

Fig.4.3-3-(7) General Layout

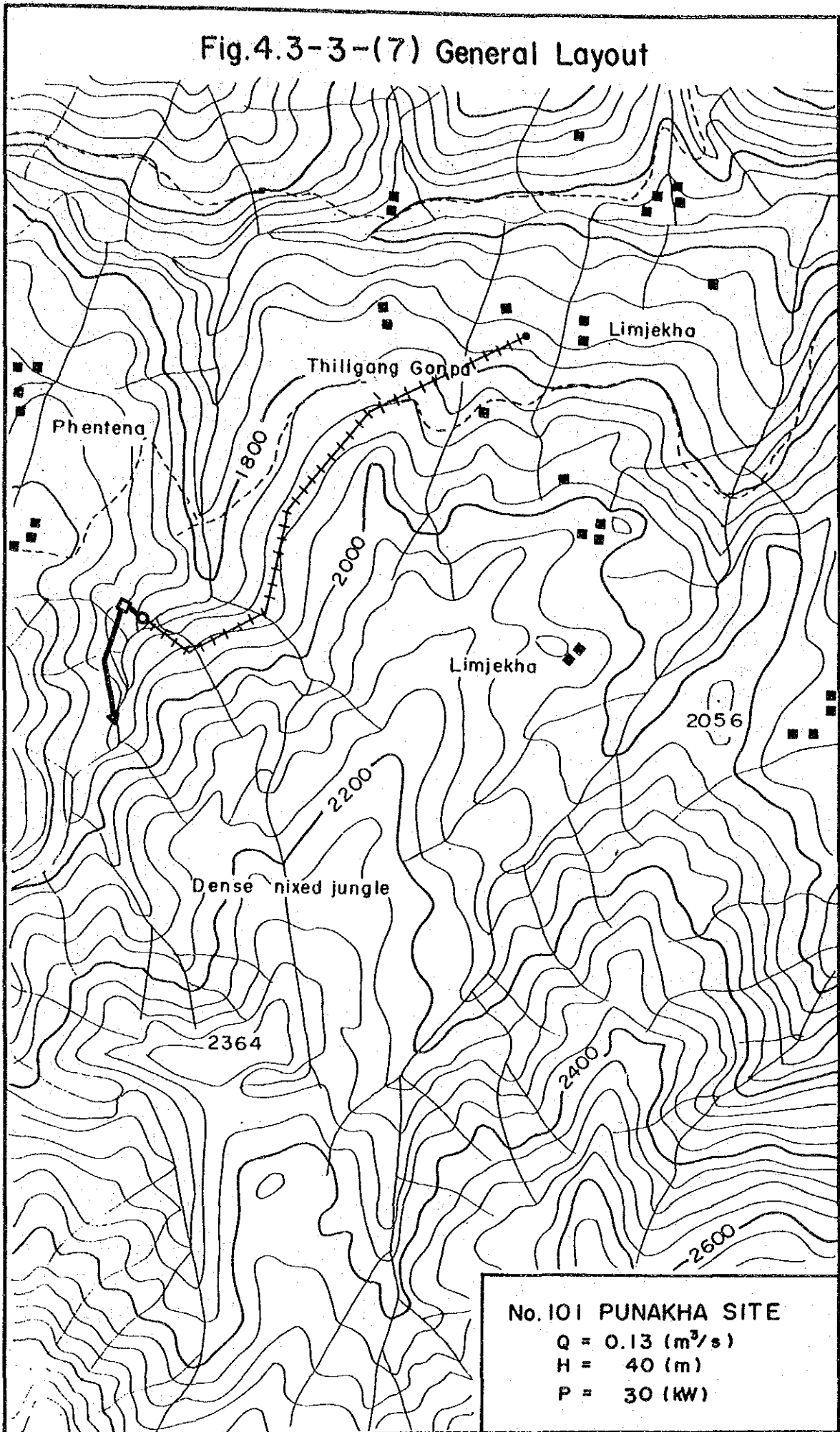


Fig.4.3-3-(8) General Layout

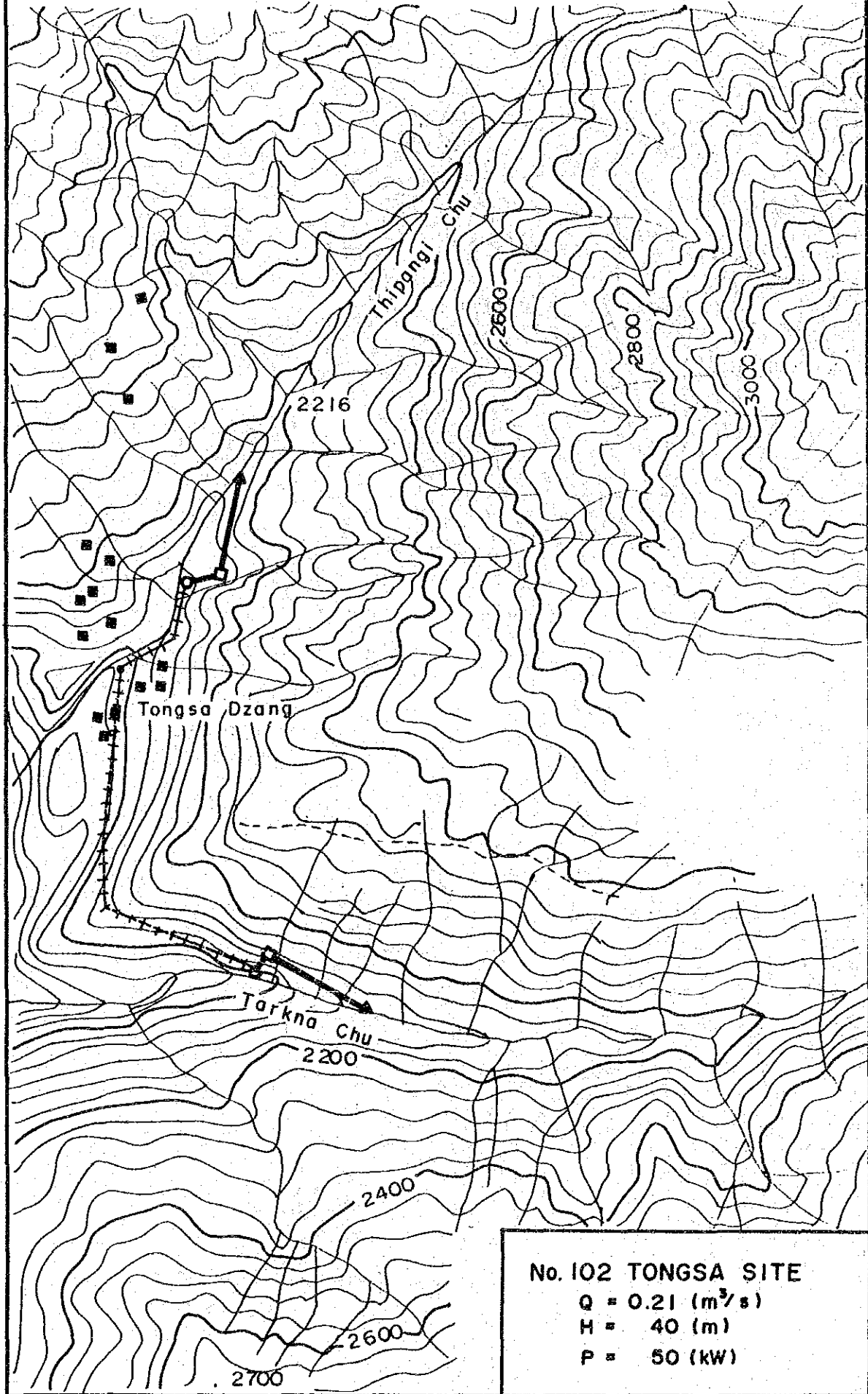


Fig.4.3-3-(9) General Layout

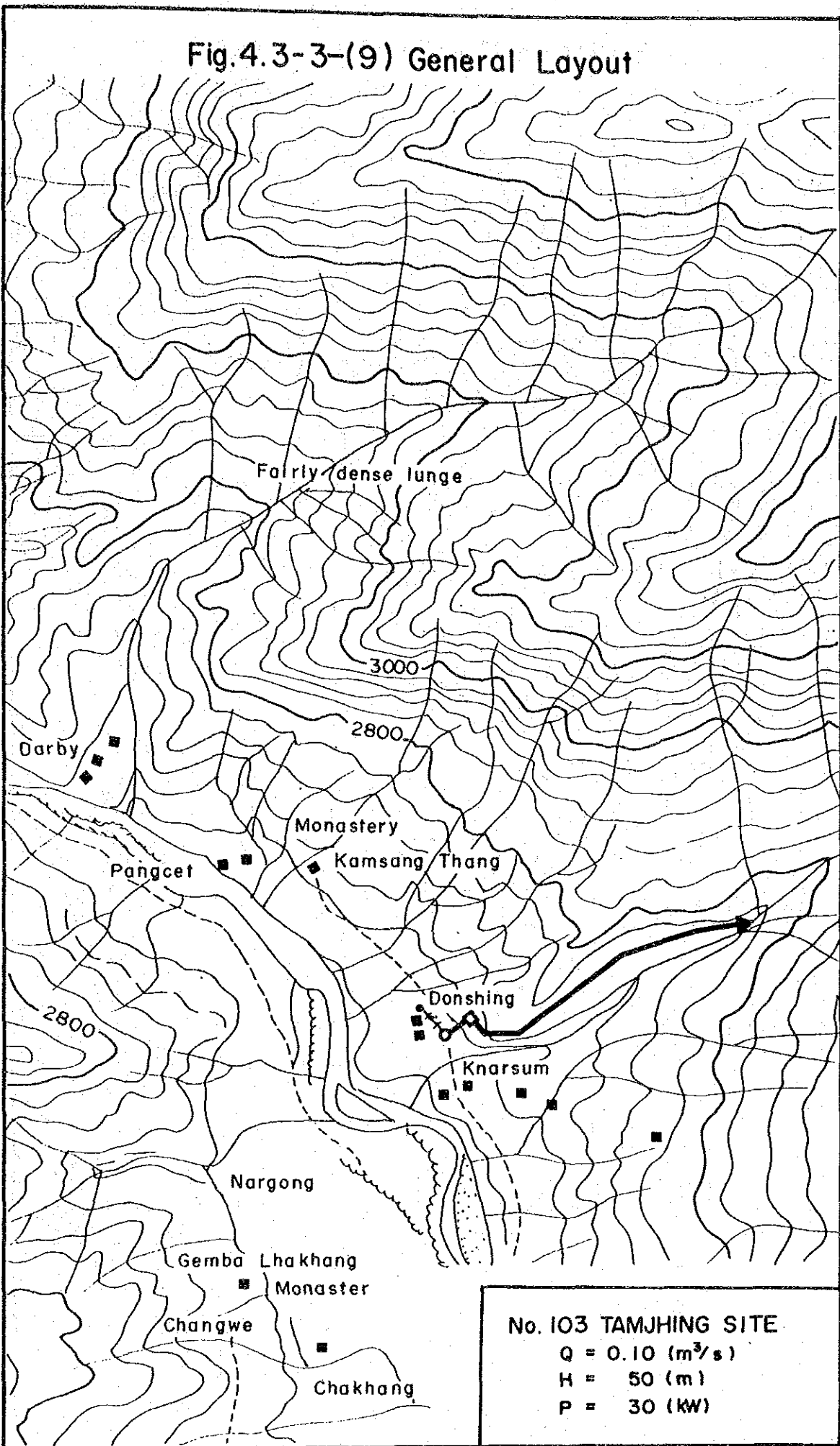
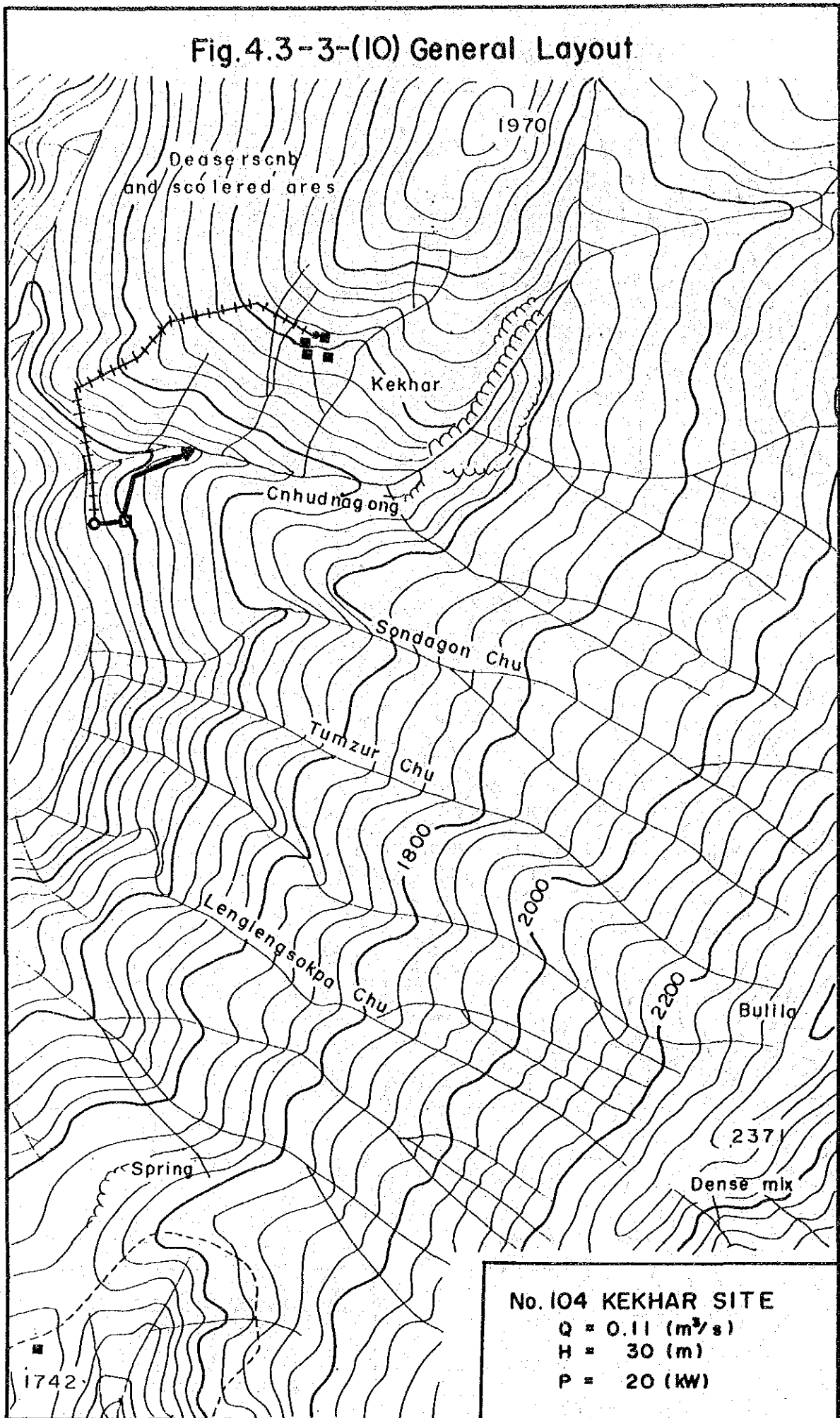


Fig. 4.3-3-(10) General Layout

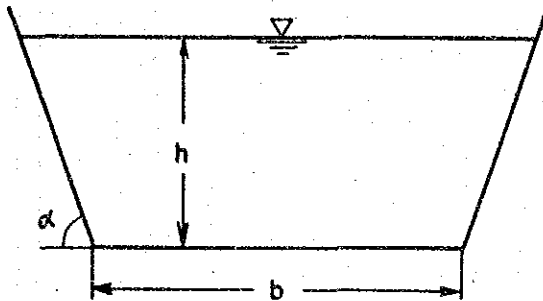


資料-11 開水路の計算書

開水路の計算書

(a) 開水路の水理学的最有利断面

(i) 台形水路



水路勾配 I ，断面積 A ，粗度係数 n が与えられた場合，流量を最も多く流しうるような断面の条件は，

流量 $Q = \frac{1}{n} A R^{2/3} I^{1/2}$ (マニング公式) より動水半径 $R = \frac{A}{P}$ を最大，すなわち P を最小にする事である。(P : 潤辺)

$$A = h (b + h \cot \alpha) \quad \therefore P = b + 2 h \operatorname{cosec} \alpha = \frac{A}{h} - h \cot \alpha + 2 \operatorname{cosec} \alpha$$

有利断面は $\frac{\partial P}{\partial h} = 0$ から

$$-\frac{A}{h^2} - \cot \alpha + 2 \operatorname{cosec} \alpha = \frac{-(b + h \cot \alpha)}{h} - \cot \alpha + 2 \operatorname{cosec} \alpha = 0$$

$$\therefore b = 2 h \frac{1 - \cos \alpha}{\sin \alpha} = 2 h \tan \frac{\alpha}{2}$$

この値をマニングの公式に用いると

$$Q = \frac{1}{n} A R^{2/3} I^{1/2} = \frac{1}{n} I^{1/2} h^{8/3} \left(2 \tan \frac{\alpha}{2} + \cot \alpha \right) \left(\frac{1 + \frac{\cot \alpha}{2 \tan^{3/2} \frac{\alpha}{2}}}{1 + \frac{1}{\sin \alpha \cdot \tan^{3/2} \frac{\alpha}{2}}} \right)^{2/3}$$

