



$$K_t = \frac{9E_{cs} \cdot C}{L_2 (1 - C_2/L_2)^3}$$

where $C = \sum (1 - 0.63 \frac{x}{y}) \frac{x^3 \cdot y}{3}$

x = smaller dimension

If parallel beam to direction (L_1) exists, then increase K_t to K_{to}

$$K_{to} = \frac{9E_{cs} C}{L_2 (1 - C_2/L_2)^3} * \frac{I_{sb}}{I_s}$$

$$I_s = \frac{L_2 t^3}{12} \quad \text{as beam}$$

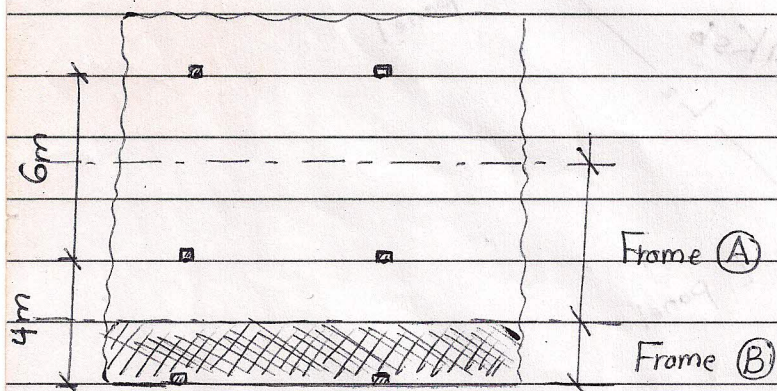
$$I_{sb} = \frac{bh^3}{12} * 2 \quad \text{int. beam (App.)}$$

$$\text{or } I_{sb} = I_o + Ad^2 \quad (\text{Exact})$$

Note/

① If there is No beam in direction (1) then $\frac{I_{sb}}{I_s} = 1$

② If the width of frame (L_2) is different



① For exterior Longitudinal Frame (B) $\Rightarrow K_t = \frac{9EC}{4(1 - C_2/L_2)^3}$

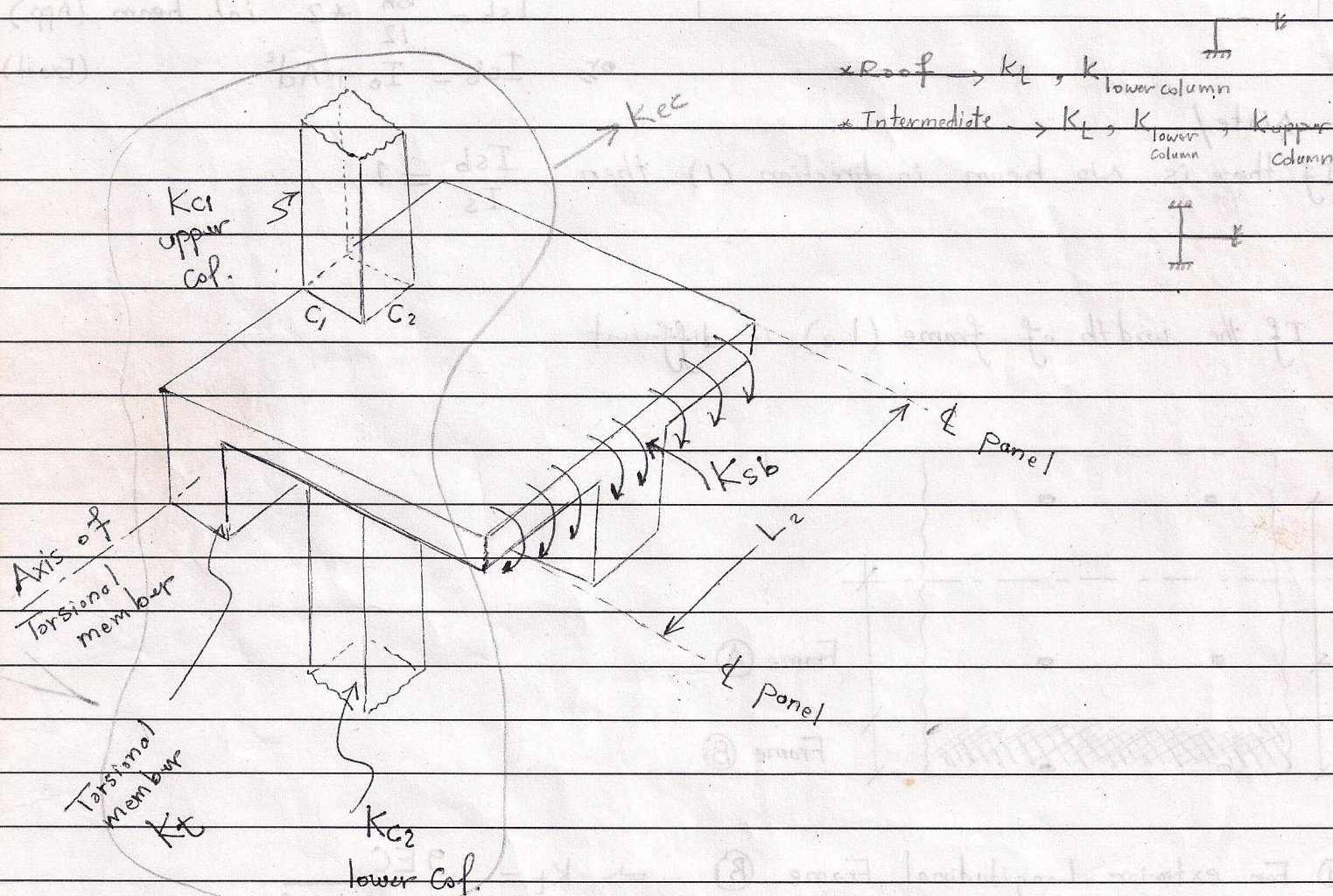
② For interior longitudinal Frame (A) $\Rightarrow K_t = \frac{9EC}{6(1 - C_2/L_2)^3} + \frac{9EC}{4(1 - C_2/L_2)^3}$

