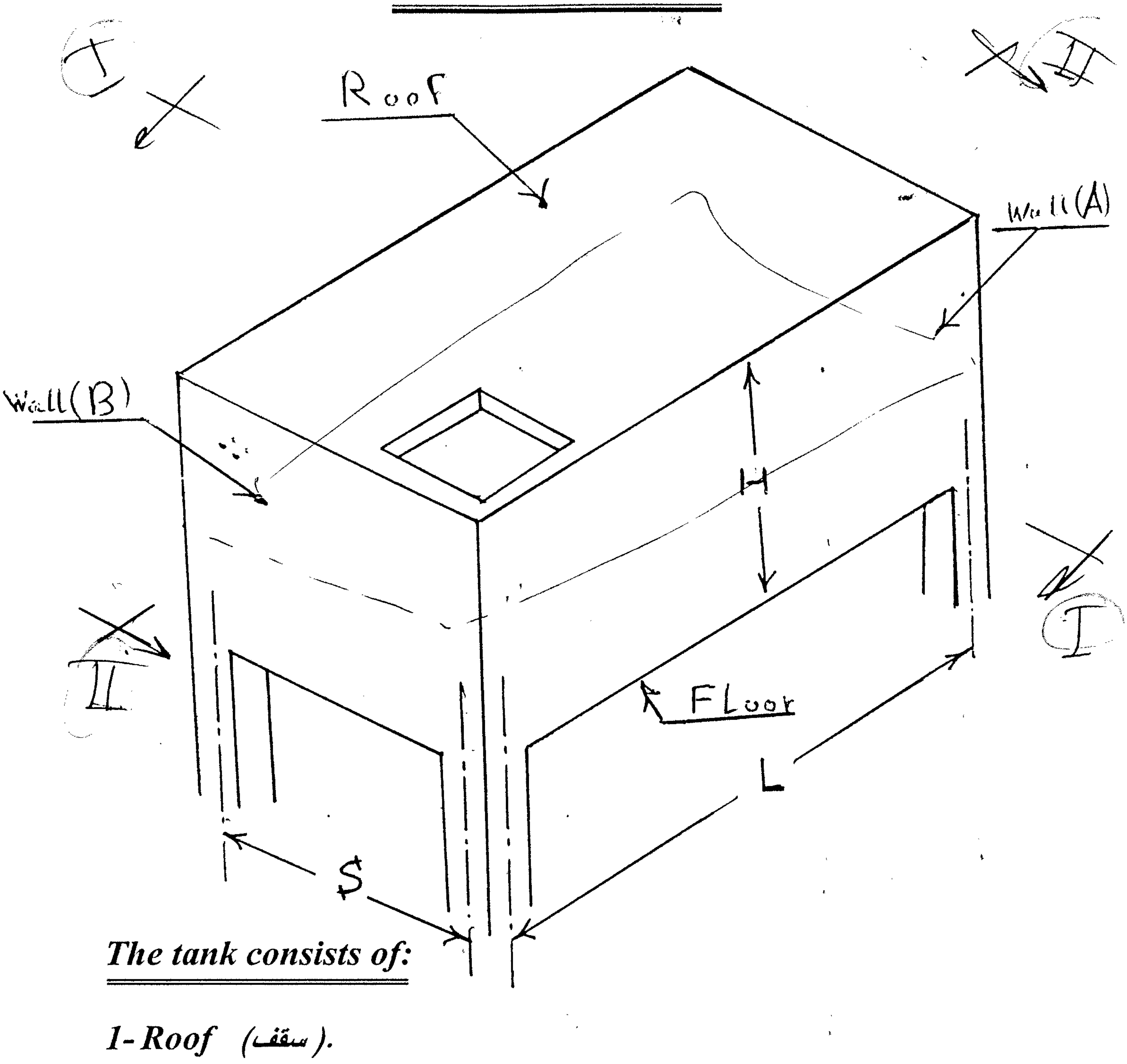
بسم الله الرحمن الرحيم

Design of Rectangular Elevated Tanks



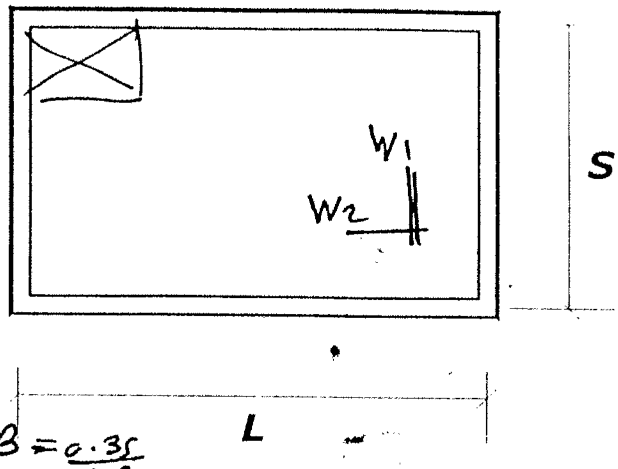
The tank consists of:

1- Roof (سقف).

2- Walls (حوائط جانبية) (acts as beams for the roof & floor).

3- Floor (أرضية).

I] Roof:



- يتم تصميم سقف الخزان كبلاطة عادية (T.W.S) ترتكز ارتكاز بسيط (simple) على حوائط الخزان و الحمل عليها w_{roof}