側壁の勾配を 1 : 0.25 とすると

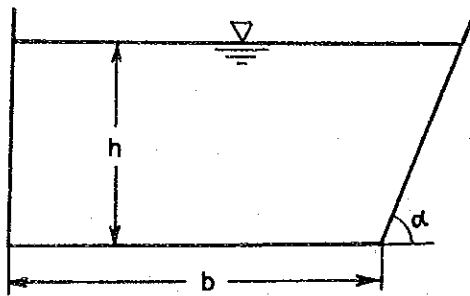
$$\tan \alpha = 4, \quad \alpha = 75.96^\circ \quad \frac{\alpha}{2} = 37.98^\circ, \quad \sin \alpha = 0.97$$

$$\cot \alpha = 0.25, \quad \cos \alpha = 0.243, \quad \tan \frac{\alpha}{2} = 0.781, \quad \operatorname{cosec} \alpha = 1.03$$

$$Q = \frac{1.1412}{n} I^{1/2} h^{8/3}$$

n	Q	I	h
0.014	81.514786 $I^{1/2} h^{8/3}$	$\left(\frac{0.012268 Q}{h^{8/3}} \right)^2$	$\left(\frac{0.012268 Q}{I^{1/2}} \right)^{3/8}$
0.015	76.080467 "	$\left(\frac{0.013144 Q}{h^{8/3}} \right)^2$	$\left(\frac{0.013144 Q}{I^{1/2}} \right)^{3/8}$
0.016	71.325438 "	$\left(\frac{0.014020 Q}{h^{8/3}} \right)^2$	$\left(\frac{0.014020 Q}{I^{1/2}} \right)^{3/8}$
0.017	67.129824 "	$\left(\frac{0.014897 Q}{h^{8/3}} \right)^2$	$\left(\frac{0.014897 Q}{I^{1/2}} \right)^{3/8}$

(ii) 台形水路 (片側直)



最有利断面の条件を求める。

$$A = h \left(b + \frac{h}{2} \cot \alpha \right)$$

$$\therefore b = \frac{A}{h} - \frac{h}{2} \cot \alpha$$

$$P = \frac{A}{h} \cot \alpha + h + h \operatorname{cosec} \alpha$$

$\frac{\partial P}{\partial h}$ を求めると $b = h \left(1 + \tan \frac{\alpha}{2} \right)$

$$A = h \left(b + \frac{h}{2} \cot \alpha \right) = h^2 \left\{ \left(1 + \tan \frac{\alpha}{2} \right) + \frac{\cot \alpha}{2} \right\}$$

$$P = h \left\{ \left(1 + \tan \frac{\alpha}{2} \right) + 1 + \operatorname{cosec} \alpha \right\}$$

$$R = \frac{A}{P} = \frac{h \left\{ \left(1 + \tan \frac{\alpha}{2} \right) + \frac{\cot \alpha}{2} \right\}}{\left\{ \left(1 + \tan \frac{\alpha}{2} \right) + 1 + \operatorname{cosec} \alpha \right\}}$$

$$Q = \frac{A}{n} R^{2/3} I^{1/2} = \frac{1}{n} I^{1/2} h^{8/3} \left\{ \left(1 + \tan \frac{\alpha}{2} \right) + \frac{\cot \alpha}{2} \right\} \left\{ \frac{\left(1 + \tan \frac{\alpha}{2} \right) + \frac{\cot \alpha}{2}}{\left(1 + \tan \frac{\alpha}{2} \right) + 1 + \operatorname{cosec} \alpha} \right\}$$

側壁勾配を 1 : 0.25 とすると

$$Q = \frac{1.200564}{n} I^{1/2} h^{8/3}$$

n の値に対する Q, I, h は夫々

n	Q	I	h
0.014	85.754571 $I^{1/2} h^{8/3}$	$\left(\frac{0.011661Q}{h^{8/3}} \right)^2$	$\left(\frac{0.011661Q}{I^{1/2}} \right)^{3/8}$
0.015	80.037600 "	$\left(\frac{0.012494Q}{h^{8/3}} \right)^2$	$\left(\frac{0.012494Q}{I^{1/2}} \right)^{3/8}$
0.016	75.035250 "	$\left(\frac{0.013327Q}{h^{8/3}} \right)^2$	$\left(\frac{0.013327Q}{I^{1/2}} \right)^{3/8}$
0.017	70.621412 "	$\left(\frac{0.014160Q}{h^{8/3}} \right)^2$	$\left(\frac{0.014160Q}{I^{1/2}} \right)^{3/8}$

(b) 開水路の特性計算

$$v = \frac{Q}{A} = \frac{1}{n} R^{2/3} I^{1/2}$$

片側直, 両勾配のいずれの場合も流速 $v = 1 \text{ m/sec}$ とすると

$$R^{2/3} = (0.5)^{2/3} h^{2/3} = 0.629961 h^{2/3} \text{ となる。}$$

$$\therefore h^{2/3} = \frac{n}{0.629961} \sqrt{\frac{1}{I}}$$

n = 0.014 のとき

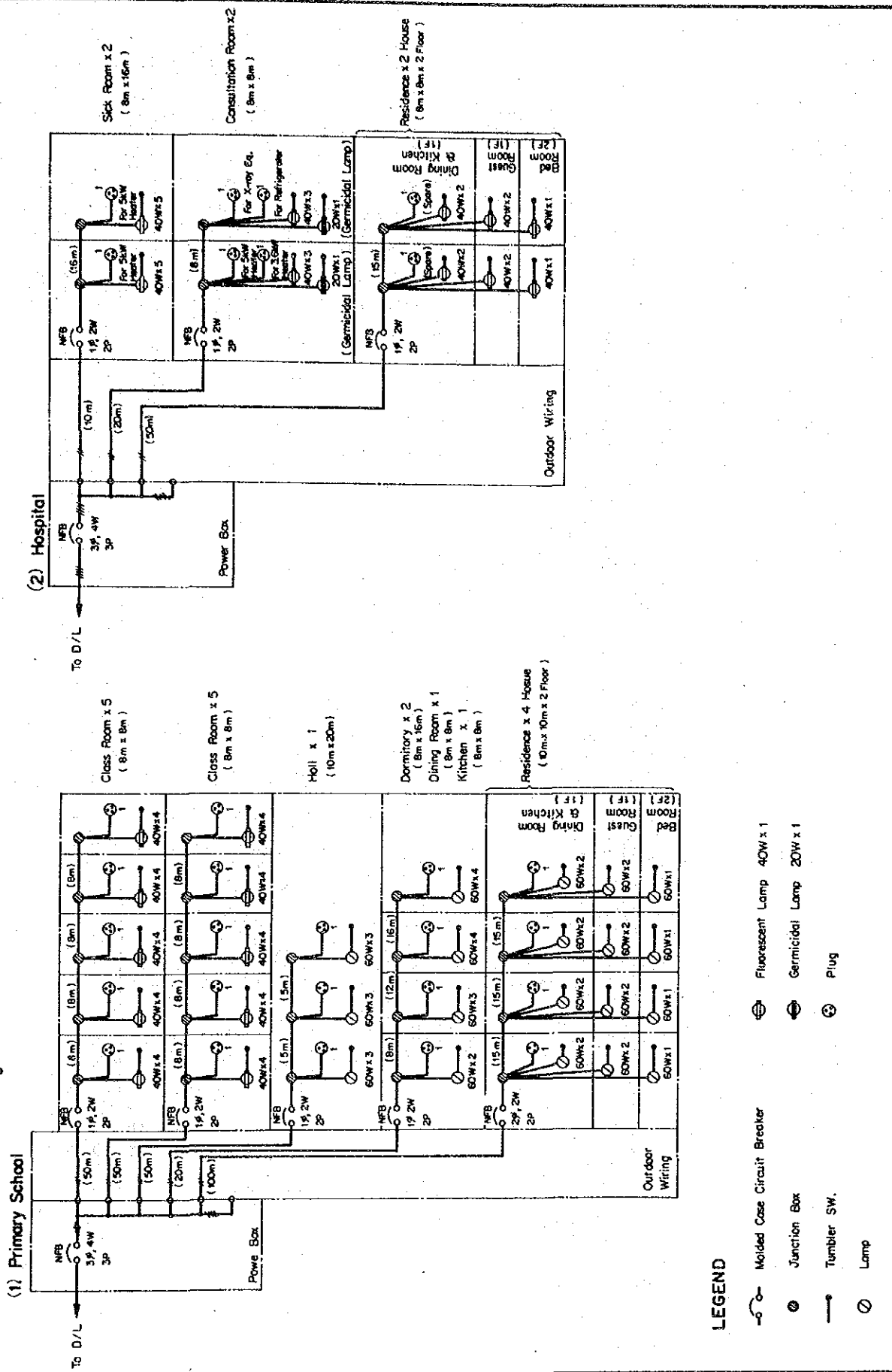
片側直	両勾配
$b = 1.781 h$	$b = 1.562 h$
$= 0.005901 \left(\frac{1}{I} \right)^{3/4}$	$= 0.005175 \left(\frac{1}{I} \right)^{3/4}$
$\left(\frac{1}{I} \right) = \left(\frac{b}{0.005901} \right)^{4/3}$	$\left(\frac{1}{I} \right) = \left(\frac{b}{0.005175} \right)^{4/3}$
$h = \frac{b}{1.781}$	$h = \frac{b}{1.562}$

n = 0.017 のとき

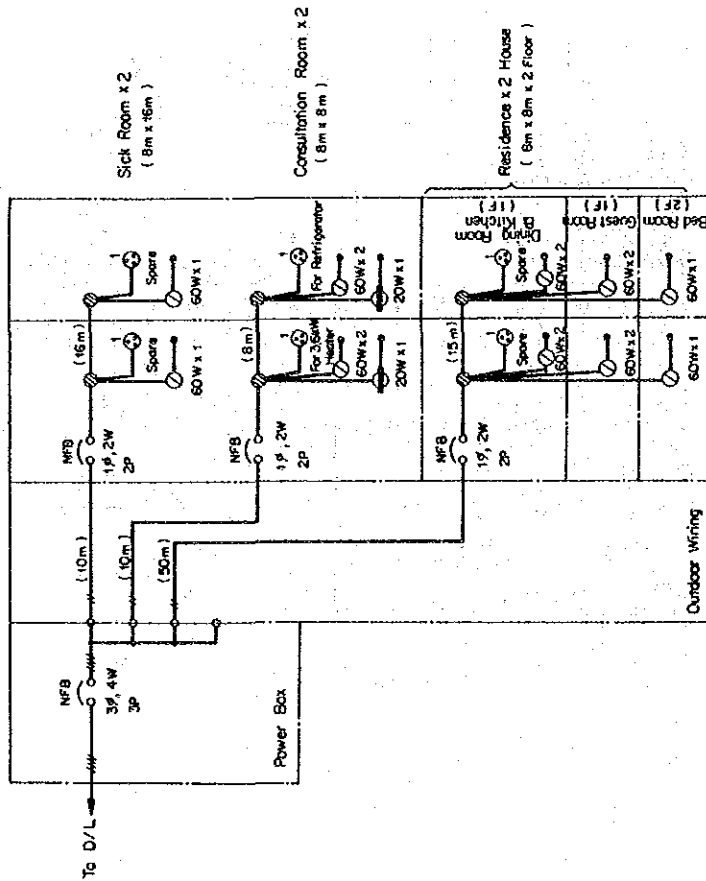
片側直	両勾配
$b = 1.781 h$ $= 0.007895 \left(\frac{l}{I} \right)^{3/4}$ $\left(\frac{l}{I} \right) = \left(\frac{b}{0.007895} \right)^{4/3}$ $h = \frac{b}{1.781}$	$b = 1.562 h$ $= 0.006925 \left(\frac{l}{I} \right)^{3/4}$ $\left(\frac{l}{I} \right) = \left(\frac{b}{0.006925} \right)^{4/3}$ $h = \frac{b}{1.562}$

資料-12 基本設計図

Fig. 4.5-4 TYPICAL DESIGN OF INDOOR WIRING FOR PUBLIC FACILITIES

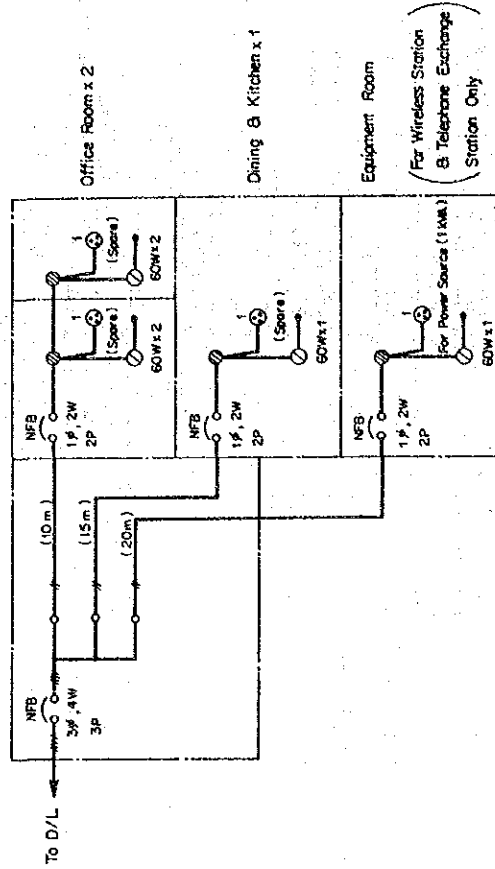


(3) Vet. Hospital



(4) Other Office

(Village Office, Food Corporation, Post Office, Wireless Station, Agriculture Office, Telephone Exchange Station, etc.)



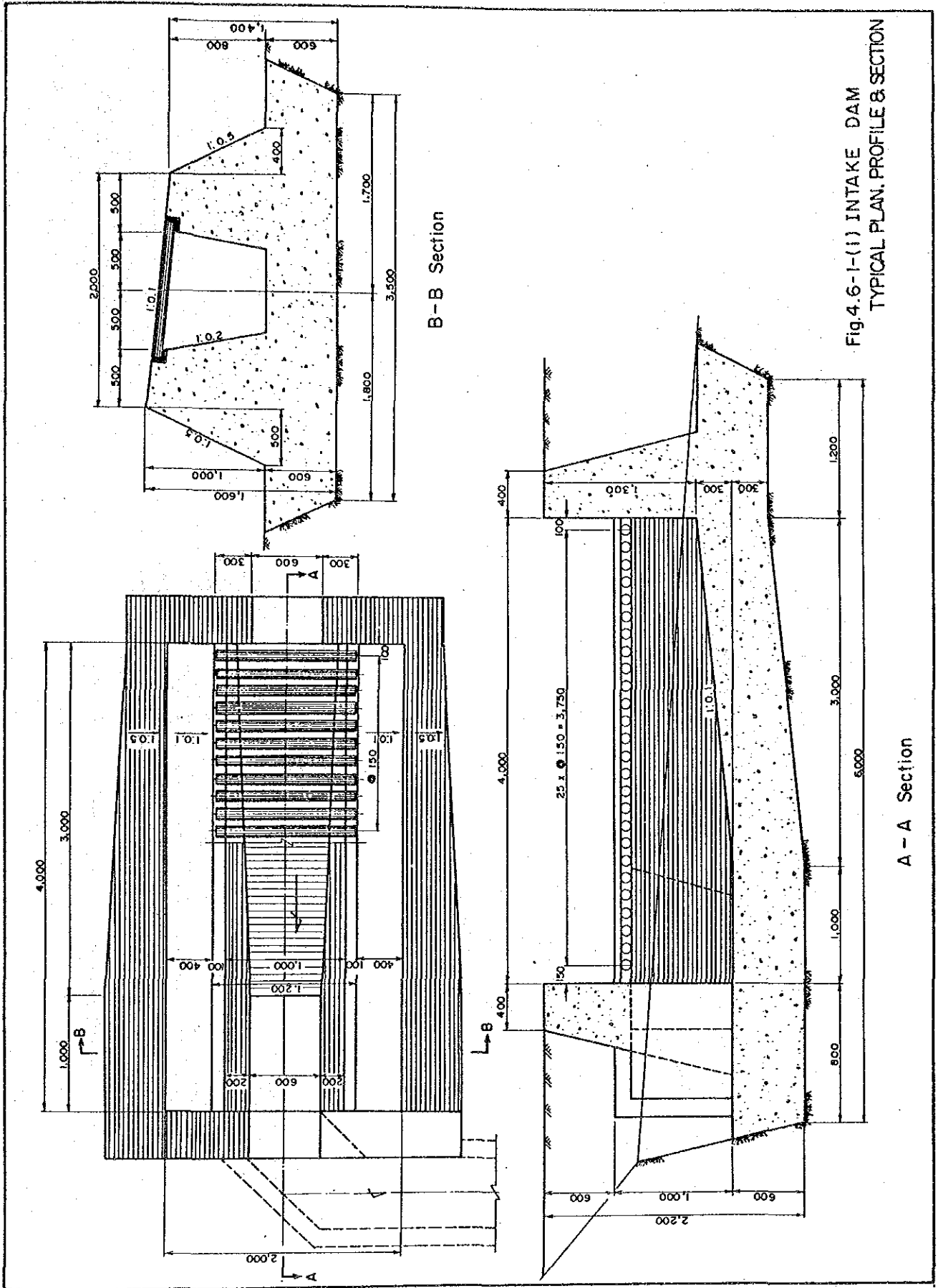
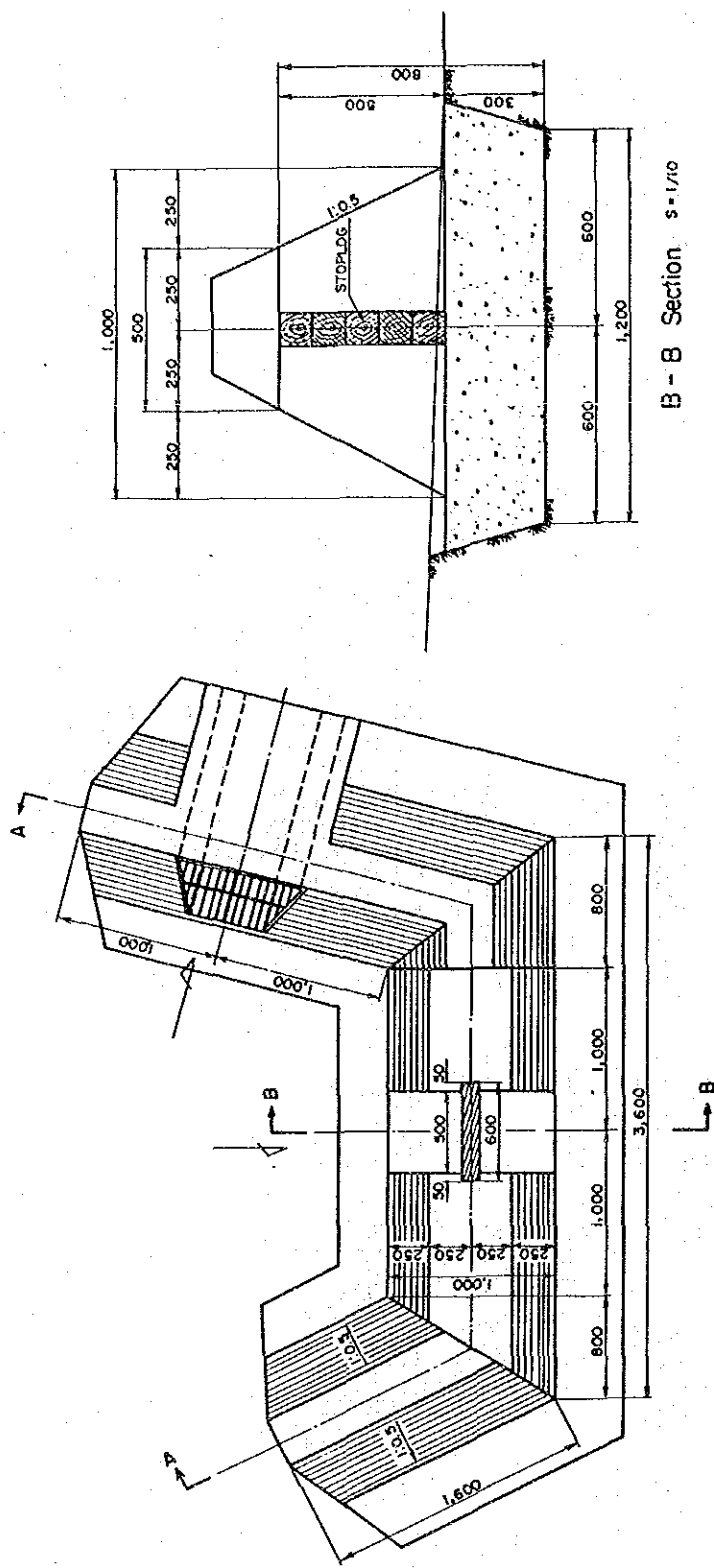
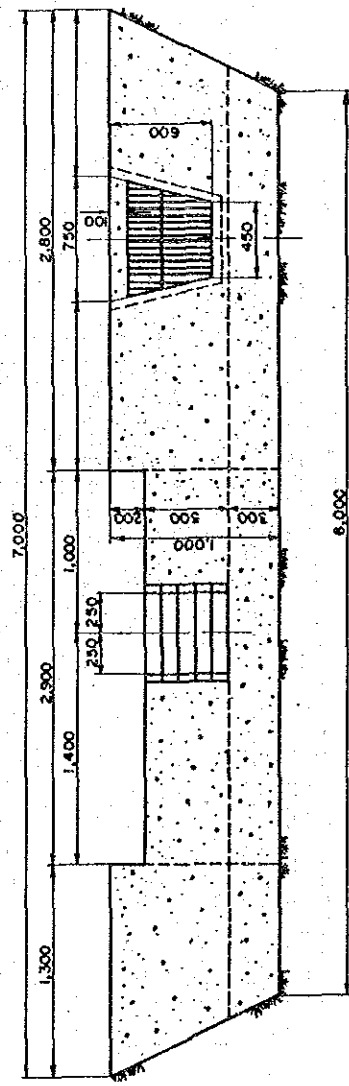


