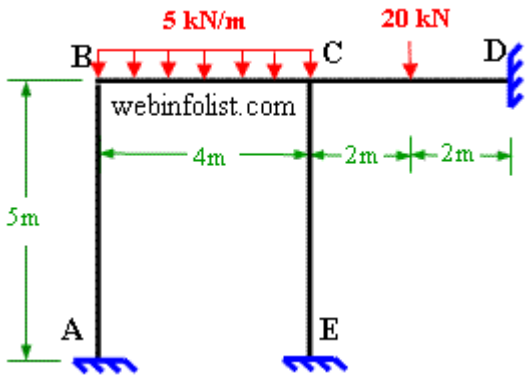
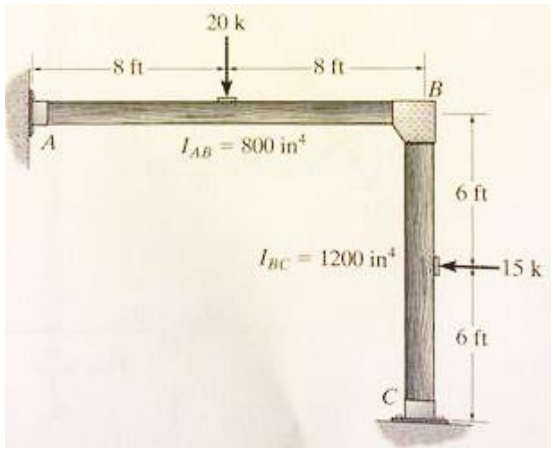
SLOPE DEFLECTION METHOD

Frames-Non Sway

- In frames there are two cases possible when there is no-sway and when there will be sway.
- In non sway frames, the horizontal movement of the frames is restrained with the help of adequate supports as shown in the following figures.

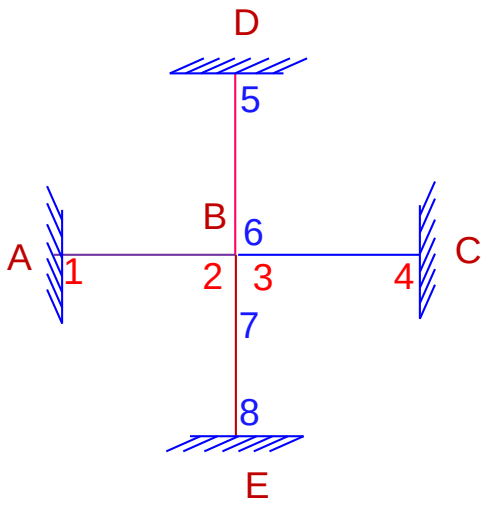




SLOPE DEFLECTION METHOD

Frames-Non Sway

- The analysis of non sway frames is similar to the analysis of beams except at a joint there will be more than one moments as shown below.