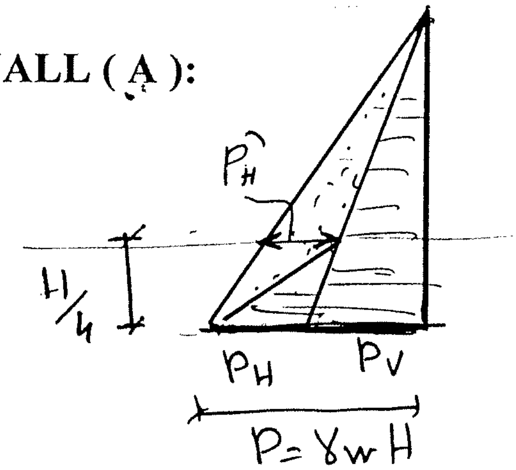
$$w_{roof} = t_s \gamma_{R.C.} + \text{cov.} + L.L.$$

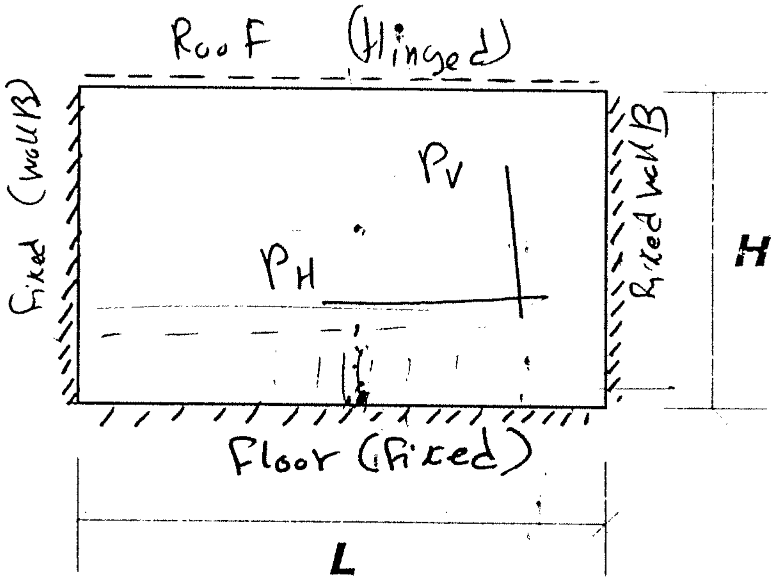
For T.W.S : $\alpha = 0.5r - 0.15$, $\beta = \frac{0.35}{r^2}$
$L.L \leq 5.0$

ملاحظة: قطاعات السقف تصمم (cracked) لأنة لا يلامس المياه

II] WALLS :

WALL (A):





$- if\ L' > H'$

Load distribution according to Grashoff coff.

