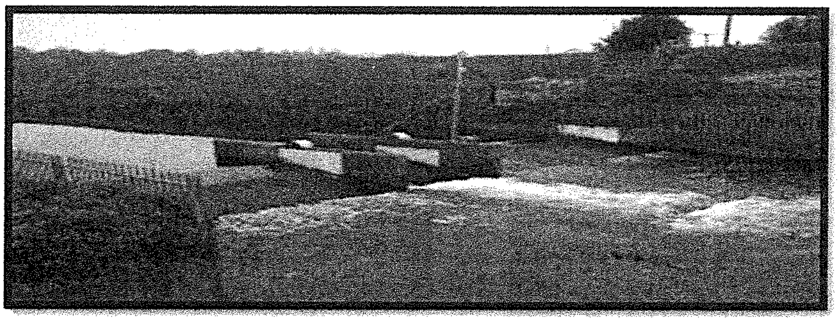
DESIGN OF IRRIGATION STRUCTURE (2)

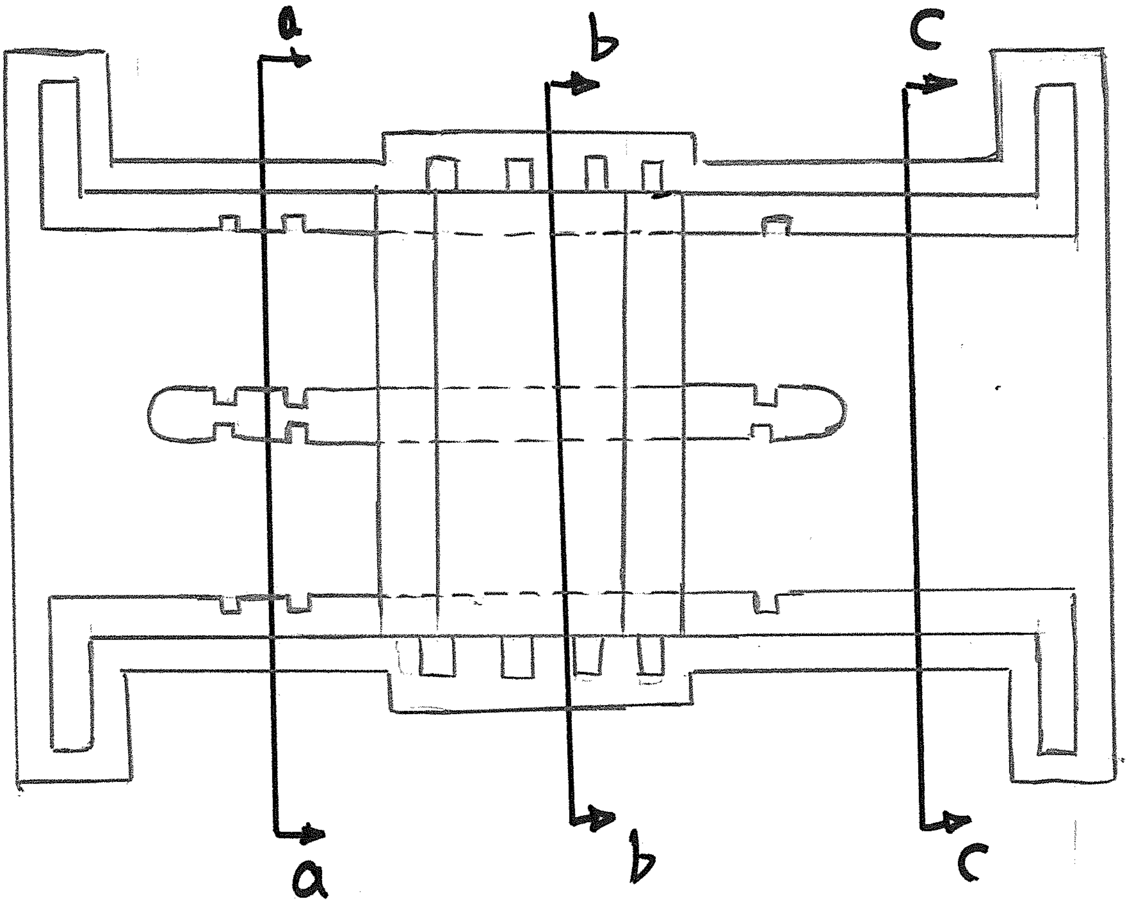
رابعة مدني



Regulator
(Design of Floor)

9

Design of floor

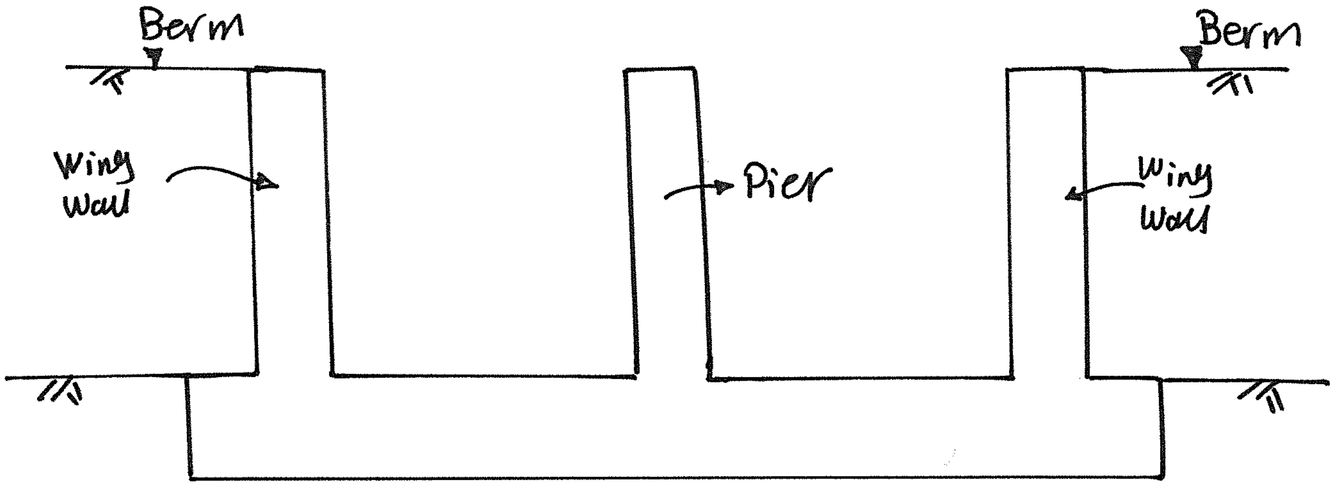


← يتم تصميم الفرشة بدراسة شريحة عرضها **(1m)** من الـ Floor
ولكن المشكلة في اختيار مكان هذه الشريحة وبالتالي يوجد
3 اماكن:

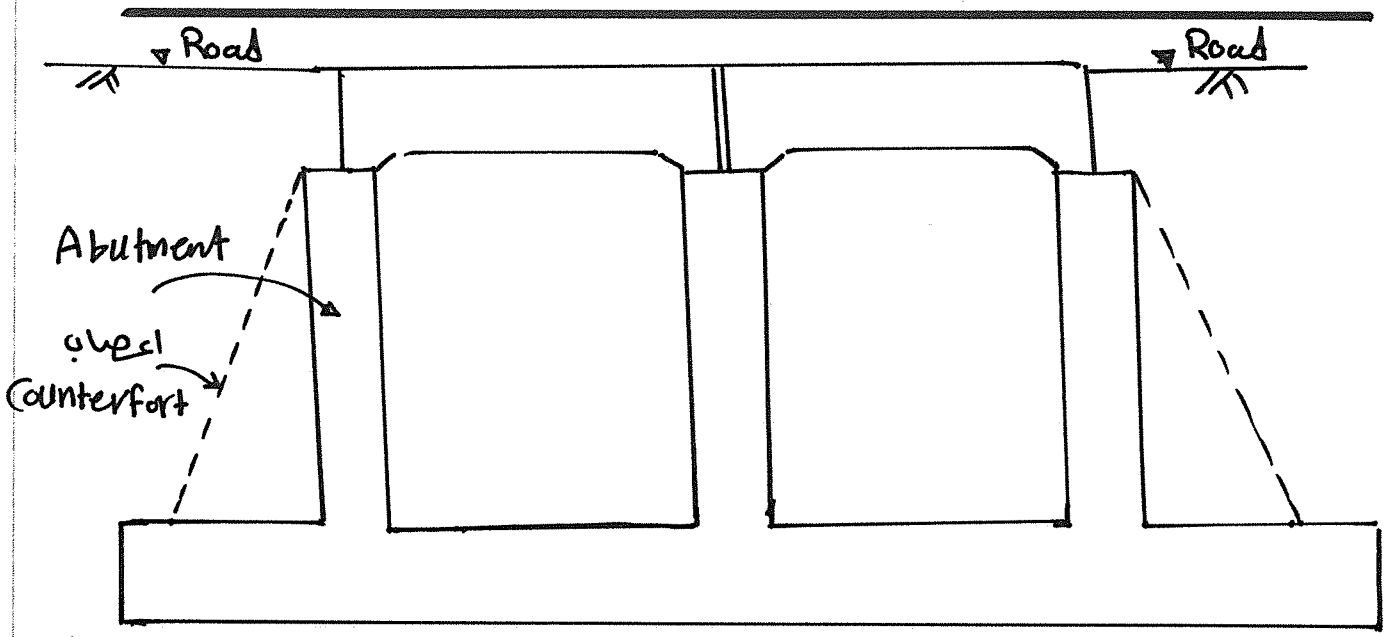
see a-a

see b-b

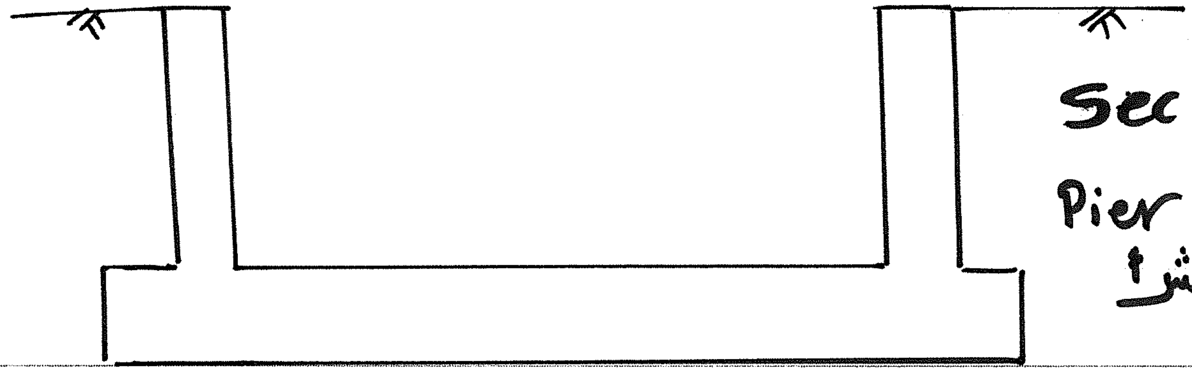
sec c-c



Sec (a-a) قبل الكوبرى



لان احمال الكوبرى كبيرة Sec (b-b) الاسواء



Sec (c-c)

بعد الـ Pier مباشرةً

ولكن

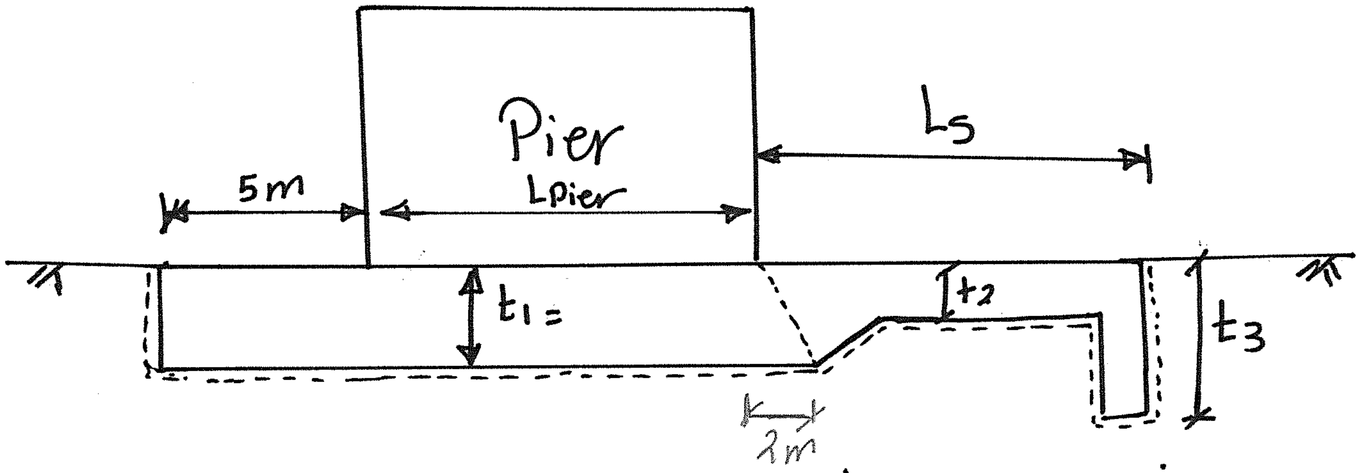
يتم التصميم على (see b-b) باعتبارة اسوا حالة (Worst Case) فى الاحمال وكمان يتم التصميم باعتبار عدم وجود المياة وهى الحالة التى تمثل بعد الانشاء مباشرة (Just after construction)

* معنى (just after construction) اى بعد الانشاء (بدون ماء)

لتصميم اى منشأ يتم عمل الاتى :-

1- assume Dimension فرض الابعاد
2- Loading حساب الاحمال
3- Straining action (M, N, Q)
4- Design
5- Drawing

* assume Dimension :