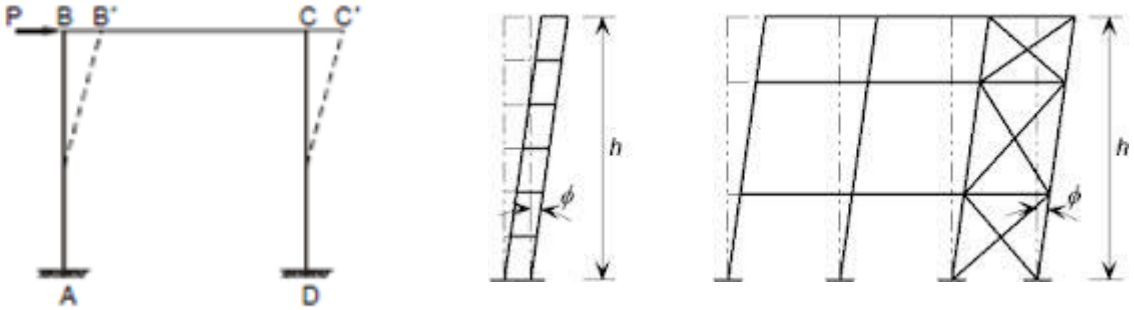
At Joint “B” we can write

$M_2+M_3+M_6+M_7=0$

SLOPE DEFLECTION METHOD

Frames- Sway

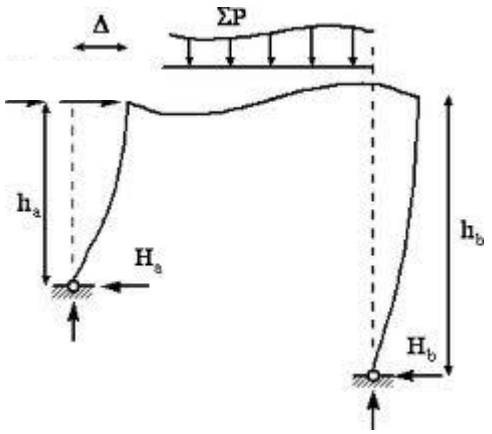
- Sway in the frames exists under wind or earthquake loading generally as shown below.



SLOPE DEFLECTION METHOD

Frames- Sway

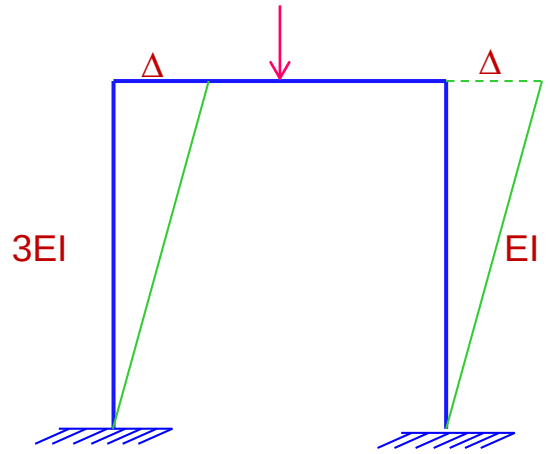
- Sway in frames also exists if no horizontal load is applied under following conditions.
  - When height of columns are different and only gravity loading is applied.



SLOPE DEFLECTION METHOD

Frames- Sway

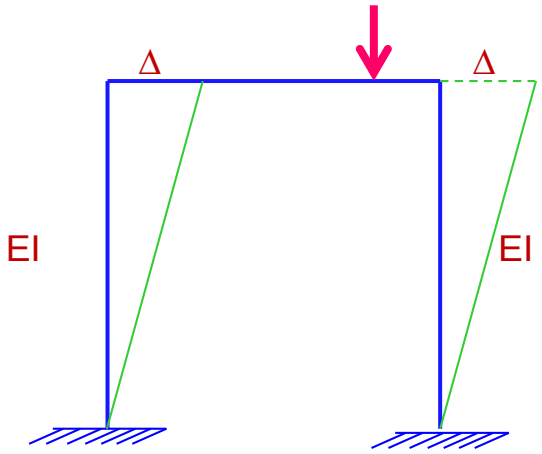
- When height of the columns are same but MOI or rigidity is different for two columns.



SLOPE DEFLECTION METHOD

Frames- Sway

- When heavy loads are concentrated to one side only or un-symmetrical loading.