Fig 4.6-1-(1) INTAKE DAM
TYPICAL PLAN, PROFILE A SECTION

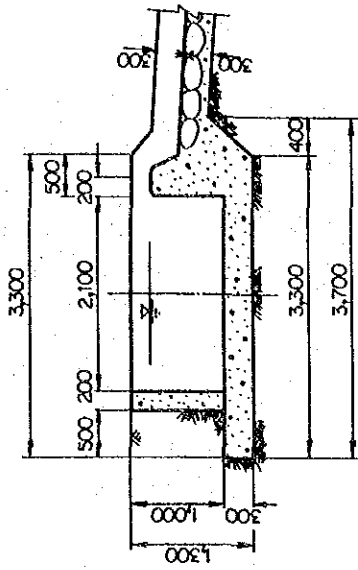
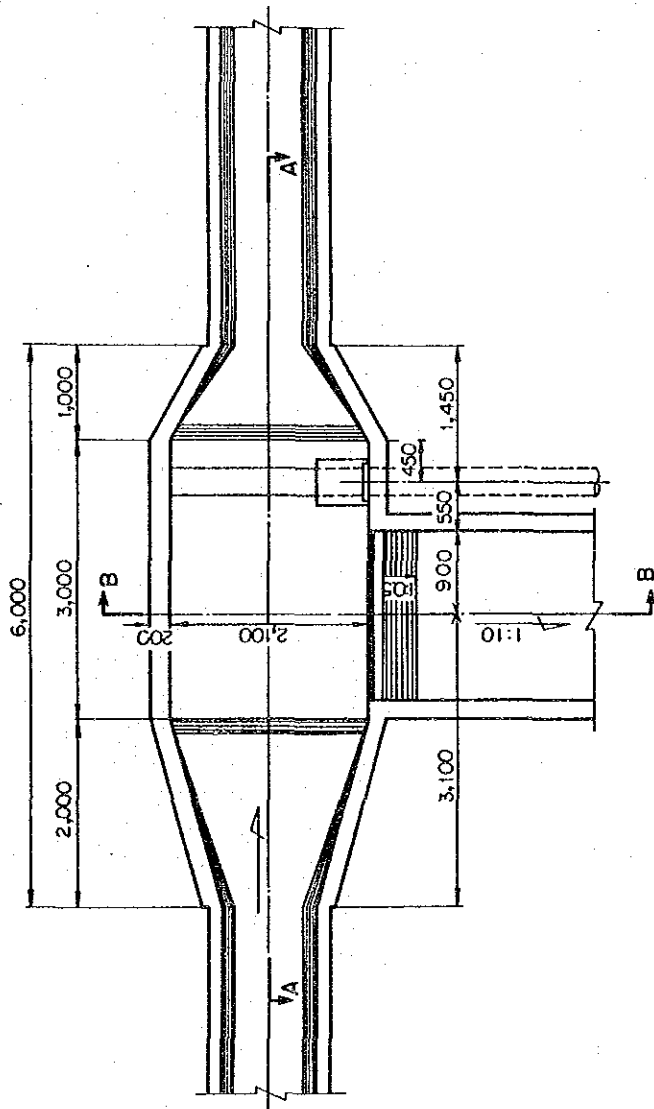


B - B Section $s = 1/10$

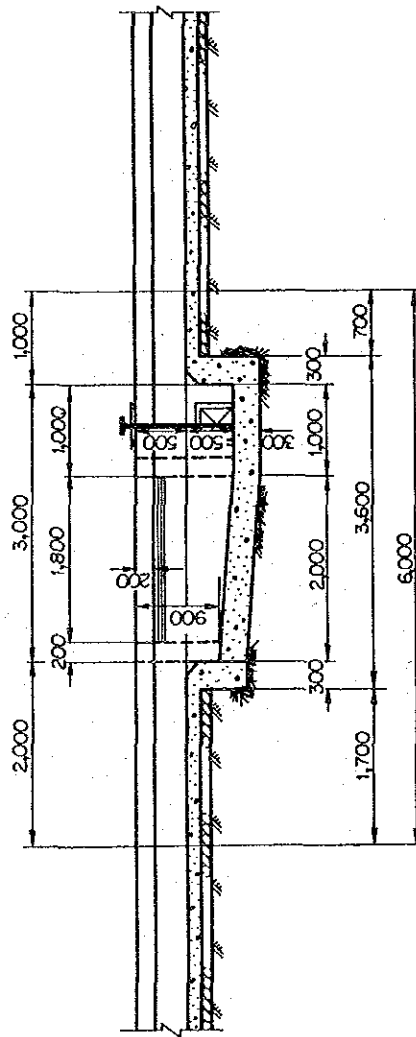


A - A Section

Fig. 4.6-1-(2) INTAKE DAM
PLAN, PROFILE & SECTION
BUEJA & TANGSIBI SITE



B - B Section



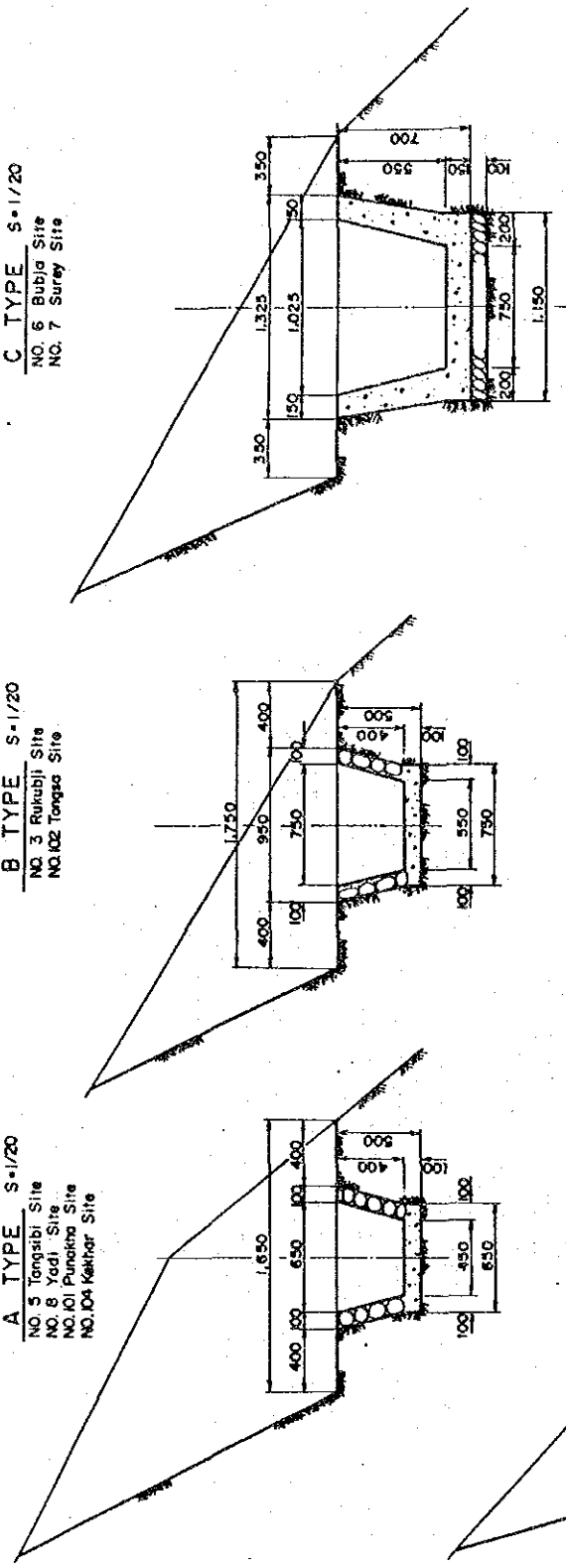
A - A Section s = 1/20

Fig. 4.6-2
Sedimentation Basin

A TYPE S=1/20
 NO. 5 Tongstbi Site
 NO. 8 Yadi Site
 NO. 101 Puncakha Site
 NO. 104 Kethar Site

B TYPE S=1/20
 NO. 3 Rukubji Site
 NO. 102 Tongsa Site

C TYPE S=1/20
 NO. 6 Bubja Site
 NO. 7 Surey Site



D TYPE S=1/20
 NO. 4 Urg Site

E TYPE S=1/10
 NO. 103 Tamjhing

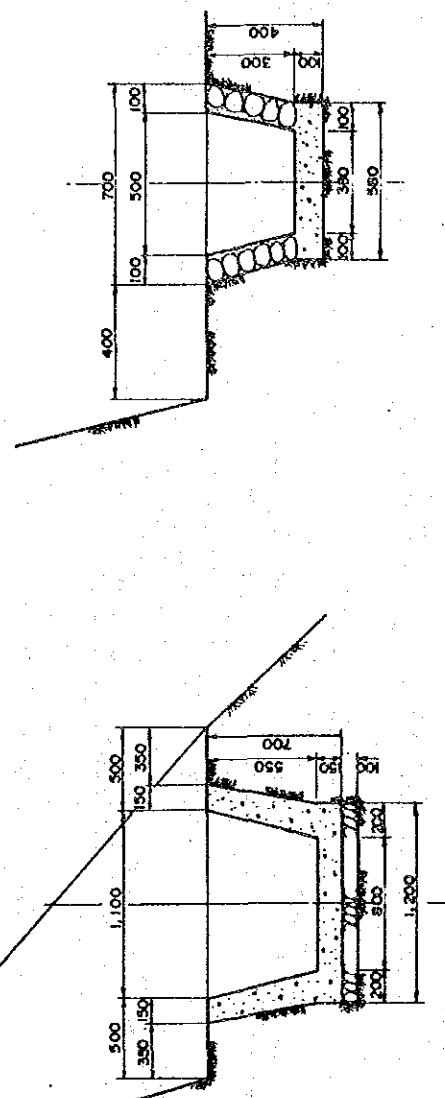
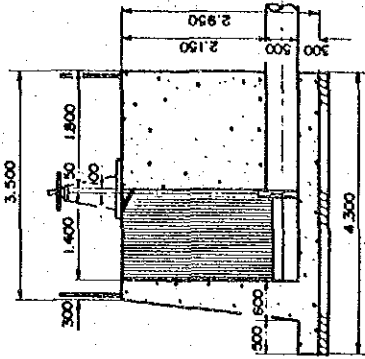
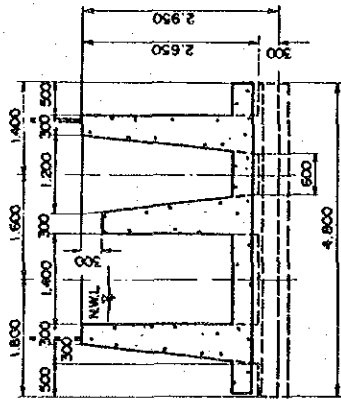


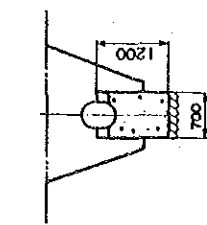
Fig. 4-6-3 HEAD RACE CROSS SECTION



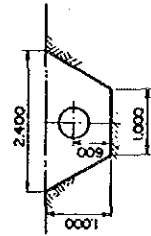
Section C-C



Section B-B



Section E-E



Section D-D

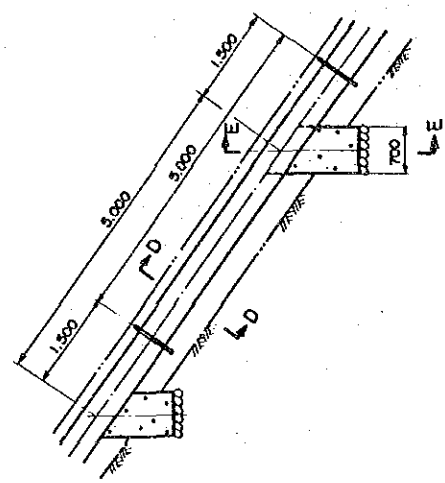
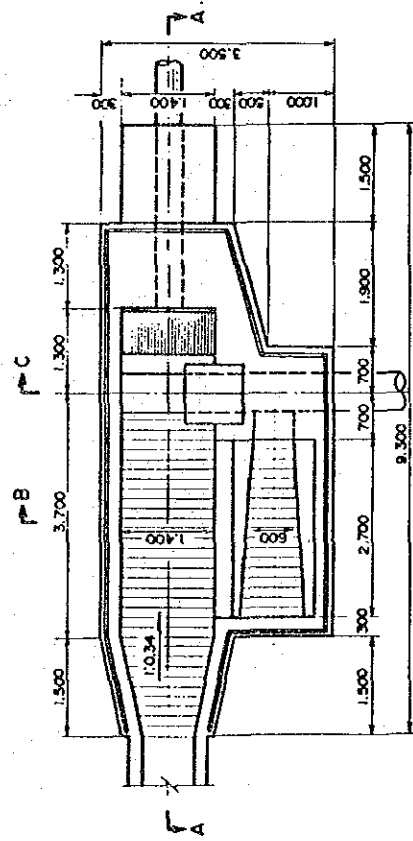
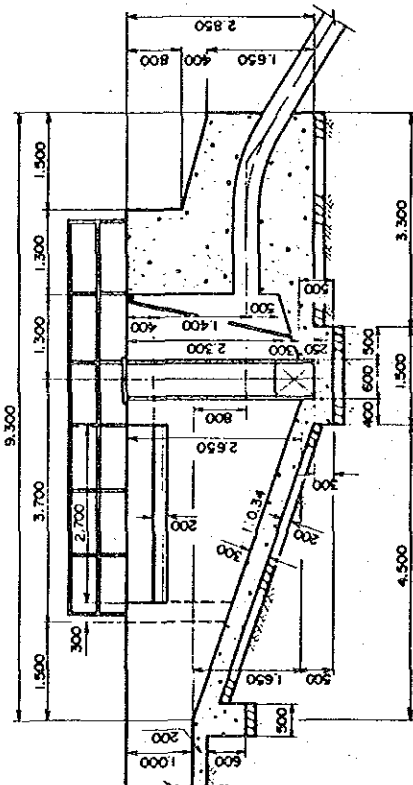


