Concrete Sections

From sec.1 to sec.4

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Section 1

رهف ١٢ — Sec conc

Flat slab

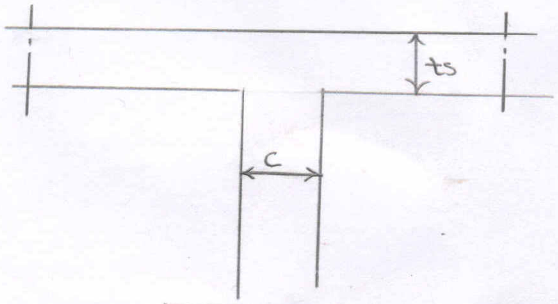
مقدمة :-

* عيوب الـ Solid slab :- ١) غير إقتصادية ٢) أماكن الحوائط مرتبطة بالكمرات [فمن الصعب تعديل الشكل المعماري]
* مزايا الـ Flat slab :- ١) مناسبة معماريا [من السهل والممكن تعديل النظام المعماري] ٢) تغطي مسافات كبيرة
* عيوب الـ Flat slab :- ١) مقاومة الزلازل فيها أقل من الـ "Solid"

* Type of Flat slab (أنواع الـ Flat)

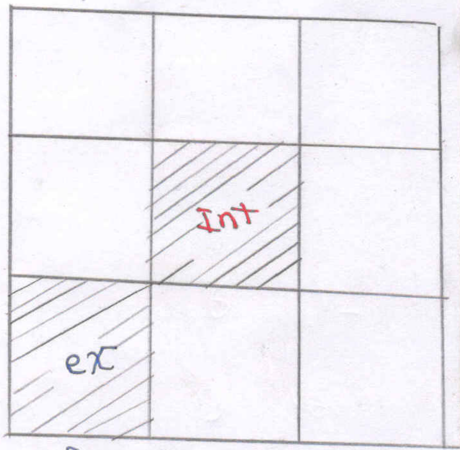
1) Flat slab without Col. Head and drop.

1) Conc. Dimensions



A) ts (الكود بيقول اية ؟!!) → $t_s \geq$ 150 mm, $\frac{L_{ex}}{32}$, $\frac{L_{int}}{36}$

B) C (الكود بيقول ايه ؟!!) → $C \geq$ 300 mm, $\frac{L_1}{20}$, $\frac{H}{15}$ due to Buckling



Note: مينفعش أقل من العمود إذا كان c له تساوي 300 لازم هنا
أقل حاجة للعمود c = 300

2) Loads

* $g_s = t_s \gamma_{conc} + f.c$
* $P_s = L.L$

$$W_u = \begin{cases} 1.5 [g_s + P_s] & \text{if } P_s/g_s < 0.75 \\ 1.4 g_s + 1.6 P_s & \text{if } P_s/g_s \geq 0.75 \end{cases}$$

3) Total static Momment

$$* M_o = \frac{w_u L_T}{8} \left[L'' - \frac{2}{3} (C) \right]^2$$

(C: البعد العمودي على الاتجاه) — (2: أوعى تنساه)

L_T → البعد العمودي على اتجاه الشريحة

L'' → البعد الموازي لاتجاه الشريحة

4) B.M.D for Cl and field strip

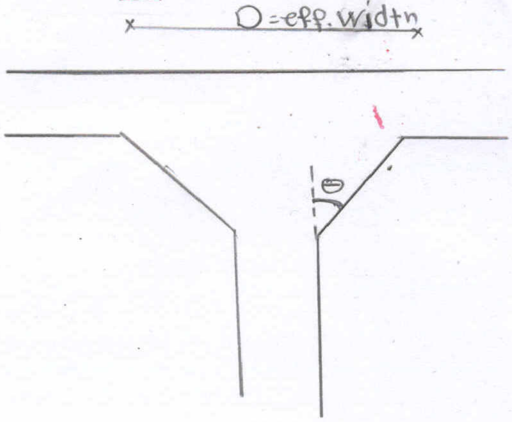
5) d

$d = t_s - cover$ always Cover =

اللهم لا تكلني إلى نفسي طرفة عين

(2) Flat slab with Col. Head only

case ① القمر على نوع الأول



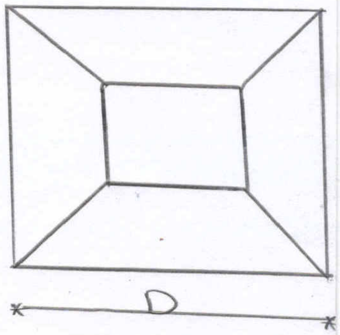
(1) Conc. Dimension

A) t_s ⟶ From Case ①

B) C ⟶ From Case ①

C) $D \leq 0.25\, L_2$ where $L = \frac{L_1 + L_2}{2}$

D) $\theta \ngtr 45$



* Loads ⟶ case (1)

(3) Total static Momment

②

$$M_o = \frac{w_u * L_T}{8}\left[L'' - \frac{2}{3}(D)\right]$$

بعد اتجاه أي مسن للبلاطة

(4) d ⟶ effective depth

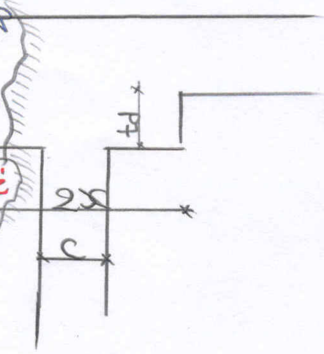
$d = t_s - \text{cover}$

$$M_o = \frac{w_u * L_T}{8}\left[L'' - \frac{2}{3}(C)\right]^2$$

(3) Flat slab With drop

* $t_s \geq$
  - 150 mm
  - $\frac{L_{ex}}{36}$
  - $\frac{L_{in}}{40}$

* d
  - t_s − cover ⟶ Field strip
  - $t_s + t_d$ − cover ⟶ Col. strip
  - +ve: t_s − Cover ⟶ في حالة وجود عزوم موجبة



* C ⟶ case (1) & $t_d = [0.25 \to 0.5]\, t_s$

$\frac{L_1}{3} < 2x \leq \frac{L_2}{2}$ always $\boxed{\frac{L_2}{2}}$ نشتغل

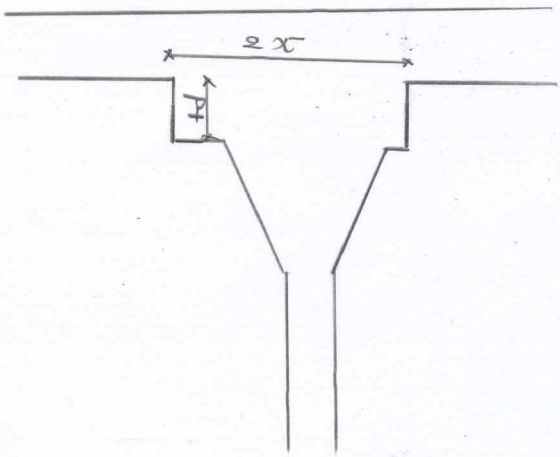
* Loads :- $P_s = L.L$

قسمت هنا على $L_1 * L_2$ علشان أوزع الوزن على البلاطة كلها

$$g_s = t_s * \gamma_{conc} + F.C + \frac{(2x)^2 * t_d * \gamma_{conc}}{L_1 * L_2}$$

داخل بالم

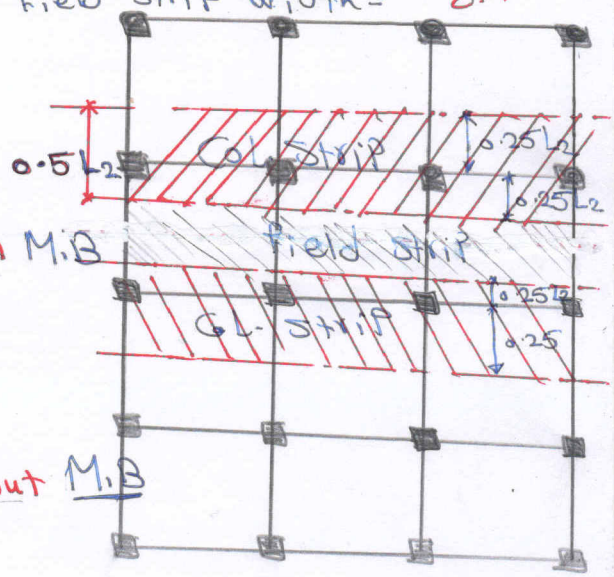
4) Flat slab with Col. Head and drop



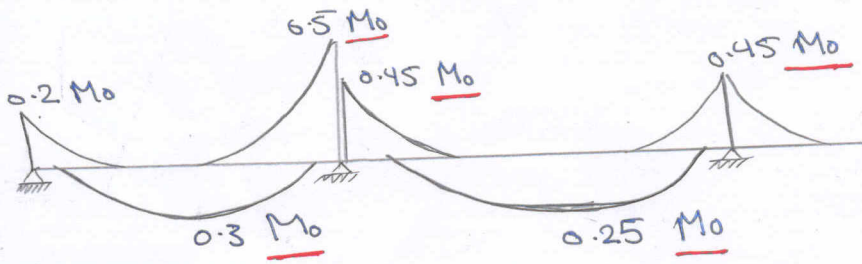
* $D \leq 0.25 L_2$
* $\theta \not> 45^\circ$
* t_s ⟶ Case (3)
* C ⟶ Case (1)
* t_d ⟶ Case (3)
* $2x$ ⟶ Case (3)
* Loads ⟶ Case (3)
* d ⟶ Case (3)
* $M_o = \frac{W_u \cdot L_T}{8} \left[L' - \frac{2}{3} (D) \right]$ ← (2) ← أوجد نسبة ما أخذ بالسباع