$\therefore L_s = 2.1\ C_B \sqrt{\frac{H_{Max}}{3.9}}$

$H_{Max} = \nabla USWL - \nabla bed = y_{us} + 0.3$

Given $y_{ds} = ..$

$\therefore y_{us} = y_{ds} + 0.1$

OR

$\therefore y_{us} = \nabla USWL - bed\ level$

$t_1 = \sqrt{H_{Max}}$

$t_2 = 0.7\ t_1$

$t_3 = 1.5\ t_1$

* Check of Percalation

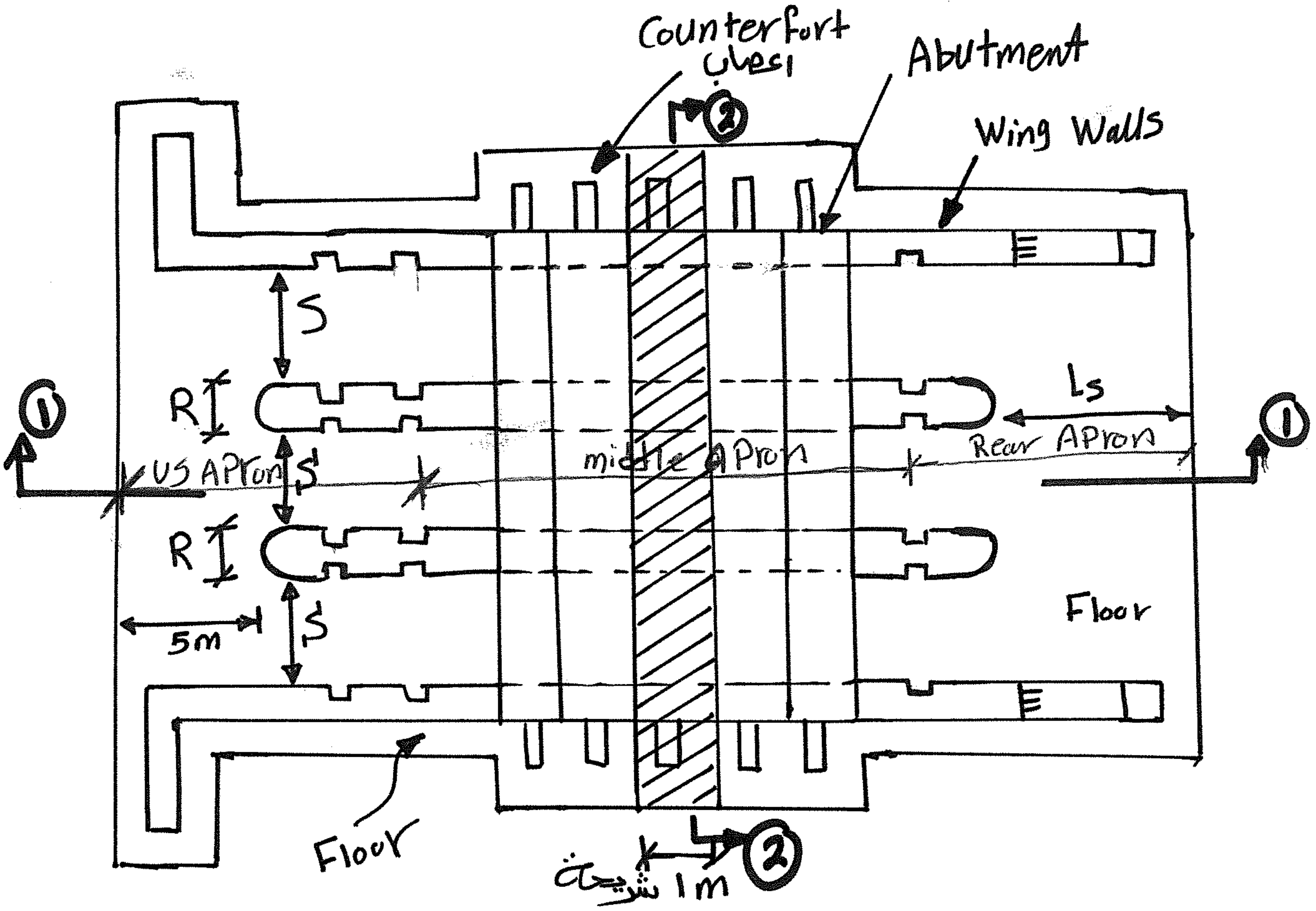
$L_{P_{req}} = C_B\ H_{Max}$

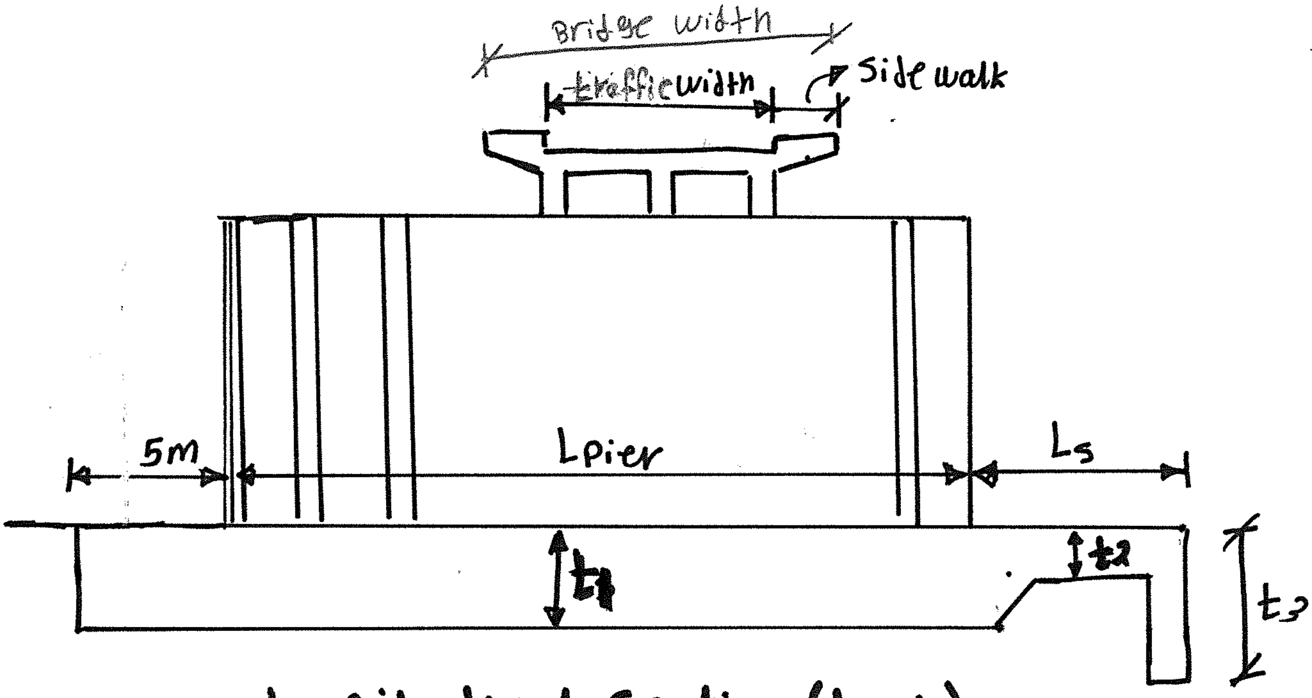
$L_{P_{act}} = 5 + L_{pier} + L_s + t_1 + (t_1 - t_2) + (t_3 - t_2) + t_3$

if $L_{P_{act}} \geq L_{P_{req}}$ ok

$L_{P_{act}} < L_{P_{req}}$ Not ok و نزود الابعاد

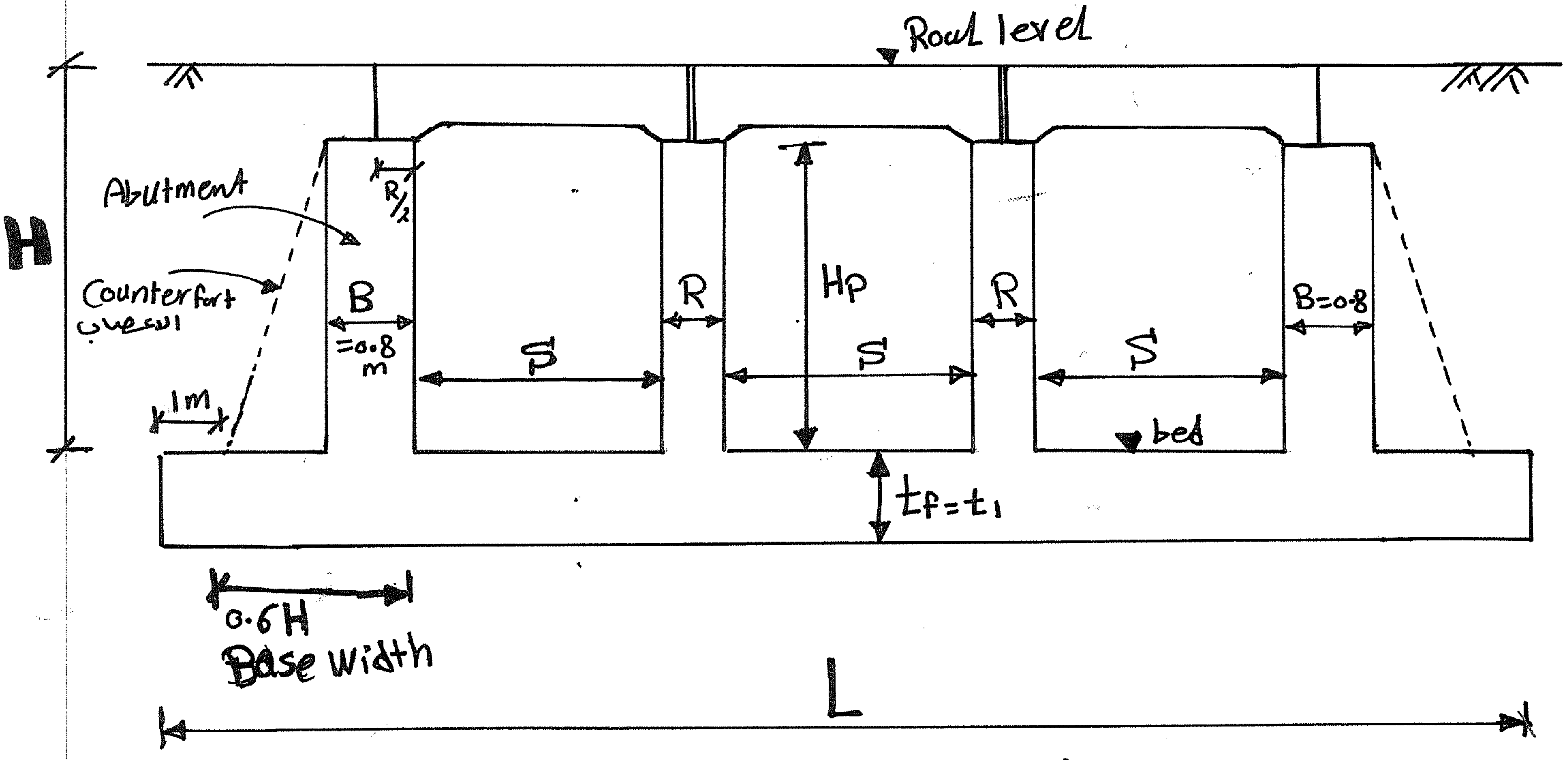
Design of floor





Longitudinal Section (1-1)

*** Dimension :-** (Design Middle Apron) Just After Constraction

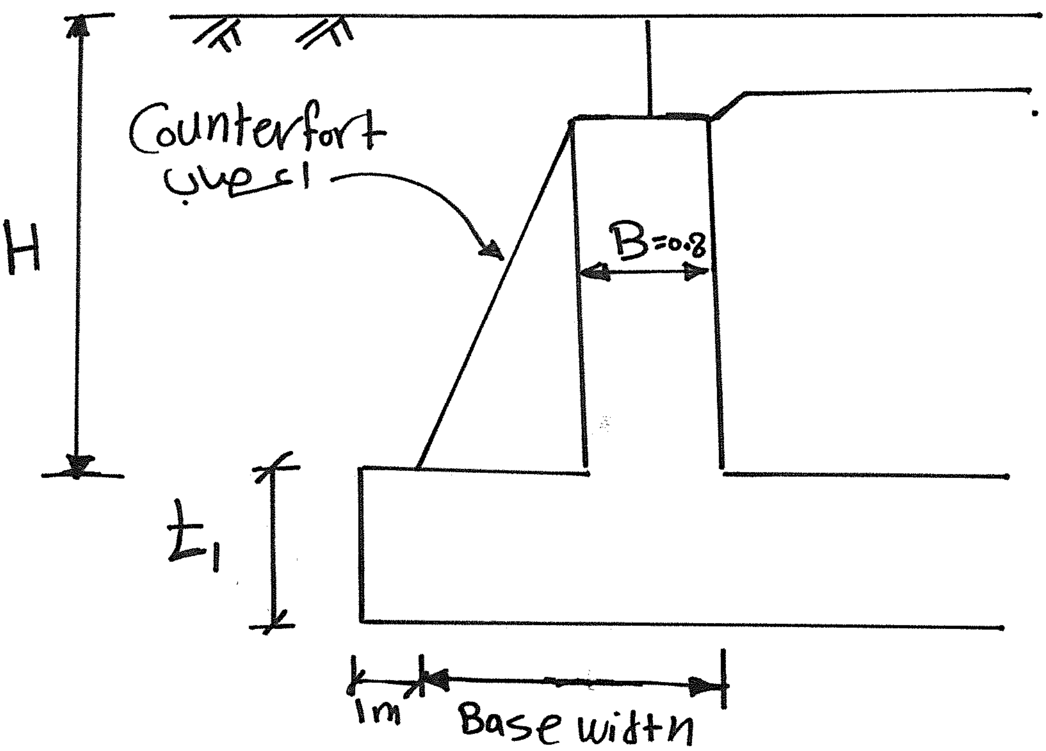


(Cross section 2-2)

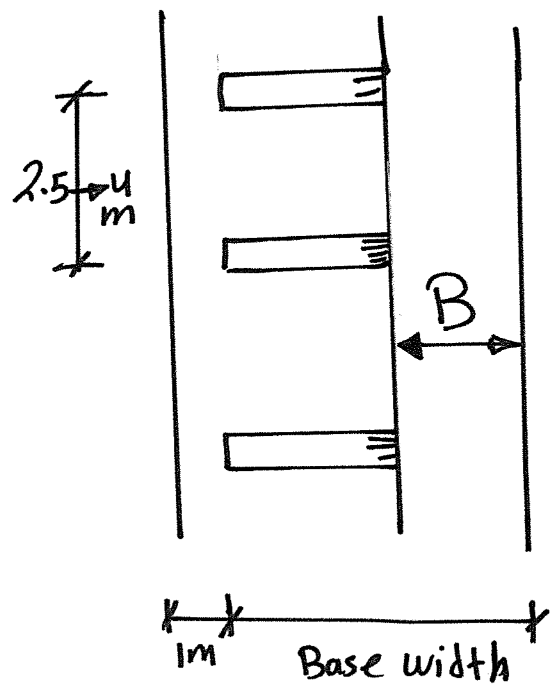
$$\therefore t_1 = \sqrt{H_{max}}$$

$H_{max} = ▽USWL - ▽bed + 0.3$

توضيح ابعاد ال Abutment :