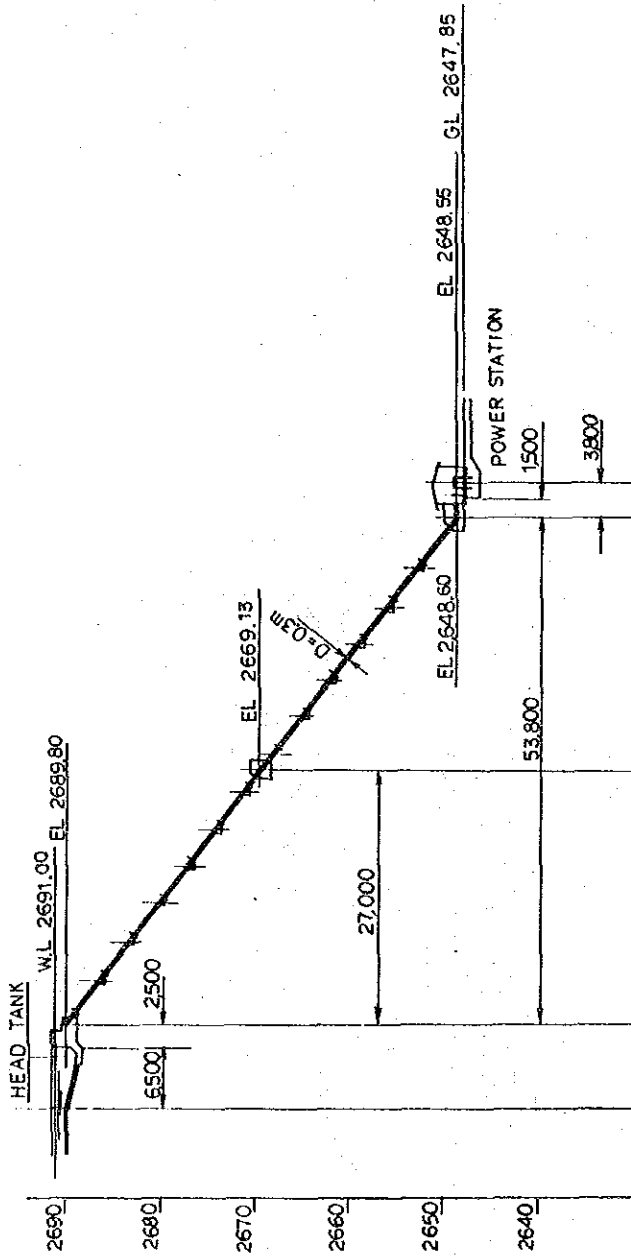
Fig. 4.6-4 HEAD TANK
PLAN AND CROSS SECTION



Section A-A

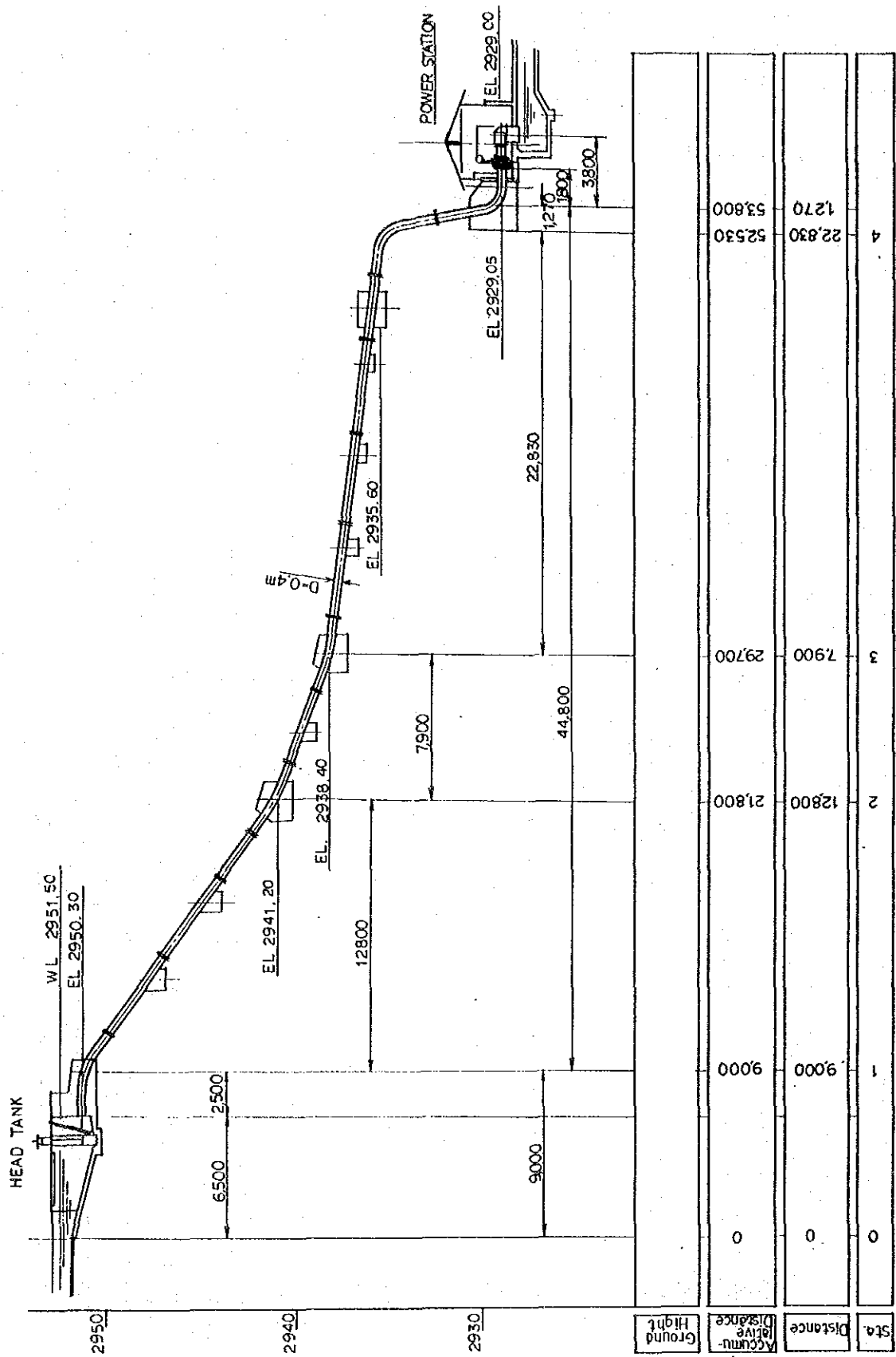


Section A-A



Sta.	Distance	Accumulative Distance	Ground Height
0	0	0	
1	9,000	9,000	
	(27,000)	36,000	
2	53,800	62,800	

Fig. 4-6-5-(1)
PENSTOCK PROFILE
NO. 3 RUKUBAJI SITE
SCALE 1/500



Sta	Distance	Accumulative Distance	Ground Height
0	0	0	
1	9000	9000	
2	12800	21800	
3	7900	29700	
4	1270	30970	
		52530	
		53800	