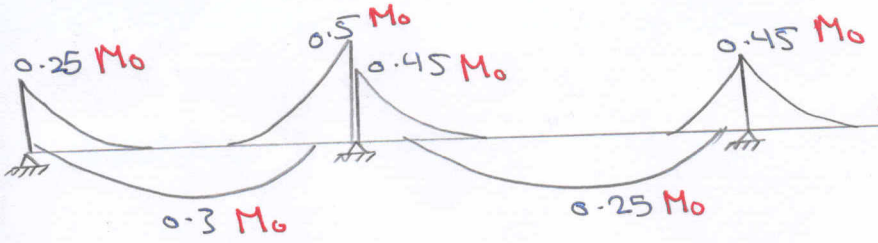
* Column strip and field strip

* Col. strip width = $0.5 L_2$
* Field strip width = الباقي

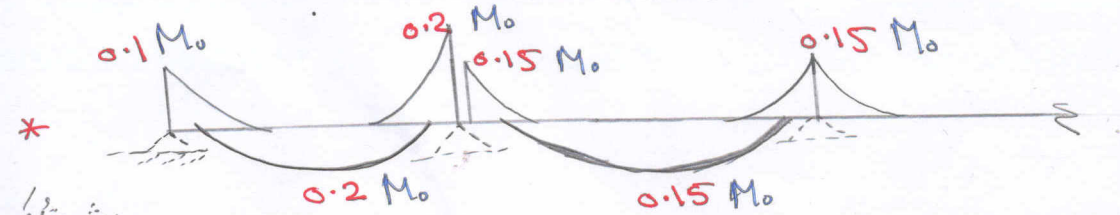


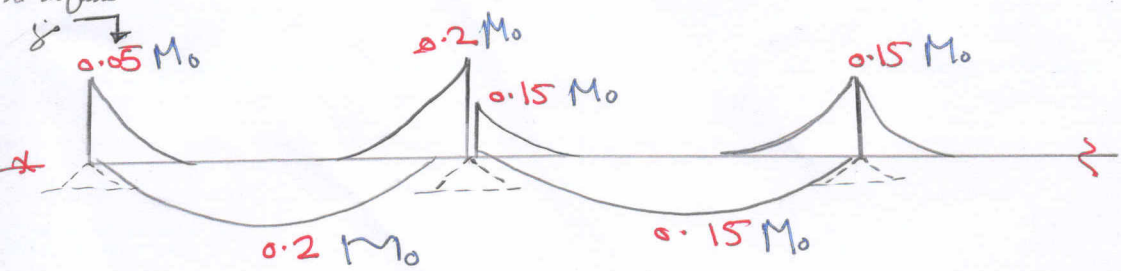
* B. M. D For Col. Strip





* B. M. D for field strip

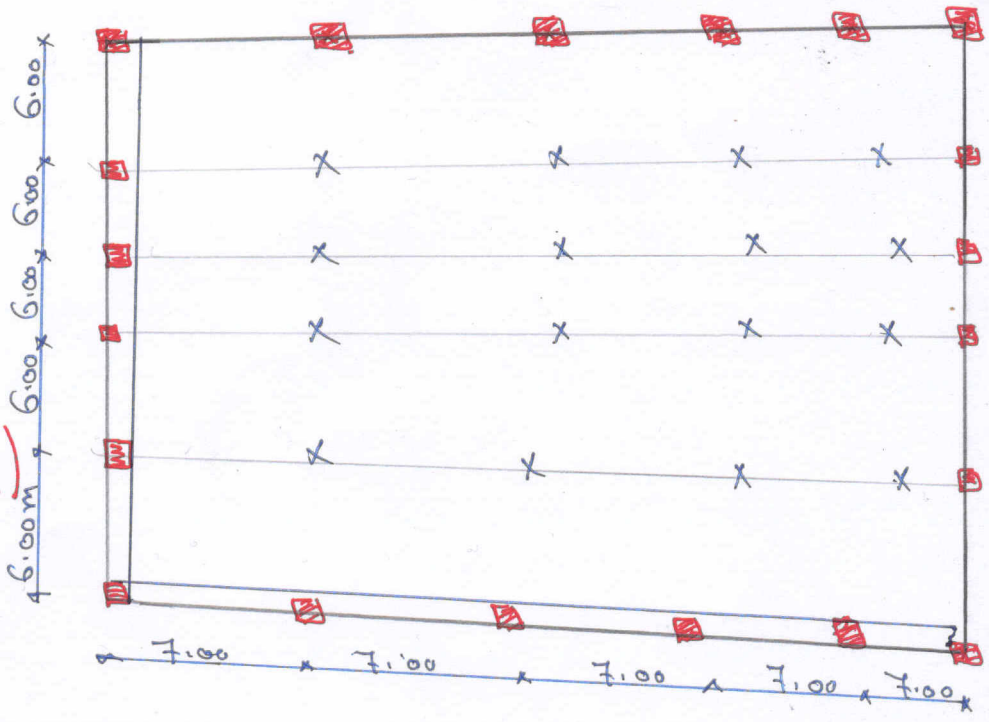




Ex :-

Data :-

$f_{cu} = 30$ M.Pa
$P.C = 2$ kN/m²
$L.L = 4$ kN/m²
Height of floor = 6.00m



(1) Conc. Dimension (أبعاد الخرسانة given)

$t_s \geq$
- 150 mm
- $\frac{65000}{32} = 203$ mm
- $\frac{6500}{36} = 181$ mm

Take $t_s = 220$ mm

- $C \geq$
  - 300 mm
  - $\frac{L_1}{20} = \frac{7000}{20} = 350$
  - $\frac{H}{15} = \frac{6000}{15} = 400$

Take Column = 400 * 400

- $D \leq 0.25\ L = 0.25 * 65000 = 1625$ mm²

Take Colu Head = 1500 * 1500

Take $\Theta = 45°$

→ Loads

$g_s = t_s * \gamma_{conc} + P.C = 0.22 * 25 + 2 = 7.5$ kN/m²
$P_s = L.L = 4$ kN/m²

$W_u = 1.5\ [g_s + P_s] = 17.25$ ⇒

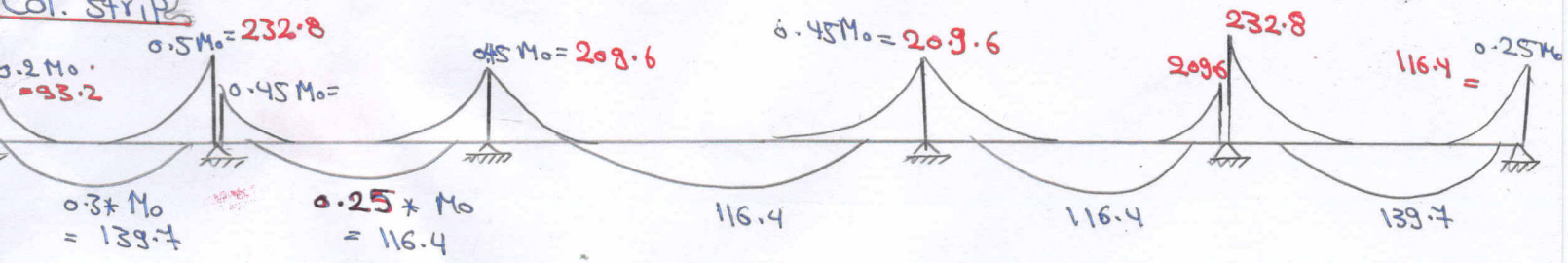
* Total static mommeny Inlong Direction

$$M_o = \frac{W_u * L_1}{8} \left[L - \frac{2}{3} * \left[D \right] \right]^2 = 465.75 \text{ kN.m}$$

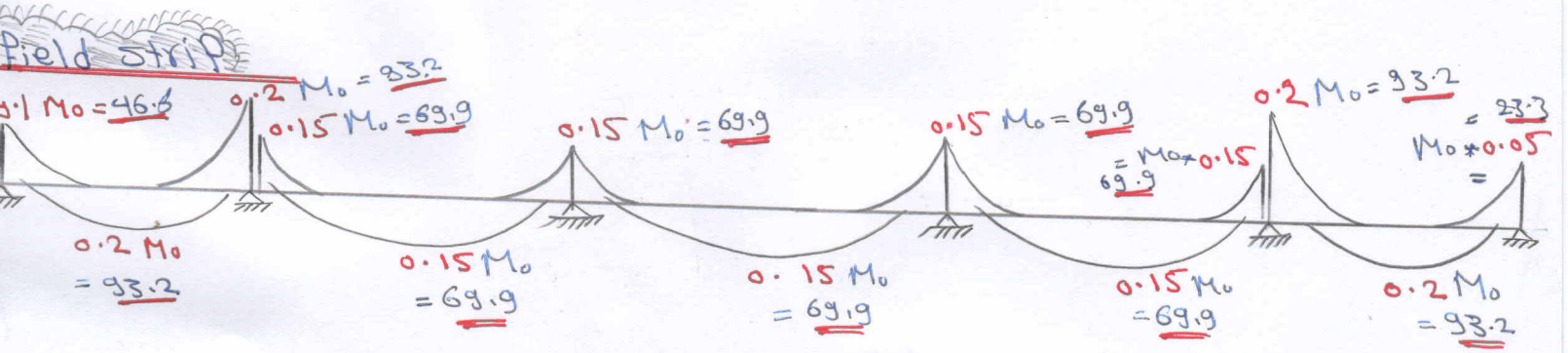
(التوزيع باتجاه)

4) ..critical strips

Col. strip



Field strip



* Design of flexure

B = 3000 mm (القسم على 2)

strip No	Mu	d	B	C_1	J	As mm^2	As/m	Choosen
Column Strip	93.2	ts - Cver = 220 - 30 = 190 mm	0.5 Ld = 3000 mm	5.38	0.826	1649	549.7	6 ϕ 12
	193.7			3.738	0.800	3539	1428	9 ϕ 16
	232.9			3.41	0.775	4394	871	6 ϕ 16
	116.4			4.82	0.826	2060	687	6 ϕ 16
	209.6			3.59	0.786	3899	1300	9 ϕ 16
Field strip	46.6	100 mm	3000 mm	7.62	0.826	824.8	275	6 ϕ 10
	93.2			5.38	0.826	1650	550	6 ϕ 12
	69.9			6.22	0.826	1237	413	6 ϕ 10
	23.3			10.77	0.826	412.4	138	6 ϕ 10