ELEV



B = 0.8 m

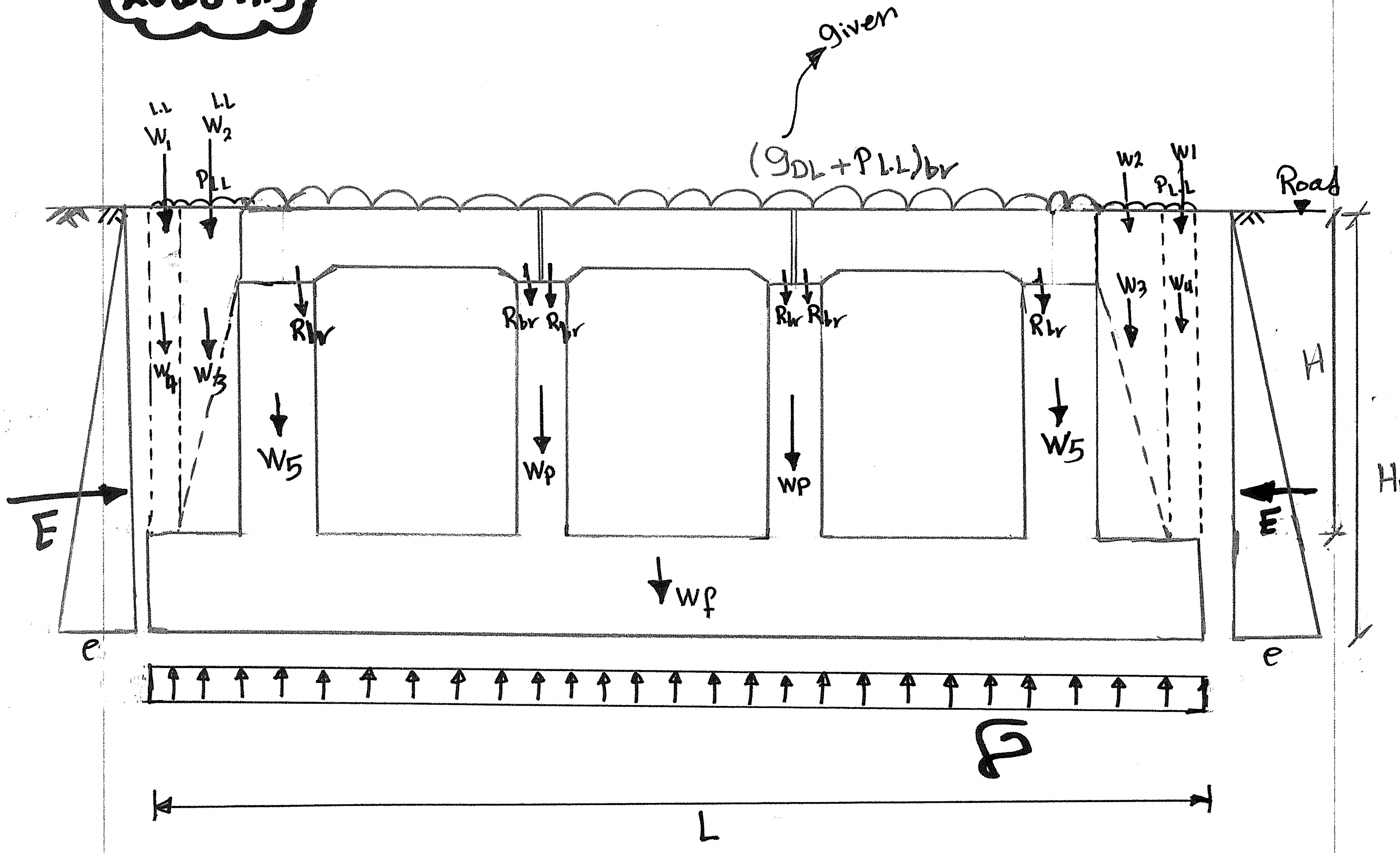
Base width =

$= (0.55 \to 0.7)\, H$

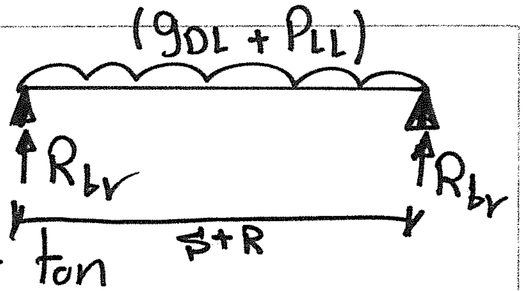
↓ 0.6

Base width = 0.6 H

Loading


given
$W_1^{L.L}$
$W_2^{L.L}$
$P_{L.L}$
$(g_{DL} + P_{L.L})_{br}$
W2
W1
$P_{L.L}$
Road
R_{br}
R_{br} R_{br}
R_{br} R_{br}
R_{br}
W_4
W_3
W3
W4
W5
W5
Wp
Wp
Wf
E
E
e
e
H
H_1
L

Loads on 1m



→ $R_{br} = \dfrac{(P_{LL} + g_{D.L})(S+R)}{2} = \checkmark\checkmark$ ton

∴ $g_{D.L}$ → given (t/m^2)

if not given take $g_{DL} = 1.2\ t/m^2$

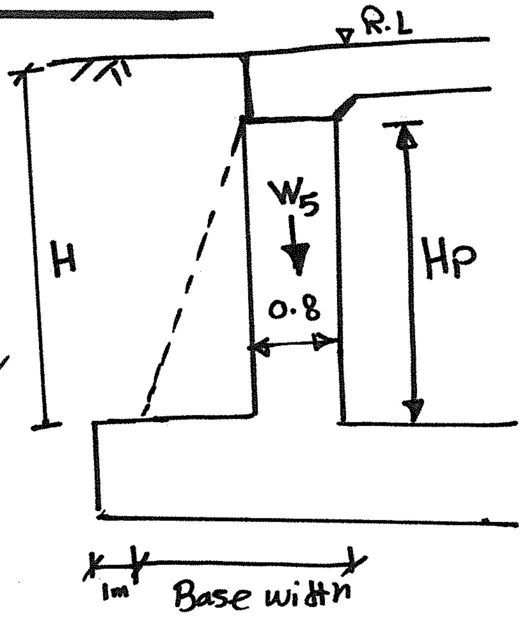
P_{LL} → given (t/m^2)

if not given take $P_{L.L} = 1.5\ t/m^2$

→ **W_P** (Weigh of Pier)

$W_P = (R * H_P * 1_m) * \gamma_c$ → 2.5 RC ✓✓ / → 2.2 P.C

→ **Abutment own wt**



∴ Base width = $0.6 * H$ = ✓✓

$W_5 = (0.8 * H_P * 1_m)\ \gamma_C$ → 2.5 RC ✓✓ / → 2.2 PC

* Earth Weigh :-

$$W_3 = \gamma_e * \left(\frac{1}{m} * (\text{Base width} - 0.8) * H \right) = \text{ton}$$

$\gamma_e \rightarrow$ unit weight of earth

$\gamma_e \rightarrow$ given

if not given take $= 1.65 \; t/m^3$

$$W_4 = \gamma_e * \left(\frac{1}{m} * \frac{1}{m} * H \right) = \text{✓✓} \; \text{ton}$$

Vertical Live Load :-

$$W_1 = (1 * 1 * P_{LL}) = \text{✓✓} \; \text{ton}$$

$$W_2 = (1 * (\text{Base width} - 0.8) * P_{LL}) = \text{✓✓} \; \text{ton}$$

---

* Floor weight :-

assume $t_1 = \sqrt{H_{Max}}$

$$W_f = \left(t_1 * L * \frac{1}{m} \right) * \gamma_c$$

$\gamma_c \rightarrow$ 2.5 R.C ✓✓

$\gamma_c \rightarrow$ 2.2 P.C

* Earth Pressure :-

$$\therefore \; e = \gamma_e * H_1 * k_a$$

$$\rightarrow \; H_1 = H + t_1$$

$$\rightarrow \; k_a = \frac{1 - \sin\phi}{1 + \sin\phi}$$

$$\therefore \; E = \frac{1}{2} * e * H_1 * \underset{m}{1} = \text{ــ ton}$$

Check of Soil Reaction

رد فعل التربة.

$$\sigma = \frac{\sum (W + R_{br})}{L * \underset{m}{1.0}} = \frac{N}{A}$$

$$\sigma = \text{ــ } t/m^2 \not> f_{all\,soil}$$

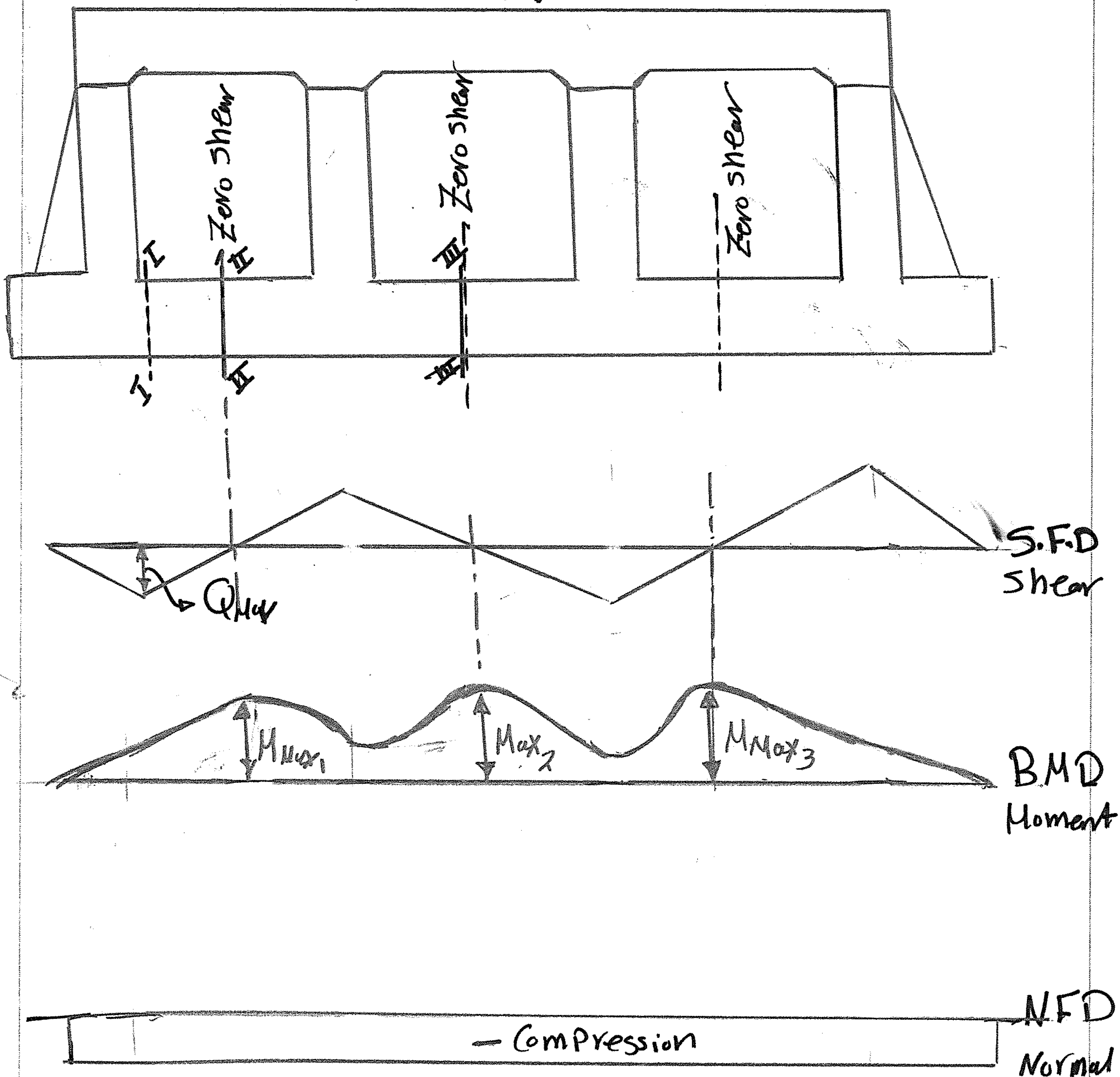
→ Bearing Capacity of Soil

تم حساب رد فعل التربة ح لانه سيدخل في حسابات العزوم كما انه ممكن يطلب ك Check لوحده

* Straining action :-

(المطلوب ايجاد (M_{Max} ، N ، Q_{Max}

*اقصى عزم يوجد عند مكان (Zero shear)

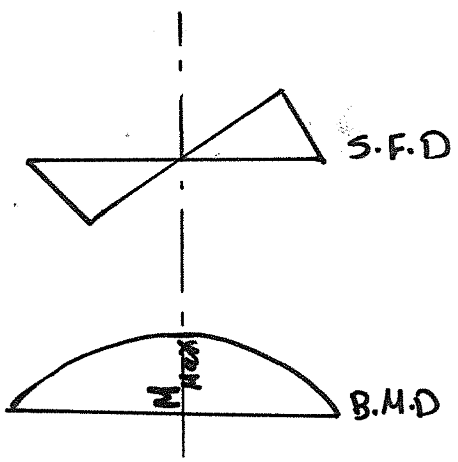


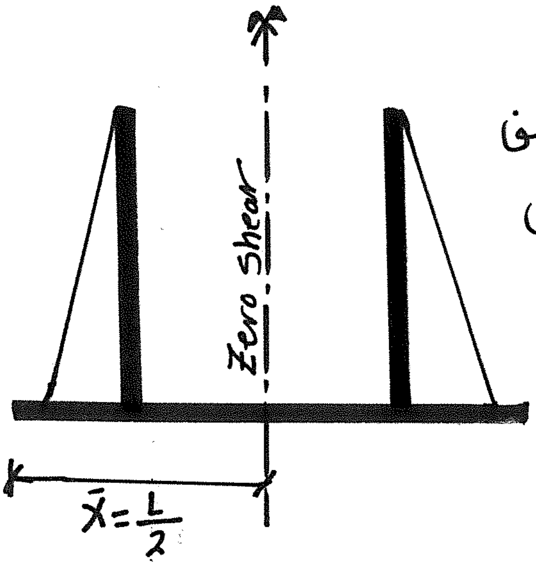
Zero shear Position :-

تحديد مكان الـ Zero shear

example

* For one vent

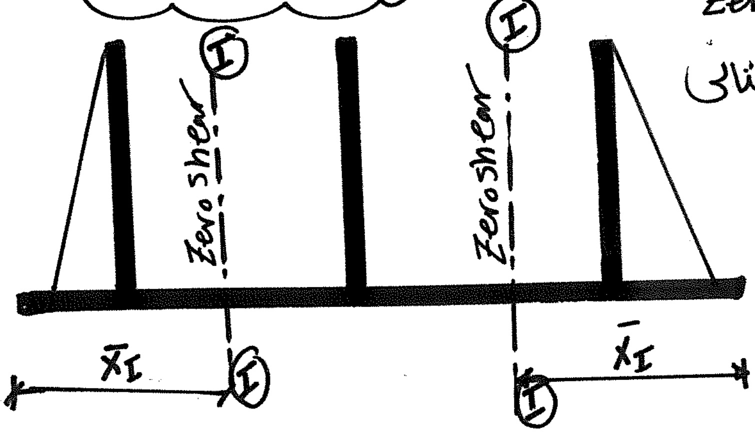




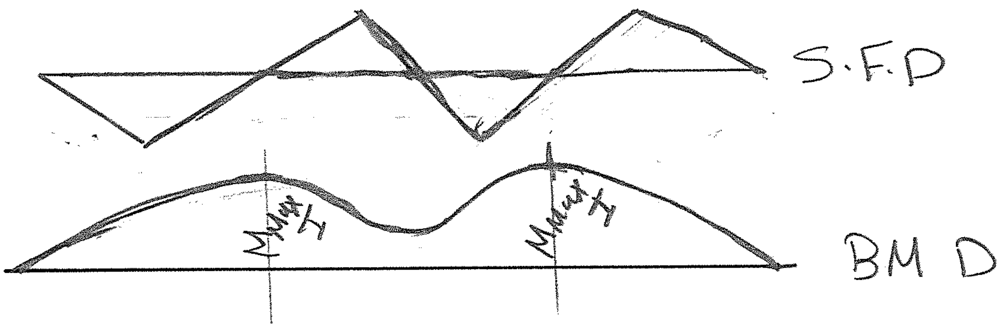
فى هذه الحالة يكون
الـ Zero shear فى المنتصف
ويتم حساب M_{Max} فى
منتصف الـ span