SLOPE DEFLECTION METHOD

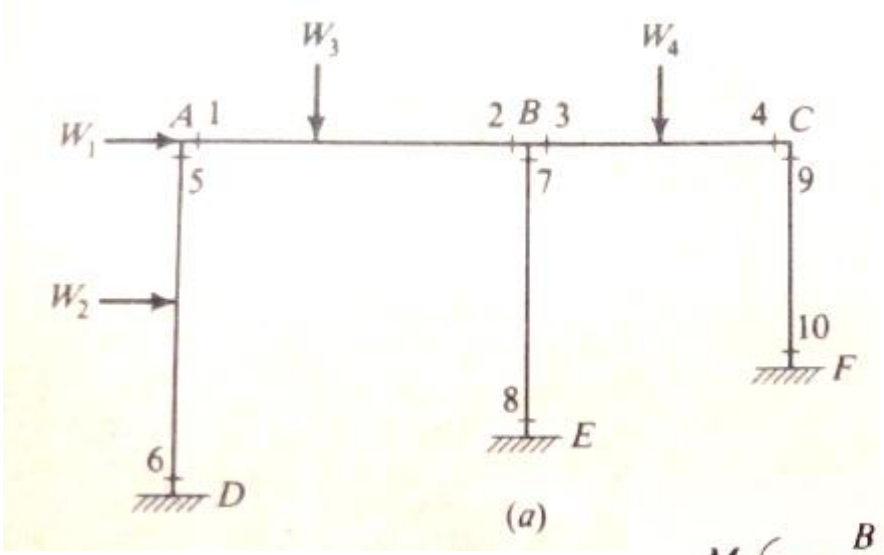
Frames- Sway

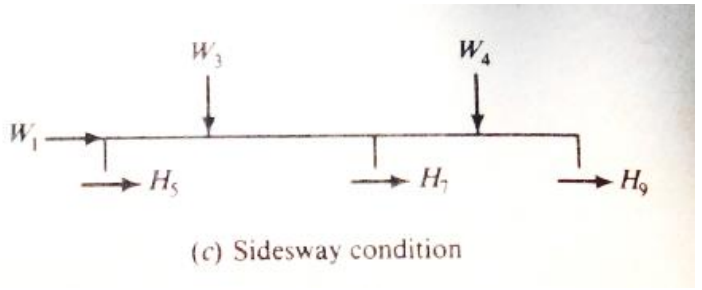
- In sway frame, lateral displacement is extra unknown which needs the additional condition for its solution.
- The additional condition obtained from the lateral deflection is called the shear condition.
- Our next discussion will be on the shear condition on the sway frames.

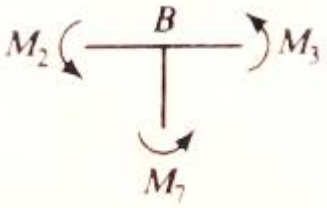
SLOPE DEFLECTION METHOD

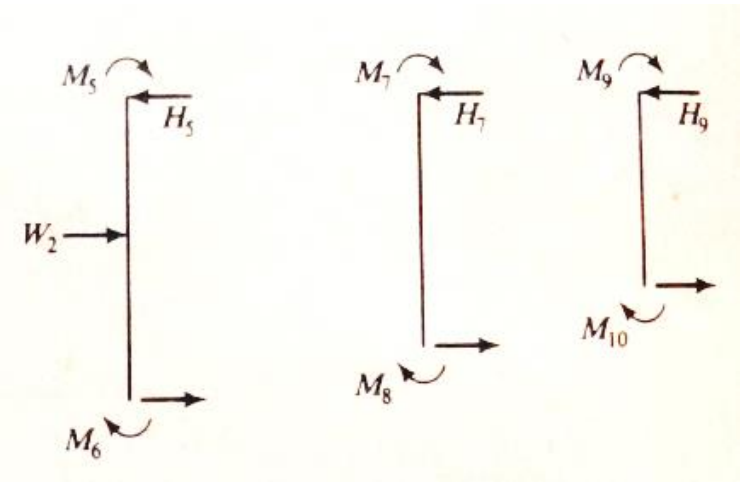
Frames- Sway (Shear Condition)

- Consider the Figure as shown below.