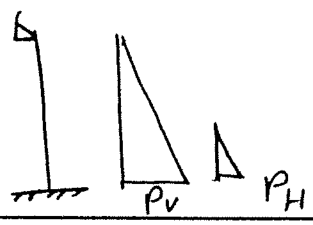
$$r = \frac{L'}{H'} = \frac{0.76L}{0.87H} = \quad \longrightarrow \quad \therefore \alpha = \frac{r^4}{1+r^4} \quad , \quad \beta = \frac{1}{1+r^4}$$

$$\alpha + \beta = 1.0$$

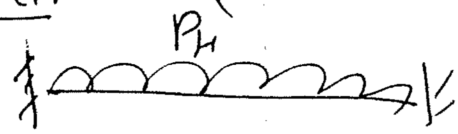
$$\therefore p_H = \beta \cdot p \quad , \quad p_V = \alpha \cdot p$$

$$\therefore P_V + P_H = P = \gamma_w H$$

Val dir.



Hal dir.



$-if\ L' < H'$

$$r = \frac{H'}{L'} = \frac{0.87H}{0.76L} = \longrightarrow \quad \therefore \alpha = \frac{r^4}{1+r^4} \quad , \quad \beta = \frac{1}{1+r^4}$$

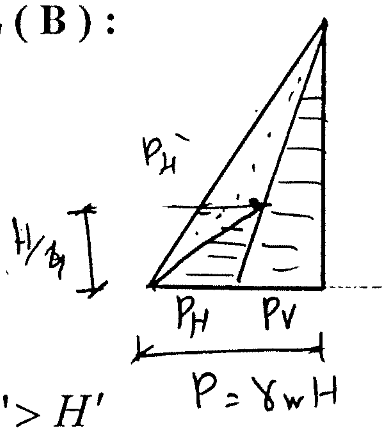
$$\therefore p_H = \alpha \cdot p \quad , \quad p_V = \beta \cdot p$$

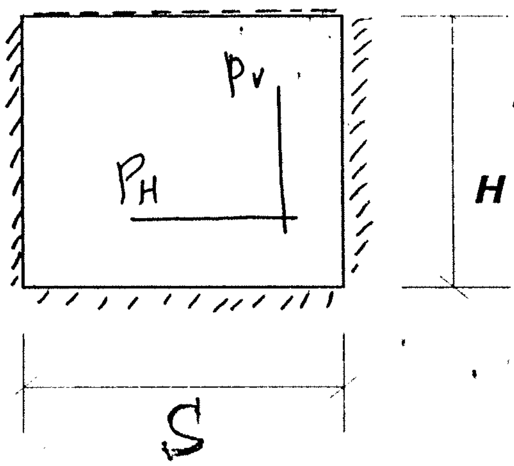
In both cases the load will be redistributed due to fixation in the floor.

يحدث إعادة توزيع للحمل فى الجزء السفلى من الحائط نتيجة التثبيت على إرتفاع (H/4)

$$\therefore p_H' = \tfrac{3}{4} P_H$$

WALL (B) :