11. Equivalent Column stiffness (K_{ec})

$$\frac{1}{K_{ec}} = \frac{1}{\sum K_c} + \frac{1}{K_t}$$

where $\sum K_c = K_{c1} + K_{c2}$

↓ ↓
upper Col. lower Col.



Divided " K_{ec} " between the upper and lower columns in proportion to their stiffness to obtain the new equivalent stiffness K_{ec1} & K_{ec2}



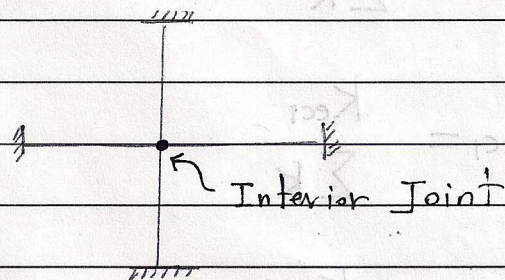
$$K_{ec1} = \frac{K_{c1}}{K_{c1} + K_{c2}} K_{ec}$$

$$\& K_{ec2} = \frac{K_{c2}}{K_{c1} + K_{c2}} K_{ec}$$

12 Distribution factors (D.F)

* For interior joint

$$\sum K = K_{sb \text{ left}} + K_{sb \text{ Right}} + K_{ec1} + K_{ec2}$$

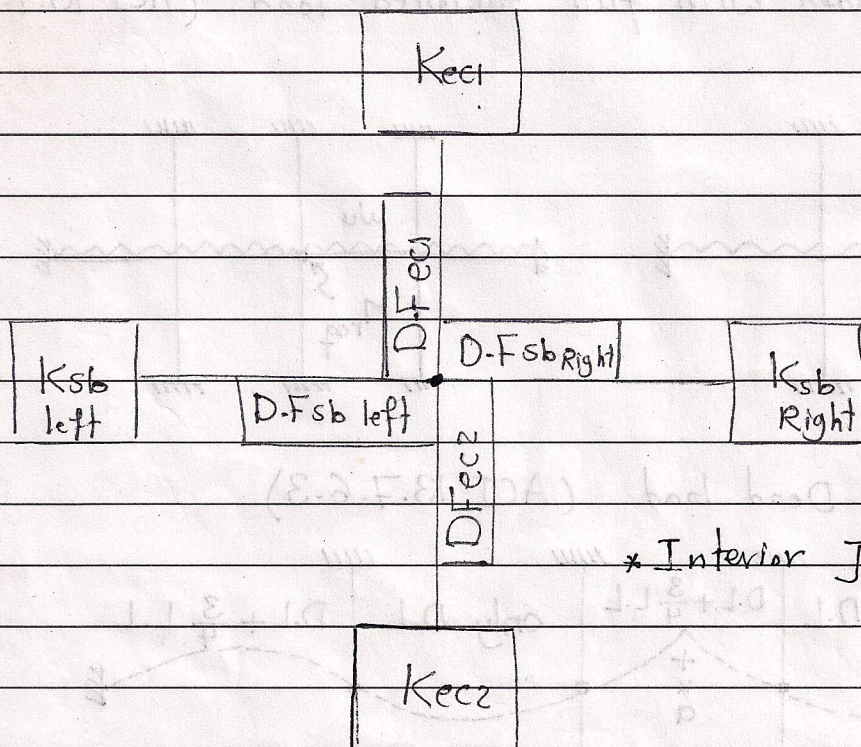


$$D.F_{sb \text{ left}} = \frac{K_{sb \text{ left}}}{\sum K}$$