$\bar{X} = L/2$

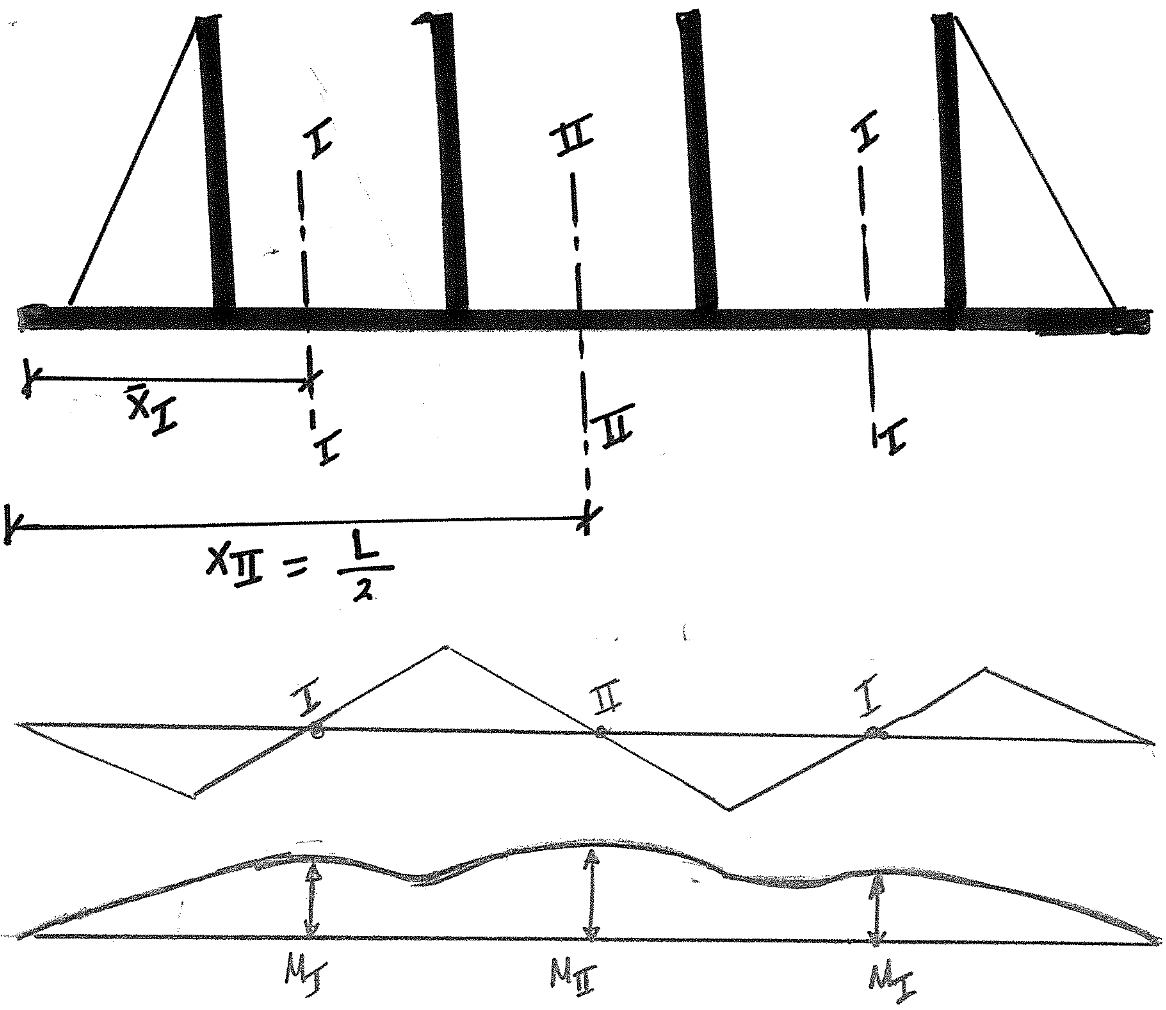
For Two vents



* يوجد مكانين للـ Zero shear
ولكنهم متماثلين وبالتالى
يوجد مكانين ايضاً
للـ M_{Max} ومتماثلين
ايضاً.



For three vents

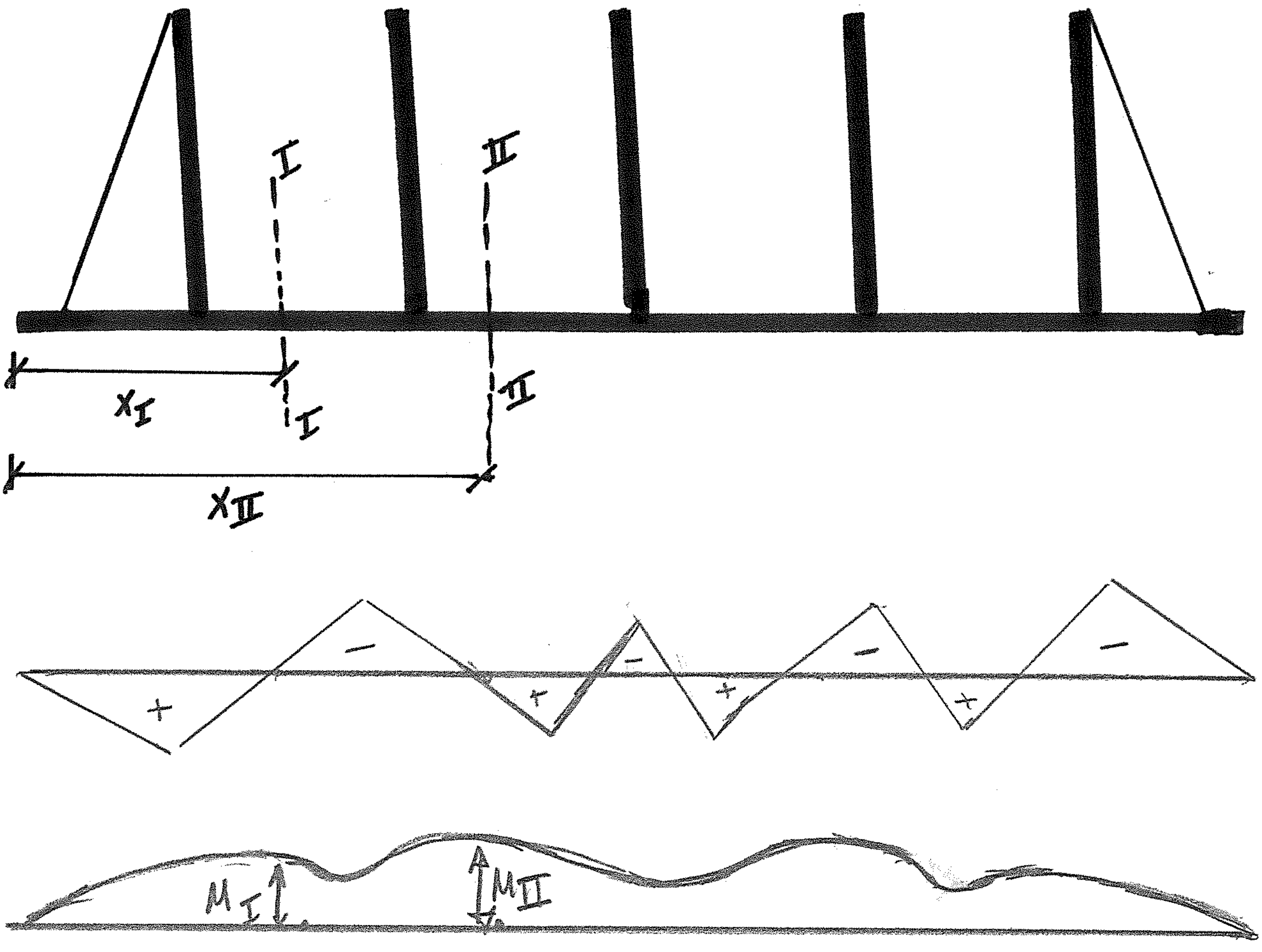


يوجد مكانين للـ Zero shear عند قطاع I ، II

← القطاع II معروف مكانه عند 1/2 الفرشة وعنده أكبر عزم

والقطاع I مكانه غير معروف يتم تحديده.

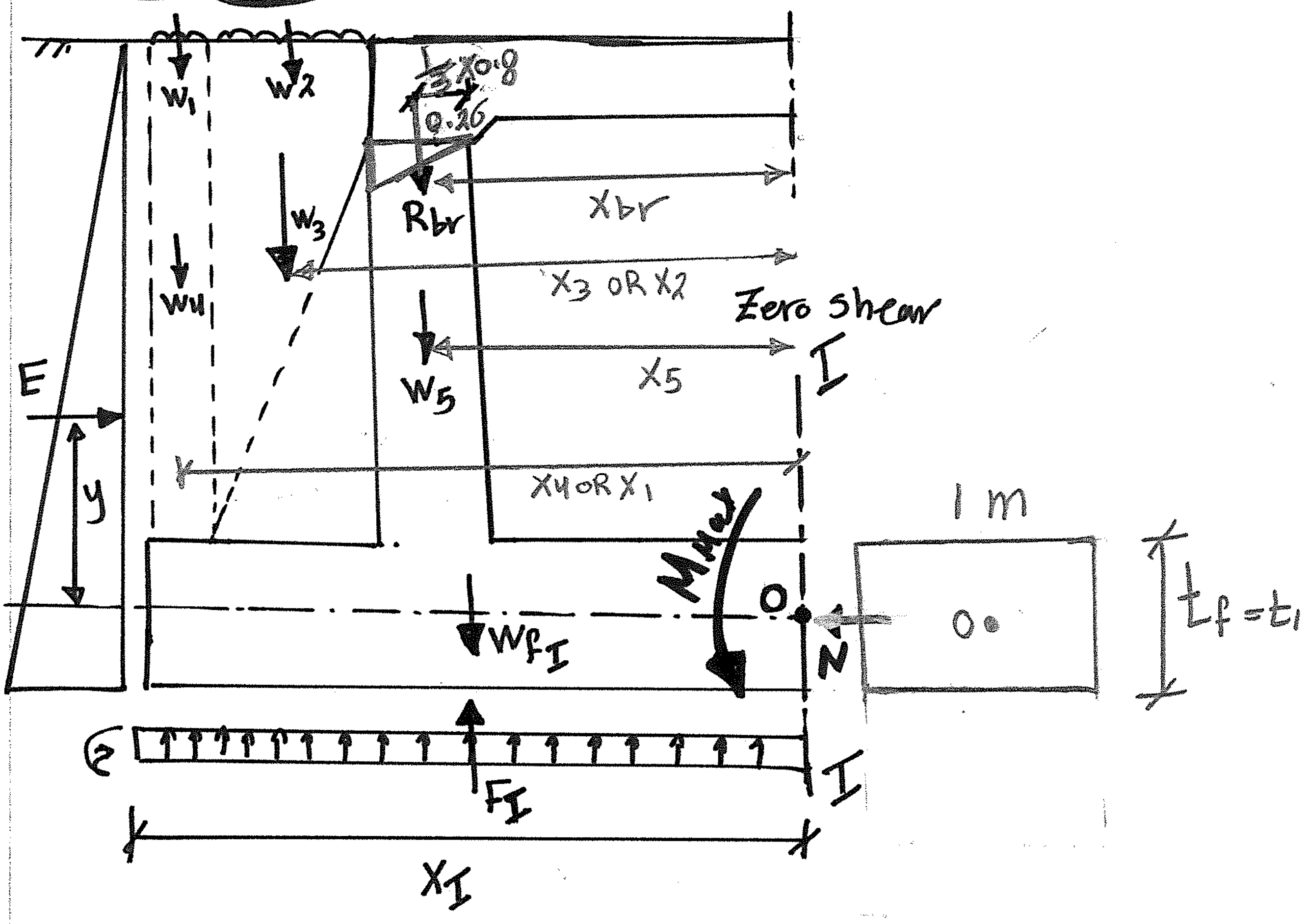
For four vents



* يوجد مكانين لل Zero shear عند قطاع I والقطاع II
والمكانين غير معروفين يتم تحديدهم
ولكن أكبر عزم يكون عند قطاع II ، ($M_{max} = M_{II}$)

نرجع لمثالنا تاني

For $M_{max\,I}$



$$\therefore\ W_{f_I} = t_1 * \gamma_c * 1_m * X_I = \sim X_I$$

$$F_I = q * 1_m * X_I = \sim X_I$$

عند مكان الـ Zero shear يكون مجموع الاحمال الراسية = صفر

$$\sum \text{Vertical Force} = \text{Zero}$$

$$W_1 + W_2 + W_3 + W_4 + W_5 + R_{br} + W_{f_I} - F_I = 0.0$$

$$X_I = \sim m$$

معادلة بها مجهول واحد $X_I = \sim$

لايجاد اقصى عزم M_{Max} يتم اخذ العزوم حول نقطة (O)

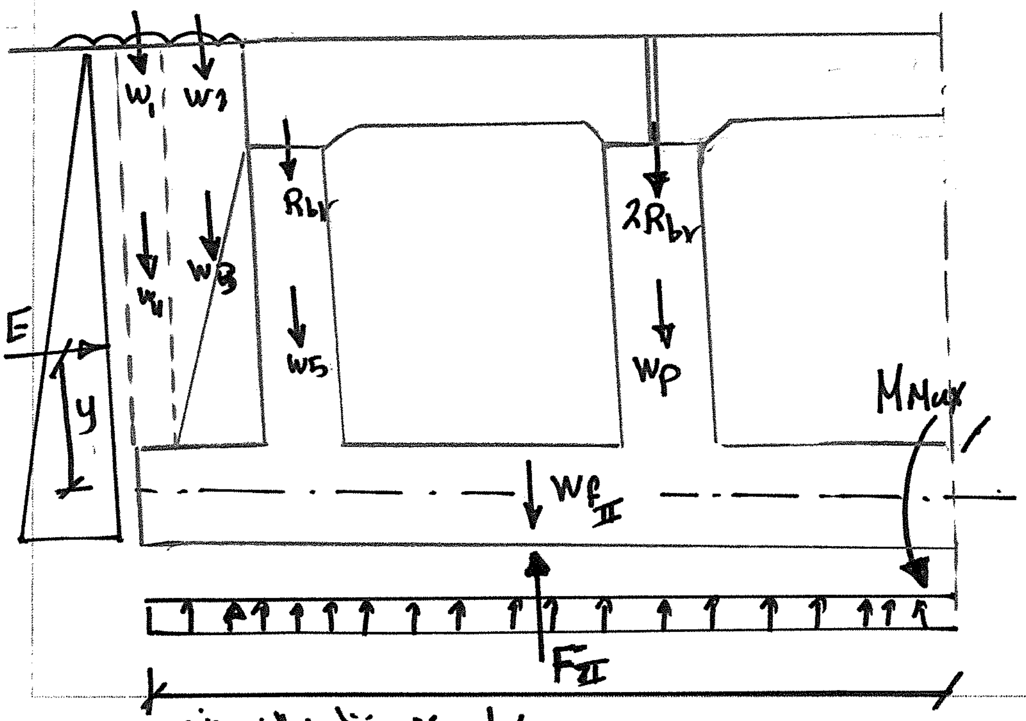
M_{Max}

$$M_{Max} = W_1 * X_1 + W_2 * X_2 + W_3 * X_3 + W_4 * X_4 + W_5 * X_5 + R_{br} * X_{br} + W_{f_I} * \frac{X_I}{2} - E * Y - F_I * \frac{X_I}{2}$$

$$M_{Max} = \text{---} \quad t.m$$

$$N = E = \text{---} \quad ton$$

وهكذا لايجاد $M_{Max_{II}}$ بنفس الفكرة.