$-if\ S' > H'$

$$r = \frac{S'}{H'} = \frac{0.76S}{0.87H} = \longrightarrow \quad \therefore \alpha = \frac{r^4}{1+r^4} \quad , \quad \beta = \frac{1}{1+r^4}$$

$$\therefore p_H = \beta \cdot p \quad , \quad p_V = \alpha \cdot p$$

$-if\ S' < H'$

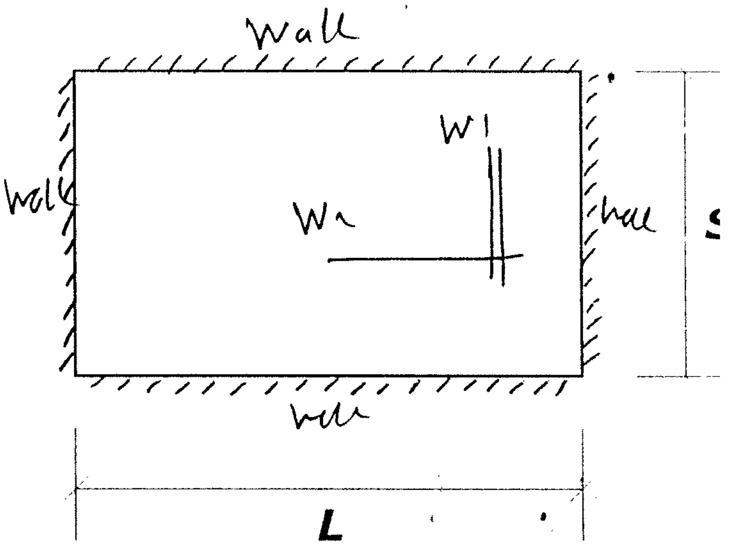
$$r = \frac{H'}{S'} = \frac{0.87H}{0.76S} = \longrightarrow \quad \therefore \alpha = \frac{r^4}{1+r^4} \quad , \quad \beta = \frac{1}{1+r^4}$$

$$\therefore p_H = \alpha \cdot p \quad , \quad p_V = \beta \cdot p$$

$$\therefore p_H' = \tfrac{3}{4} P_H$$

III] Floor:

* تصمم الأرضية كبلاطة مثبتة من جميع الجهات في الحوائط الأربعة.



Assume (t_f)

$t_f =$

$$\therefore w_f = t_f\ \gamma_{R.C.} + \text{cov.} + \gamma_w\ H$$

load distribution according to Grashoff coff.

$$\therefore r = \frac{L'}{S'} = \frac{0.76 \times L}{0.76 \times S} = \frac{L}{S}$$

