Brief Explansion of Post 27

Solved Example 4-14 From Prof. SEGUi's Book

A given Multi storey Frame with steel design

AB

a given W10x33 Columns which is an inelastic Column

The Frame is unbraced Frame, Girders data are given.

D
L → Loads are given acting. Find Find K Factor

@ a
b LRFD
ASD

Do not multiply G For pinned and Fixed support by τ_b

If the end of a column is fixed ($G = 1.0$) or pinned ($G = 10.0$), the value of G at that end should not be multiplied by the stiffness reduction factor. Values of the stiffness reduction factor τ_b as a function of P_u/A_g and P_a/A_g are given in Table 4-21 in Part 4 of the *Manual*.

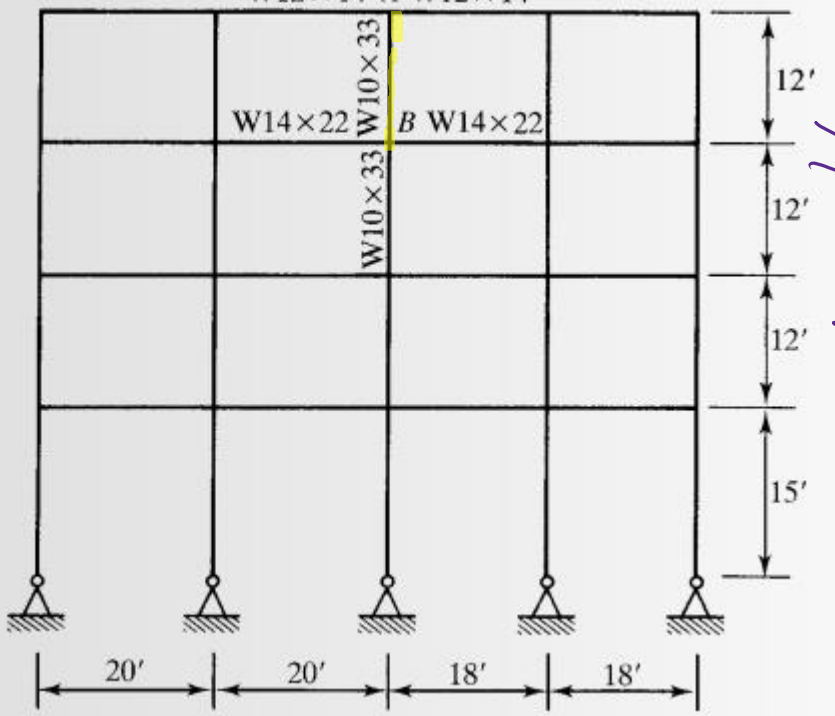
EXAMPLE 4.14

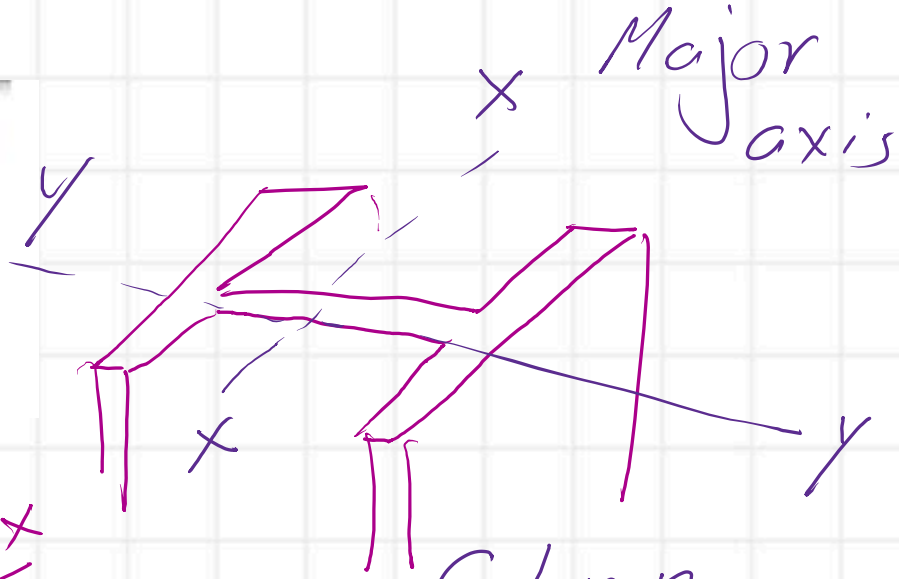
P-153

A rigid unbraced frame is shown in Figure 4.17. All members are oriented so that bending is about the strong axis. Lateral support is provided at each joint by simply connected bracing in the direction perpendicular to the frame. Determine the effective length factors with respect to each axis for member *AB*. The service dead load is 35.5 kips, and the service live load is 142 kips. A992 steel is used.