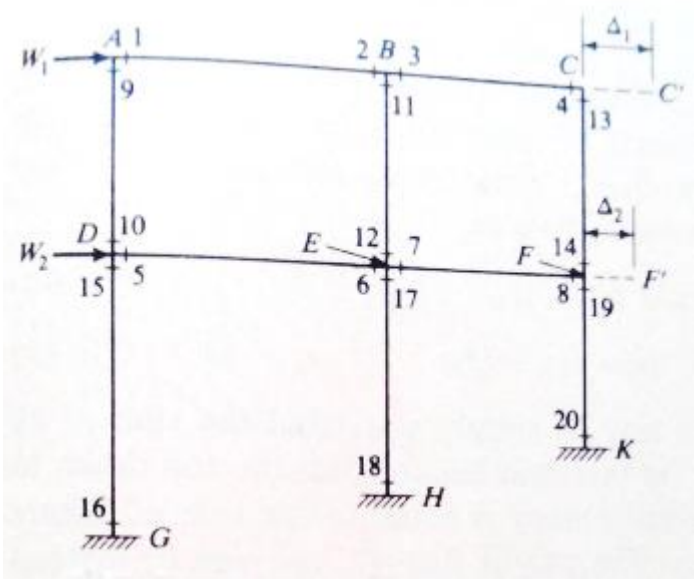
Shear Condition

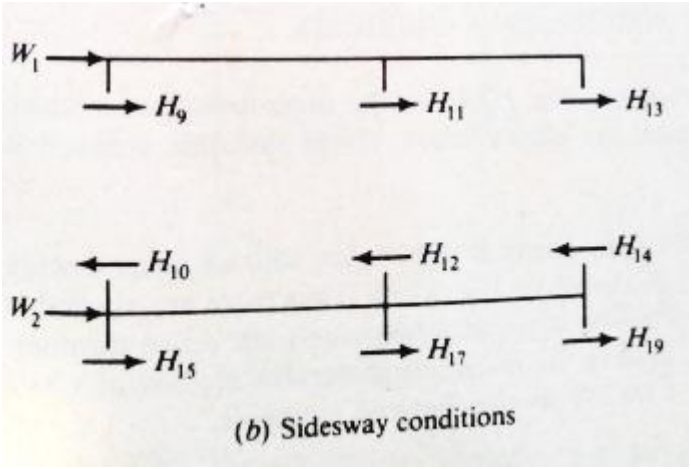
$H_5+H_7+H_9+W_1=0$

SLOPE DEFLECTION METHOD

Frames- Sway (Shear Condition)-Two storey case

- Consider the Figure as shown below.





Shear Condition-(Upper Storey)

$H_9+H_{11}+H_{13}+W_1=0$

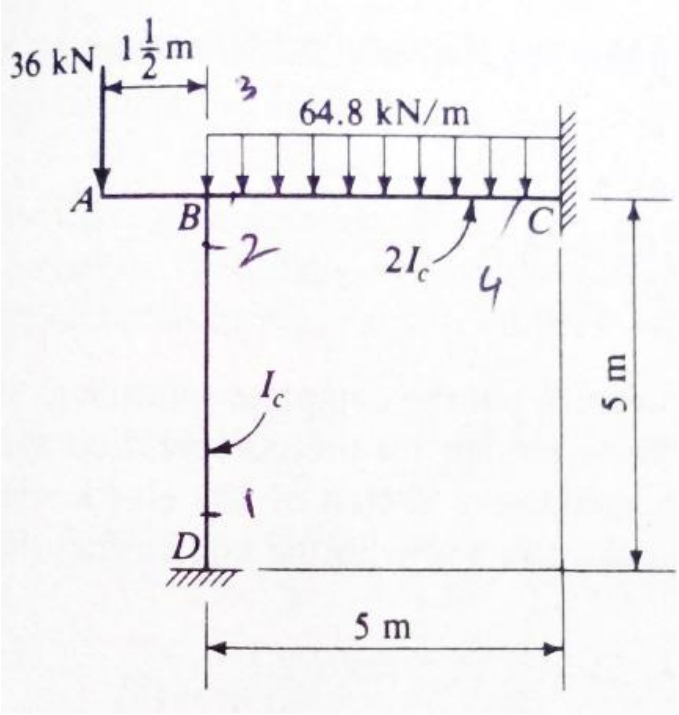
Shear Condition for Lower Storey

$H_{15}+H_{17}+H_{19}-H_{10}-H_{12}-H_{14}+W_2=0$

SLOPE DEFLECTION METHOD

Frames- Non-Sway Problem-1

- Analyze the frame using SDM also draw SF and BMD's.