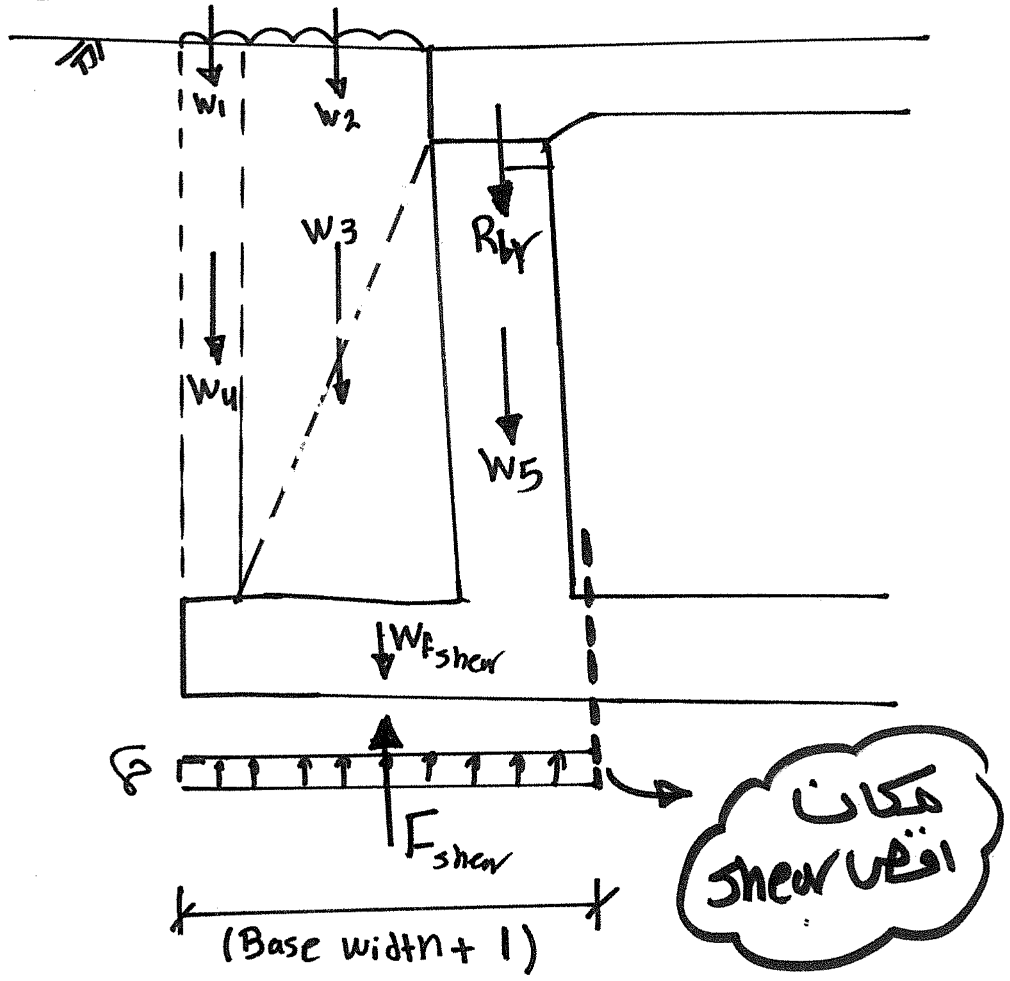


يتم حساب M_{Max}

$N = E$

نظرا للتماثل $X_{II} = L/2$

Max shear



$$W_{f\,shear} = (t_f) * (Base+1) * 1 * \gamma_c$$

$$F_{shear} = q * (Base+1) * 1$$

$$Q_{Max} = W_1 + W_2 + W_3 + W_4 + W_5 + W_{f\,shear} - F_{shear}$$

Design

$M_{max} = \checkmark\checkmark$ ton.m → Max → M_{I}, M_{II}

$N = \checkmark\checkmark$ ton

$Q_{max} = \checkmark\checkmark$ ton

$$e = \frac{M_{max}}{N} = \checkmark\checkmark > \frac{t_f}{2} \quad \text{Large ecc}$$

$$e_s = e + \frac{t_f}{2} - d'$$

$$M_s = N * e_s$$

$$d = k_1 \sqrt{\frac{M_s * 10^5}{100 \to B}} \quad m$$

$d' = 7$ cm

$$t_f = d + d' = \checkmark\checkmark$$

$$A_s = \frac{M_s * 10^5}{k_2\, d} - \frac{N * 10^3}{f_s}$$

f_s → 1400 kg/cm²

$A_{s\,min} = 0.25\, t_f = \text{cm}^2 = 6\phi16$

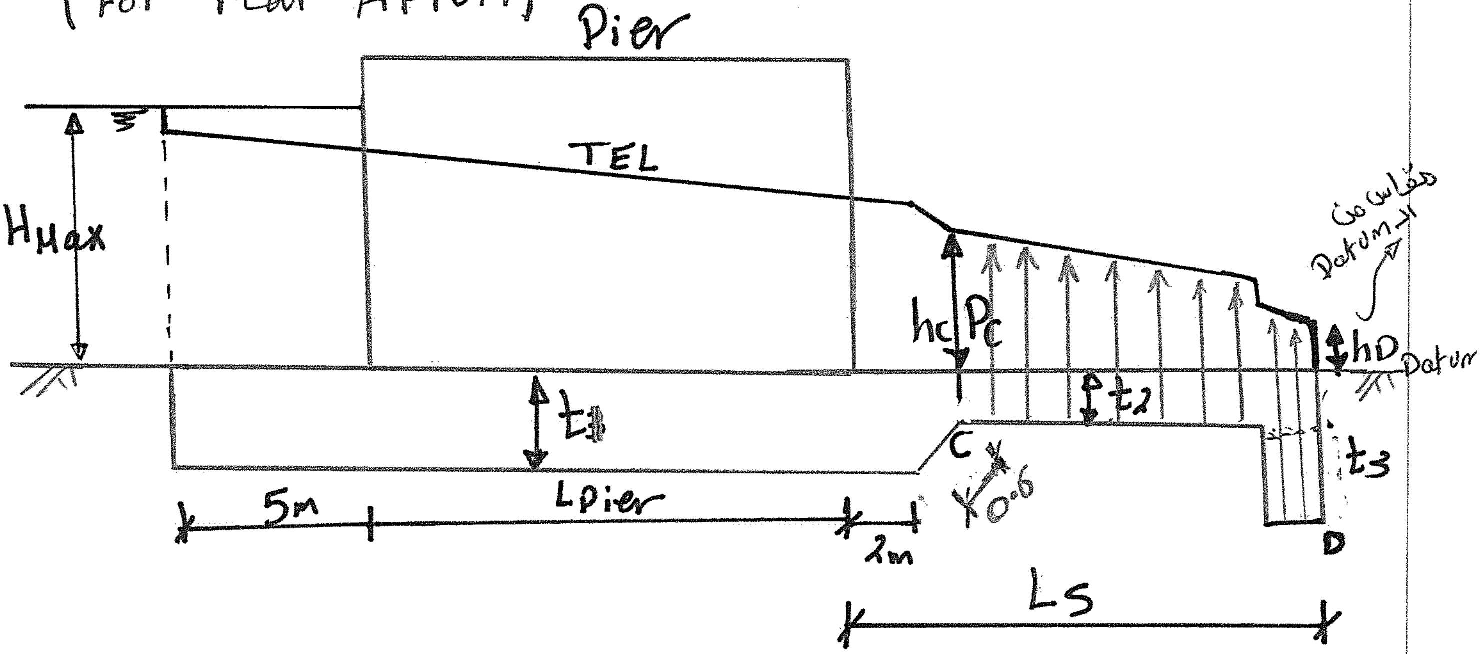
$A_s' = 0.3\, A_s \geq 5\phi12/m'$

Check of shear: $q = \frac{Q_{max} * 10^3}{0.87\, b\, d} \ngtr q_{max}$ (6 kg/cm²)

* Check of Uplift :-

مهم بالمحاضرة

(For rear Apron)



السمك t_1 يقاوم الـ uplift

* Critical section at (t_2)

نفتكر من سنة تالتة

$$h_i = H_{Max} - \frac{LP_{act}}{CB_{act}}$$

$$CB_{act} = \frac{LP_{act}}{H_{Max}} = \frac{t_1 + 5 + L_{Pier} + L_S + (t_1 - t_2) + (t_3 - t_2) + t_3}{H_{Max}}$$

$$P_i = (h_i - Z_i)\,\gamma_w$$

$$\therefore h_C = H_{Max} - \frac{(t_1 + 5 + L_{Pier} + 2 + 0.6)}{CB_{act}}$$

$$\therefore h_D = \frac{t_3}{CB_{act}}$$

مقاس من الـ Datum

$$F.O.S = \frac{W}{U} = \frac{1 * 1 * t_2 * \gamma_c}{\gamma_w\left(\left(\frac{h_c + h_D}{2}\right) + t_2\right) * 1 * 1} \geq 1.25$$

$\because \gamma_c$ → 2.2 PC خرسانة عادية
→ 2.5 RC خرسانة مسلحة

لو طلع F.O.S اكبر من 1.25 OK ← t_2 = ✓✓

" " F.O.S اقل من 1.25 فيتم زيادة t_2

Regulators & Barrages

A reinforced concrete head regulator is to be constructed to feed a main canal from a Rayah. A longitudinal dimensioned section through the main canal at the regulator site is given in the figure. The available data for the regulator are:

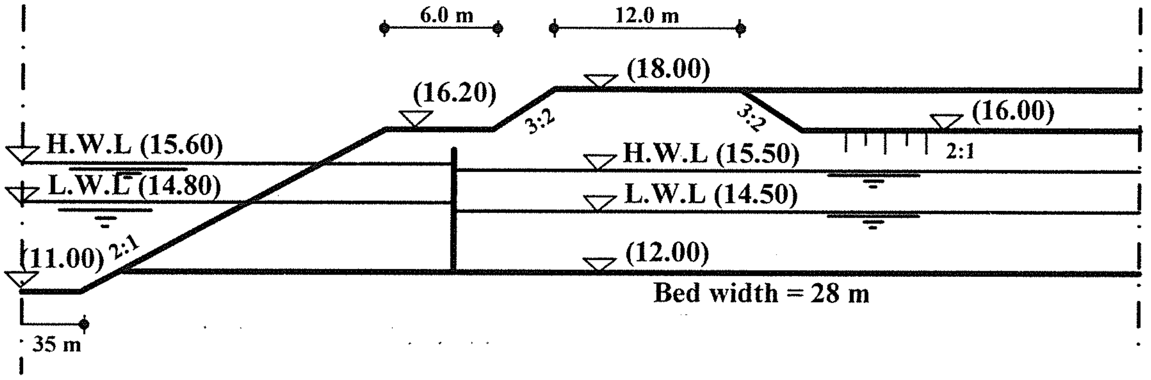
- The regulator consists of *four* vents of 6.0 m span for each,
- The maximum allowable discharge through the main canal is 7.5 million m^3/d,
- The bridge width over the regulator is 15.0 m and it has two sidewalks of 1.50 m width for each,
- The equivalent D.L of the bridge, L.L on the traffic lanes, and L.L on the sidewalks are 2.0, 1.0, 0.4 t/m^2, respectively,
- The soil properties at the regulator site are: $\Phi = 30^o$, $\gamma_{bulk} = 1.65\ t/m^3$, and the allowable bearing capacity is 1.50 kg/cm^2, and
- Sliding vertical steel gates with horizontal main girders are used.