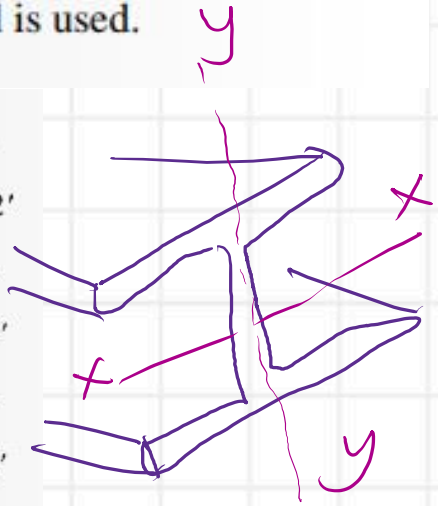
D : 35.50 kip
L : 142 kips

FIGURE 4.17





Column section



Girder section

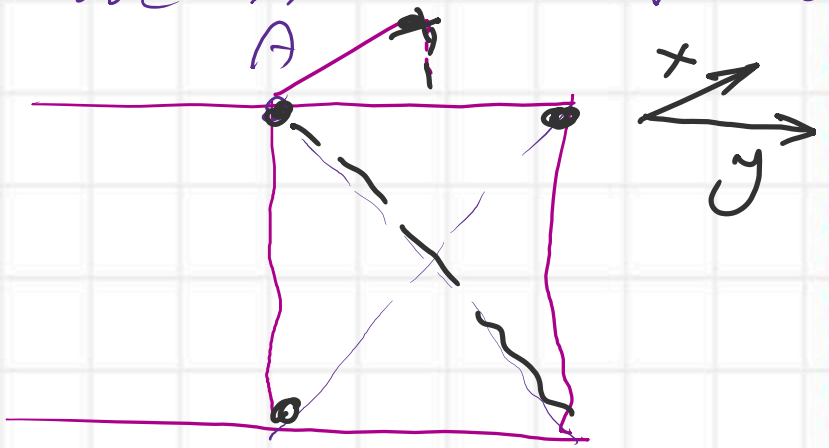
E = 29000 ksi

A992 steel Fy = 50 ksi

Check whether Column AB is Elastic or inelastic

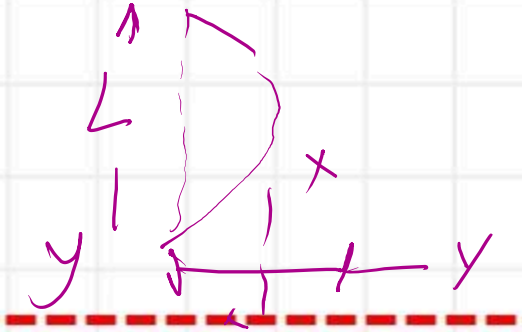
$$\left(\frac{KL}{r}\right)_x = \left(\frac{le}{r}\right)_x \geq 4.70\sqrt{\frac{E}{F_y}}$$