$EI\Theta_B = 33.75$

$M_1 = +13.5$ kN-m

$M_2 = +27$ kN-m

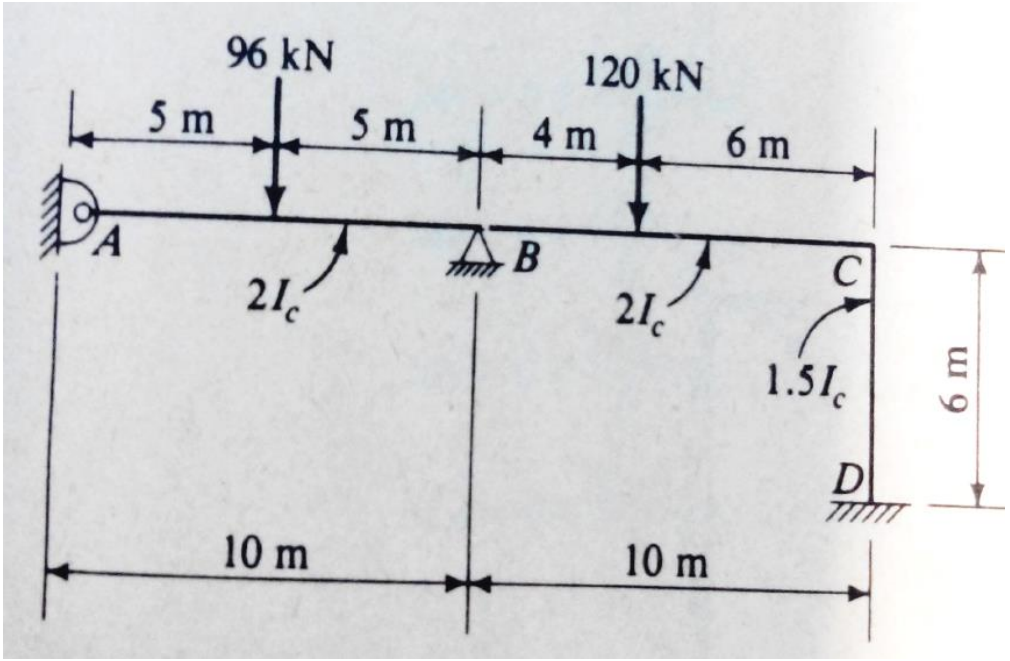
$M_3 = -81$ kN-m

$M_4 = +162$ kN-m

SLOPE DEFLECTION METHOD

Frames- Non-Sway Problem-2

- Analyze the frame using SDM also draw SF and BMD's.