$$D.F_{sb \text{ Right}} = \frac{K_{sb \text{ Right}}}{\sum K}$$

$$D.F_{ec1} = \frac{K_{ec1}}{\sum K}$$

$$D.F_{ec2} = \frac{K_{ec2}}{\sum K}$$





* For Exterior joint

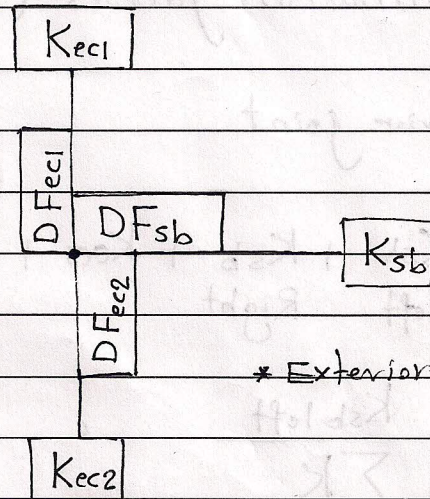
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2018

$$\sum K = K_{sb} + K_{ec1} + K_{ec2}$$

$$DF_{sb} = \frac{K_{sb}}{\sum K}$$

$$DF_{ec1} = \frac{K_{ec1}}{\sum K}$$

$$DF_{ec2} = \frac{K_{ec2}}{\sum K}$$

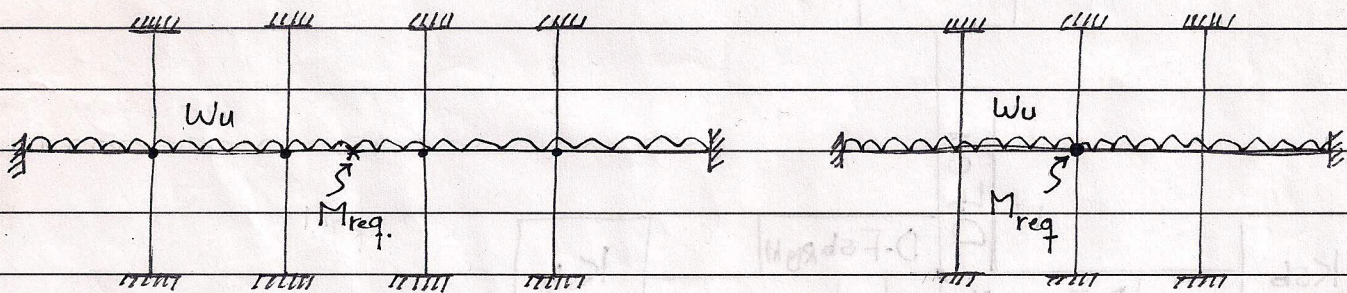


* Exterior joint

13- Loads on the Equivalent frame (ACI 13.7.6).

@ When the live load $\leq \frac{3}{4}$ Dead Load (w/o factored)

→ All panels will be loaded with full factored load. (ACI 13.7.6.2)



⑥ When the live load $> \frac{3}{4}$ Dead load (ACI 13.7.6.3)