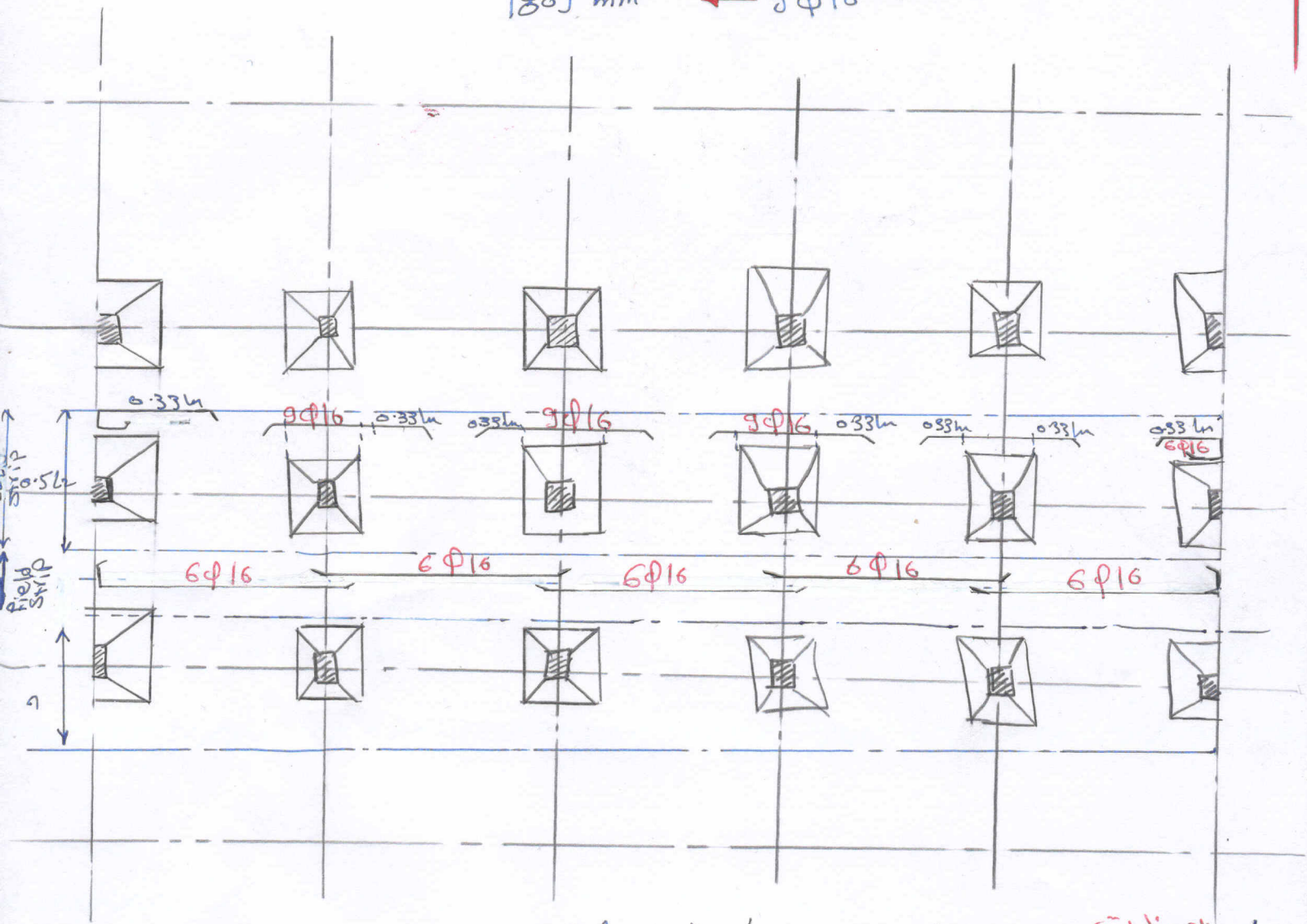
Sec (4)

Design of Flexure

NOTE:- أقل عدد من الأسياخ في تسليح الـ flat ٥ بسيخ وأقل قطر $\phi 10$ ← $\phi 12$ or أقل عدد 6

- بنختار من دول

$417\ mm^2$	← $6\phi 10$
$678\ mm^2$	← $6\phi 12$
$1206\ mm^2$	← $6\phi 16$
$1809\ mm^2$	← $9\phi 16$ ← دة أكبر حاجة

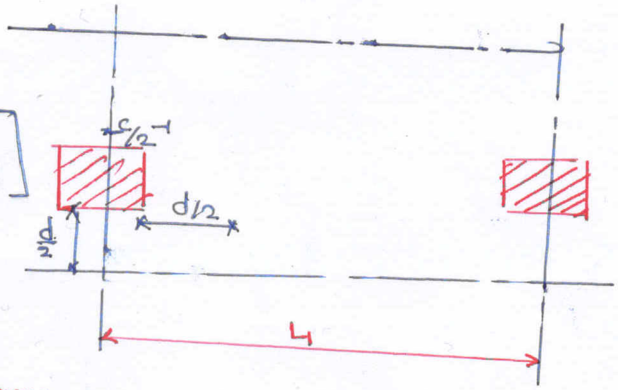


* ملاحظات:
  - يفضل أن يكون عدد السياخ في كل اتجاه ثابت
  - تسليح الـ field نفس تسليح الـ Col.strip مع اختلاف في المسافات
  - تسليح الكمرة العلوي في الـ field = 0.22m بدلاً من 0.33m

Check shear

(1) one way shear

safe غالباً



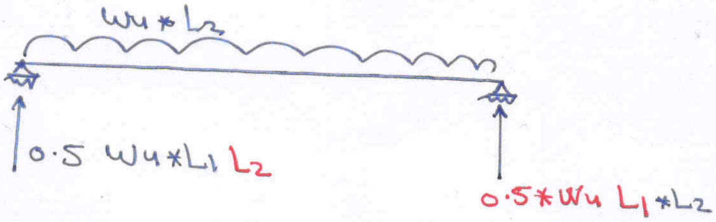
• $Q_{ucr} = R_u - W_u \cdot L_2 \left[\frac{c}{2} + \frac{d}{2} \right]$

$= 0.5\, W_u L_2 \left[L_1 - \left(\frac{c}{2} + \frac{d}{2} \right) \right]$

• $q_{ucr} = \frac{Q_{ucr} * 10^3}{L_2 * d}$

• q_{cu} → $0.24 \sqrt{\frac{f_{cu}}{\gamma_c}}$ $t_s > 250$ mm

→ $0.16 \sqrt{\frac{f_{cu}}{\gamma_c}}$ $t_s < 250$ mm



→ If $q_{ucr} \leq q_{cu}$ → safe

• If $q_{ucr} > q_{cu}$ → (تعمل عطاية من إنشين) ① Increase f_{cu} ② Increase t_s

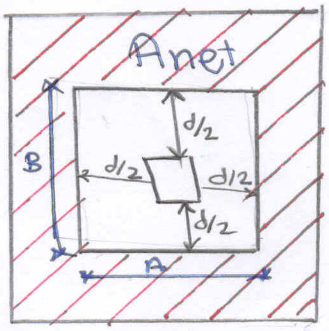
← في الغالب الدكتور one way ← safe ؟ وما بتحملش إلا لما الدكتور يطلب

Check Punching

→ Case (1) of total load

* Internal Col.

(1) Drawing



• $A = C + d$

• $B = C + d$

• $A_{net} = L_1 * L_2 - A * B$

$Q_{up} = A_{net} * W_u$

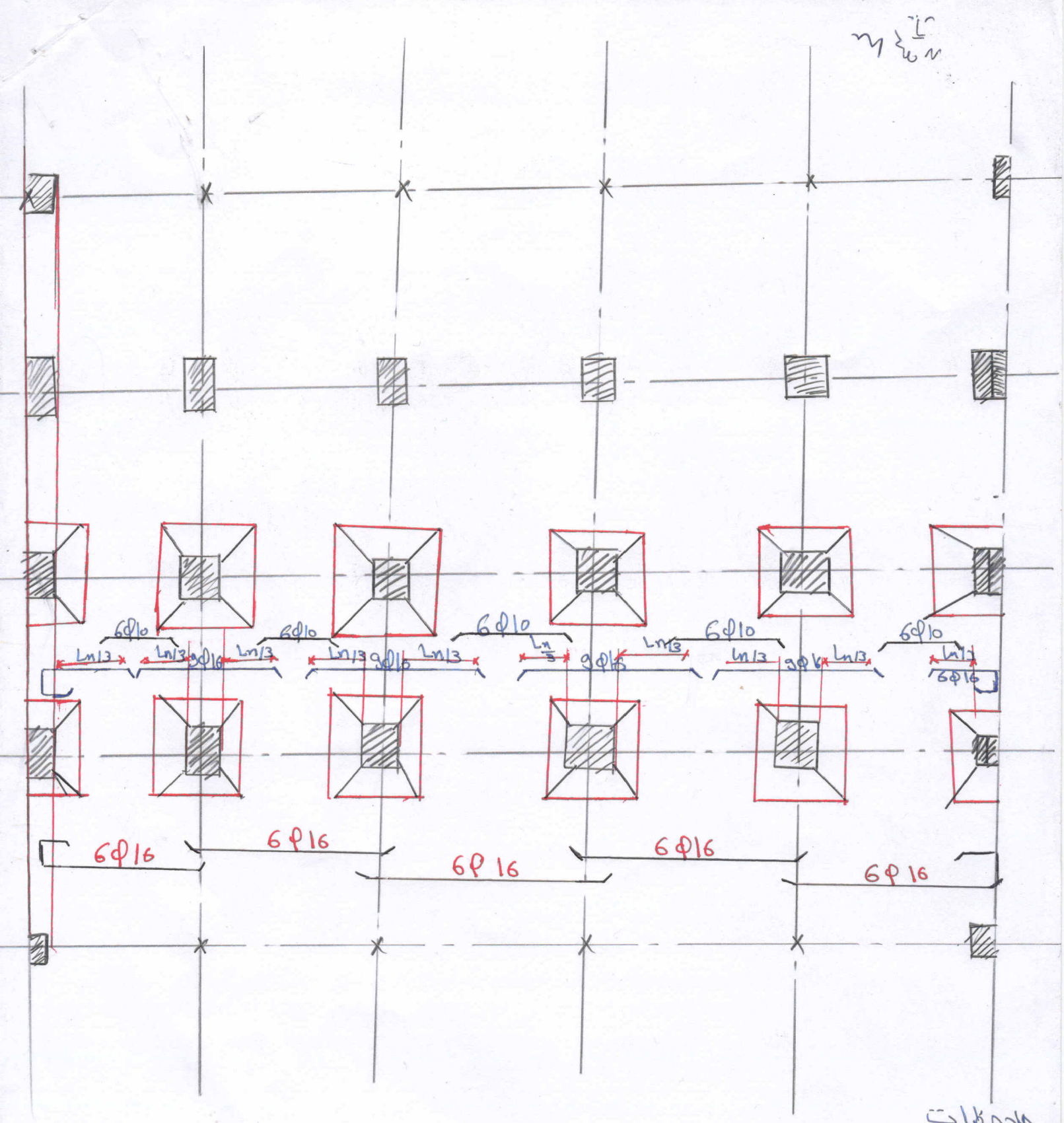
• $d = t_s - \text{Cover}$

$b_o = 2(A + B)$

↳ $q_{up} = \frac{Q_{up} * 10^3}{b_o * d}$

→ Col. only	Col. Head only
C → نفس	C → D
d = ts − Cover	d = ts − Cover
→ drop only	Col. Head + drop
C → نفسي	
d = ts + td − Cover	d = ts + td − Cover

Section 2



ملاحظات

* أقل عدد من الأسياخ ٥ أسياخ = أقل قطر ϕ_{10} ← أو 6 Bars = ϕ_{12}

$6\phi10 \rightarrow 417\ mm^2$ $6\phi16 \rightarrow 1206\ mm^2$

$6\phi12 \rightarrow 678\ mm^2$ $9\phi16 \rightarrow 1809\ mm^2$ بالتقريب لأقرب رقم

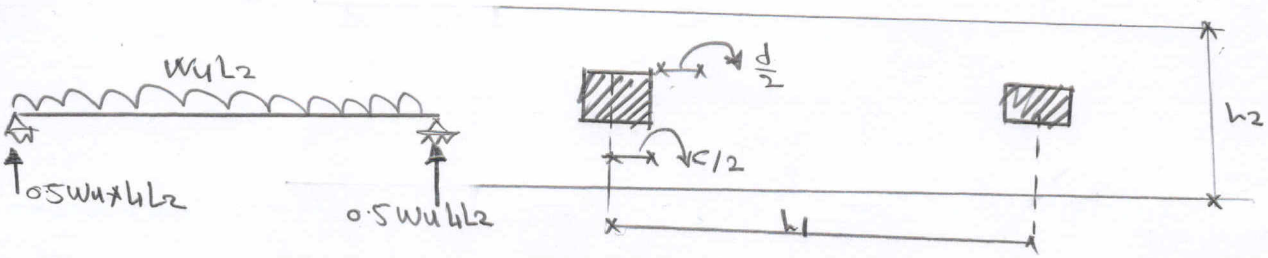
* تسليح الـ field strip نفس تسليح الـ (G1.strip) مع الاختلاف