It is required to:

1. Check the hydraulic design of the regulator,
2. Give the complete structural design for each of the following elements:
   - The sliding gates and find the required lifting force,
   - The required R.C gate lifting structure,
   - The R.C piers, and
   - The R.C floor, considering the required lengths for percolation and scouring; $C_B = 12$.
3. Draw neat sketches showing the following:

   i. Plan (H.E.R)

   ii. Longitudinal section through the regulator



Given

$N = 4$ vent

$S = 6\ m$

* Bridge width = 15 m

* Side walk = 1.5 m

$g_{D.L} \rightarrow$ Bridge $= 2\ t/m^2$

$P_{LL} \rightarrow$ Bridge $= 1\ t/m^2$

$P_{LL\,SW} \rightarrow$ Sidewalk $= 0.4\ t/m^2$

$\phi = 30^\circ$ $\gamma_e = 1.65\ t/m^3$

$f_{all\ soil} = 1.5\ kg/cm^2$

Req

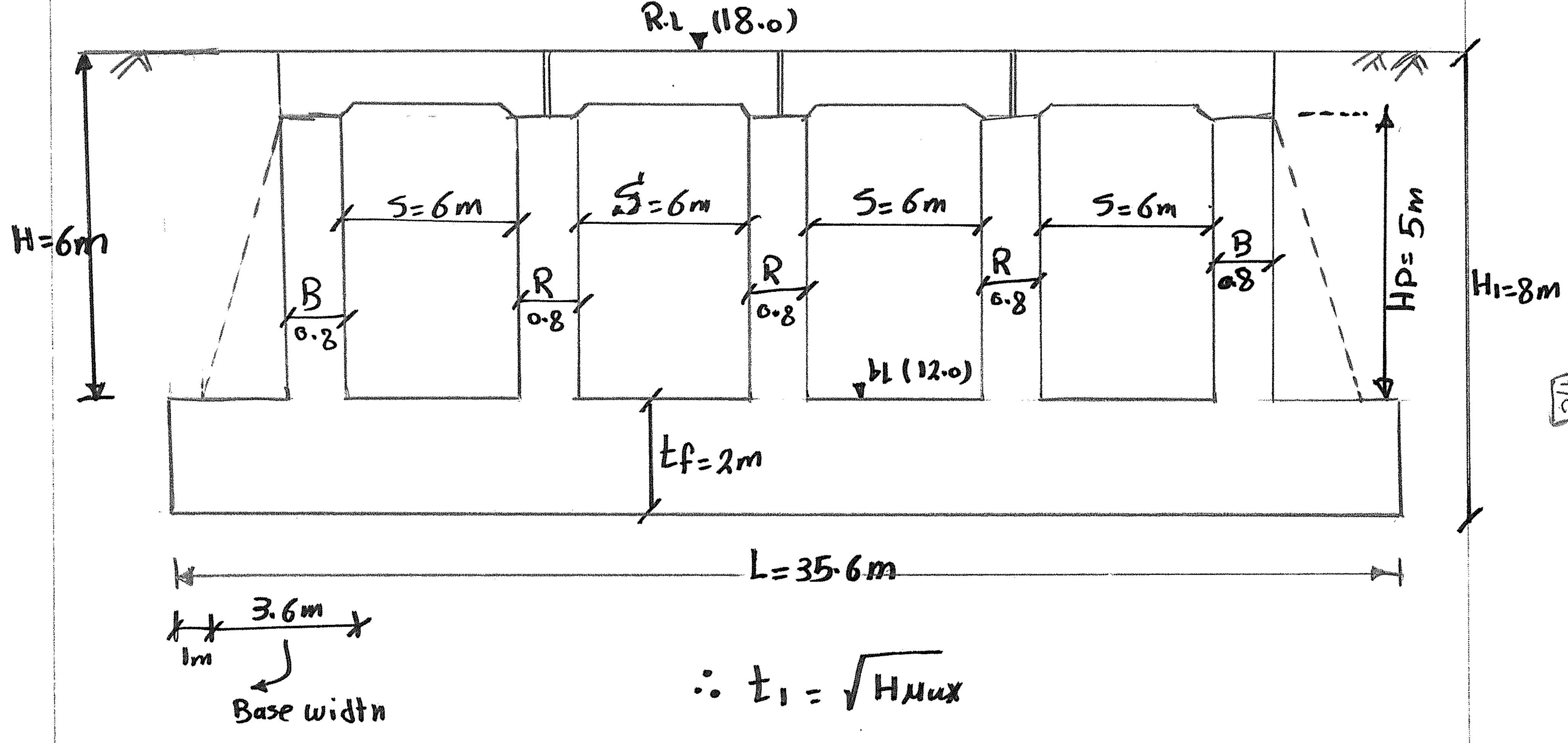
* Design the Rc Floor

From Design Pier

$R = 0.8\ m$

$HP = 5\ m$

Dimension



$\therefore t_1 = \sqrt{H_{Max}}$

$H_{Max} = \nabla USWL - \nabla bed = 15.6 - 12 = 3.6m + 0.3 = 3.9$

$\therefore$ Base width = $0.6 * H$

$H = \nabla RL - \nabla bL = (18.0) - (12.0) = 6 m$

$\therefore$ Base width = $0.6 * 6 = 3.6 m$

$\therefore L = (4 * S) + (3 * R) + 2(\text{Base width}) + 2*1$

$L = (4*6) + (3*0.8) + 2(3.6) + 2 = 35.6 m$

(Loading) **Loads on 1m**

→ $R_{br} = \frac{(P_{LL} + g_{DL})(S+R)}{2} = \frac{(2+1)(6.8)}{2} = 10.2$ ton

→ **Wp** (weight of Pier)

$W_P = (R * H_P * 1)\ \gamma_{RC}$

$= (0.8 * 5 * 1)\ 2.5 = 10$ ton

→ Abutment own wt :-

$$W_5 = (0.8 * H_P * 1)\, \gamma_{RC}$$
$$= (0.8 * 5 * 1)\, 2.5 = 10 \text{ ton}$$

* Earth weigh :-

$$W_3 = \gamma_e\, (1 * (\text{Base width} - 0.8)) * H$$
$$= 1.65\, (1 * (3.6 - 0.8)) * 6 = 27.7 \text{ ton}$$

$$W_4 = \gamma_e\, (1 * 1 * H) = 1.65 * (1 * 1 * 6) = 9.9 \text{ ton}$$

* Vertical Live Load :-

$$W_1 = P_{LL} * 1 * 1 = 1 * 1 * 1 = 1 \text{ ton}$$

$$W_2 = P_{LL} * (\text{Base width} - 0.8) * 1 = 1 * 2.6 = 2.6 \text{ ton}$$

* Floor weight :-

$$W_f = (t_1 * L * 1)\, \gamma_{RC}$$
$$= (2 * 35.6 * 1)\, 2.5 = 178 \text{ ton}$$

* Earth Pressure :-

$$e = \gamma_e * H_1 * K_a$$

$$H_1 = H + t_1 = 6 + 2 = 8m$$

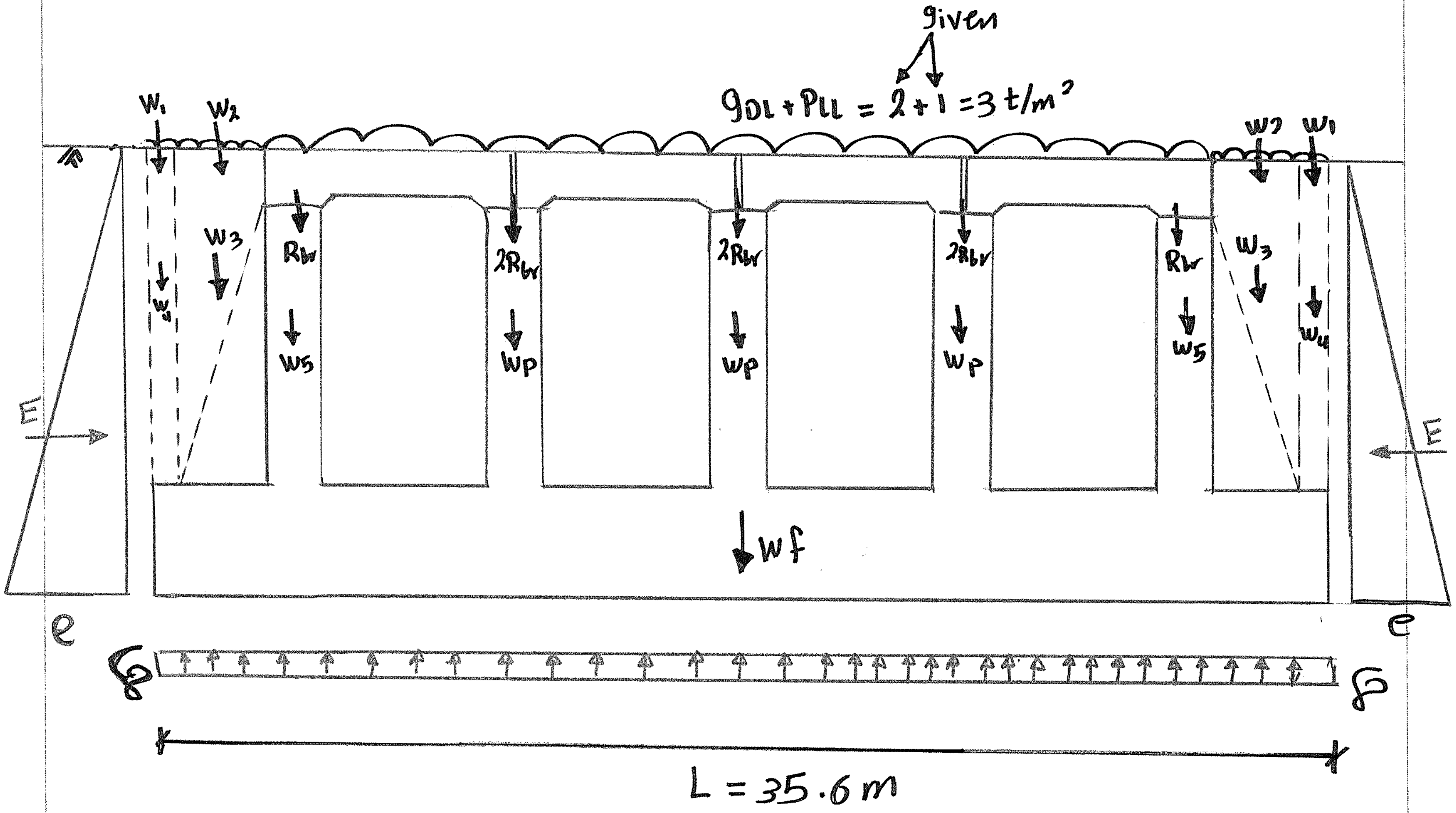
$$e = 1.65 * 8 * K_a$$

$$K_a = \frac{1 - \sin\phi}{1 + \sin\phi} = \frac{1 - \sin 30}{1 + \sin 30} = \frac{1}{3}$$

$$e = 1.65 * 8 * \frac{1}{3} = 4.4\ t/m^2$$

$$E = \frac{1}{2} * e * H_1 * \frac{1}{m} = \frac{1}{2} * 4.4 * 8 * 1$$

$$E = 17.6\ ton$$


given
$g_{DL} + P_{LL} = 2 + 1 = 3\ t/m^2$
W1
W2
W3
W4
W5
Rbr
2Rbr
2Rbr
2Rbr
Rbr
Wp
Wp
Wp
W5
W3
W2
W1
W4
E
E
Wf
e
e
L = 35.6 m

Check of Soil Reaction :-

$$\delta = \frac{\Sigma (W + R_{br})}{L * 1}$$

ممكن يكون مطلوب على حدى في المسألة

$\Sigma (W + R_{br}) = 2W_1 + 2W_2 + 2W_3 + 2W_4 + 2W_5$
$+ W_f + 3W_p + 8R_{br}$

$\Sigma (W + R_{br}) = (2 * 1) + (2 * 2.6) + (2 * 27.7) + (2 * 9.9)$
$+ (2 * 10) + 178 + (3 * 10) + (8 * 10.2)$

$= 392$ ton

$$\delta = \frac{392}{(35.6 * 1)} = 11.01 \; t/m^2$$

$\delta = 11.01 \; t/m^2 \div 10 = 1.101 \; kg/cm^2$

$\therefore \delta = 1.1 \; kg/cm^2 < 1.5 \; kg/cm^2$

fall soil given

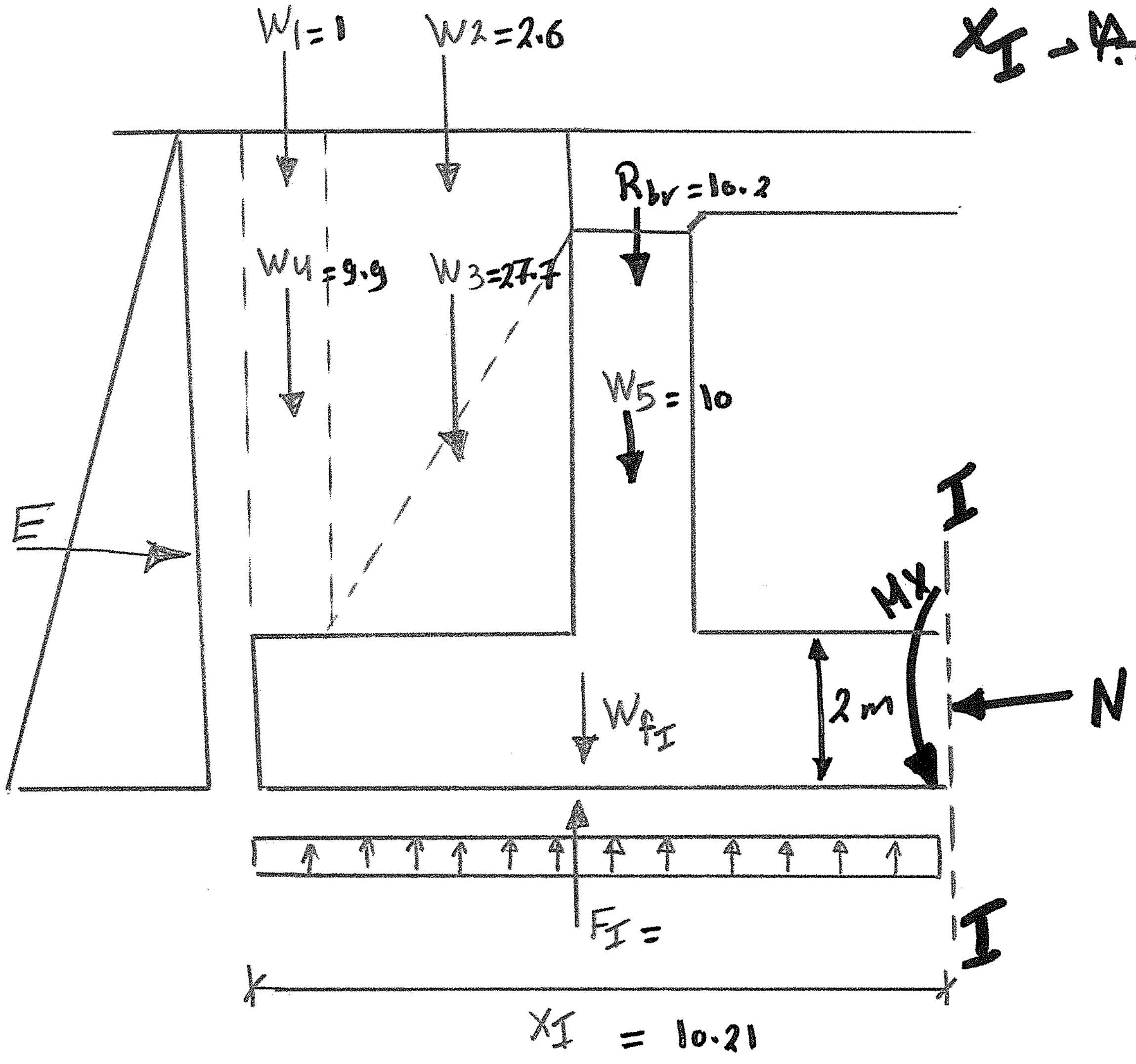
ok

* Zero shear position :-

يوجد بالمسألة ← 2 Zero shear

لابد من ايجاد مكان X_I , X_{II} لان عدد الفتحات $N = 4$

*ايجاد X_I



$$\therefore W_{f_I} = t_1 * \gamma_{RC} * 1 * X_I = 2 * 2.5 * 1 * X_I = 5\, X_I$$