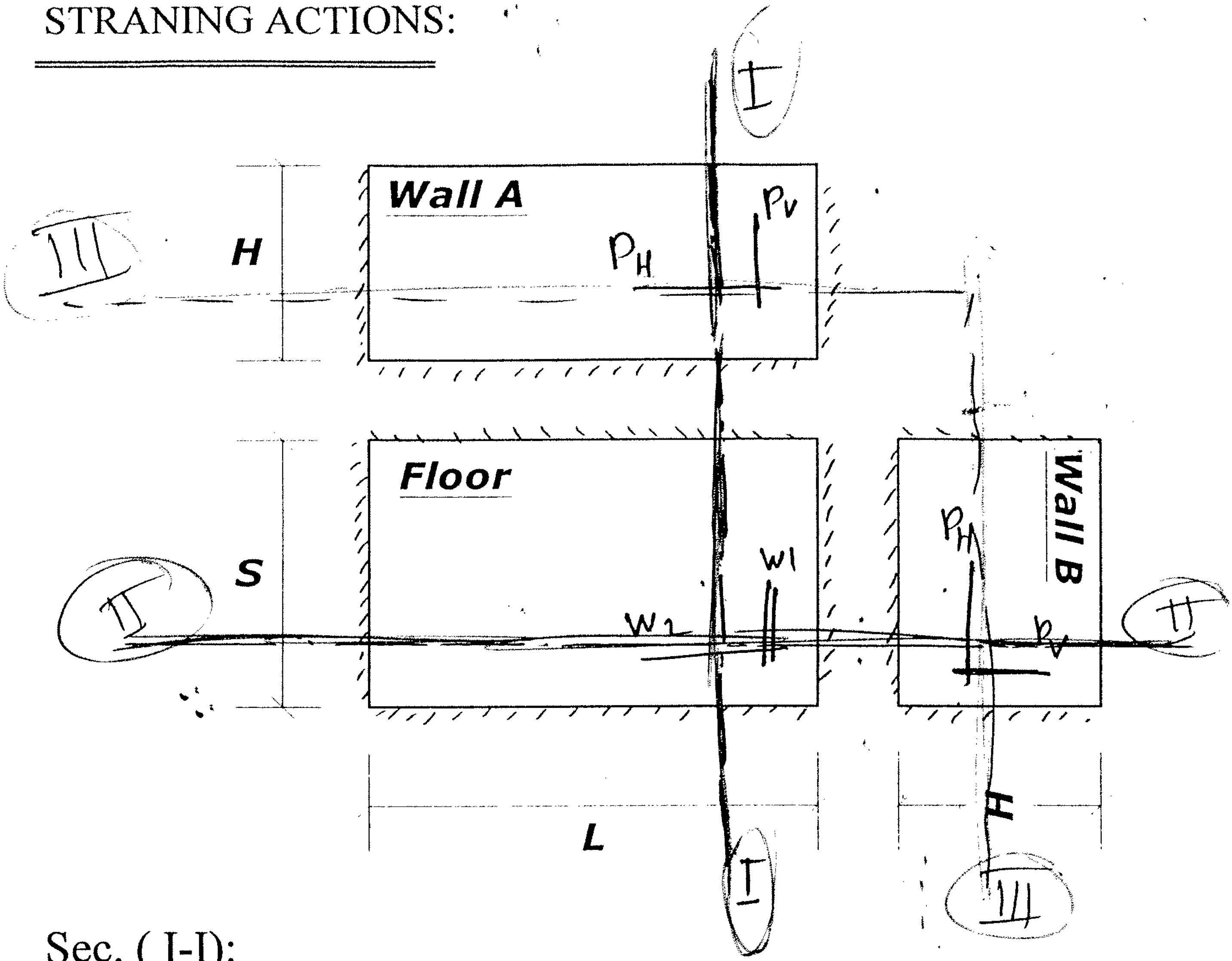
- If $r < 2.0 \longrightarrow$ *T.W.S*

$$\therefore \alpha = \frac{r^4}{1+r^4} \quad , \quad \beta = \frac{1}{1+r^4} \qquad w_1 = \alpha\ w_f \quad , \quad w_2 = \beta\ w_f$$

- If $r \geq 2.0 \longrightarrow$ *O.W.S*

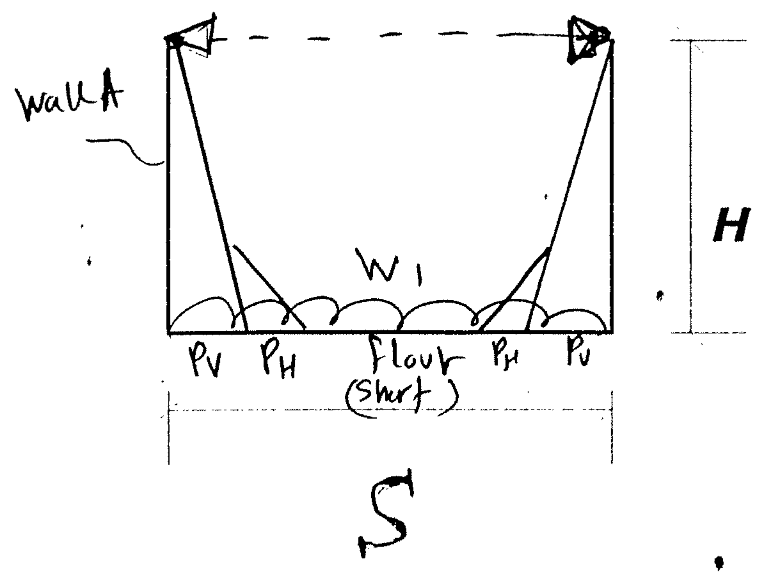
$$\therefore w_1 = w_f \quad , \quad w_2 = 0.0$$

