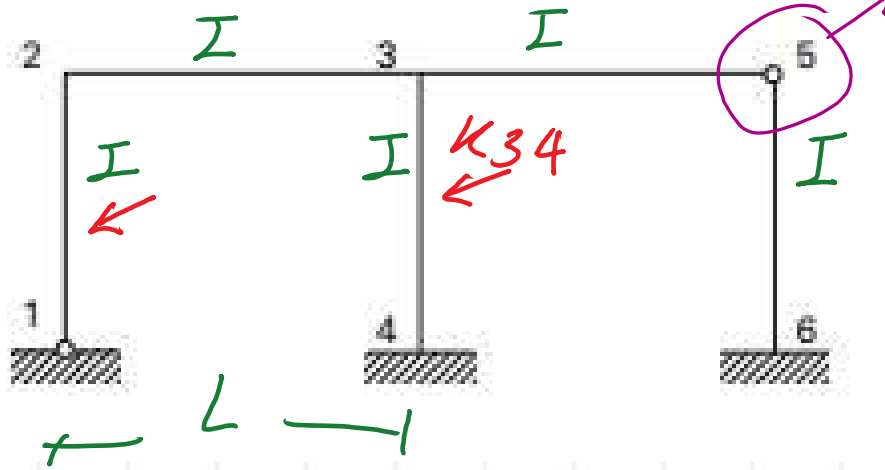
Example 4.16

The sway frame shown consists of members with identical I/L values. Determine the effective length factors of columns 12 and 34.



Pinned

unbraced Frame

h ?

L = h

Joint - 2
No - hinged
No Fixed
m = 1

Solution

For Column 1-2

$$G_2 = \frac{\Sigma(EI/L)\text{Column}}{m\Sigma(EI/L)\text{Girder}}$$

m = 1

① $G_2 = \dfrac{(EI/L)_{1-2}}{(1)\left[\frac{EI}{L}\right]_{2-3}}$

Prepared by Eng.Maged Kamel.