(أ) قيم التسليح الحدية العلوي $0.22\ L_n$ يزداد إلى $0.33\ L_n$

Cheeck shear

* غالبًا safe

(1) one way shear



* دايمًا ال one way safe وميتعملش إلا إذا طلب

* $Q_{ucr} = W_u *$ Area of one way shear

$$= W_u * \left[L_2 * \left(\frac{L_1}{2} - \frac{(D + d)}{2} \right) \right] \quad * *$$

(D → c)

$$* \; q_{ucr} = \frac{Q_{ucr} * 10^3}{L_2 * d} \quad * *$$

* q_{cu}:

- $(0.24)\sqrt{\frac{f_{cu}}{\gamma_c}}$ If $t_s > 250$ mm
- $(0.16)\sqrt{\frac{f_{cu}}{\gamma_c}}$ If $t_s \ngtr 250$ mm

* If $q_{ucr} \leq q_{cu}$ safe

If unsafe:

- Increase f_{cu}
- Increase t_s

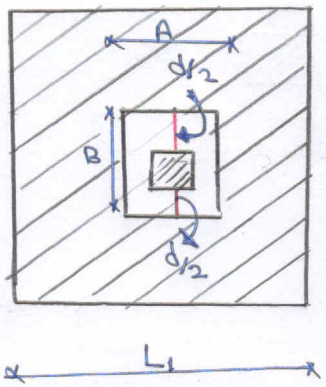
on Col. only	Col. Head only
$C = C$ تصميم $d = t_s -$ Cover	$C \Rightarrow D$ $d = t_s -$ Cover
drop only	**Col. Head + drop**
$C \rightarrow C$ $d = t_s + t_d -$ Cover	$C \rightarrow D$ $d \rightarrow t_s + t_d -$ Cover

(2) Check two way shear (Punching)

(1) Interior Col.

1) Drawing

* $A = C + d$
* $B = C + d$
* $A_{net} = L_1 L_2 - A * B$
* $Q_{uP} = W_u * A_{net}$
* $d = t_s - \text{cover}$
* $b_o = 2A + 2B$
* $q_{uP} = \dfrac{Q_{uP} * b^3}{b_o * d}$



$q_{uP} \leq$

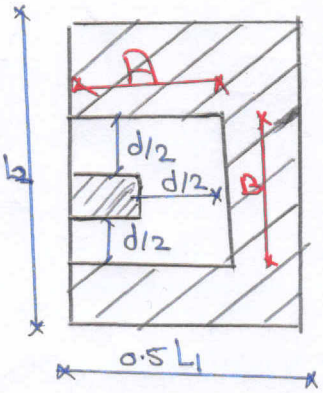
- $0.316 \sqrt{\frac{f_{cm}}{\gamma_c}}$
- $0.8\left(\frac{\alpha d}{b_o} + 0.2\right)\sqrt{\frac{f_{cm}}{\gamma_c}}$
- $0.316\left(\frac{A}{B} + 0.5\right)\sqrt{\frac{f_{cm}}{\gamma_c}}$
- $1.6 \sim 1.P_d$

$\alpha = 4$

$\alpha =$ عدد الـ Punching الموجودة

4 → Interior Col.
3 → edge Col.
2 → Corner Col.

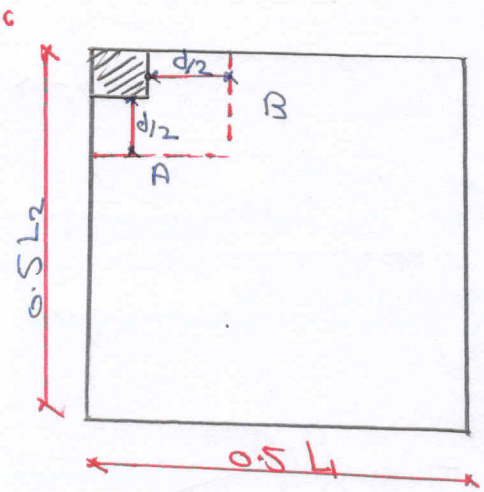
(2) Edge Column



* $A = C + d/2$
* $B = C + d$
* $b_o = 2A + B$
* $A_{net} = 0.5 L_1 L_2 - A * B$
* $d = t_s - \text{cover}$
* $Q_{uP} = W_u * A_{net}$
* $q_{uP} = \dfrac{Q_{uP} * 10^3}{b_o * d}$

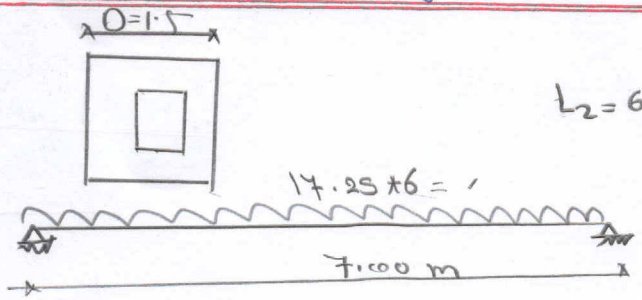
* $\alpha = 3$

(3) Corner Column



* $A = C + \frac{d}{2}$
* $B = C + \frac{d}{2}$
* $A_{net} = \frac{1}{2} L_1 * \frac{1}{2} L_2 - A * B$
* $b_o = A + B$
* $\alpha = 2$

* Check one way Shear



$$Q_{ucr} = W_u \left[\frac{6}{L_2} * \left(\frac{7}{\frac{L_1}{2}} - \frac{1.5}{\frac{D+d}{2}} \right) \right]$$

$W_u = 17.25$, $d = 0.19$

$\therefore Q_{ucr} = 274.8$ KN.m

$$q_{ucr} = \frac{Q_{ucr}}{L_2 * d} = \frac{274.8 * 10^3}{6000 * 190} = 0.24$$

$$q_{au} = 0.16 \sqrt{\frac{f_{cu}}{\delta c}} = 0.72$$

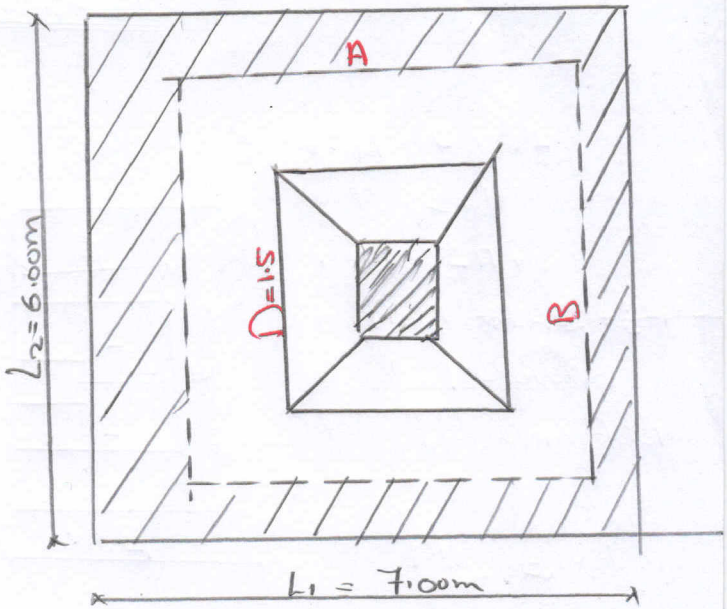
$q_{ucr} <<< q_{au}$ safe

الخلطة جيدة تزيد القوة وهو ok

AL-Sebaey

2012-2013

* Check Punching Shear



$A = D + d = 1.69$

$B = D + d = 1.69$

$A_{net} = L_1 L_2 - A * B$

$= 7 * 6 - 1.69 * 1.69 = 39.14 \, m^2$

$b_o = 2A + 2B = 6.7 * 10^3$ mm

$Q_{up} = A_{net} * W_u = 675.17$ KN

$$q_{up} = \frac{Q_{up} * 10^3}{b_o * d} = 0.526$$

$q_{au} <<$

- $0.316 \sqrt{\frac{f_{cu}}{\delta c}} = 1.41$
- $0.8 \left(\frac{\alpha d}{b_o} + 0.2 \right) \sqrt{\frac{f_{cu}}{\delta c}} = 1.12$
- $0.316 \left[\frac{A}{B} + 0.5 \right] \sqrt{\frac{f_{cu}}{\delta c}}$
- 1.6 M.Pa

