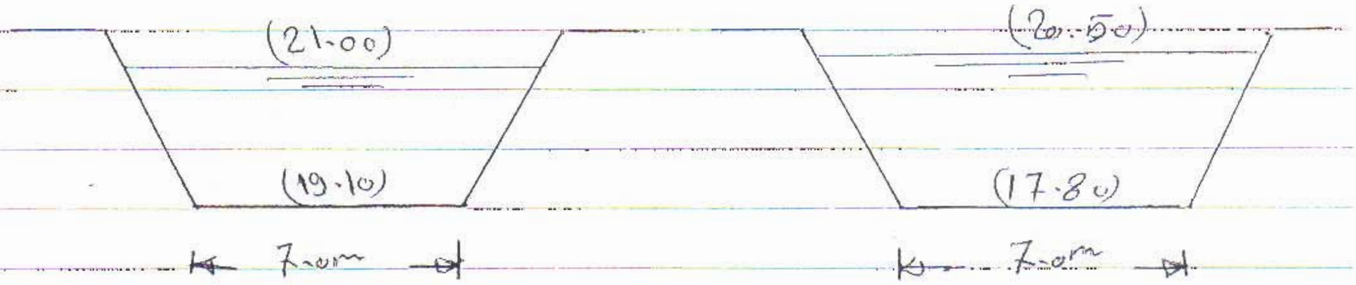
Sheet (2)

prob ①

data

Fayoum type weir



U.S cross sec   D.S cross sec

$Q = 12.00\ m^3/sec$

$C_B = 15.0$

Req:-

1- Complete design for the weir

مطلوب عمل كل تصميم للهدار ، مصمم

1- Hydraulic design

2- Floor design [length, uplift, thick, scour]

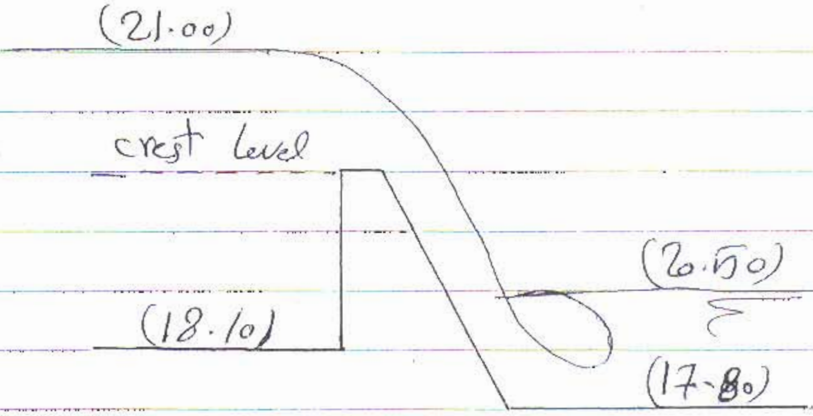
2- P.H.E.R , sec ELEV.

Solution.

1- Hydraulic design.

يتم رسم اسكتش للهدار

$Q = \frac{2}{3} C_d \, B \sqrt{2g} \, H^{1.5}$



$Q = 12 \, m^3/sec$

assume $C_d = 0.7$

B = unknown

H = U.S.W.L − crest level

في هذه المعادلة يكون المجهول H و B يتم فرض احدهما وحساب الاخر

* يتم فرض منسوب الهدار crest level اعلى منسوب D.S بمقدار 10cm حتى يكون الهدار حر "free overfull"

assume crest level = 20.50 + 0.1 = (2.60)

$H = 21.5 - 20.60 = 0.9 \, m$

$Q = \frac{2}{3} C_d \, B \sqrt{2g} \, H^{3/2}$

$12 = \frac{2}{3} \times 0.7 \times B \sqrt{2 \times 9.81} \, (0.9)^{1.5}$

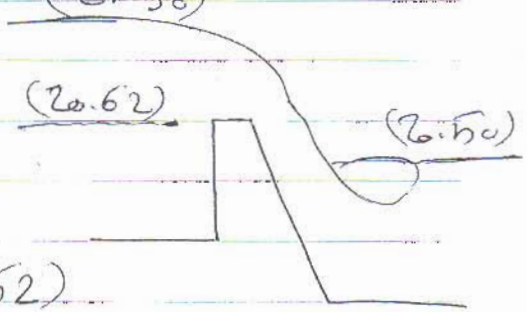
$B = 6.8 \, m$

Take $B = 7.0 \, m$

بعد ذلك نحصل على منسوب الـ crest الذي يعطي $Q = 12 \, m^3/sec$

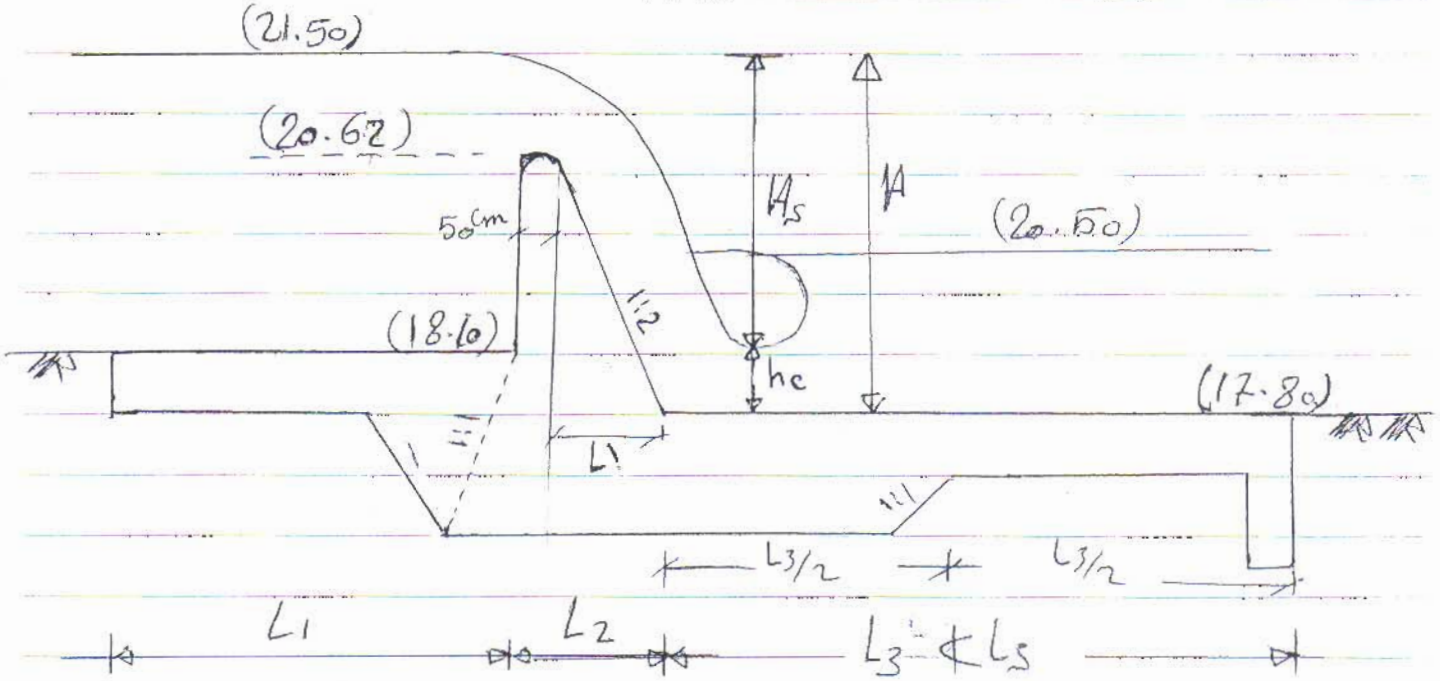
$$12 = \frac{2}{3} * .7 * 7 * \sqrt{2 * 9.81} * H^{1.5}$$