$$F_I = \delta * X_I = 11.01 * X_I = 11.01\, X_I$$

لايجاد ال Zero shear

مجموع الاحمال الراسية = صفر

$$w_1 + w_2 + w_3 + w_4 + w_5 + R_{br} + w_{f_I} - F_I = 0.0$$

$$1 + 2.6 + 27.7 + 9.9 + 10 + 10.2 + 5x_I - 11.01\,x_I = 0.0$$

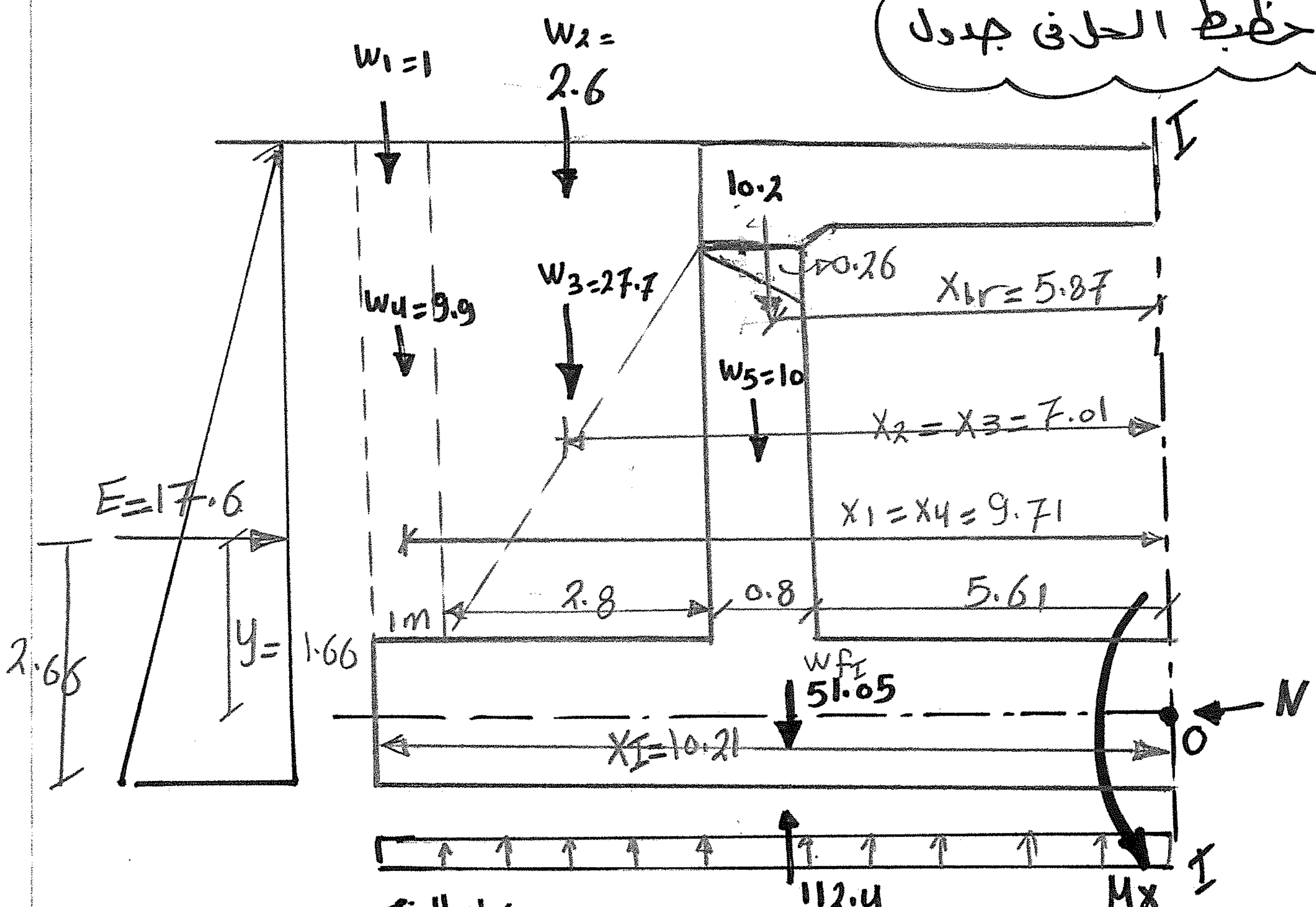
$$x_I = 10.21 \text{ m}$$

$$\therefore \quad w_{f_I} = 5 * 10.21 = 51.05 \text{ ton}$$

$$F_I = 11.01 * 10.21 = 112.41 \text{ ton}$$

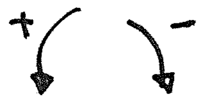
* لايجاد اقصى عزوم عند قطاع I-I :-

حطط الحل فى جدول



ذراع العزم

Force	Arm	M@ O
$W_1 = +1$	9.71	+ 9.71
$W_4 = +9.9$	9.71	+ 96.129
$W_2 = +2.6$	7.01	+ 18.226
$W_3 = +27.7$	7.01	+ 194.177
$W_5 = +10$	6.01	+ 60.1
$R_{br} = +10.2$	5.87	+ 59.287
$W_{f_I} = +51.05$	5.105	+ 260.61
$F_I = -112.4$	5.105	− 573.8
$E = -17.6$	1.66	− 29.216