$q_{au} > q_{up}$ safe

Section 3

* Momment transfer from Flat slab to Column

(1) Interior Column

C_1

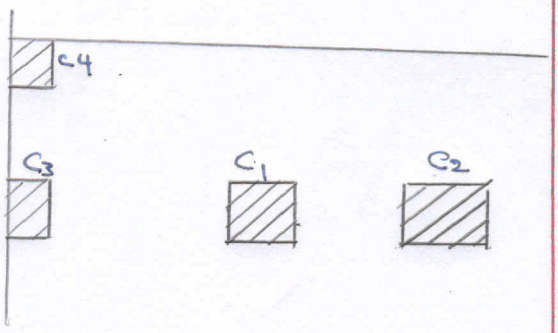
$M_F = 0.5\, M_{-ve}$ Column strip

$\therefore M_F = 0.5 * 0.5\, M_o$

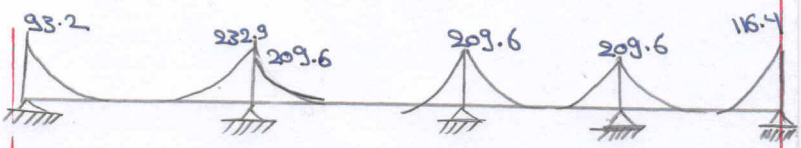
C_2 ↳ $M_F = 0.25\, M_o$

$M_F = 0.5 * 0.45\, M_o$

↳ $M_F = 0.225\, M_o$



Example

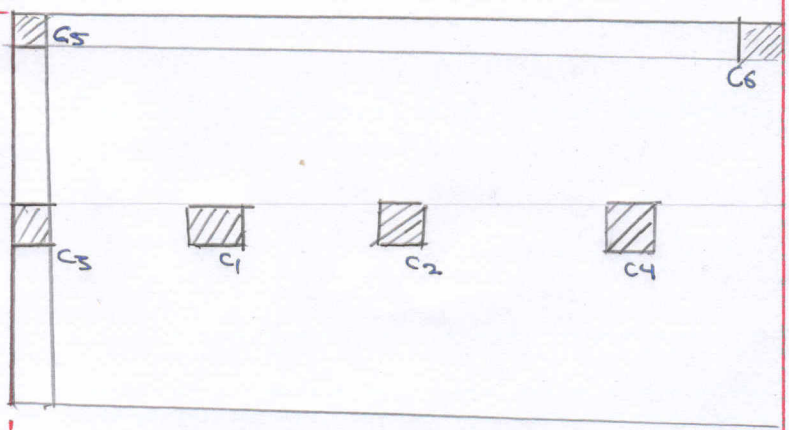


(2) Edge Column C_3

$M_F = 0.9\, M_{Gl.strip}$

* $M_F = 0.9 * 0.2\, M_o$ — In case With M.B → $0.18\, M_o$

* $M_F = 0.9 * 0.25\, M_o$ — In case without M.B → $0.225\, M_o$



C_1 :-

$M_F = 0.5\, M_{G1}$

$= 0.5 * 232.9 = 116.45$ kN.m

C_2 :-

$M_F = 0.5 * 209.6 = 104.8$ kN.m

C_3 :-

$= 0.9 * 93.2 = 83.88$ kN.m

$C_4 = 0.5 * 209.6 = 104.8$

$C_5 = 0.5\, M_{edge} = 0.5 * 83.88 = 42$ kN.m

$C_6 = 0.5\, M_{edge} = 0.5 * 116.4 = 58.2$ kN.m

(3) Corner Column C_4

$M_F = 0.5\, M_{F\,edge}$

* In case of M.B → $0.5 * 0.9 * 0.2\, M_o$

* In case of With out M.B → $0.5 * 0.9 * 0.25\, M_o$

Check Punching

Case II

→ $D.L + \frac{1}{2} L.L$

* Interior Column

* $W_u = 1.4\,D.L + 0.5 * 1.6\,L.L$

* $A = c + d$

* $B = c + d$

* $A_{net} = L_1 L_2 - AB$

* $b_o = 2A + 2B$

* $Q_{up} = W_u . A_{net}$

* $q_{up} = \frac{Q_{up}}{b_o * d}$

→ $q_{total} = q_{up} + q_{torsion}$

$$q_{torsion} = \frac{\sum M_q * 10^6}{J_{cy}} C_{A.B}$$

$$\sum M_q = \gamma_q * \sum M_f$$

$\gamma_q = 1 - \gamma_f$??

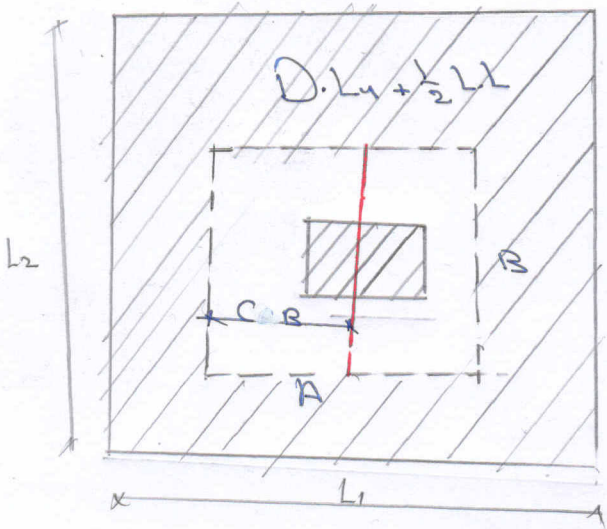
$$\gamma_f = \frac{1}{1 + \frac{2}{3}\sqrt{\frac{c_1 + A}{c_2 + B}}}$$

← $\sum M_f = 0.5\ M.G1$

← $C_{A.B} = \frac{c+d}{2} = \frac{A}{2}$

$$J_{cy} = \frac{d(c_2 + d(c_1+d)^2)}{2} + \frac{(c_1+d)d^3}{6} + \frac{d(c_1+d)^3}{6}$$

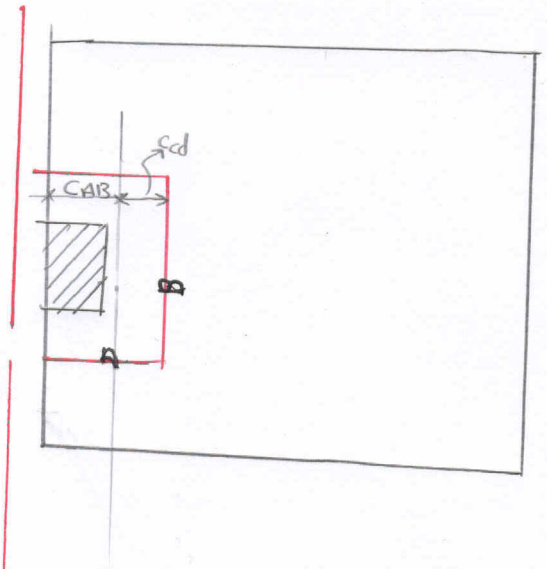
مختلفات ثابتة



* A ← البعد الأفقي
* B ← البعد الشاقولي
* C_1 ← البعد الأفقي
* C_2 ← البعد الشاقولي

* Edge Column

* $Wu = 1.4\,D.L + 0.5 * 1.6\,L.L$
* $A = C + \frac{d}{2}$
* $B = C + d$
* $b_o = 2A + B$
* $A_{net} = 0.5\,L_1 * L_2 - A * B$
* $Q_{up} = Wu * A_{net}$
* $q_{up} = \frac{Q_{up} * 10^3}{b_o * d}$



→ $M_P = 0.9 * 0.25 * M_o$

$$\gamma_f = \frac{1}{1 + \frac{2}{3}\sqrt{\frac{A}{B}}}$$

$\gamma_q = 1 - \gamma_f$

* $M_q = \gamma_q * M_P$

* $q_t = \frac{M_q * 10^6}{J_{cy}}$

$$C_{AB} = \frac{(C_1 + \frac{d}{2})^2}{(C_2 + d) + 2(C_1 + \frac{d}{2})}$$

ز الكود

$$J_{cy} = d(C_2 + d) * (C_{AB})^2 + \frac{2}{3} * d * (c_{cd}^3) + \frac{2}{3} * d\,(C_{AB}^3) + \frac{(C_1 + \frac{d}{2})}{6} d^3$$

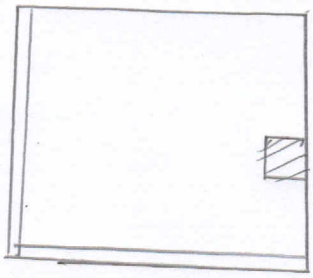
ز الكود

$C_d = A - C_{AB}$

$c_{cd} = (C_1 + \frac{d}{2}) - C_{AB}$

Example :-

$C_4 \rightarrow$



D.L=

L.L=

D= 1.5 m

L_1 = 7

L_2 = 6

$W_u' = 1.4 * 7.5 + 0.5 * 1.6 * 4$

$= 13.7$ kN

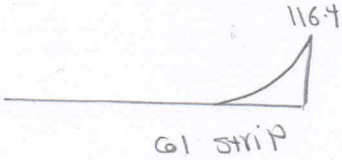
$A = D + \frac{d}{2} = 1.5 + \frac{0.19}{2} = 1.59$

$B = D + d = 1.5 + 0.19 = 1.69$

$b_o = 4.87$ m = 4870 mm

$A_{net} = 0.5 L_1 L_2 - A * B$

$= 3.5 * 6 * 0.5 - 1.59 * 1.69 = 18.3$ m²



$Q_{up} = W_u' * A_{net} = 13.6 * 18.3 = 248.88$ kN

$q_{up} = \frac{248.88 * 10^3}{4870 * 190} = 0.27$ M.Pa

$M_f = 0.9 * 116.4 = 104.76$ kN.m

$\gamma_f = \frac{1}{1 + \frac{2}{3}\sqrt{\frac{A}{B}}} = 0.61$

$\gamma_q = 1 - \gamma_f = 0.39$

$M_q = \gamma_q * M_f = 40.86$ kN.m

$C_{AB} = \frac{\left(D + \frac{d}{2}\right)^2}{(D+d) + 2\,[D + 0.5d]} = 520$ mm

$C_{cd} = D + \frac{d}{2} - C_{AB} = 1070$ mm

$J_{cy} = 2.66 * 10^{11}$ mm⁴

$q_t = \frac{40.86}{2.616 * 10^4} * 10^6 * 1070 = 0.08$

$q_{t+} = q_{uP} + q_{tor} = 0.27 + 0.08 = 0.35$ M.Pa

$q_{uP} = 1.13$ M.Pa $> q_{total}$ safe $\rightarrow$ ✓

Ideas on Flat slab

(١) خطوة الـ Conc. Dim ← معطاه (given)

(٢) الأحمال ←

① Total D.L = 10 kN/m²
Total L.L = 5 kN/m²

$W_u = 1.5\,(10+5) = -$

$W_u' = 1.4 * 10 + 1.6 * 5 * 0.5$

② Total Factoriezed D.L = 15 kN/m² = $D.L_u$
Total Factoriezed L.L = 10 kN/m² = $L.L_u$

$W_u = D.L_u + L.L_u$

$W_u' = D.L_u + \frac{L.L_u}{2} = -$

③ Total ultimate Factoriezed Load = 20 kN/m²

$W_u = 20$ kN/m² ⇒ $W_u' = ??$

$D.L_u = 1.4\,(t_s\,\gamma_c + F.C) = -$

$L.L_u = W_u - D.L_u$

$W_u' = D.L_u - 0.5\,L.L_u$

④ Eq. Load For wall Load

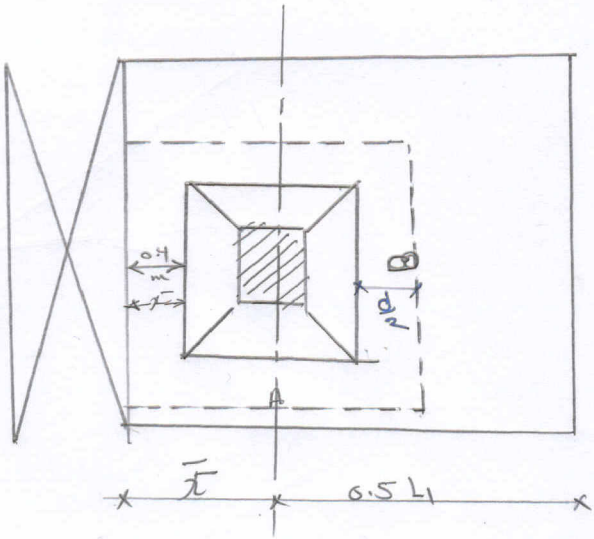
$D.L = t_s * \gamma_{conc} + F.C$

$L.L = r$

$W_u = \begin{cases} 1.5\,(D.L + L.L) & \frac{L.L}{D.L} < 0.75 \\ 1.4\,D.L + 1.6\,L.L & \frac{L.L}{D.L} > 0.75 \end{cases}$