$H = .88\ m$



* crest level = 21.50 − .88 = (20.62)
* crest width = 7.0 m

2- Floor design



يتم فرض الابعاد الاولية والحل

1- Part ① [u.s part].

* For length

$L_1 = (2-3) H_{u.s}$

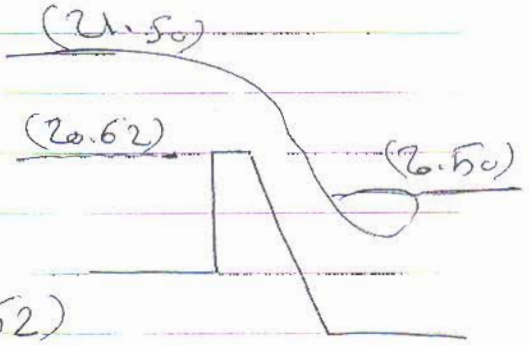
Take $L_1 = 6.0\ m$

* For thickness

assume $t_1 = 0.75\ m$

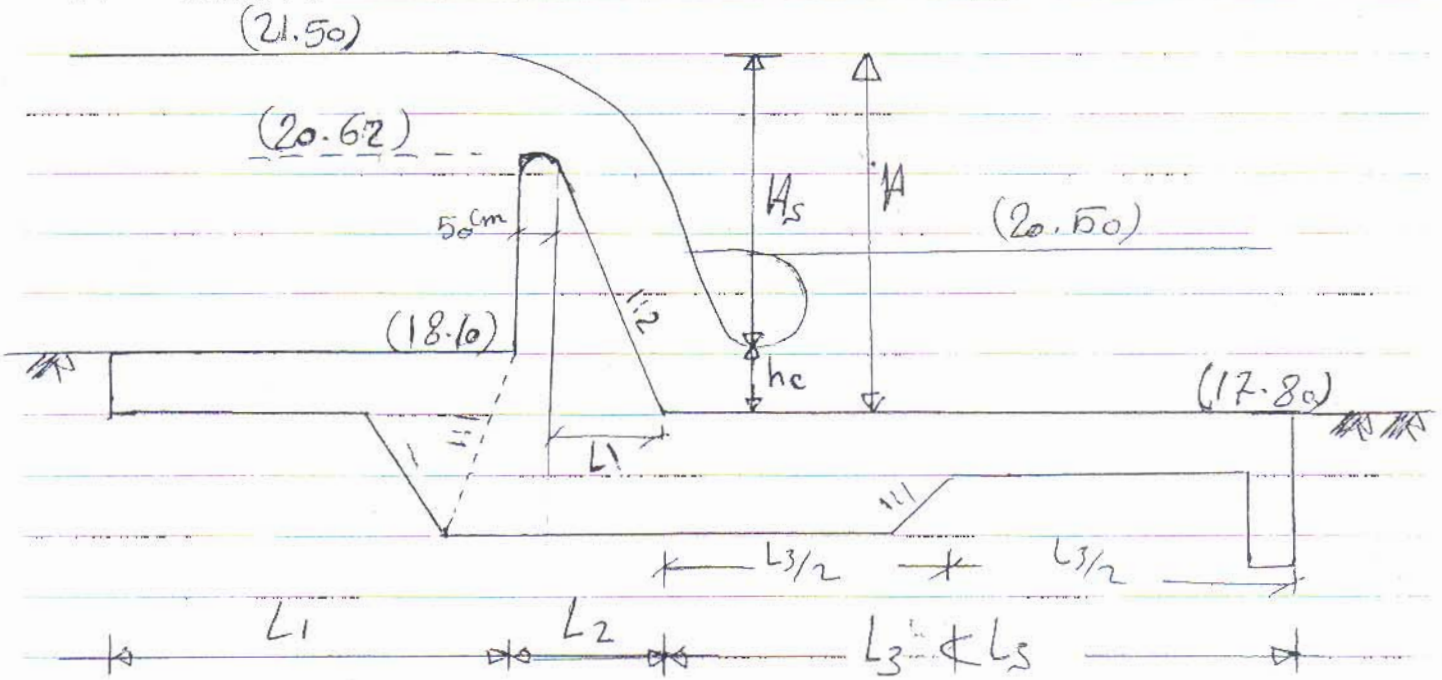
$$12 = \frac{2}{3} * .7 * 7 * \sqrt{2 * 9.81} * H^{1.5}$$

$$H = .88\,m$$



* crest level = 21.50 − .88 = (20.62)
* crest width = 7.0 m

2- floor design



يتم فرض الابعاد الاولية للحل

1- Part ① [U.S Part].

* For length

$L_1 = (2-3) H_{U.S}$

Take $L_1 = 6.0\,m$

* For thickness

assume $t_1 = 0.75\,m$

2- Part ② [structure part]

length

* $L_2 = 0.5 + L'$

$L' = (20.62 - 17.8) * \frac{1}{2} = 1.41\ m$

$L_2 = 0.5 + 1.4 = 1.90\ m$

thickness

* $t_2 = \sqrt{H_{max}}$

$H_1 = 21.50 - 20.50 = 1.0\ m$

$H_2 = 20.62 - 17.8 = 2.82\ m$

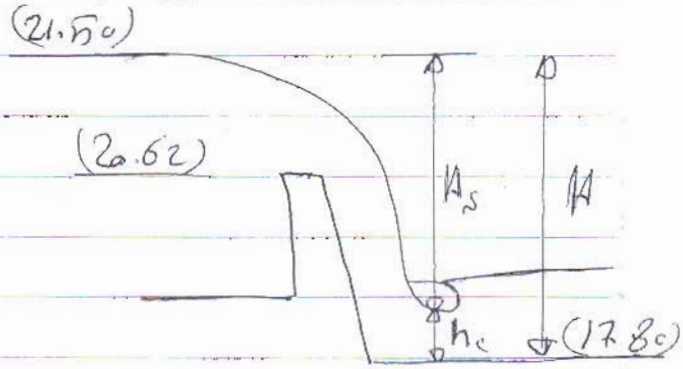
$\therefore H_{max} = 2.82\ m$

$t_2 = \sqrt{2.82} = 1.67\ m$ Take $t_2 = 1.75\ m$

3- Part ③ [D.S Part]