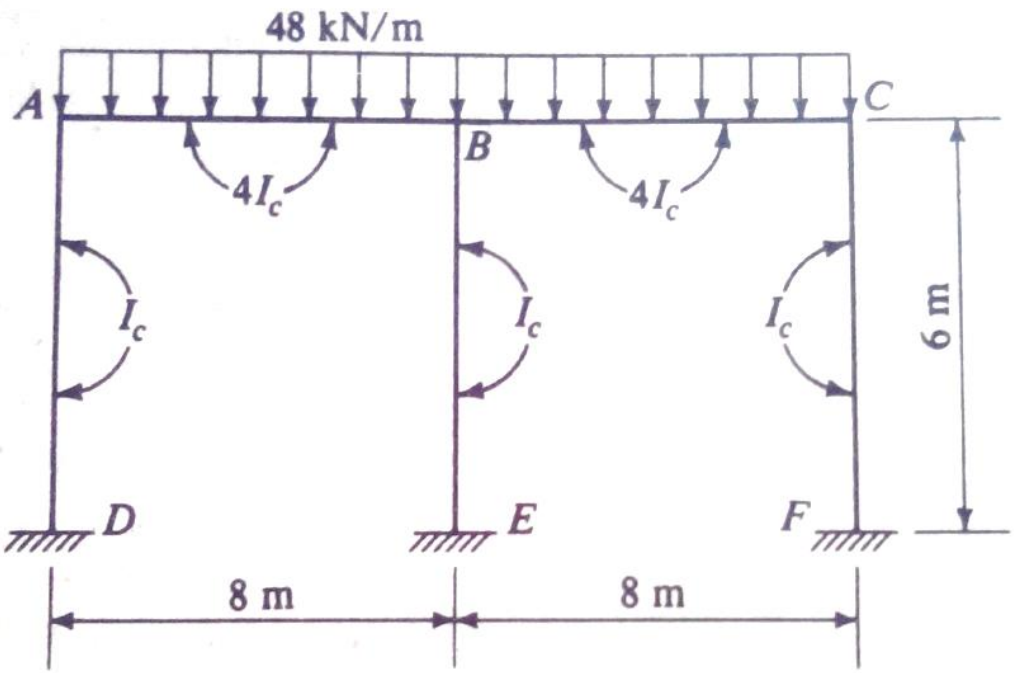


$EI\Theta_A$= -67.12
$EI\Theta_B$= 14.03
$EI\Theta_C$= 142.98
M_2= +188.42 kN-m
M_3= -188.42kN-m
M_4 = +67.12kN-m
M_5= -67.12 kN-m
M_6= -33.56kN-m

SLOPE DEFLECTION METHOD

Frames- Non-Sway Problem-3

- Analyze the frame using SDM also draw SF and BMD's.



$EI\Theta_A = +96$

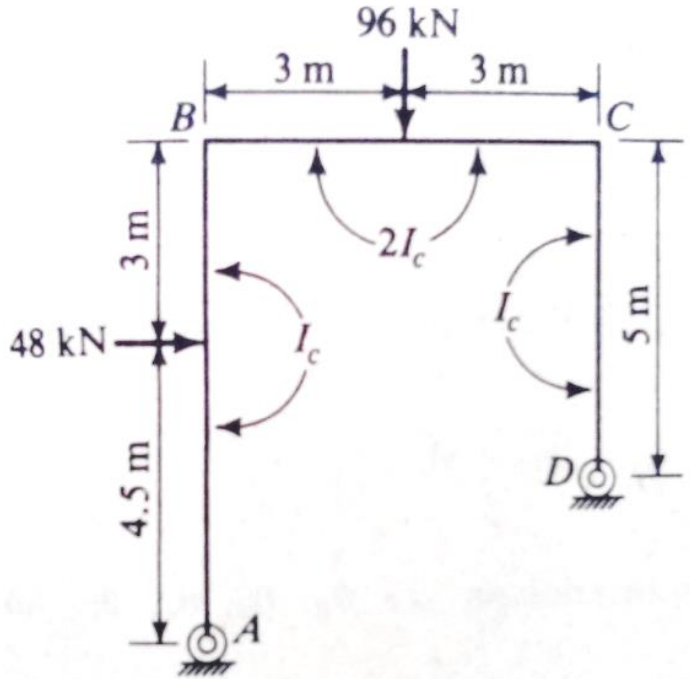
$EI\Theta_B = 0$

$EI\Theta_C = -96$

SLOPE DEFLECTION METHOD

Frames-Sway Problem-1

- Analyze the frame using SDM also draw SF and BMD's.



$EI\Theta_A$= +336.42
$EI\Theta_B$= 29.82
$EI\Theta_C$= 41.40
$EI\Theta_D$= 409.12
$EI\Delta$= 1432.7