* Openning

* Larg openning



$\bar{x} = \frac{x + D}{2} = \frac{0.4 + 1.5}{2} = 1.15$ m

$\bar{L} = \frac{1}{2}L_1 + \bar{x} = 3.5 + 1.15 = 4.65$ m

$A = x + D + \frac{d}{2} = 0.4 + 1.5 + \frac{0.19}{2} = 1.99$

$B = D + d = 1.69$

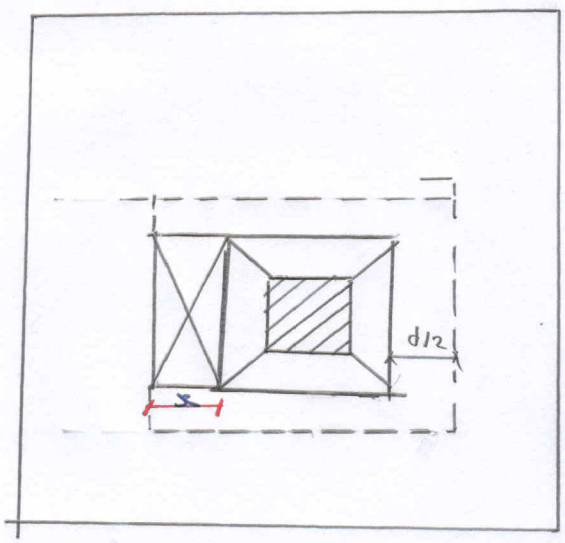
$b_o = 2A + B = 2 * 1.99 + 1.69 = 5.68$ m^2

$A_{net} = L_1 L_2 - A * B = 24.54$

$Q_{up} = A_{net} * W_u =$ —

$q_{up} = \frac{Q_{up} * 10^3}{b_o * d}$

Small openning



* $A = D + \frac{d}{2}$

$B = D + d$

$b_o = 2A + B + d$

$A_{net} = L_1 L_2 - A * B$ — عكس الاتجاه $(\bar{x} \cdot D)$

$Q_{up} = W_u * A_{net}$

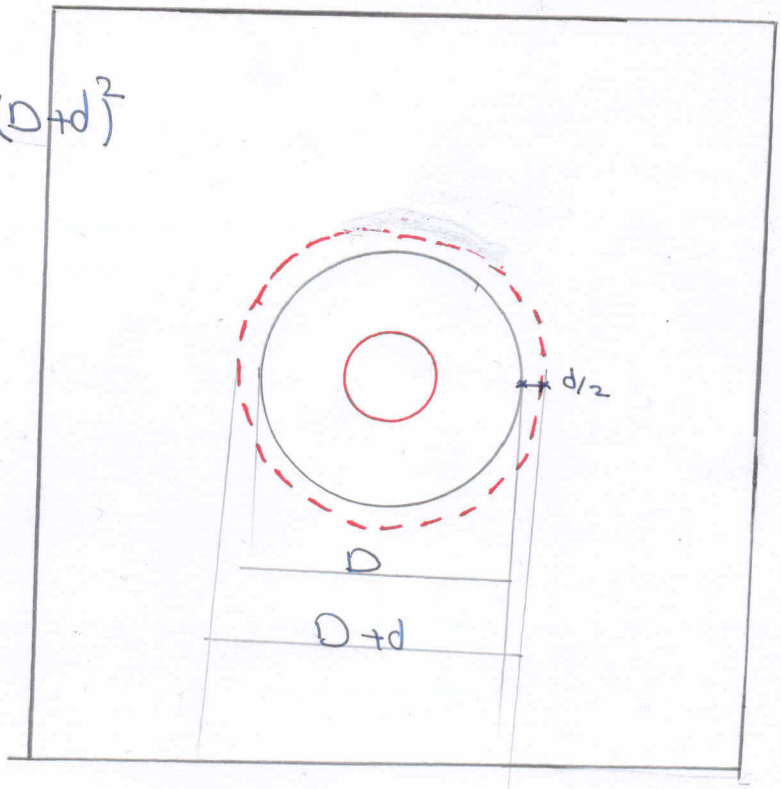
$q_{up} = \frac{Q_{up} * 10^3}{b_o * d}$

* $b_o = \pi (D+d)$

* $A_{net} = L_1 L_2 - \frac{\pi}{4} * (D+d)^2$

* $\phi_{up} = V_u * A_{net}$

$q_{up} = \frac{\phi_{up} * 10^3}{b_o * d}$



الكمرة المدفونة و قطاع ف الـ Flat slab

t = ـــ

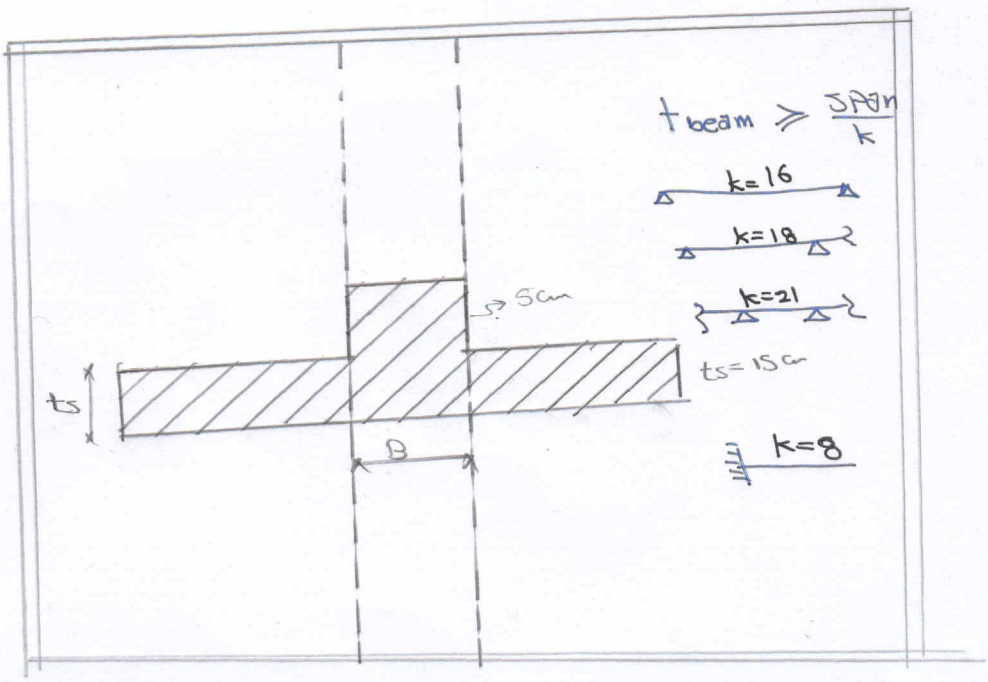
d = t - cover

Mu = ـــ

$d = c_1 \sqrt{\frac{Mu * 10^6}{\rho_w * B}}$??

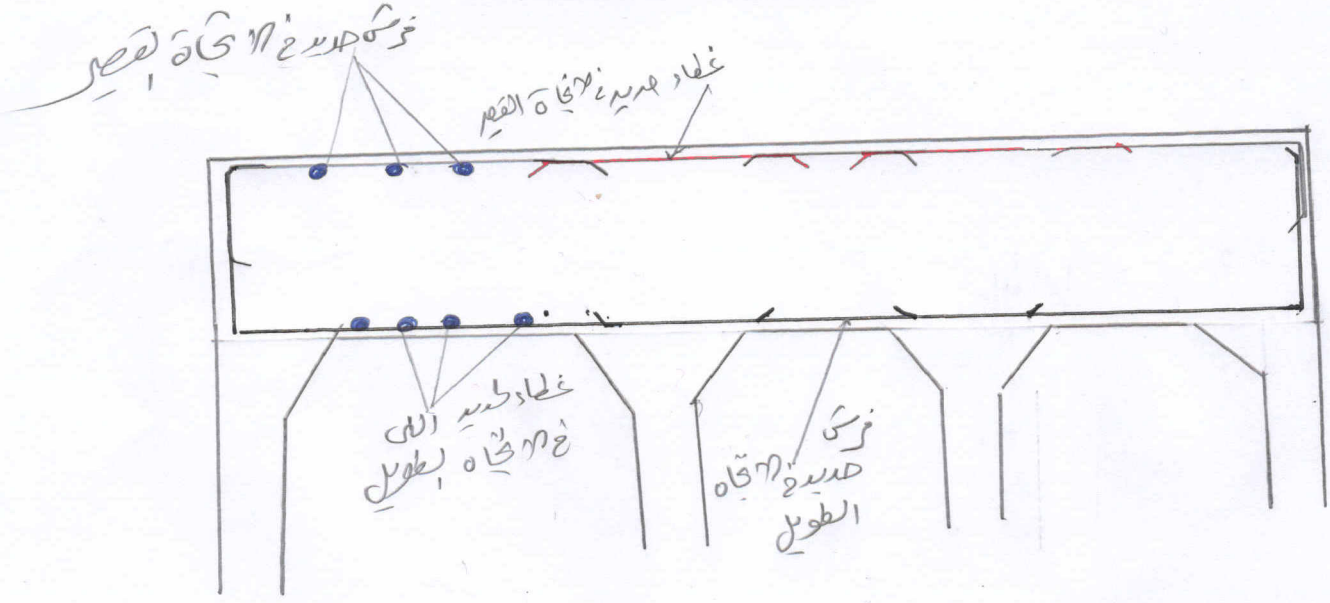
B = ـــ

Q_{ur} = ـــ

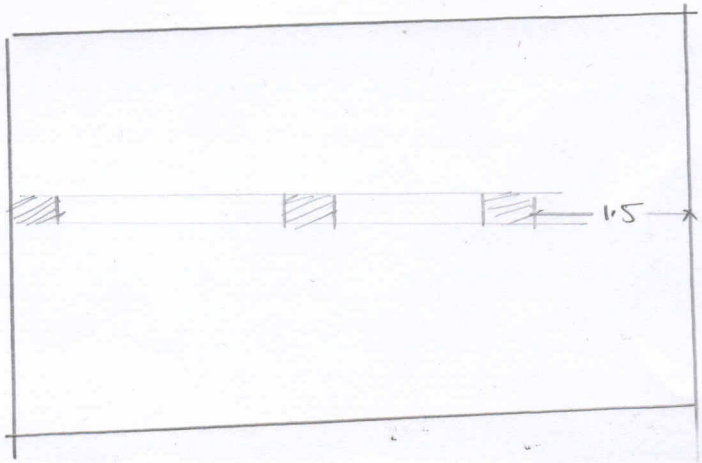


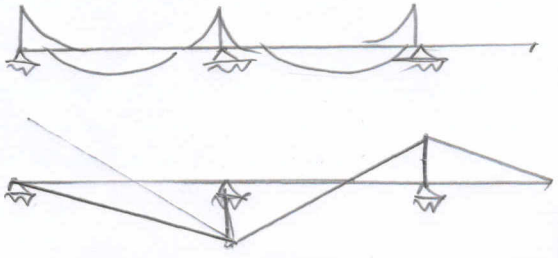
* الحديد العلوى = الحديد السفلى
لأن من فوائد الحديد العلوى تقليل الـ deff