* For length

$L_3 \& L_S$



$L_S = 0.61\ C_p \sqrt{H_S}$

$H_S = H - h_c$

$H = 21.5 - 17.8 = 3.70\ m$

$h_c = \sqrt[3]{\frac{q^2}{g}}$

$q = \frac{Q}{B} = \frac{12}{7} = 1.7\ m^3/sec/m'$

$h_c = \sqrt[3]{\frac{1.7^2}{7}} = 0.66\ m$

$H_s = 3.7 - .66 = 3.0m$

$L_s = 0.61 \times 15 \times \sqrt{3.0} = 15.8m$

Take $L_3 = 16.0m$

الطول الموجود في D.S للابتل ـسد 16.0^m

* For thickness

$t_3 = \frac{1}{2} t_2 = \frac{1.75}{2} = .87$

Take $t_3 \simeq 1.0m$

ملحوظة

$L_3 < L_2 < L_1$ هذه الأطوال أقل أطوال مطلوبة لوضع المنشأ.

إذا الطول الموجود حالياً

$L = 6 + 1.9 + 16 + 1.75 \times 2 = 27.40m$

بعد ذلك يتم حساب طول التسرب اللازم لنفس طاقة صندوق

$H_{max} = 2.82^m$

$L_p = C_B \times H_{max}$

$= 15 \times 2.82 = 42.3m$

المنشأ $L = 27.40m$

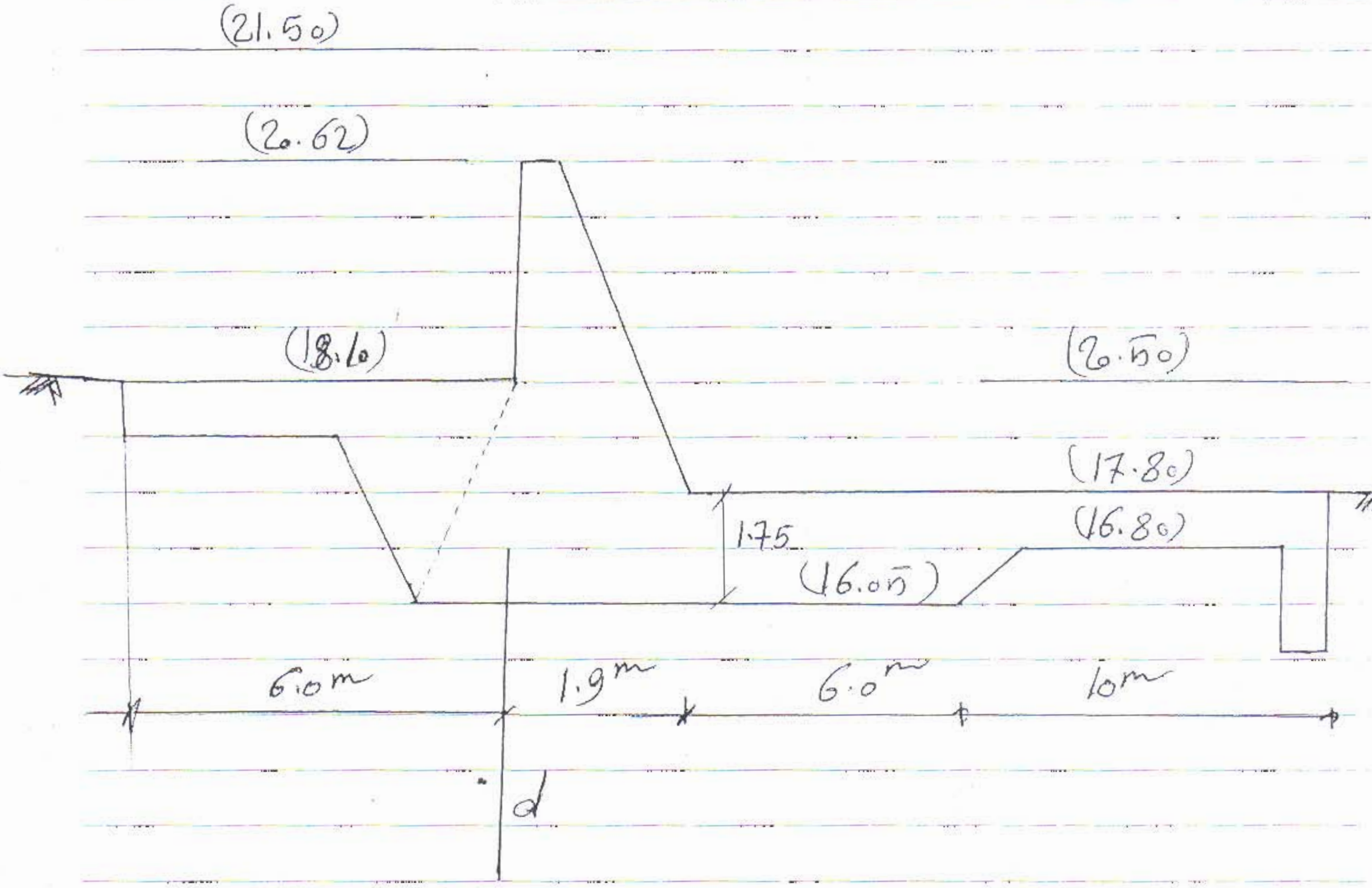
التسرب $L_p = 42.30m$

الفرق $= 42.30 - 27.40 = 14.90m$

نلاحظ أن الفرق 14.9m كبير نسبيا فيتم وضع sheet pile

أسفل الصدار الخرساني ، نحسب له عمق الـ sheet pile وتكمل

الحل مثل الـ sheet (1)

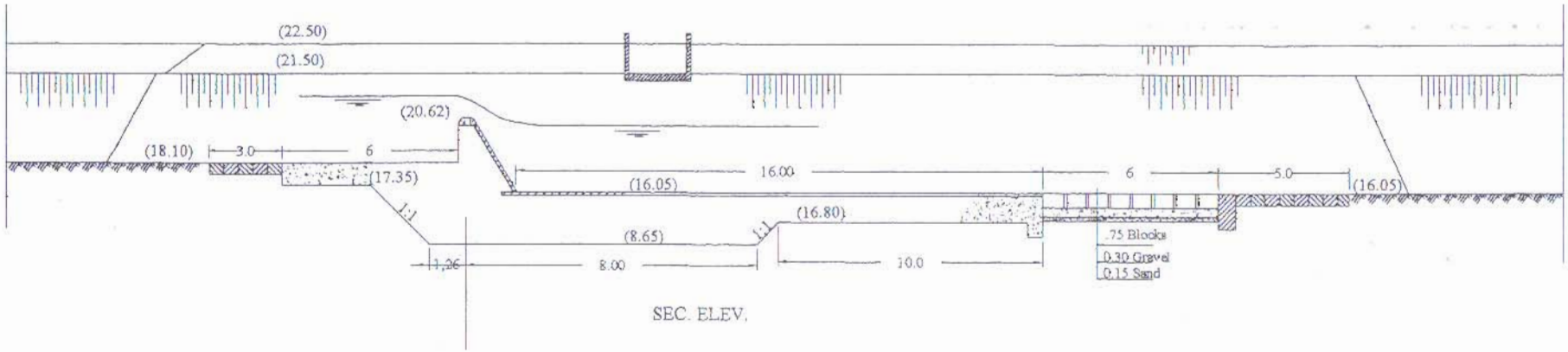


1- يتم حساب عمق الـ sheet pile مثل sheet (1)