STRANING ACTIONS:



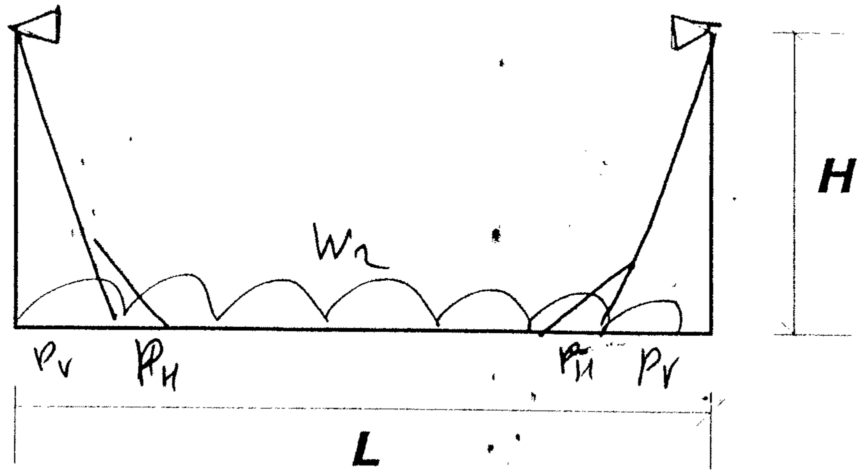
Sec. (I-I):

Wall A (vat dir.)
Floor (short dir.)



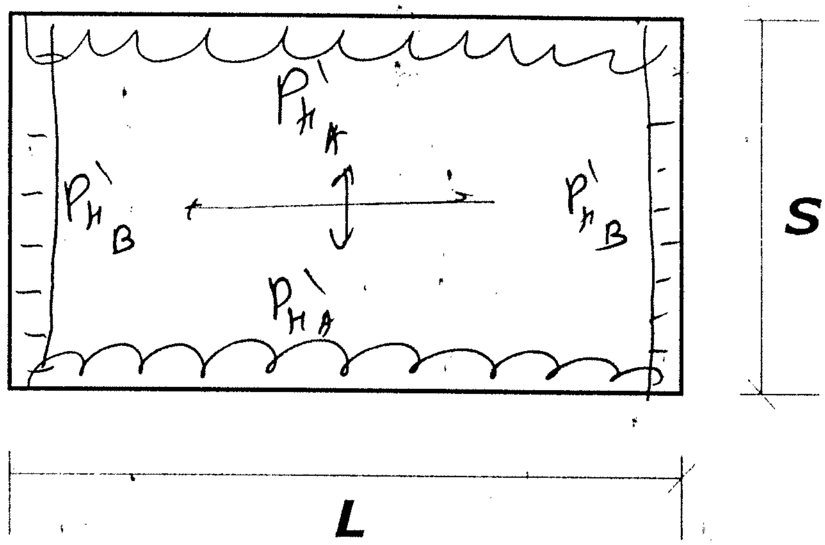
Sec. (II-II):

Wall B (Ver)
Floor (Long)



Sec. (III-III):

Wall A (Hal)
Wall B (Hal)

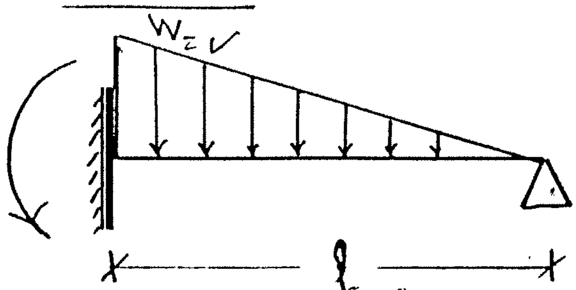


– يتم حل هذه القطاعات باستخدام (Moment distribution) لإيجاد قيم العزوم و الشد فى الإتجاهات المختلفة ، و يمكن أيضاً إستخدام (3- Moment equ.) لأيجاد العزوم (فقط فى قطاع III-III).