قطاع ف الـ Flat slab



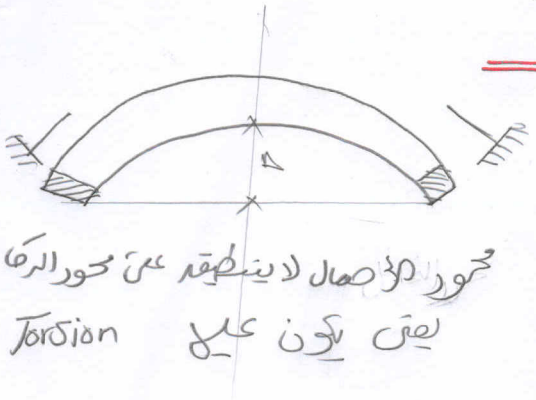
* لو فرضنا



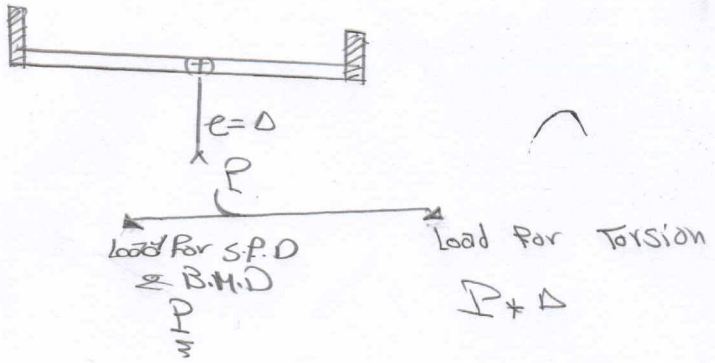


Section 4

Torsion



محور الأعمال لا ينطبق على محور الركائز
Torsion يعني يكون عليه



Design Steps

1- Conc Dimension

2- Load (70% تقريباً)
- (1) Load for S.F.D
- (2) Load for T.M.D

3- Straining action
- (1) N.F.D
- (2) S.F.D
- (3) B.M.D
- (4) T.M.D

غالباً = 0.0

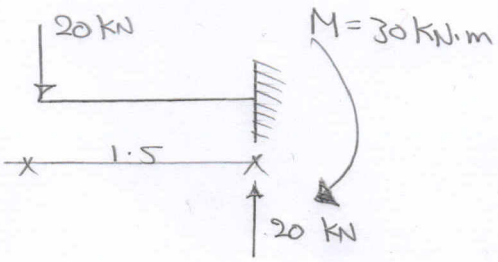
4- Design of Flexure

5- Design of shear
- Torsion
- Shear Force

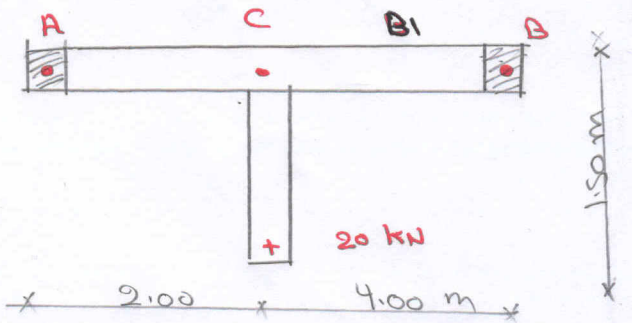
6- R.F.T Details

→ Neglect O.W

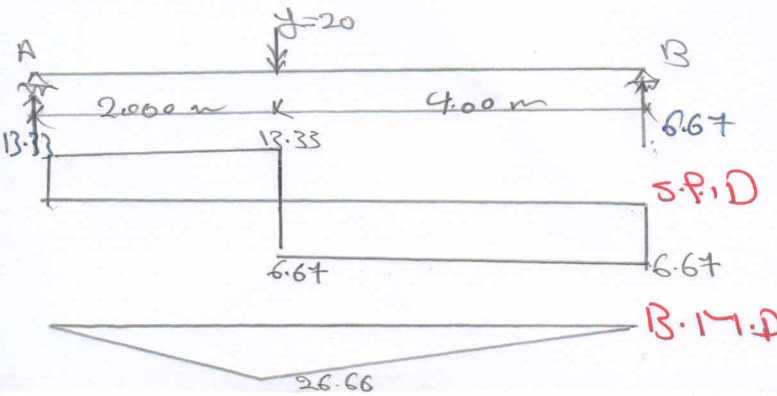
Cant. Dc



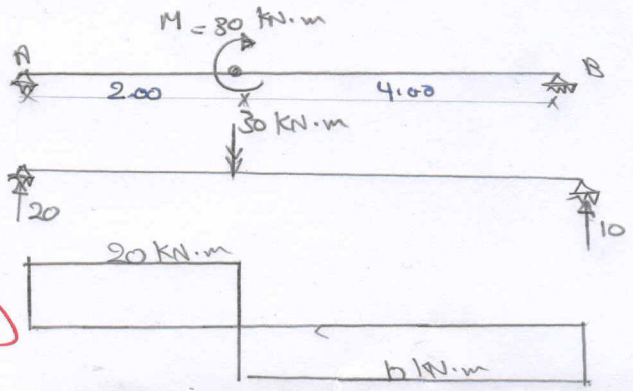
*Beam (B1)



Load For S.F.D & B.M.D



Load For T.M.D



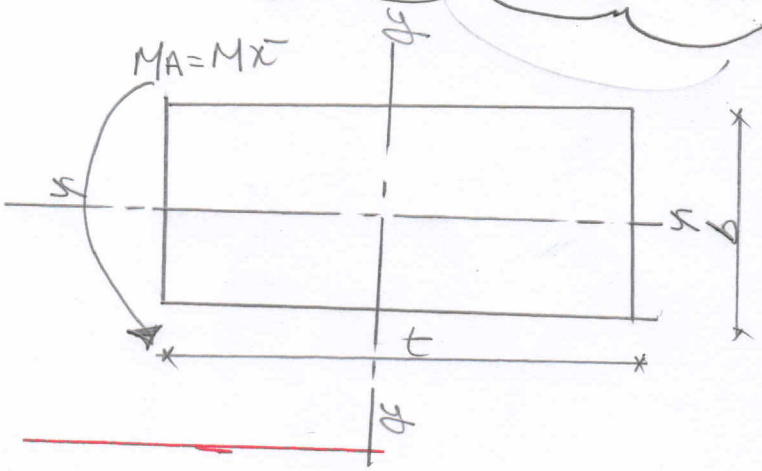
Calculate Load Acting on Columns

(2) Straining action + N.B

$N_u = 1.1 * \bar{y} * No.\ of\ Floors$ (13.33)

$M_{1x} = M_A * No.\ of\ Floors$

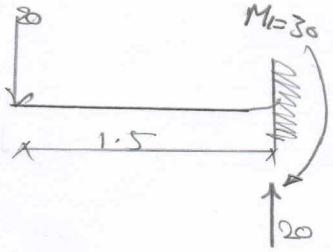
↳ use I.D $A_S = A_S'$



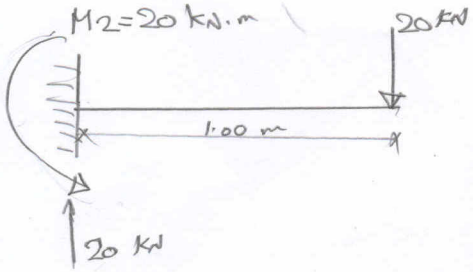
Example (2)

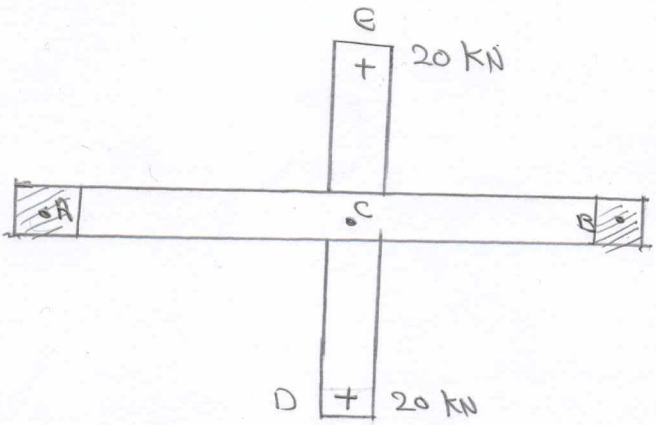
We Lect our:

*Cant. Oc



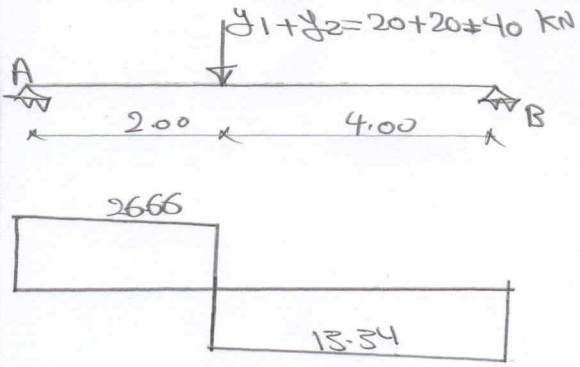
*Cant C.E

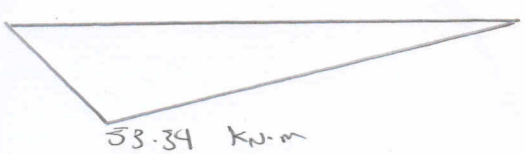




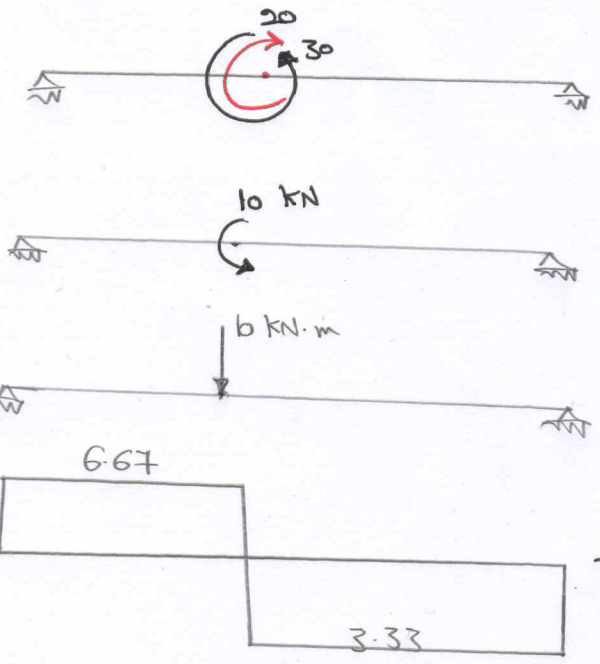
Beam AB

Load for S.F.D & B.M.D

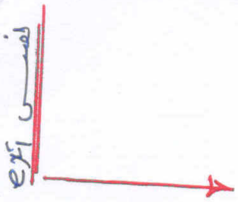


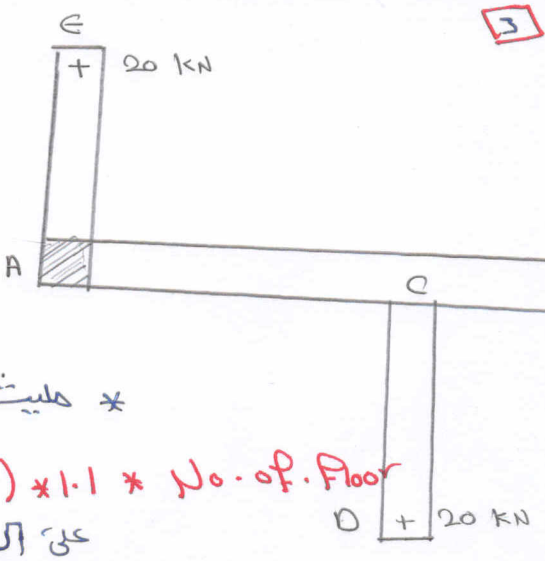


Load for Torsion



Example

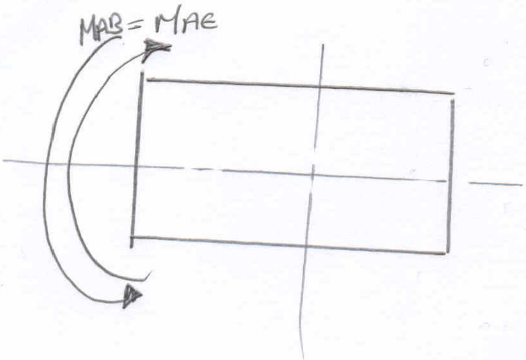


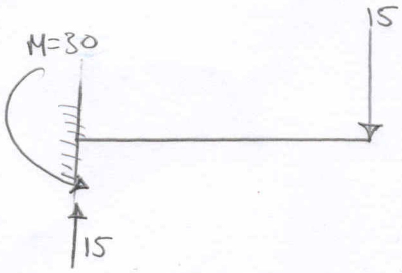


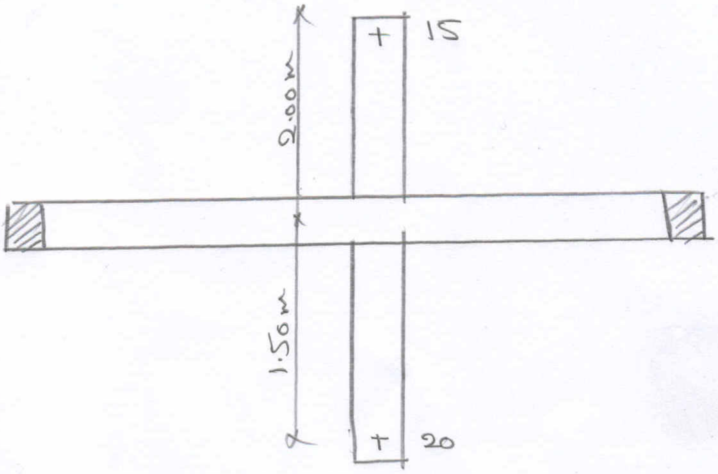
AE Cant   مليش دعوة بال *

$N_u = (\gamma_{AB} + \gamma_{AE}) * 1.1 * \text{No. of. Floor}$ (26.66, 20)

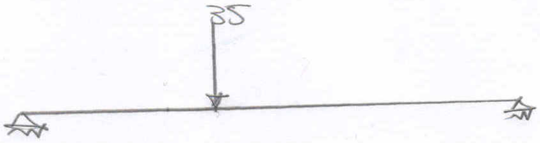
$\Delta M = \text{Zero}$ على العمود





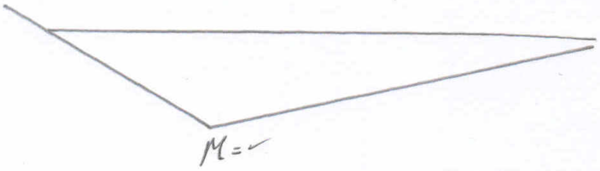


S.F.D



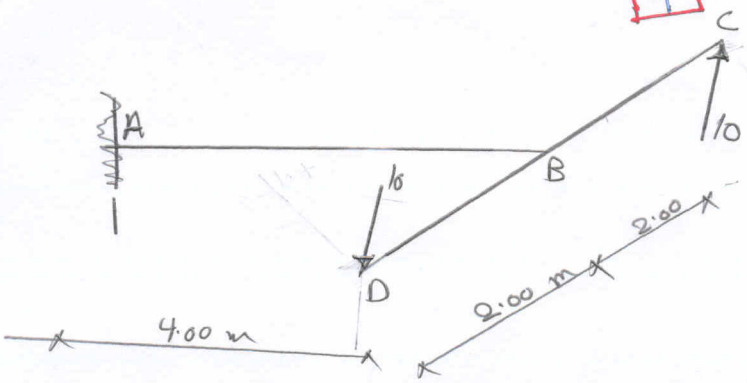
T.M.D

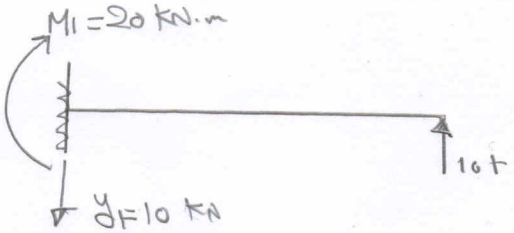
B.M.D

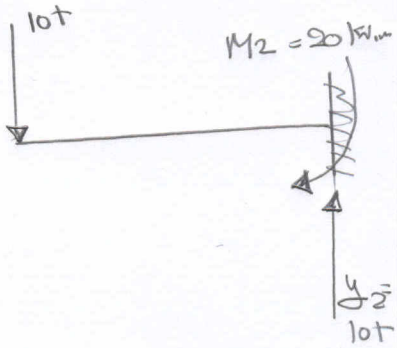


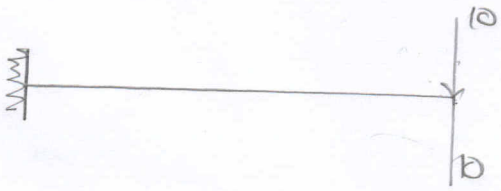
4

Pure torsion



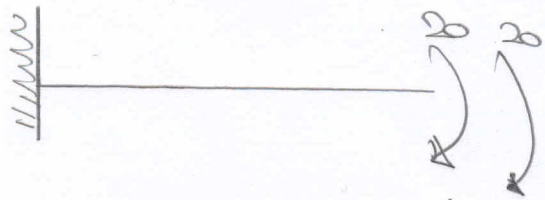


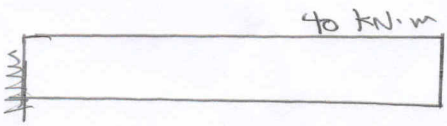




S.F.D

B.M.D





T.M.D

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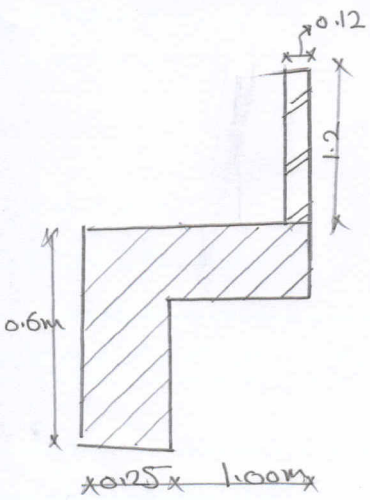
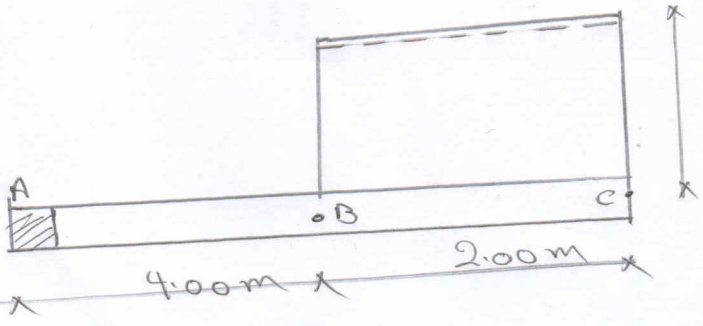
*Example





Data:-

$\gamma_{r.c} = 1.50\ kN/m^2$

$L.L = 3\ kN/m^2$

1- Conc. Dimen Given

2- Loads

* O.W. of Beam = b * t * γconc * 1.4 (ultimate)

= 1.4 * 0.25 * 0.6 * 25 = 5.25 kN/m'

* Slab Load

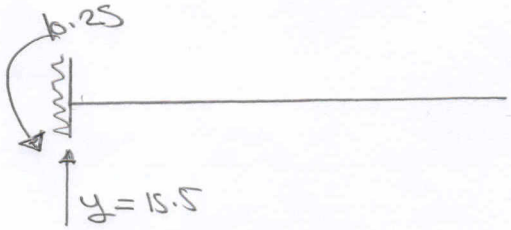
Wus = 1.5 (ts * γconc + F.C + L.L)

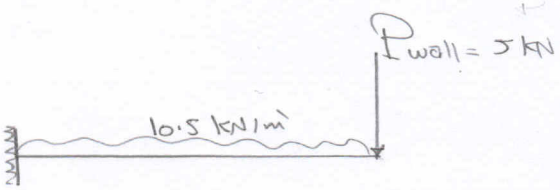
= 1.5 (0.1 * 25 + 1.5 + 3)

= 10.5 kN/m²

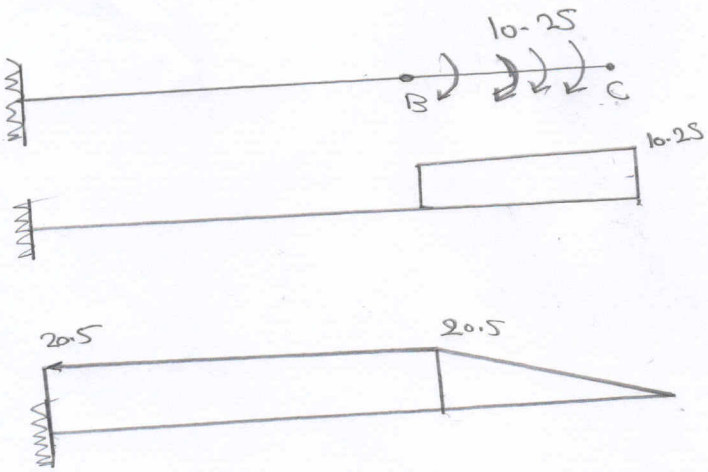
Hand rail = Int * hw = 3 * 1.2 * 1.4 (ult)

P ult wall = 3 * 1.2 * 1.4 = 5 kN/m'





* Load For Torsion



At Colum C_2 Calc. straining action

V_u = 62.5 * 1.1 * No. of. floor

M_x = 20.5 due to Torsion

M_y = 249.50 due to flexure

Load For S.F.D & B.M.D