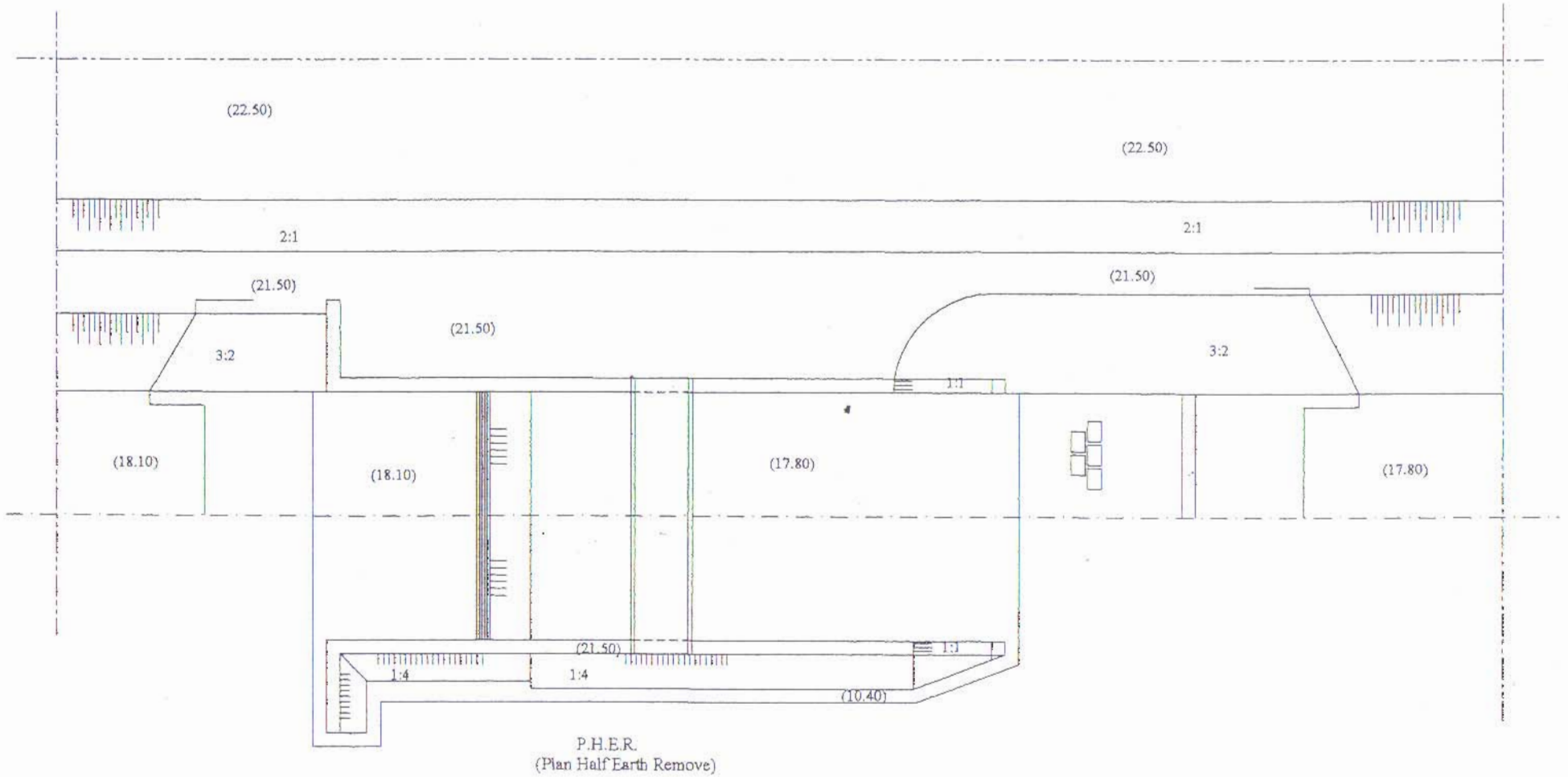
2- رسم uplift

3- عمل check of thickness

4- بالنسبة لـ local Scoure تم أخذها في الاعتبار.



SEC. ELEV.



P.H.E.R.
(Plan Half Earth Remove)

Free Over Fall Weir

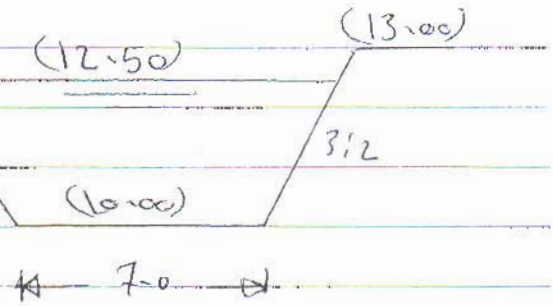
Prob (2)

* data.

Standing wave weir

$Q = 14.50\ m^3/sec$

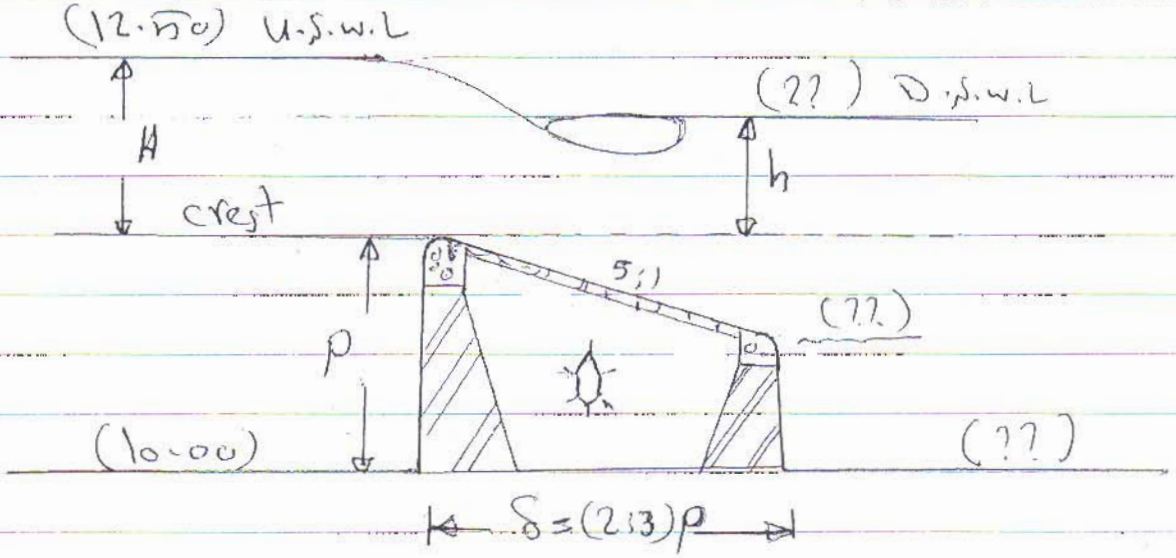
$q = 2.05\ H^{1.6}$



* Req.