Fig. 4-6-5-(2)
PENSTOCK PROFILE
NO. 4 URA SITE
SCALE 1/200

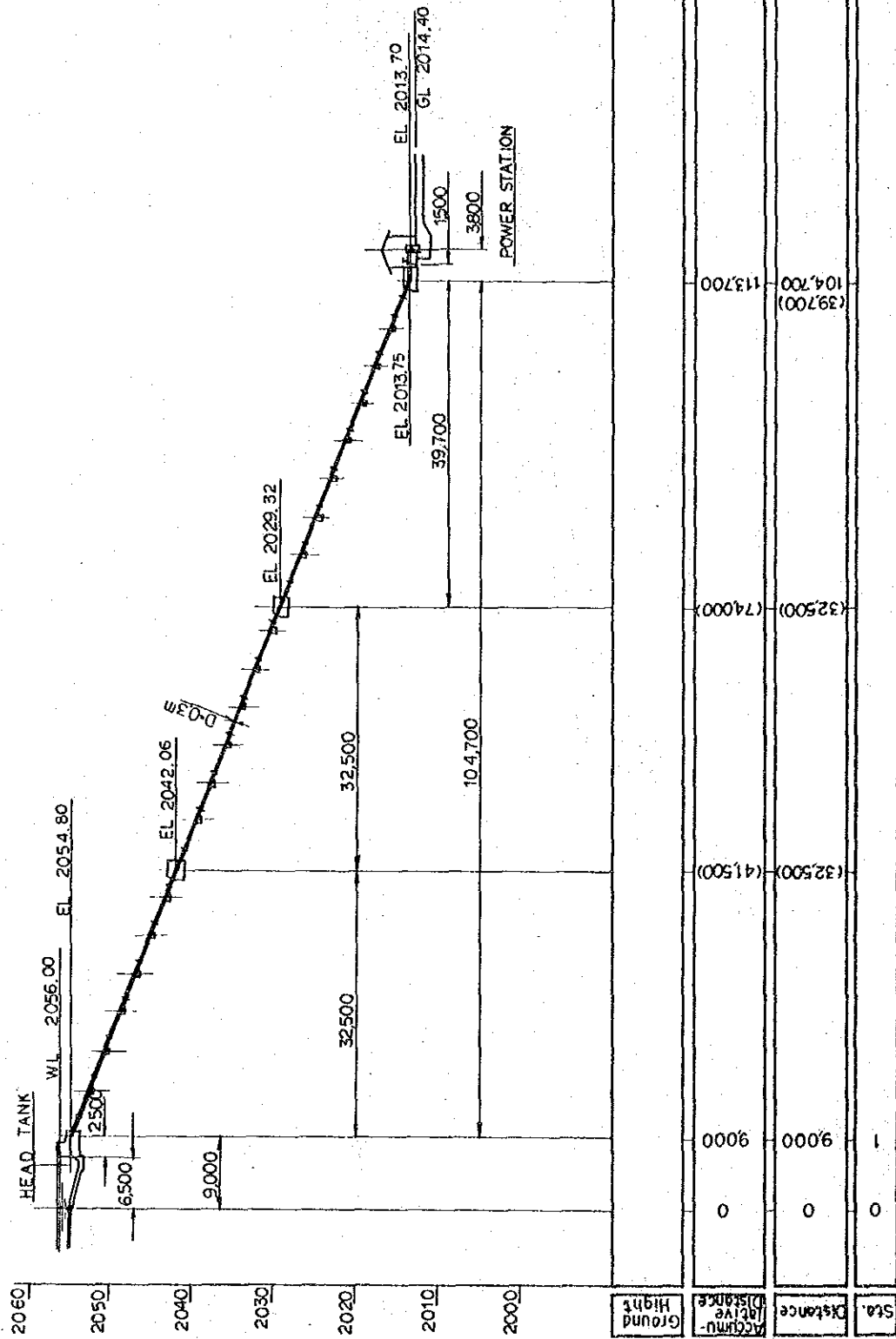


Fig. 4-6-5-(3)
 PENSTOCK PROFILE
 No. 5 TANGSIBI SITE
 SCALE 1/500

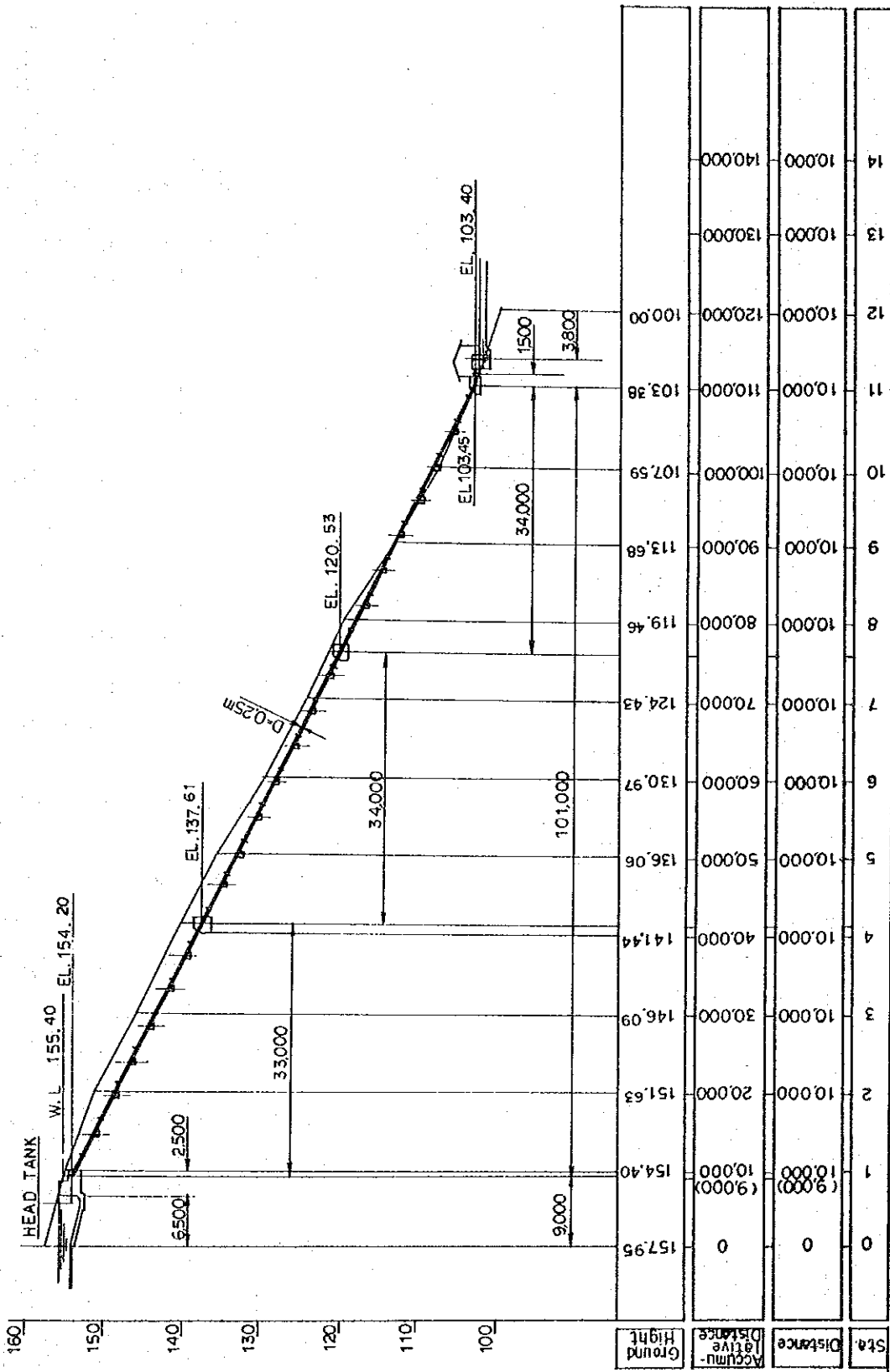


Fig. 4-6-5-(4)
 PENSTOCK PROFILE
 NO. 6, BUBJA SITE
 SCALE 1/500

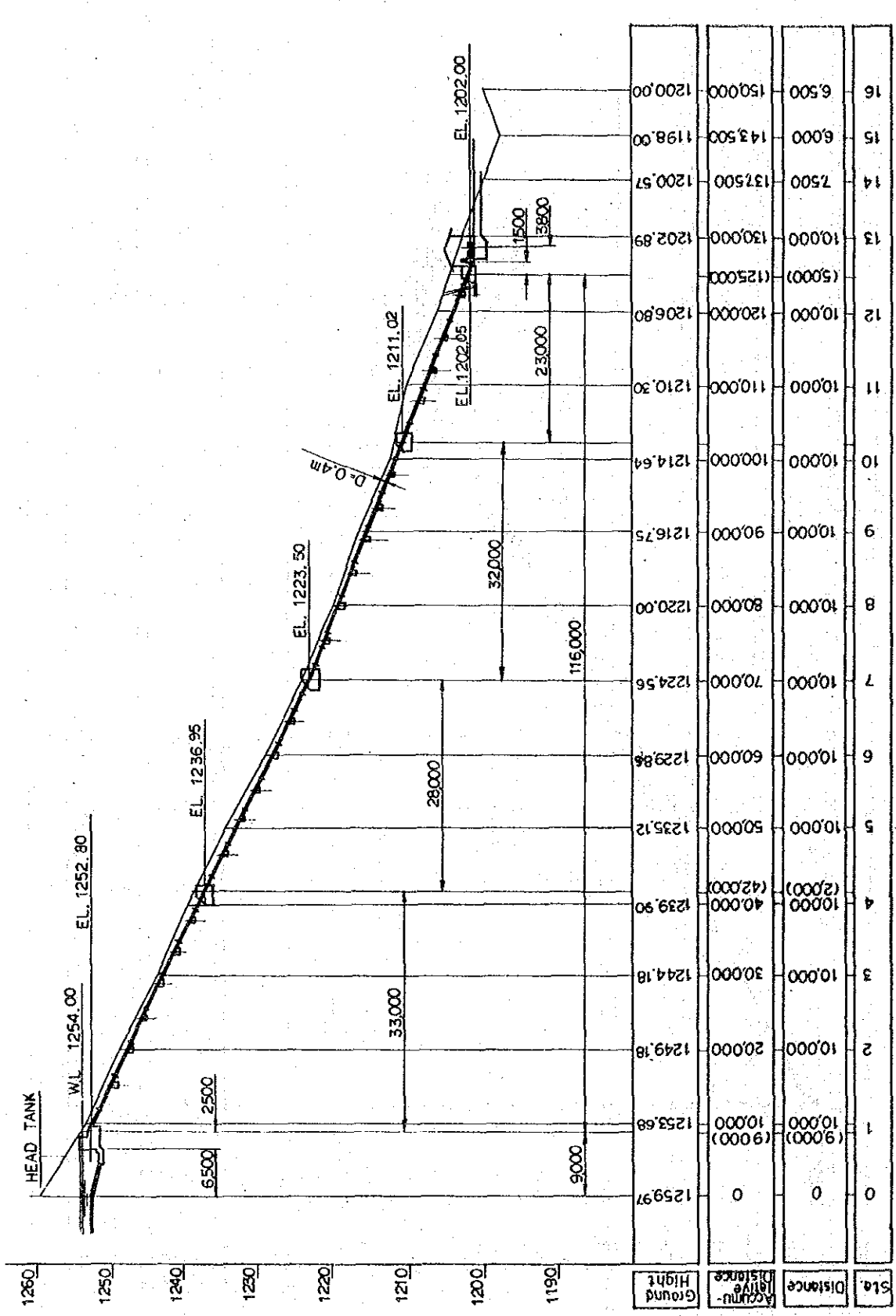


Fig. 4-6-5-(5)
PENSTOCK PROFILE
NO. 7 SURVEY SITE
SCALE 1/500

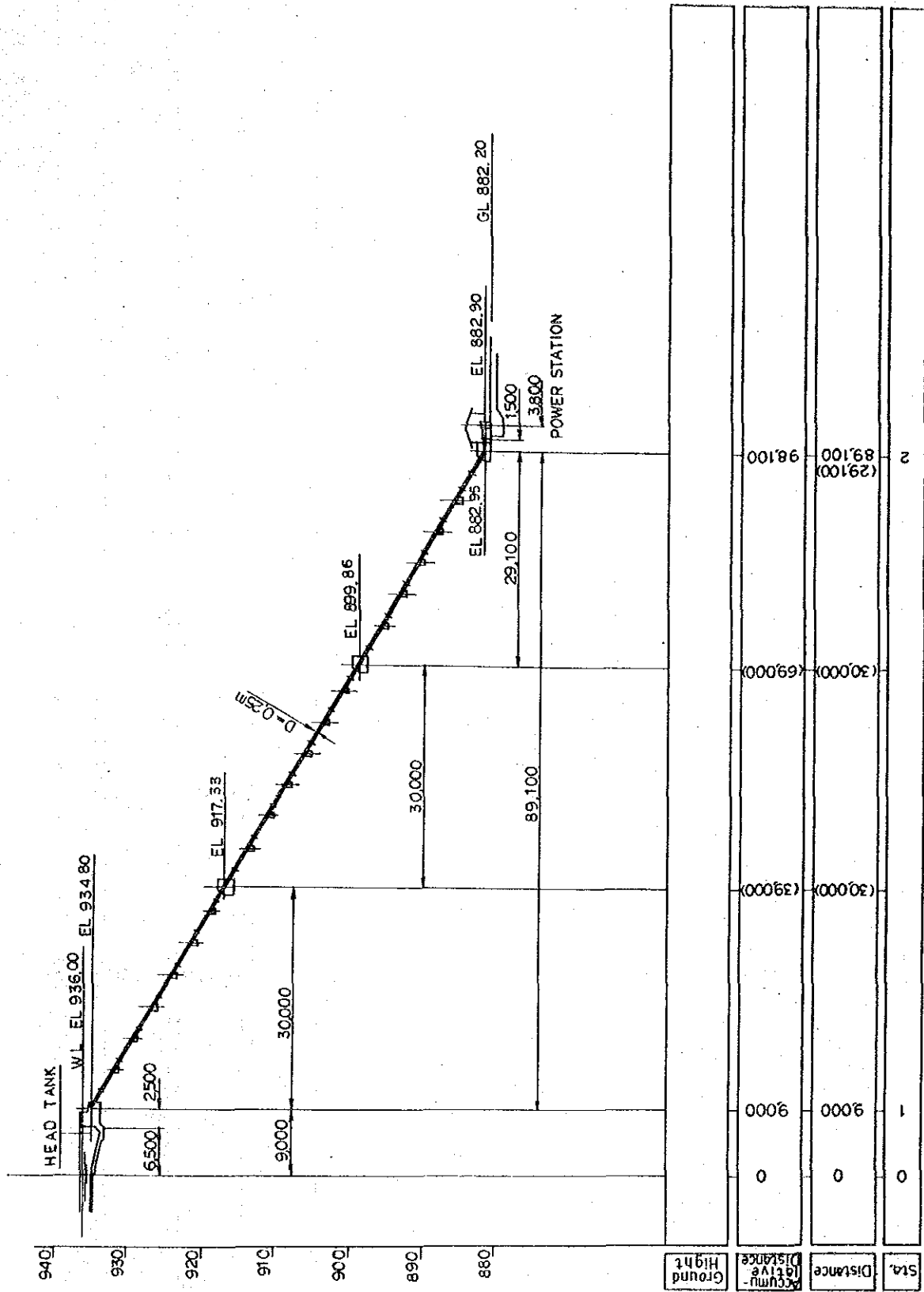
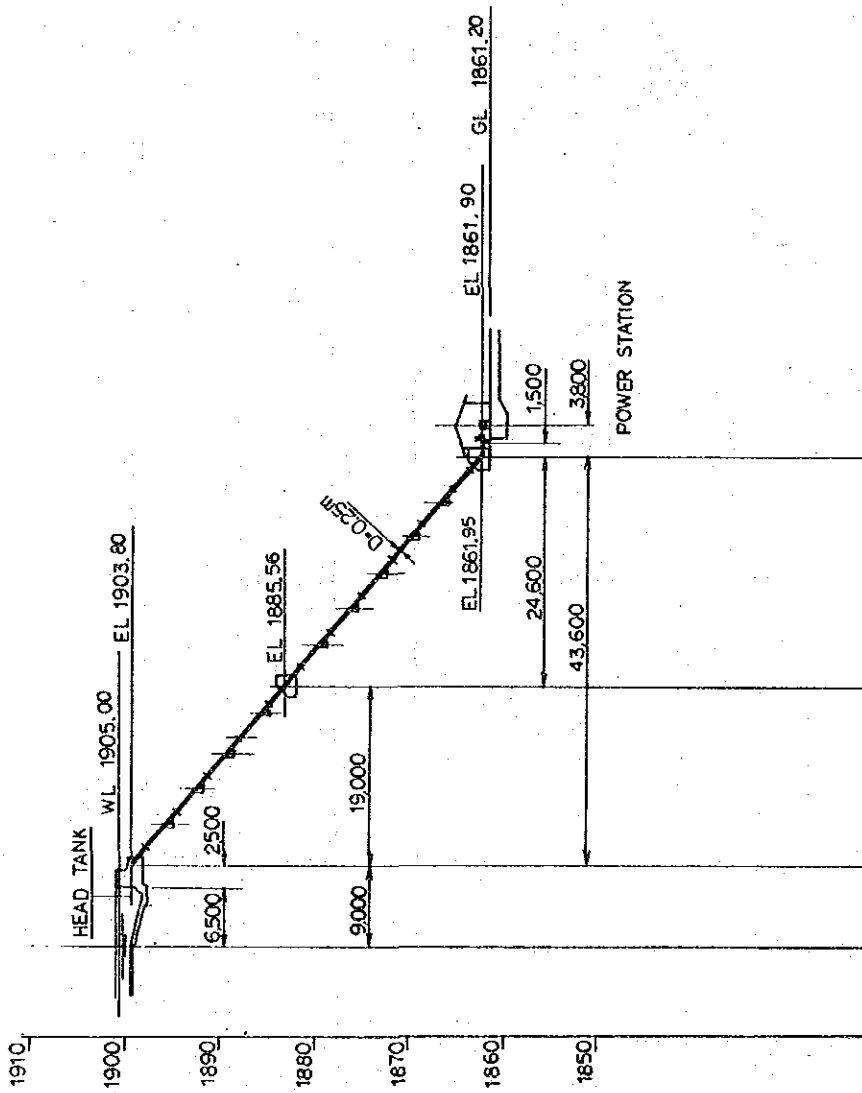


Fig. 4-6-5-(6)
 PENSTOCK PROFILE
 No. 0 YADI SITE
 SCALE 1/500



Sta	Distance	Accumulative Distance	Ground Height
0	0	0	
1	9,000	9,000	
2	43,600	52,600	