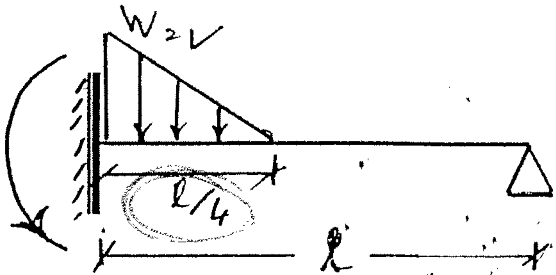
$$M = \frac{W_L L^3 + W_S S^3}{12(L+S)}$$

Moment Distribution: (Revision)

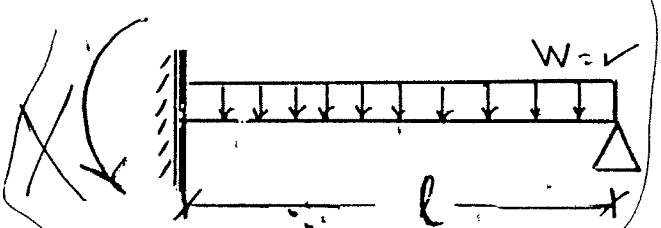
F.E.M.s :



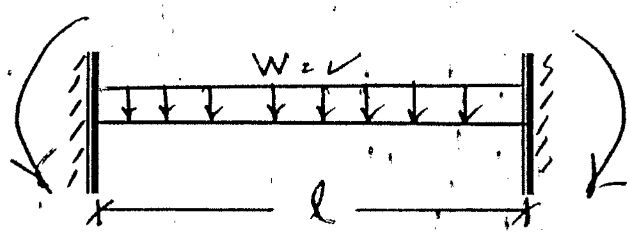
$$F.E.M = \frac{w\,l^2}{15}$$



$$F.E.M = \frac{w\,l^2}{117}$$

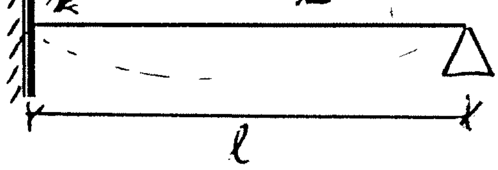


$$F.E.M = \frac{w\,l^2}{8}$$

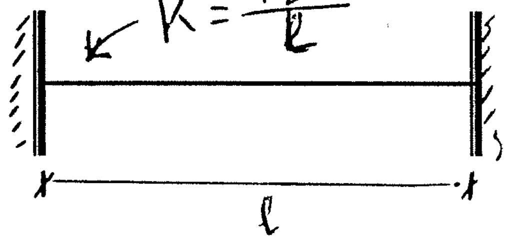


$$F.E.M = \frac{w\,l^2}{12}$$

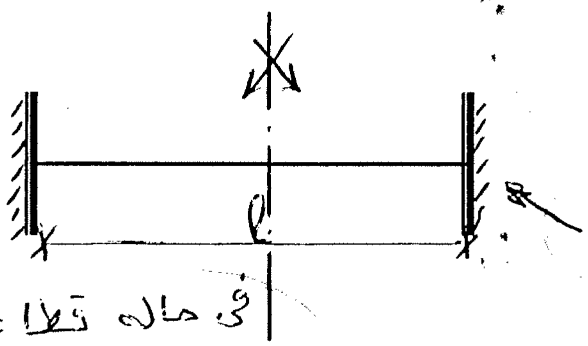
Stiffness: (K)



$$K = \frac{3\,EI}{l}$$



$$K = \frac{4\,EI}{l}$$



$$K = \frac{2\,EI}{l}$$

في حالة تماثل
[illegible]