1- Hydraulic design
2- Struc. design

* Solution



$Q = 2.05\ B\ H^{1.6}$

$Q = 14.50\ m^3/sec$

* H = U.S.W.L - crest crest
* B = Unknown

W ٢٥

assume $B = 7.0 m$

نفرض عرض الهدار = عرض القناة

$14.50 = 2.05\,(7.0)\,(H)^{1.6}$

$H = 1.0 m$

crest level $= 12.50 - 1 = (11.50)$

وكما بالنسبة لل D.S القانون الوحيد الذي يربط

h.u.s مع h.D.S هو

$\delta_{max} = \dfrac{h_{max}}{H_{max}} \qquad \delta_N = \dfrac{h_N}{H_N} \qquad \delta_{min} = \dfrac{h_{min}}{H_{min}}$

نلاحظ في هذا المثال لا يوجد max ، min ولكن يوجد

منسوب واحد فقط وهو Normal

assume $\delta_N = 80\% = 0.8$

$0.8 = \dfrac{h_N}{H_N} \qquad H_N = 1.0 m$

$h_N = .8 m$

$\therefore$ D.S.W.L $=$ crest $+ h_N = 11.50 + .8 = 12.30 m$

b.L.D.S $=$ w.L.D.S $- y_{canal}$

$= 12.3 - 2.5 = (9.80) m$

$P = 11.50 - 10 = 1.5 m$

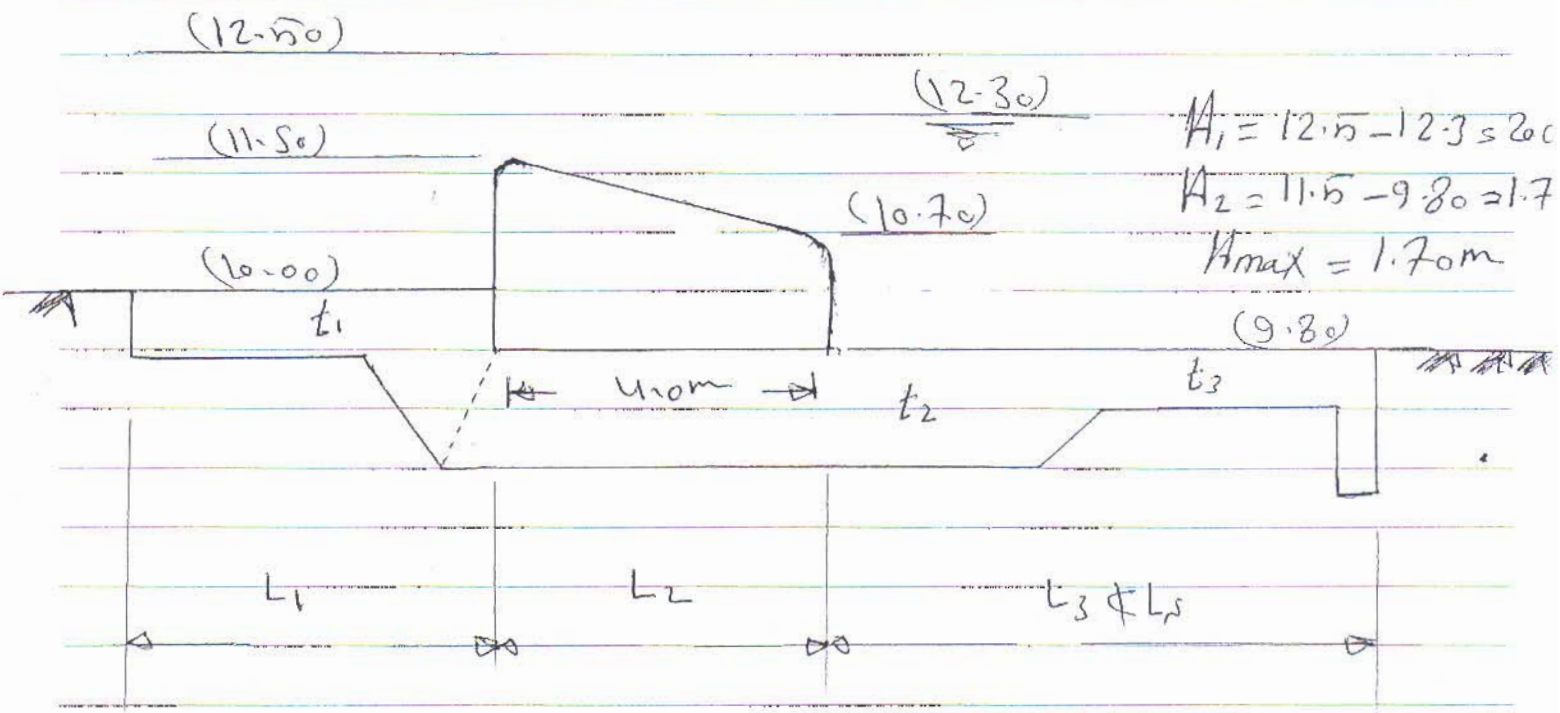
$\delta = (2-3)P = 3 - 4.5$

Take $\delta = 4.0 m$

crest level in D.S = crest $- \frac{\delta}{5}$

$= 11.5 - \frac{4}{5} = (10.70)$

"Floor design"