Fig. 4-6-5-(7)
PENSTOCK PROFILE
NO. 101, PUNAHA SITE.
SCALE 1/500

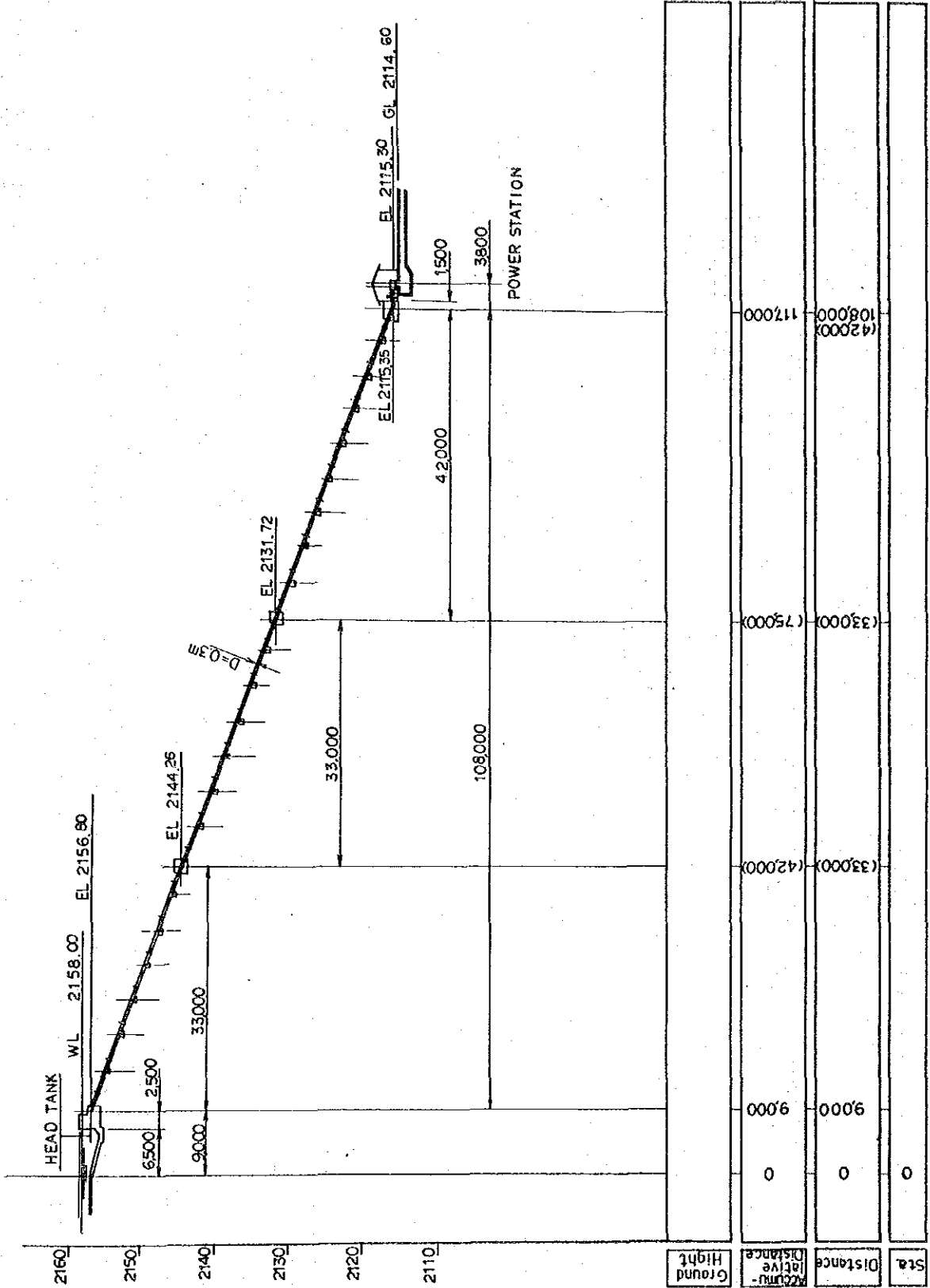


Fig. 4-6-5-(8)
 PENSTOCK PROFILE
 NO. 102 TONGSA SITE
 SCALE 1/500

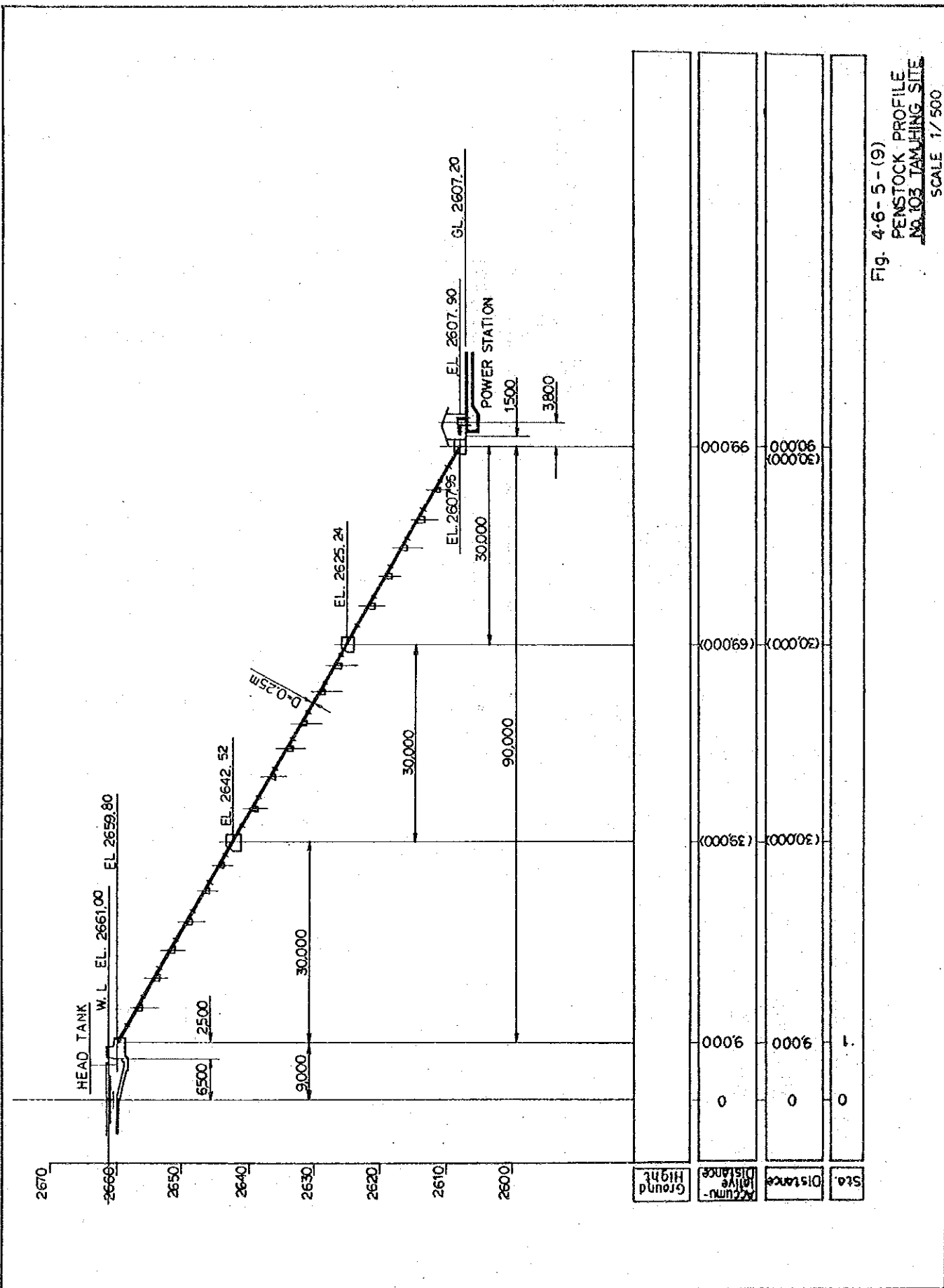


Fig. 4-6-5-(9)
PENSTOCK PROFILE
No. 103 TAMMING SITE
SCALE 1/500

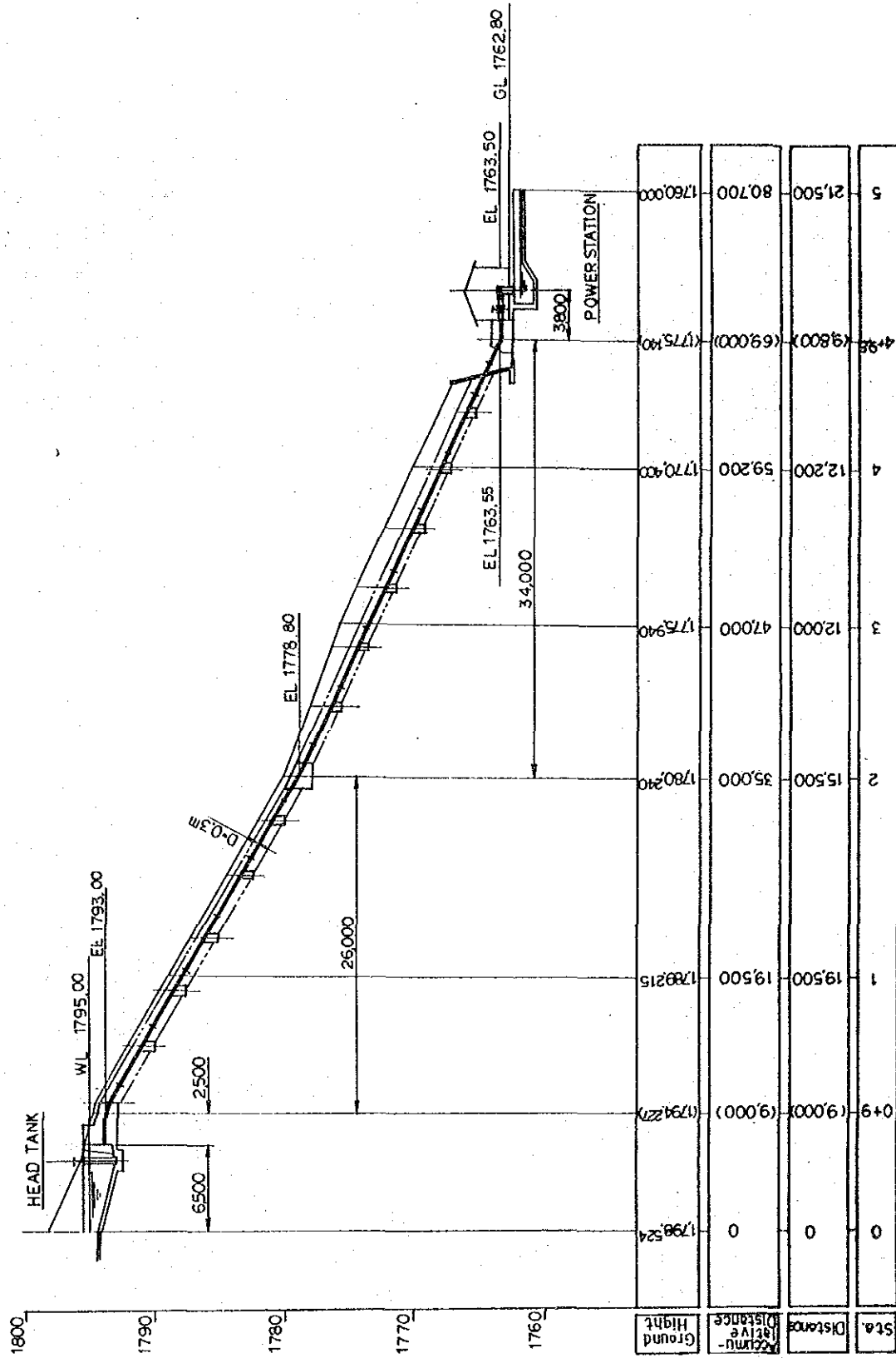


Fig. 4-6-5 - (10)
PENSTOCK PROFILE
No. 10 KEKHAR SITE

SCALE 1/500

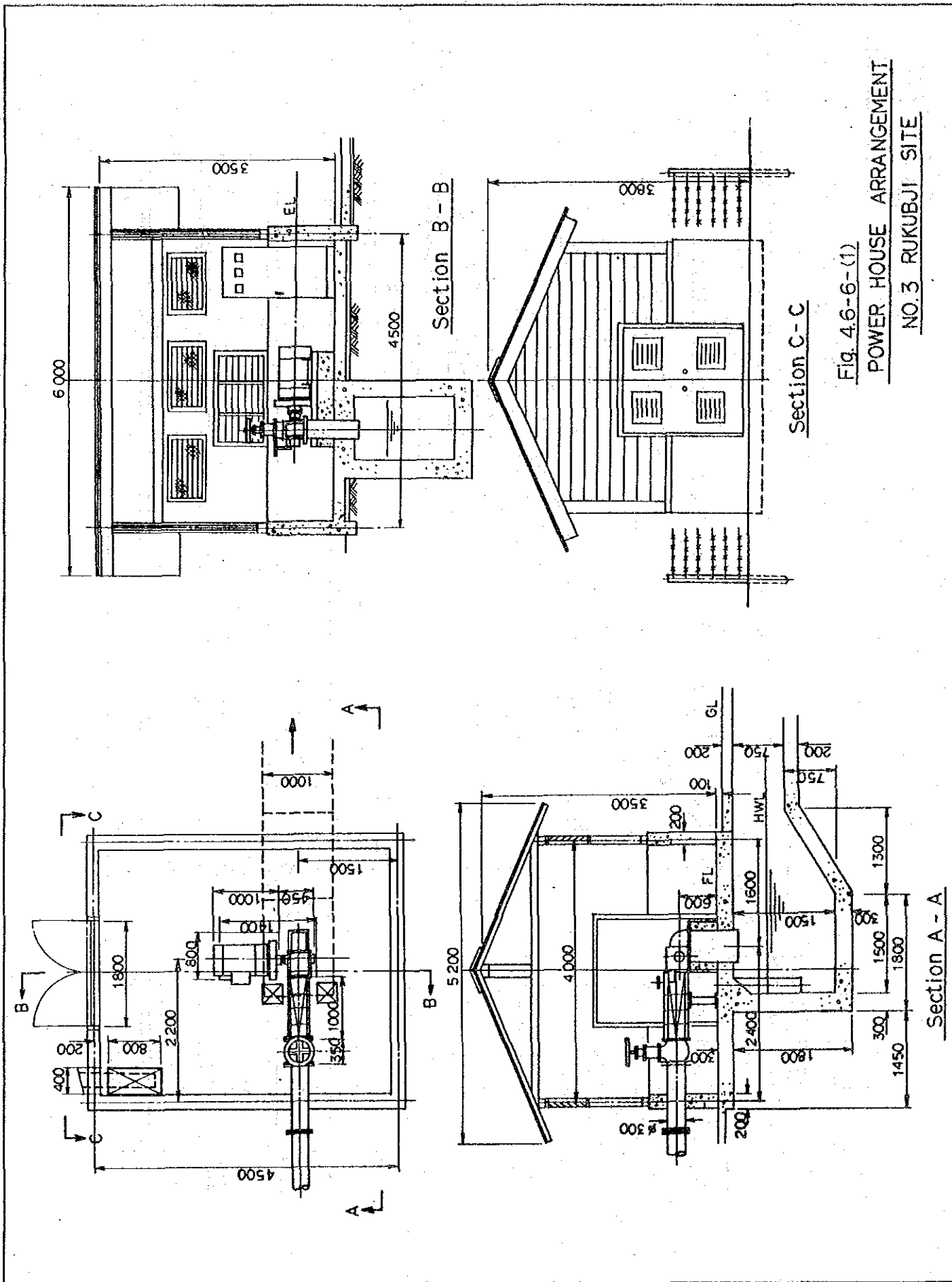


Fig. 4.6-6-(1)
 POWER HOUSE ARRANGEMENT
 NO.3 RUKUBJI SITE

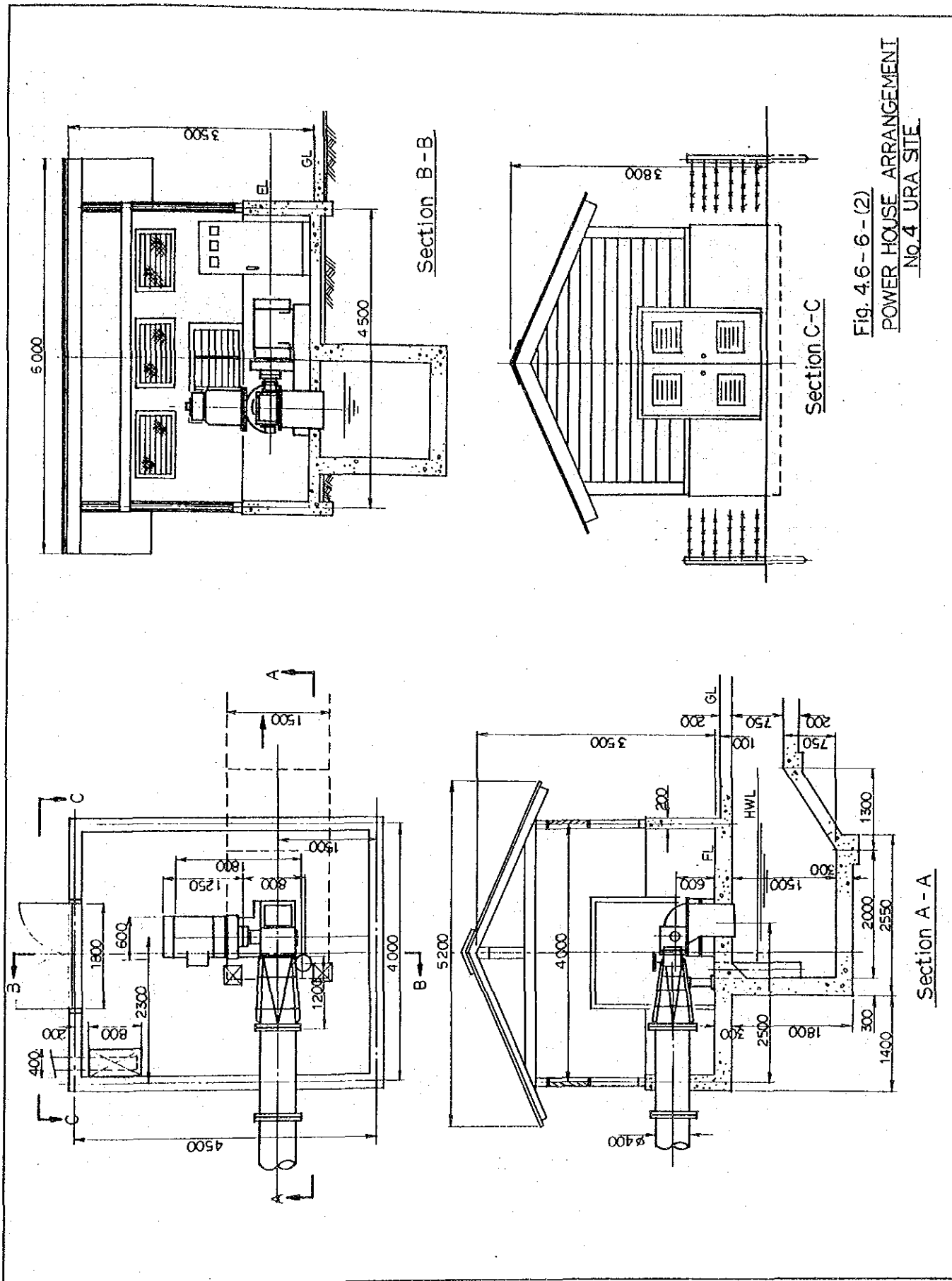


Fig. 4.6-6-(2)
 POWER HOUSE ARRANGEMENT
 No. 4 URA SITE

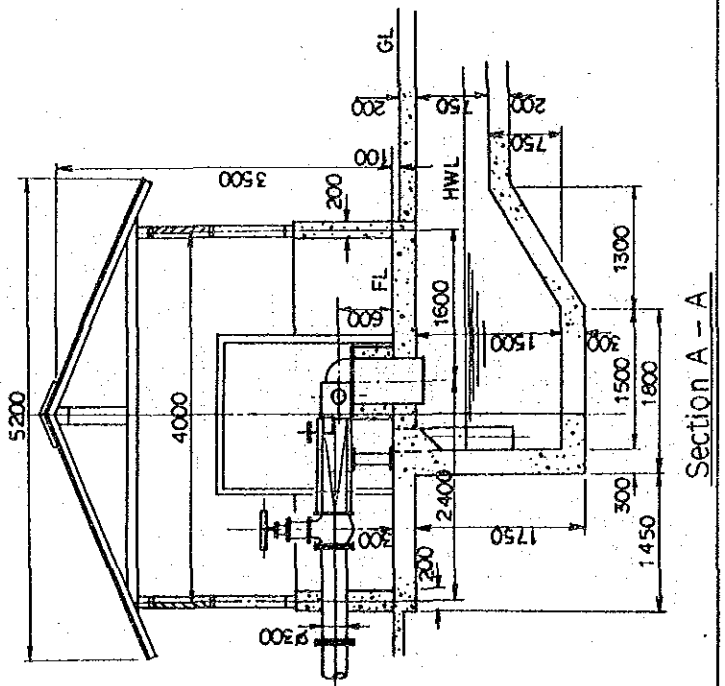
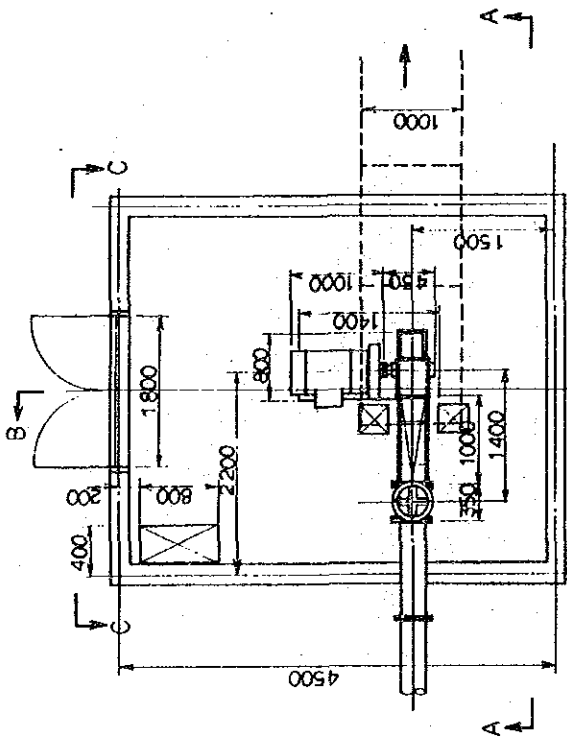
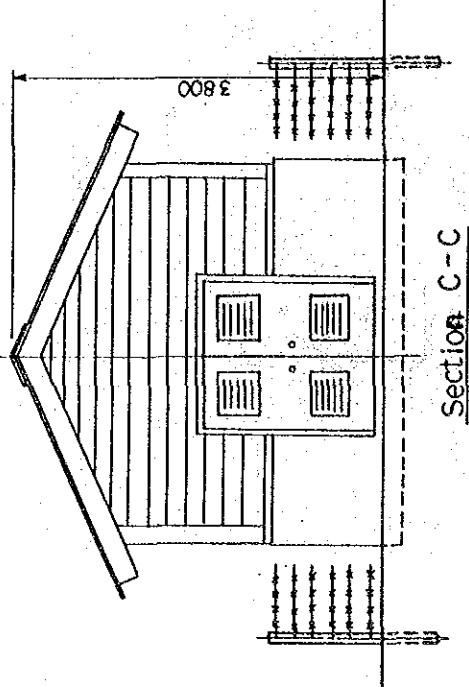
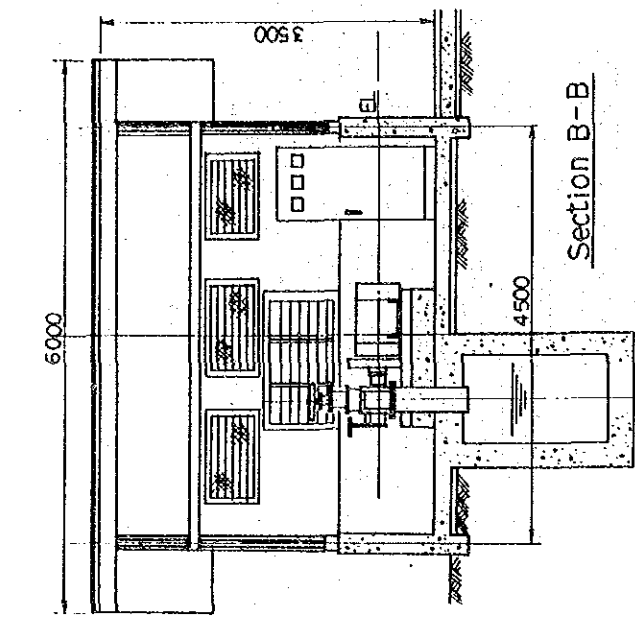