we need K value



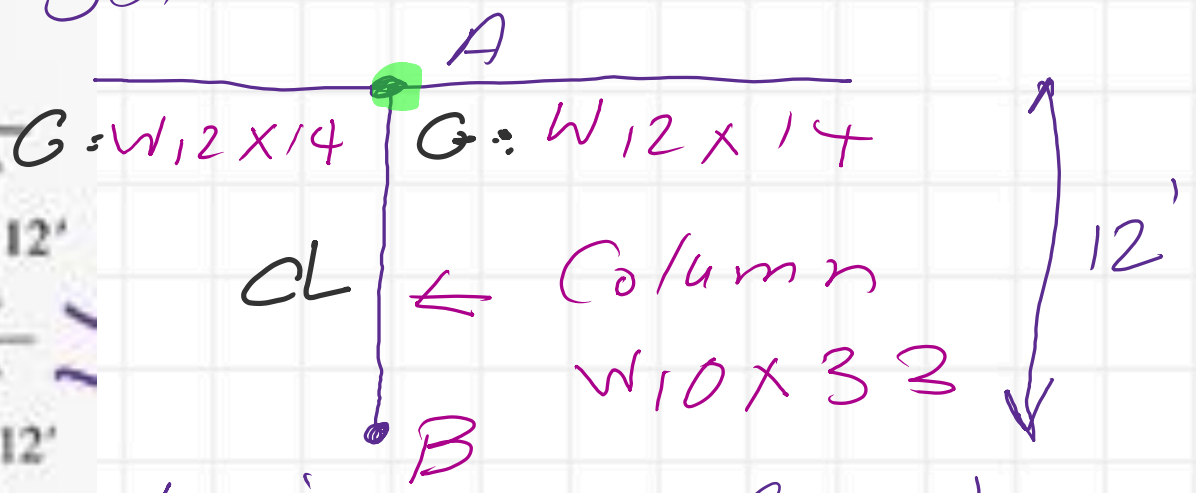
Frame is braced in the y-direction

We do our calculation for x-direction



y-direction

Joint A



Type	Std_Nomen	AISC_Manual_La	Weigl	A
W	W10X33	W10X33	33.0	9.71

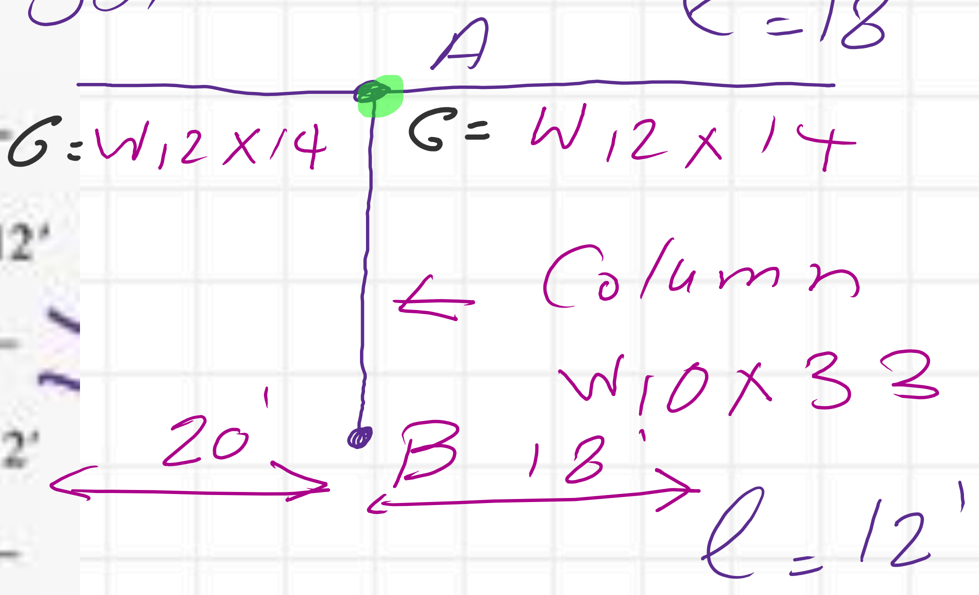
I_x	Z_x	S_x	r_x
171	38.8	35.0	4.19

Colum AB

$$\left(\frac{EI_x}{L_x}\right)_C = E\left(\frac{171}{12(12)}\right)$$

$$\left(\frac{EI_x}{L_x}\right)_{\text{Column AB}} = E(171/44)$$

Joint A



Two Girders (beams) W12×14

Type	Std_Nomen	AISC_Manual_La	Weigh	A
W	W12X14	W12X14	14.0	4.16

I_x	Z_x	S_x	r_x
88.6	17.4	14.9	4.62

Colum AB

$$\left(\frac{EI_x}{L_x}\right)_C = E\left(\frac{171}{12}\right)$$

$$\Sigma\left(\frac{EI}{L_x}\right)_{Beam} = E\left(\frac{88.6}{18} + \frac{88.6}{20}\right) \Rightarrow E(3366.80/360)$$

Girder →

$$G_A = \frac{E(171/12)}{E(3366.8/360)} = 1.5237$$

→ Column

→ Girder

Prepared by Eng.Maged Kamel.