$A_1 = 12.5 - 12.3 = 20$

$A_2 = 11.5 - 9.80 = 1.7$

$A_{max} = 1.70m$

① Part ① is Part

① Take $L = 6.0m$

② $t_1 = 0.75m$

② Part ② structure Part

① $L_2 = \delta = 4.0m$

② $t_2 = \sqrt{A_{max}} = \sqrt{1.7} = 1.3^m$

Take $t_2 = 1.50\,m$

③ Part ③ D.S

1- $L_3 \neq L_s$

$L_s = 0.61\, C_\beta \sqrt{A_s}$

$A_s = A - h_c$

$A = 12.5 - 9.8 = 2.70\,m$

$h_c = \sqrt[3]{\frac{q^2}{g}}$

$q = \frac{14.5}{7} = 2.0\ m^3/sec/m$

$h_c = \sqrt[3]{\frac{2.0^2}{9.81}} = 0.76\,m$

$A_s = 2.70 - 0.76 = 1.94\,m$

$L_s = 0.61 * 15 * \sqrt{1.94} = 12.75\,m$

Take $L_3 \simeq 15.0\,m$

assume $t_3 = 0.75\,m$

اذا كانت $L_3 < L_2 < L_1$ يحدث انواع

$L = L_1 + L_2 + L_3 + L_w = 6 + 4 + 15 = 25\,m$

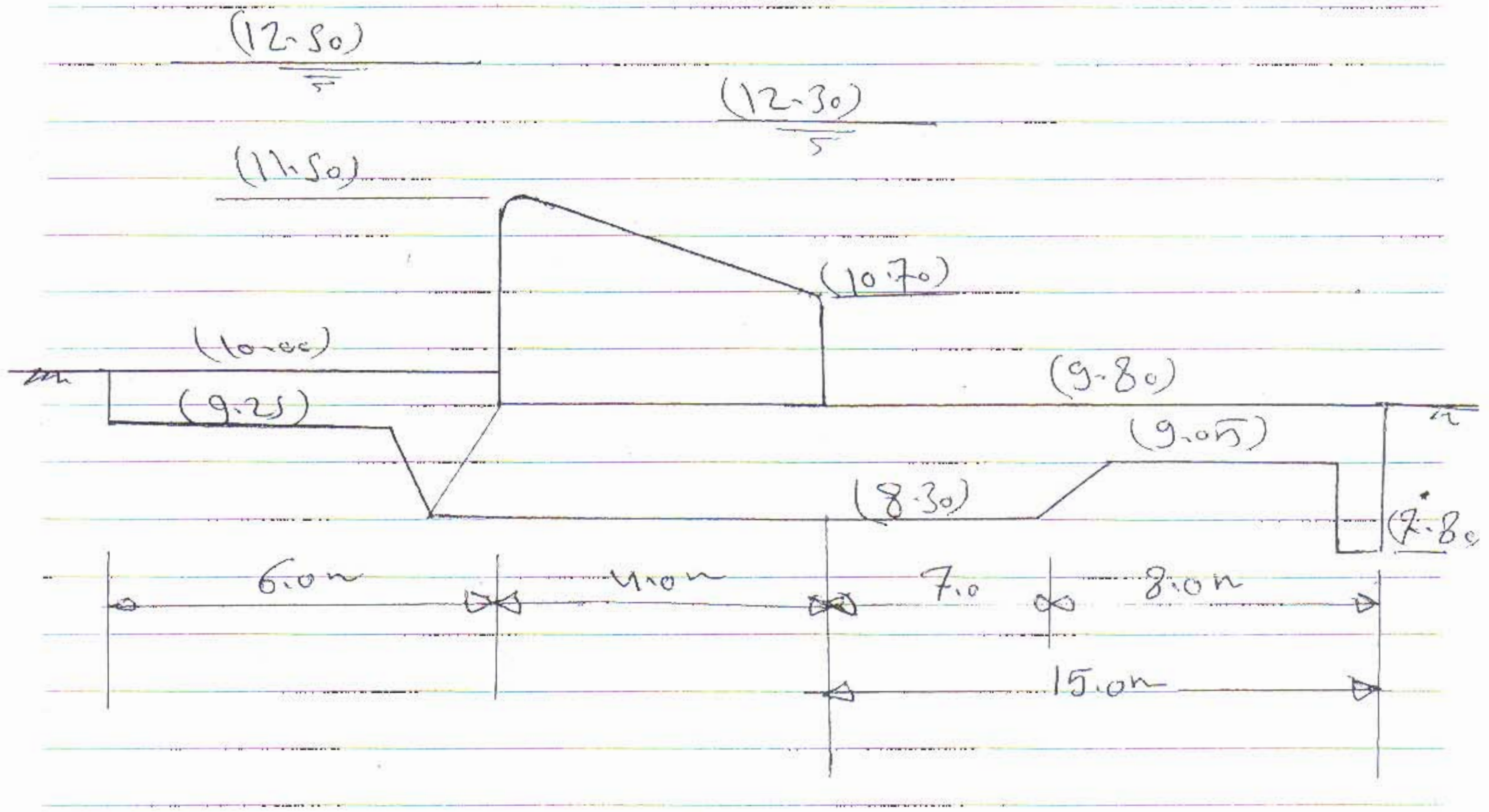
but

$L_p = C_\beta * A_{max} = 15 * 1.70 = 25.50\,m$

الغرز = $L_p - L_{min} = 25.5 - 25 = 0.5 m$

الغرز = 0.5^m يعني الاحتفاظ بعدم حساب ها

في هذا المثال لا نحتاج الى وضع sheet pile .