Fig. 4.6-6-(3)
POWER HOUSE ARRANGEMENT
NO. 5 TANGSIBI SITE

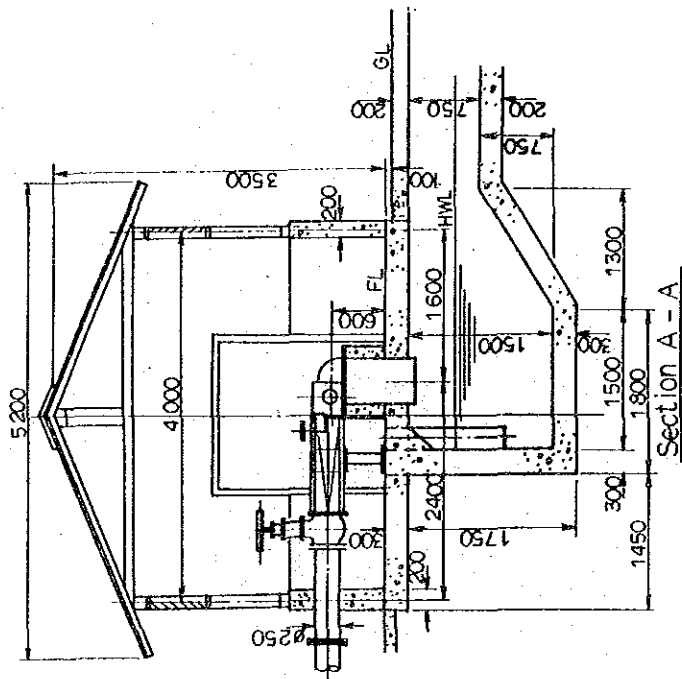
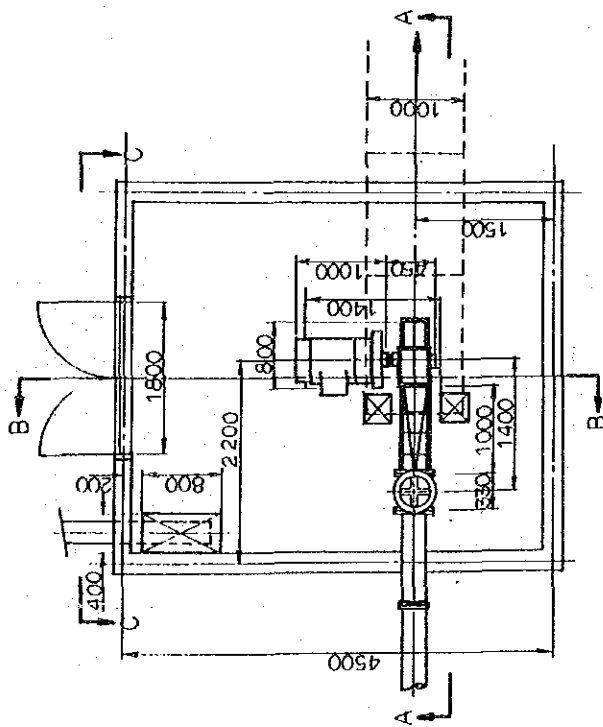
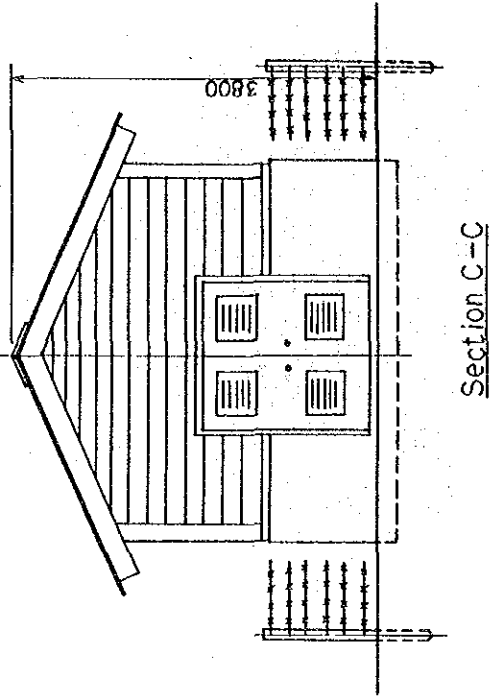
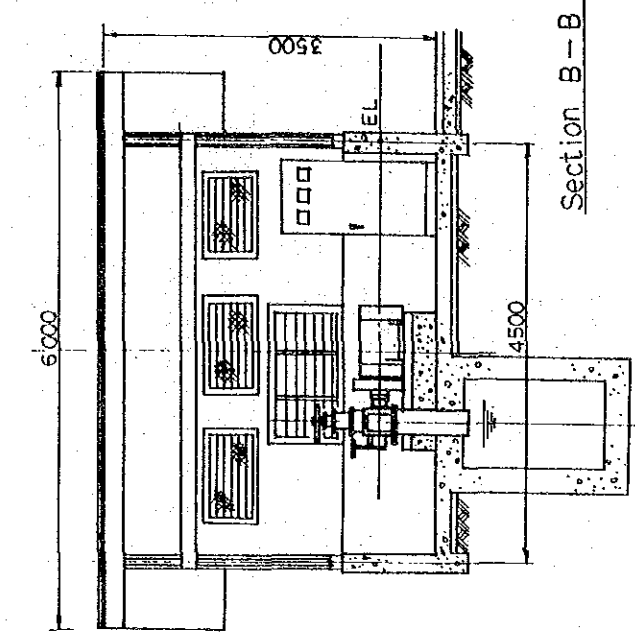


Fig. 4.6-6 - (4)
POWER HOUSE ARRANGEMENT
No. 6 BUBJA SITE

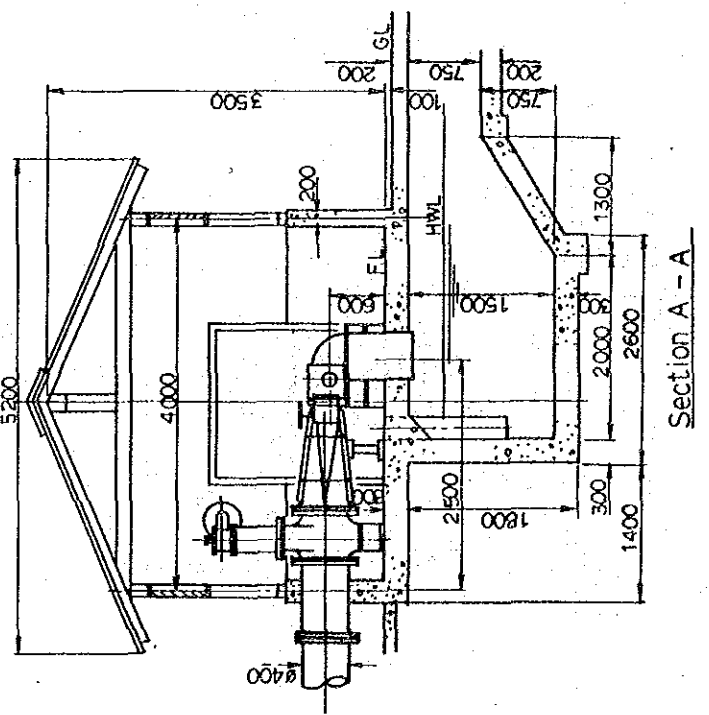
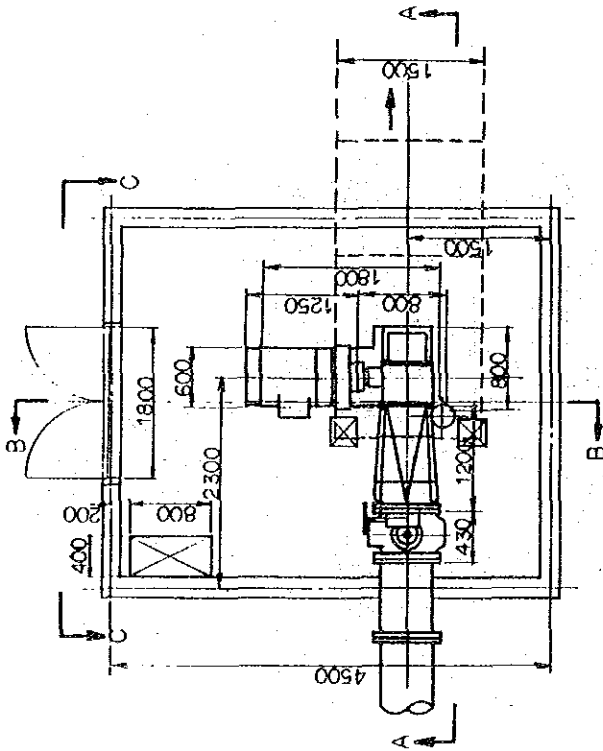
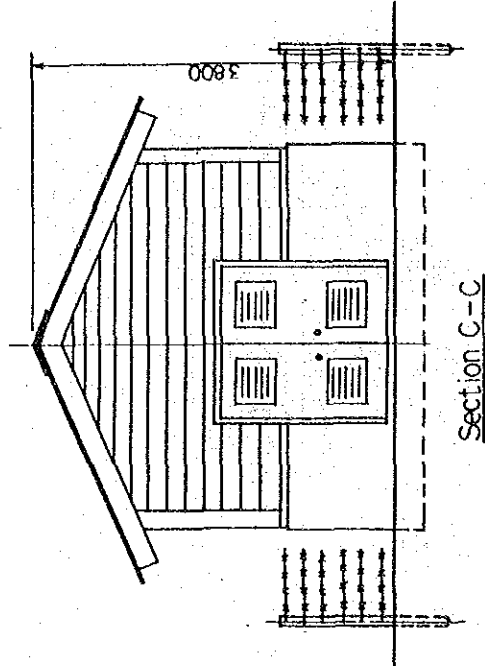
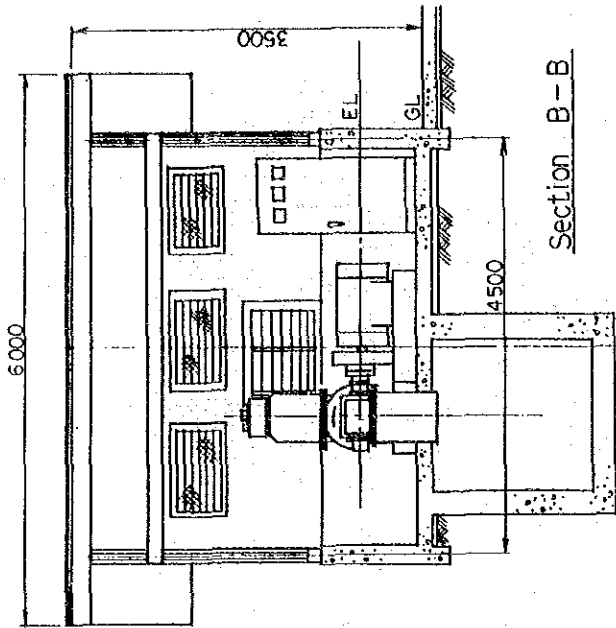
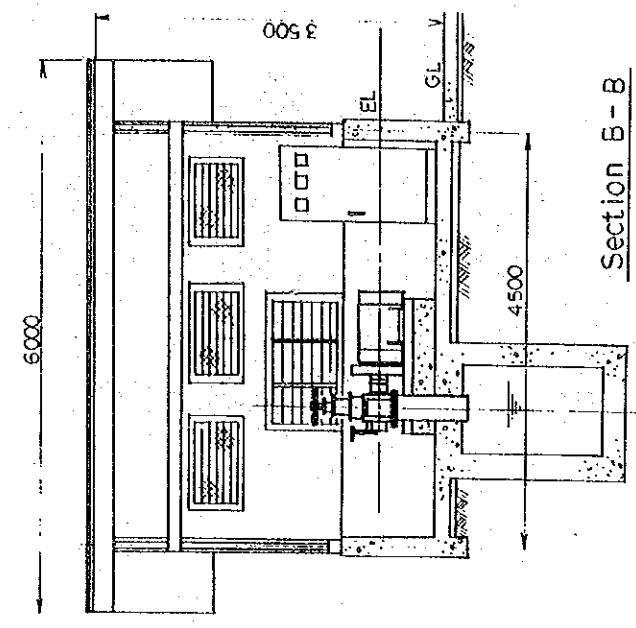
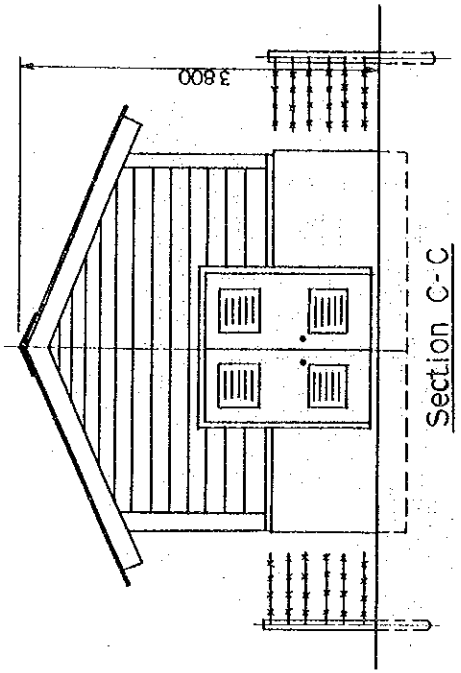


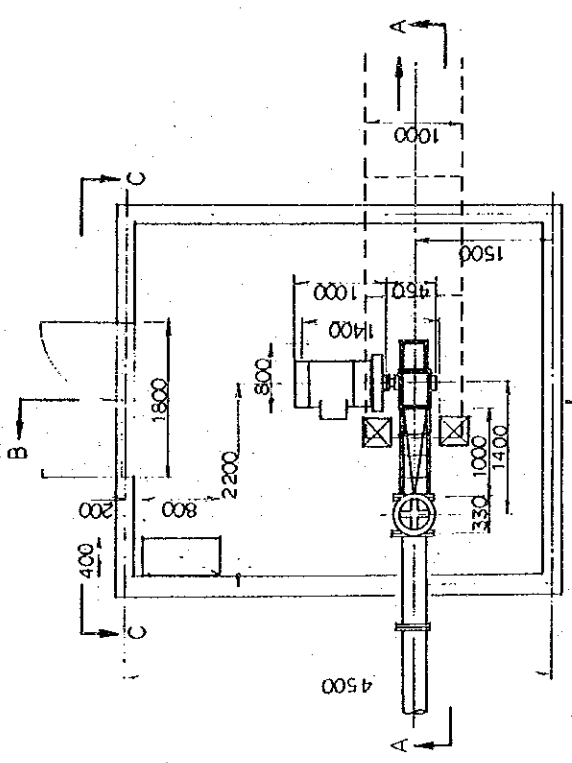
Fig. 4.6-6-(5)
POWER HOUSE ARRANGEMENT
No. 7 SUREY SITE



Section B-B



Section C-C



Section A-A

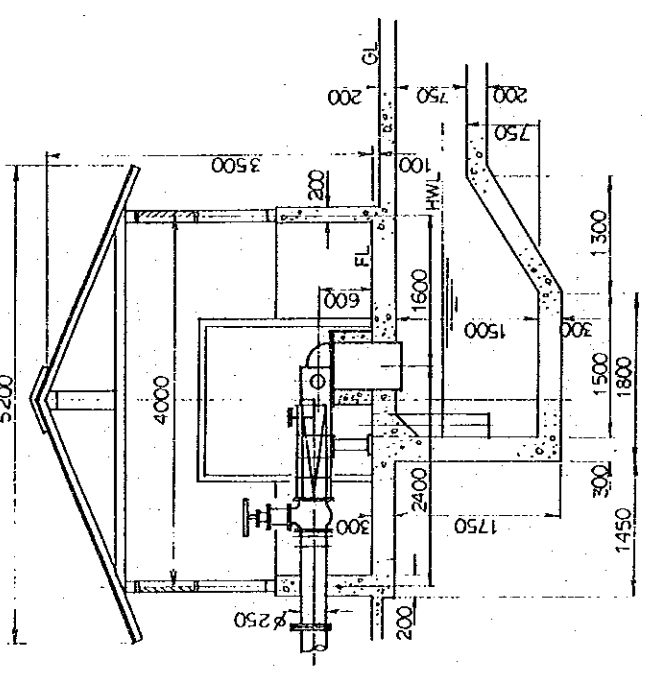
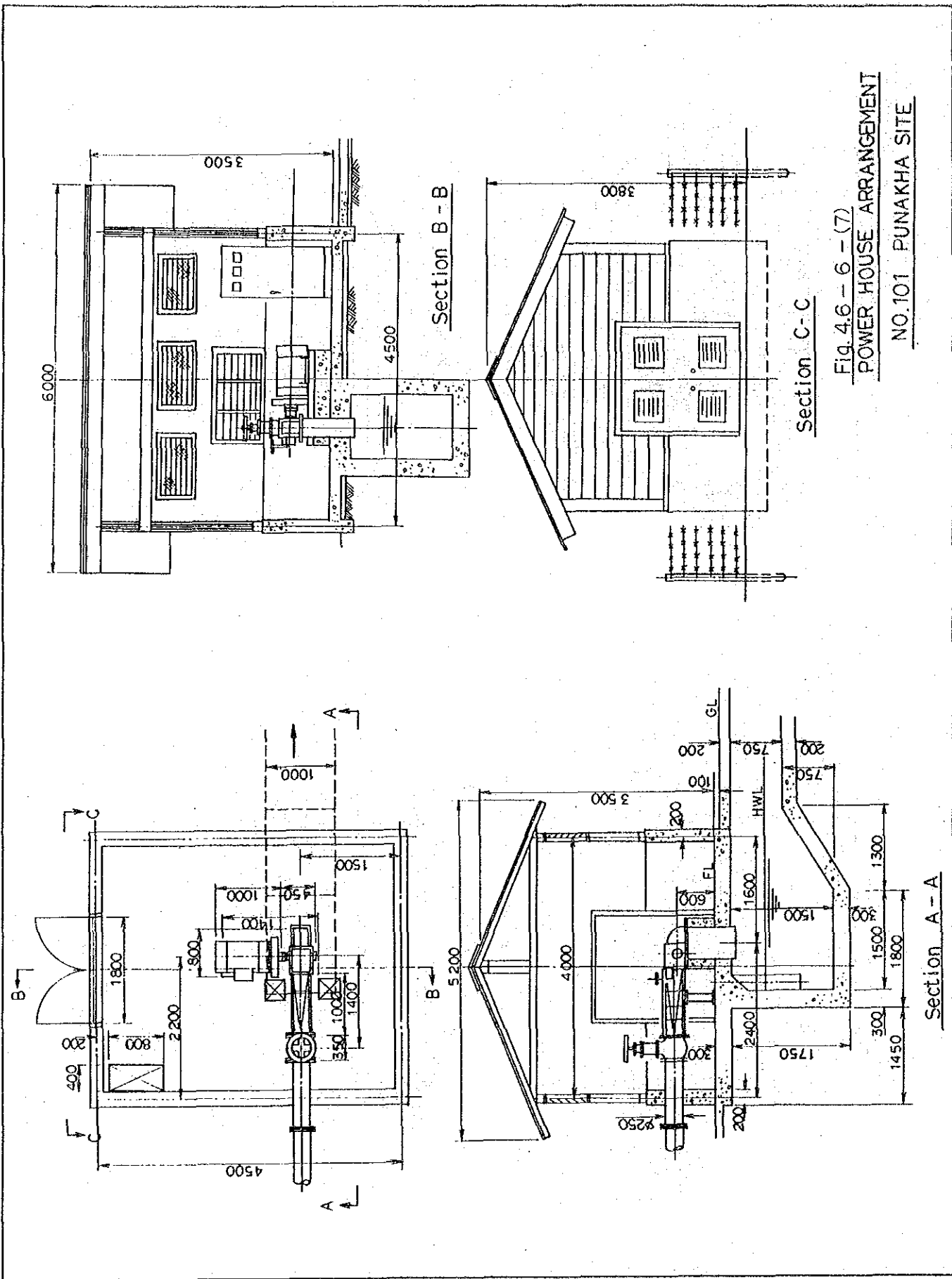