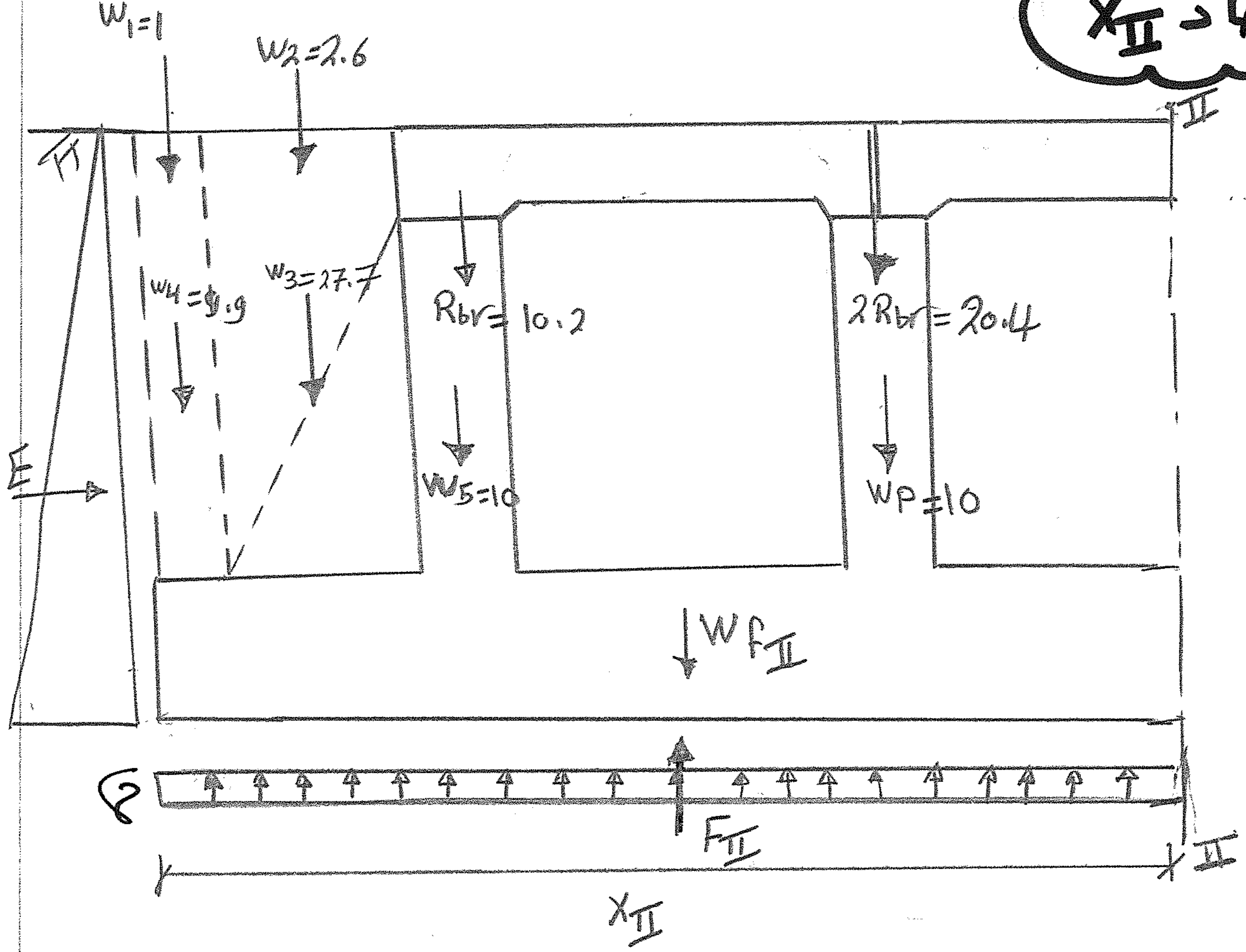


$$M_{Max_I} = \sum M@_o$$

$$M_{x_I} = 95.223 \text{ t.m}$$

$$N = E = 17.6 \text{ ton}$$

ايجاد X_{II}



$$W_{f_{II}} = t_1 * \gamma_{RC} * X_{II} = 2 * 2.5 * X_{II} = 5\,X_{II}$$

$$F_{II} = q * X_{II} = 11.01 * X_{II} = 11.01\,X_{II}$$

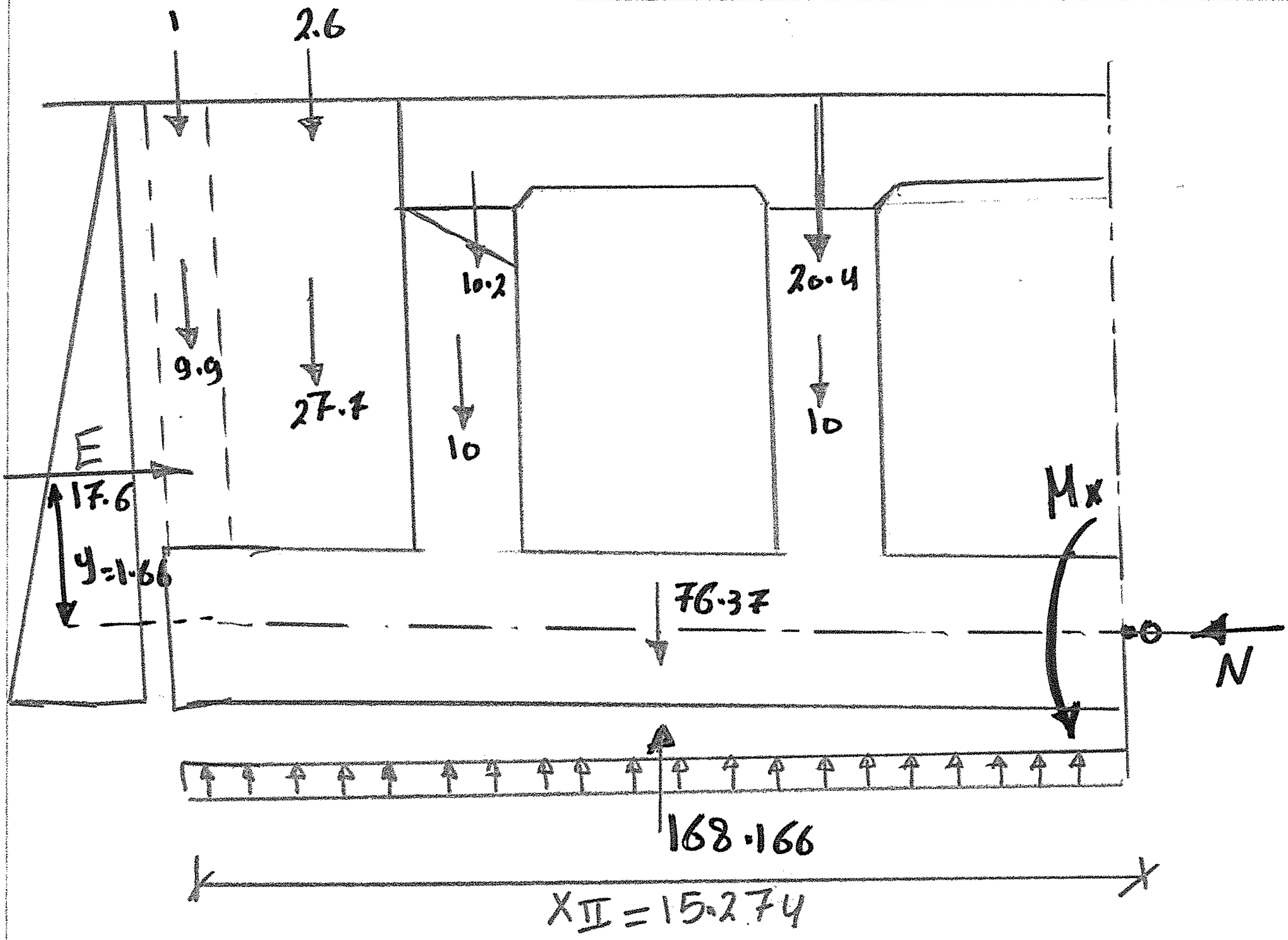
لايجاد الـ Zero shear

$$W_p + W_1 + W_2 + W_3 + W_4 + W_5 + 3R_{br} + W_{f_{II}} - F_{II} = 0.0$$

$$10 + 1 + 2.6 + 27.7 + 9.9 + 10 + 3 * 10.2 + 5\,X_{II} - 11.01\,X_{II} = 0.0$$

$$X_{II} = 15.274\ m$$

* لايجاد اقصى عزوم عند قطاع II-II :-



$\therefore \quad W_{F_{II}} = 5 * 15.274 = 76.37$ ton

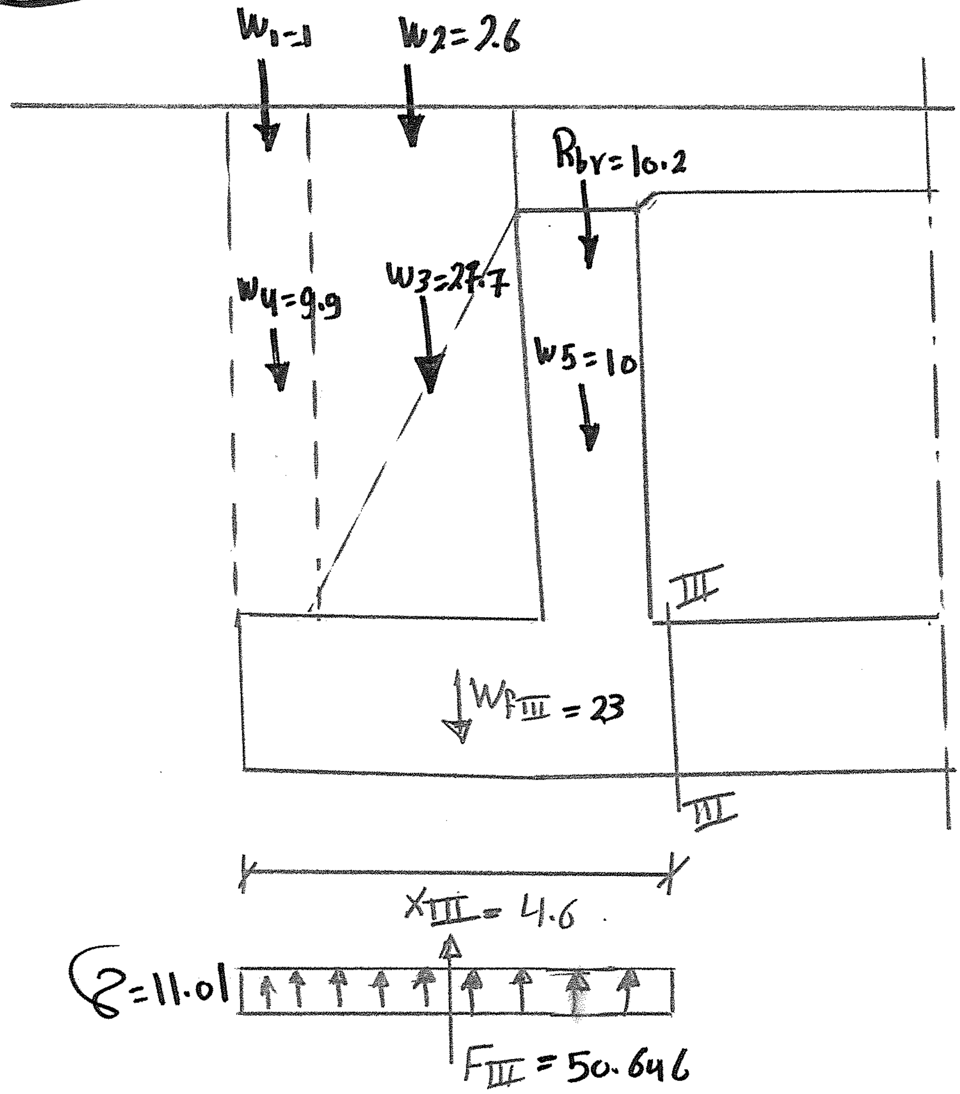
$F_{II} = 11.01 * 15.274 = 168.166$

Force	Arm	M@o
$+W_1 = +1$	14.77	+14.77
$W_u = +9.9$	14.77	+146.223
$W_2 = +2.6$	12.874	+33.47
$W_3 = +27.7$	12.874	+356.6
$R_{br} = +10.2$	10.934	+111.52
$W_5 = +10$	11.074	+110.74
$W_{P_{II}} = +76.37$	7.637	+583.25
$F_{II} = -168.16$	7.637	-1284.23
$E = -17.6$	1.66	-29.216
$W_P = +10$	4.274	+42.74
$2R_{br} = +20.4$	4.274	+87.189

$$M_{Max_{II}} = 173.056 \text{ t.m}$$

$$N = E = 17.6 \text{ ton}$$

Max shear



$\therefore W_{FIII} = (t_1 \times X_{III} * 1)\gamma_{RC} = (2 * 4.6 * 1) * 2.5 = 23$ ton

$F_{III} = q * X_{III} = 11.01 * 4.6 = 50.646$ ton

لايجاد اقصى (shear)

$\because$ Q_{Max} at section III - III

$Q_{Max} = W_1 + W_2 + W_3 + W_4 + W_5 + R_{br} + W_{FIII} - F_{III}$

$Q_{Max} = 1 + 2.6 + 27.7 + 9.9 + 10.2 + 10 + 23 - 50.646 = 33.7$ ton

Design

ملحوظة مهمة بالمحاضرة

نفرض $t_1 = 2\ m$ فى الدول

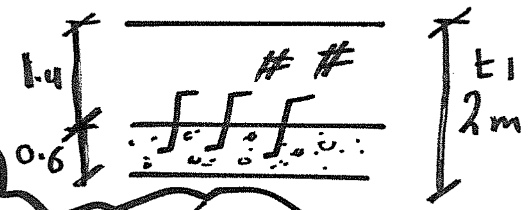
* يتم تجزئة t_1 إلى جزئين (جزء Rc + جزء P.c)

assume $\underline{t_{PC}} = 60\ cm$ $\therefore$ $t_{RC} = 2 - 0.6 = 1.4\ m$

$\therefore$ $N = 17.6\ ton$

$Q_{Max} = 33.7\ ton$

$M_{Max} = Max\,(\underset{M_{x_I}}{95.22}\ ,\ \underset{M_{x_{II}}}{173.05})$



Design

قطاع معرض إلى (M,N)

$$e = \frac{M_{Max}}{N} = \frac{173.05}{17.6} = 9.83\ m > \left(\frac{t_f}{2} = \frac{1.4}{2}\right)$$

Large ecc

$$e_s = e + \frac{t}{2} - \overset{0.07\,m}{Cover} = 9.83 + \frac{1.4}{2} - 0.07 = 10.46\ m$$

$$M_s = e_s * N = 17.6 * 10.46 = 184.096\ t.m$$

$$d = k_1 \sqrt{\frac{M_s * 10^5}{B_{100}}} = 0.31 \sqrt{\frac{184.09 * 10^5}{100}} = 133 \text{ Cm}$$

$$\therefore \quad t = d + d' = 133 + 7 = 140 \text{ Cm}$$

$$d_{act} = 140 - 7 = 133 \text{ Cm}$$

$$A_s = \frac{M_s * 10^5}{k_2 * d} - \frac{N * 10^3}{f_s} \qquad f_s = 1400 \text{ kg/cm}^2$$

$$= \frac{184.09 * 10^5}{1218 * 133} - \frac{17.6 * 10^3}{1400} = 101 \text{ Cm}^2$$

Use 17 Ø28/m'

$$A_{s_{min}} = 0.25\, t_1 = 0.25 * 140 = 35 \text{ Cm}^2$$

Check of shear

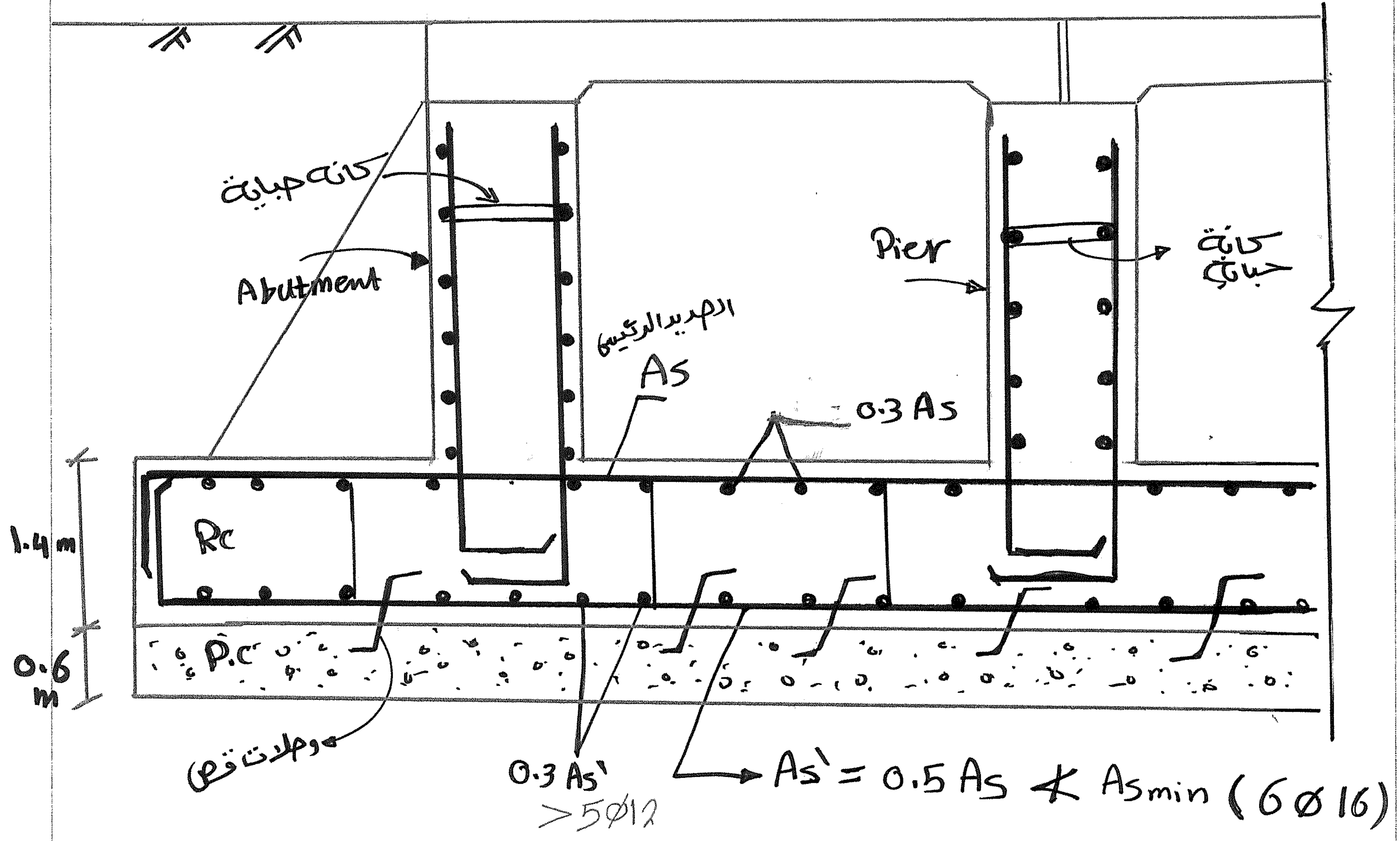
$$q = \frac{Q_{Max} * 10^3}{0.87 * b * d}$$

$$q = \frac{33.7 * 10^3}{0.87 * 100 * 133} = 2.91 \text{ kg/cm}^2 \ngtr 6 \text{ kg/cm}^2$$

OK

مهم

(رسم تفاصيل التسليح)



Alexandria University
Faculty of Engineering
Irrigation & Hyd. Dept

Fourth year Civil Eng.
Mid-term Exam, Nov. 2003
Time allowed 1.0 hour.

Design of Irrigation Structures (II)

A) A reinforced concrete **head regulator** with 200 m approach channel is to be constructed to feed a main canal from a Rayah. The cross section of the main canal is given in Fig. (1). The cross section of the regulator under the bridge is given in Fig.(2). The regulator consists of two vents, **each span** = 4.0 m. The pier thickness is 1.0 m. The width of the bridge = 10.0 m and it has two side walks of 1.25m width each. The maximum allowable heading up is 10 cm. The maximum allowable discharge through the main canal is 16.0 m^3/sec. The equivalent Dead and Live loads of the bridge are 1.2 and 1.5 t/m^2, respectively. The soil **properties** at the regulator site are: $\phi = 30^o$, $\gamma_{bulk} = 1.8$ t/m^3, and the soil bearing capacity = 1.15 kg / cm^2.
(For the used R.C, $k_1 = 0.313$ & $k_2 = 1218$)

حل السابق

It is required to :
1- **Check** the full **hydraulic** design of the regulator,
2- **Check** the soil **stresses under** the floor, and
3- **Check** the given **floor thickness**

B) Draw a Plan and **Sec Elev.** for the miter gate position of a symmetrical lock.

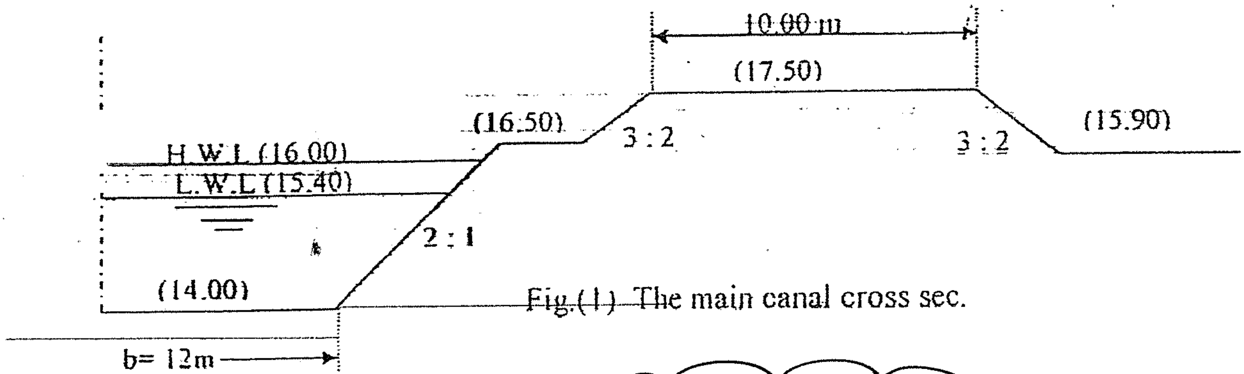


Fig.(1) The main canal cross sec.

معطى الابعاد كلها

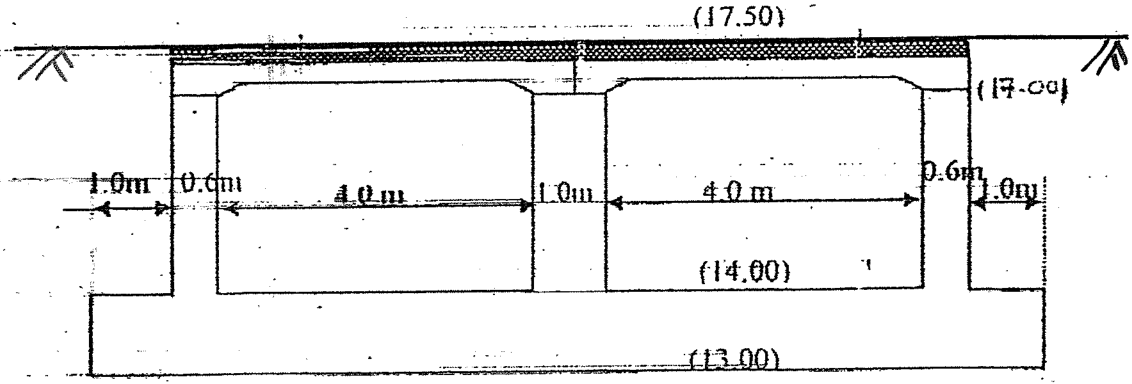


Fig.(2) The regulator cross sec under the bridge

Good luck