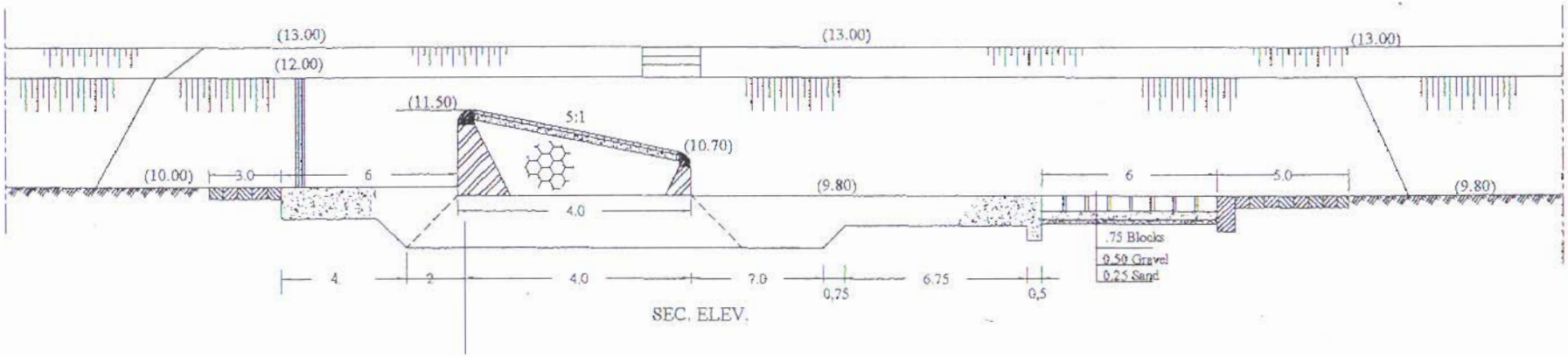


نلاحظ هذا الريجيم لا يوجد sheetpiles

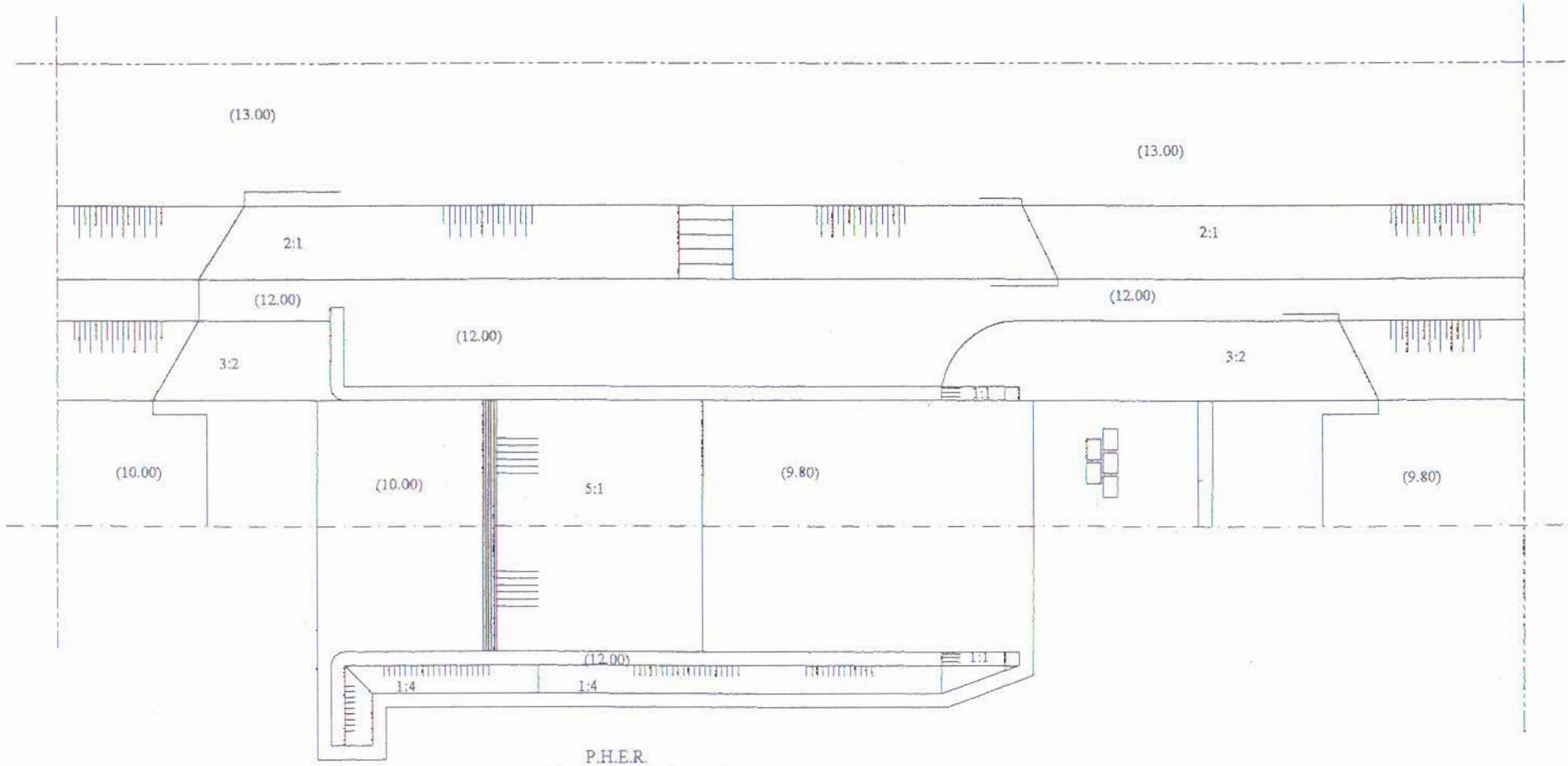
1- for length

2- uplift pressure (Total, net) — شي حساب Bact

3- check of thickness (t_2, t_3)

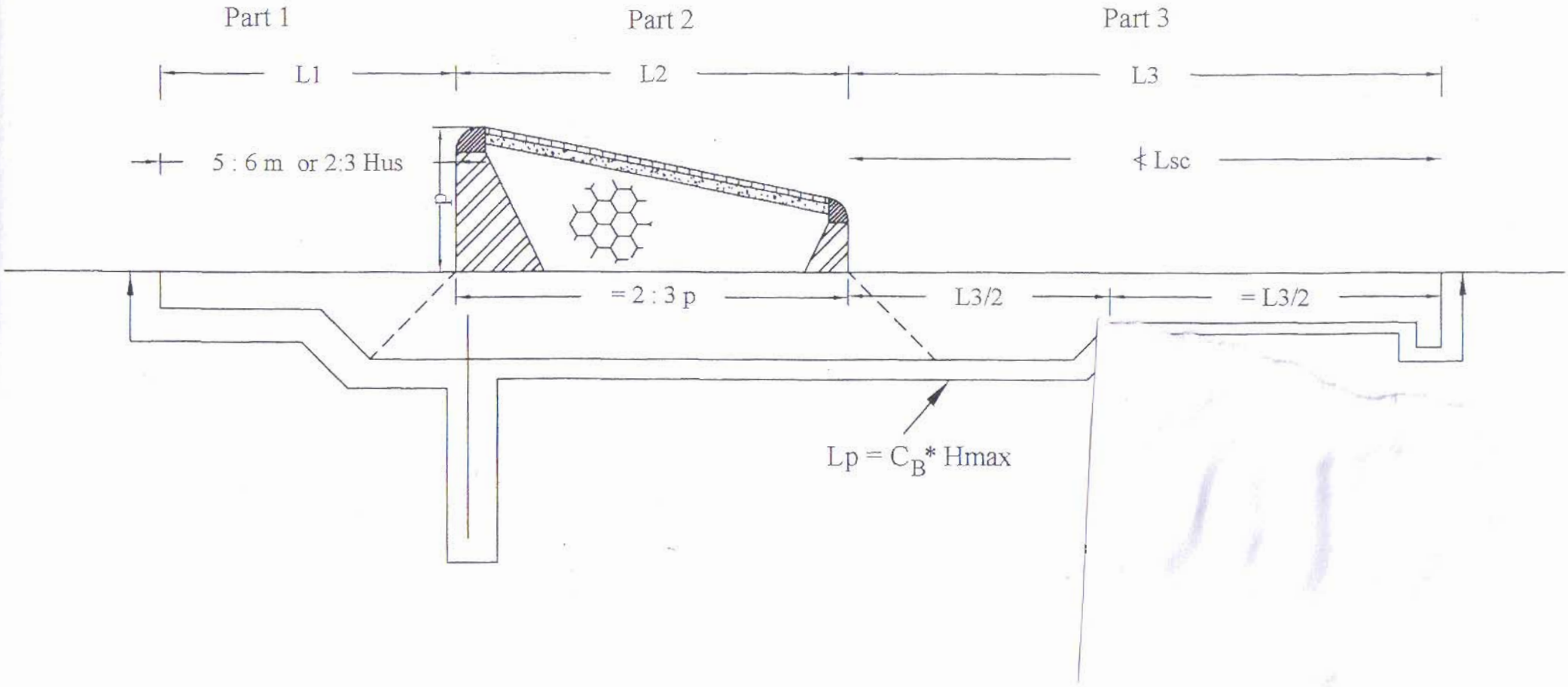


SEC. ELEV.



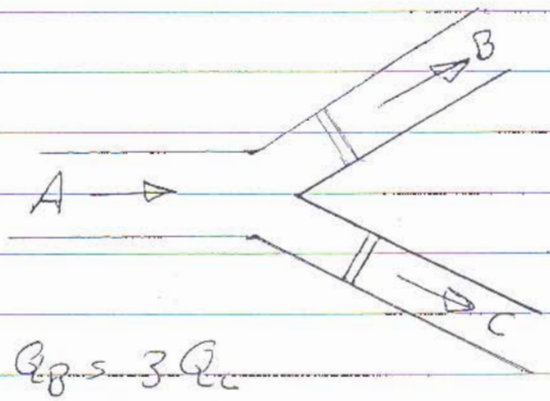
P.H.E.R.
(Plan Half Earth Remove)

Standing Wave Weir


Part 1
Part 2
Part 3
L1
L2
L3
5 : 6 m or 2:3 Hus
∜ Lsc
= 2 : 3 p
L3/2
= L3/2
Lp = C_B* Hmax

Sheet "2"

Question "3" "S.w.w"



at H.W.L $Q_A = 120\ m^3/sec$ $Q_B = 3Q_C$

at L.w.L $Q_A = 45\ m^3/sec$ $Q_B = 2Q_C$

H.w.L in Canal (B) D.S the weir = (15.00) m

$C_f = 0.6$ for Canal B

$Q = 2B\,H^{1.5}$

$H_F - H_S = 0.65$ m for Canal A

Solution.

1- For flood

$Q_A = 120\ m^3/sec$

$Q_A = Q_B + Q_C = 120$ but $Q_B = 3Q_C$

$4Q_C = 120 \longrightarrow Q_C = 30\ m^3/sec$

$Q_B = 3 \times 30 = 90\ m^3/sec$

2- For summer

$Q_A = 45\ m^3/sec$

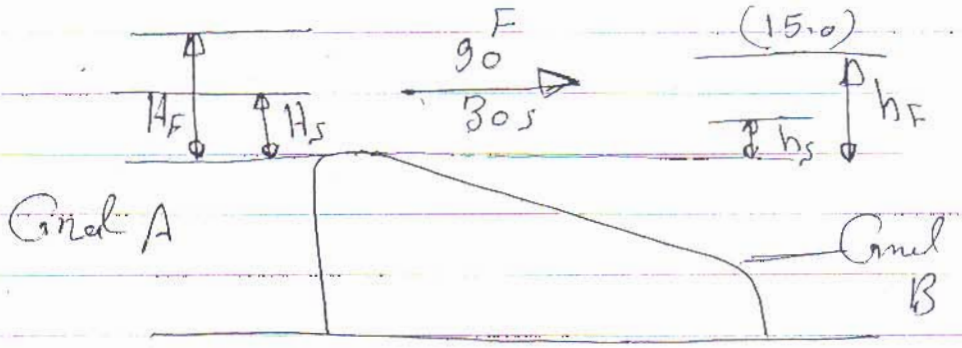
$Q_A = Q_B + Q_C = 45$ $\quad Q_B = 2Q_C$

$2Q_C + Q_C = 45$

$Q_C = 15\ m^3/sec$

$Q_B = 30\ m^3/sec$

For Canal B



$Q_F = 90\ m^3/sec$

$Q_s = 30\ m^3/sec$

$$\frac{90}{30} = \left(\frac{H_F}{H_s}\right)^{1.5}$$

$$2 = \frac{H_F}{H_s} \qquad H_F = 2H_s \rightarrow I$$

$$H_F - H_s = 0.65\ m \rightarrow II$$

$H_s = 0.65\ m$

$H_F = 1.3\ m$

but

$$\frac{h_F}{H_F} = 0.6 \qquad h_F = .78\ m$$

∴ crest level = 15.0 − .78 = (14.22)

* length of weir

$$Q_F = 2B H_F^{1.5}$$

$$90 = 2 * B * (4.3)^{1.5} \rightarrow B = 30.35\ m$$

*

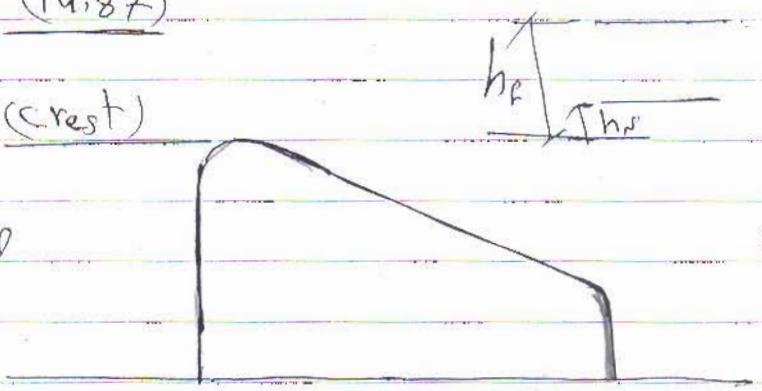
H.W.L = 14.22 + H_F = 14.22 + 1.3 = (15.52)

L.W.L = 14.22 + H_s = 14.22 + 0.65 = (14.87) } 4.5

↗ crest

For Canal C (15.52)

(14.87)



$Q_f = 30 m^3/sec$ $Q_s = 15 m^3/sec$

$$\frac{30}{15} = \left(\frac{H_F}{H_s}\right)^{1.5} \quad H_f = 1.6\, H_s \rightarrow (1)$$

but $H_F - H_s = 0.65$

$1.6 H_s - H_s = 0.65$ $H_s = 1.0 m$ $H_f = 1.65 m$

$\therefore$ crest level $= 14.87 - H_s = (13.87)$

length of crest

$$Q_f = 2B H_f^{1.5}$$

$$30 = 2 \times B \times 1.65^{1.5}$$

$$B = 7.0 m$$

H.W.L in Canal A = 15.52

L.W.L " " " = 14.87

(15.52)

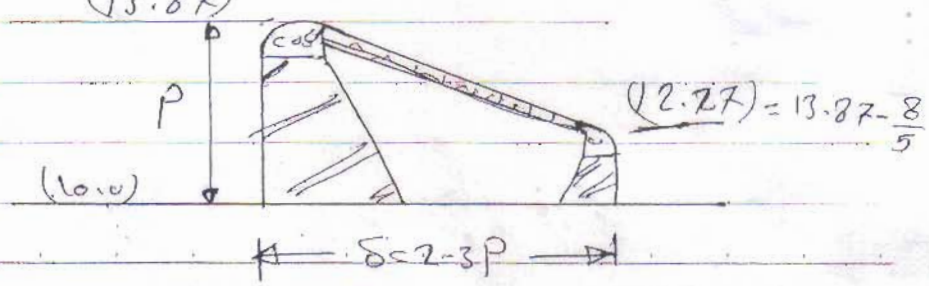
assume bed level = (10.0) (14.87)

(13.87)

P = 3.87

δs 7.74 → 11.6 m

Take δs 8m



Cont. on