Fig. 4.6-6-(G)

POWER HOUSE ARRANGEMENT

NO.8 YADI SITE



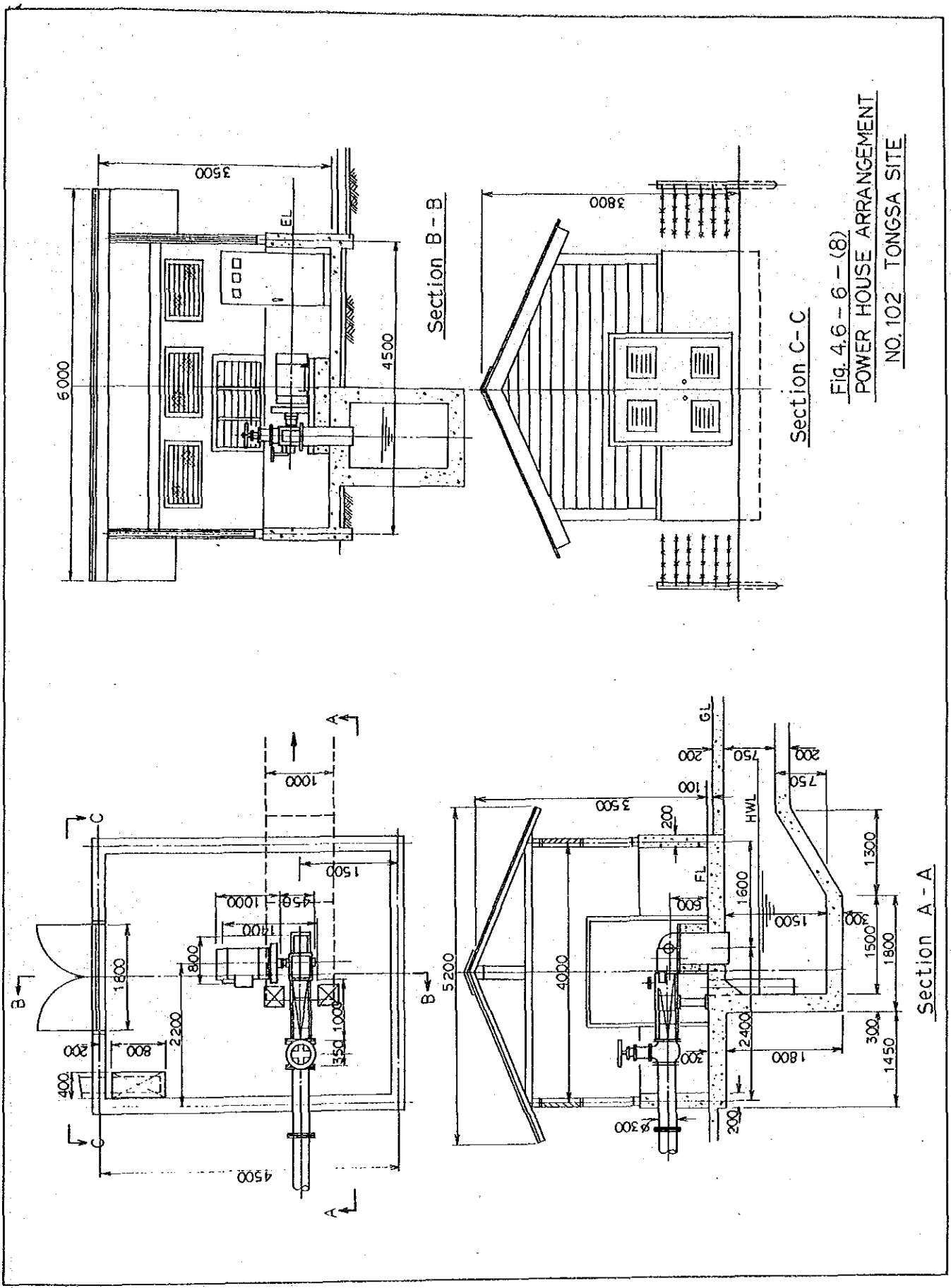


Fig. 4.6 - 6 - (8)
 POWER HOUSE ARRANGEMENT
 NO. 102 TONGSA SITE

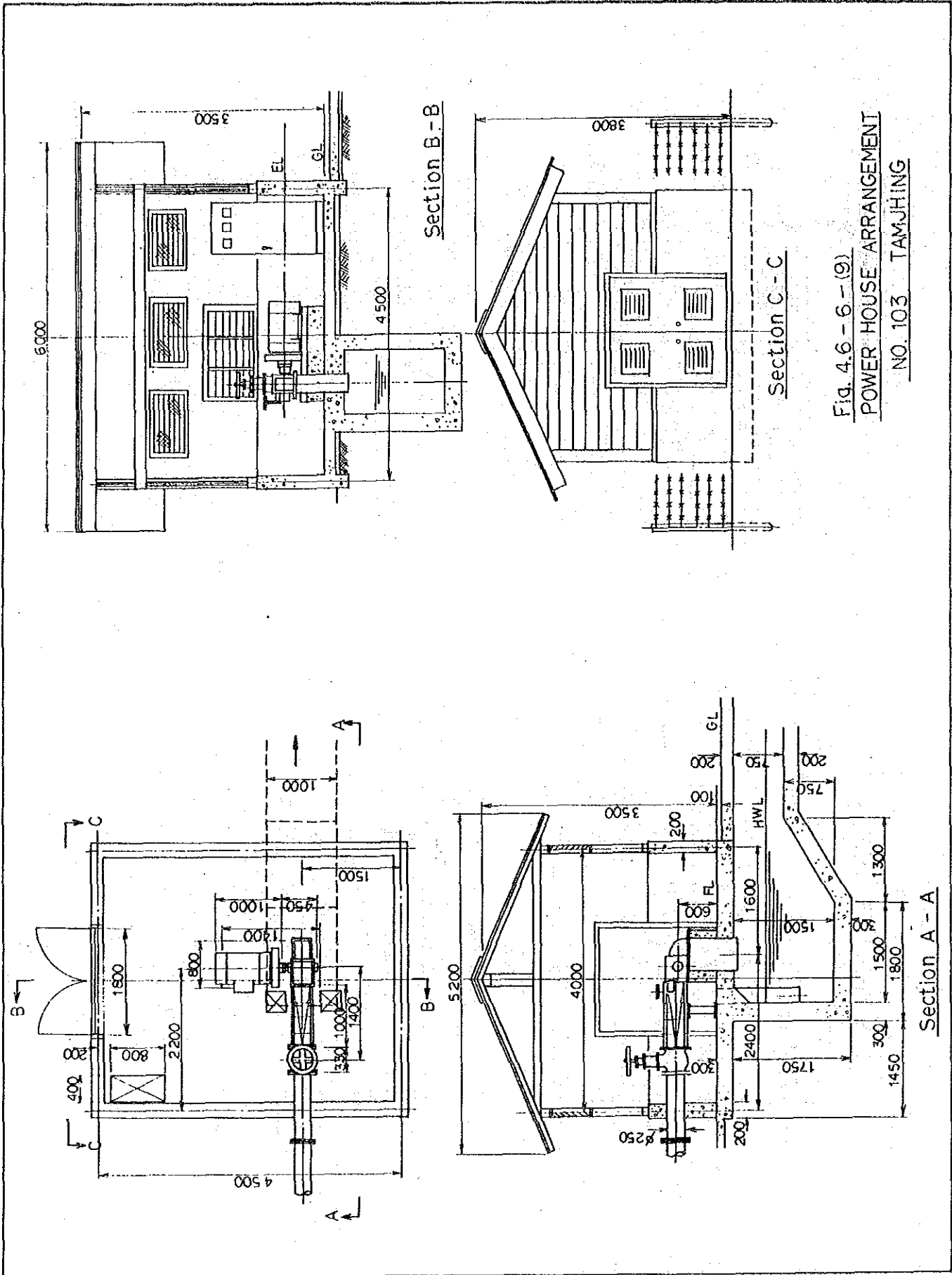


Fig. 4.6 - 6 - (9)
 POWER HOUSE ARRANGEMENT
 NO. 103 TAMJHING

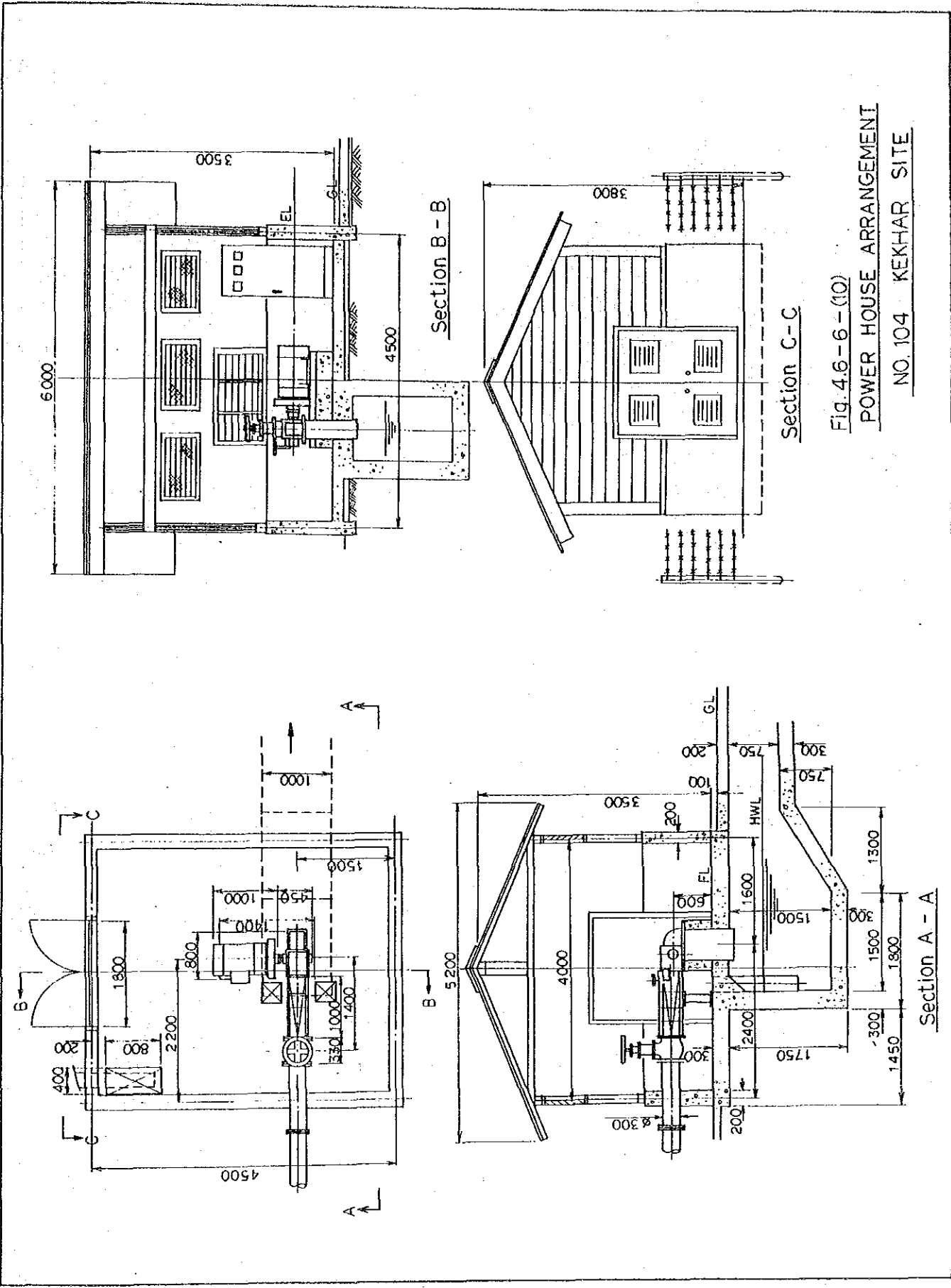
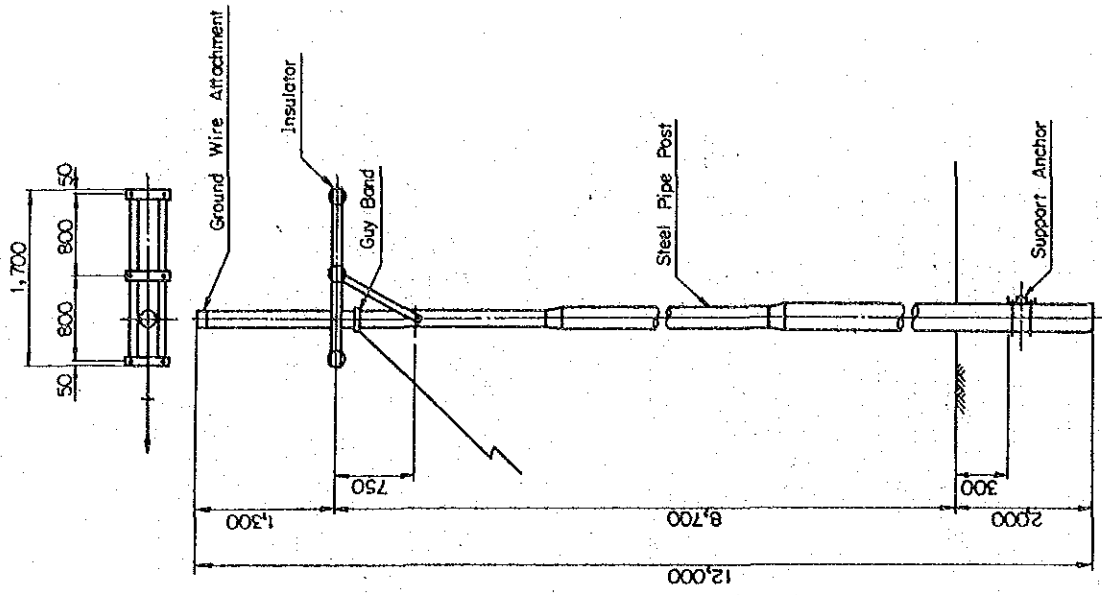
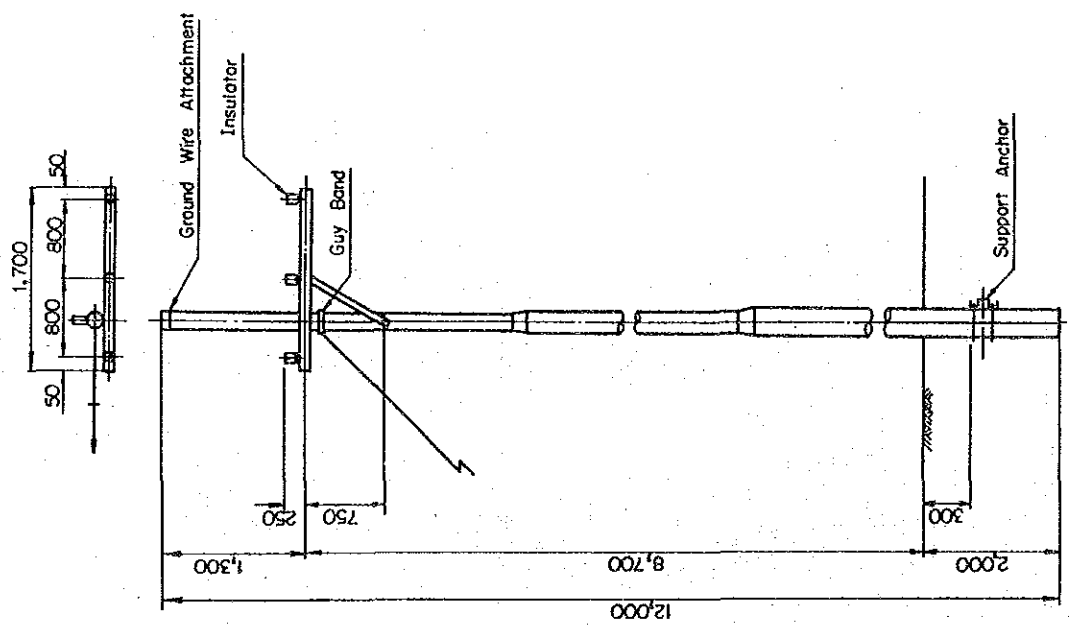


Fig. 4.6-6-(10)
 POWER HOUSE ARRANGEMENT
 NO. 104 KEKHAR SITE

Fig. 4.6-7 (1) 6.6kV T/L Post Arrangement



for Dead End Type



for Straight Line

Fig. 4. 6-7(2) 6.6kV T/L Post Arrangement
For Sending end and Receiving end

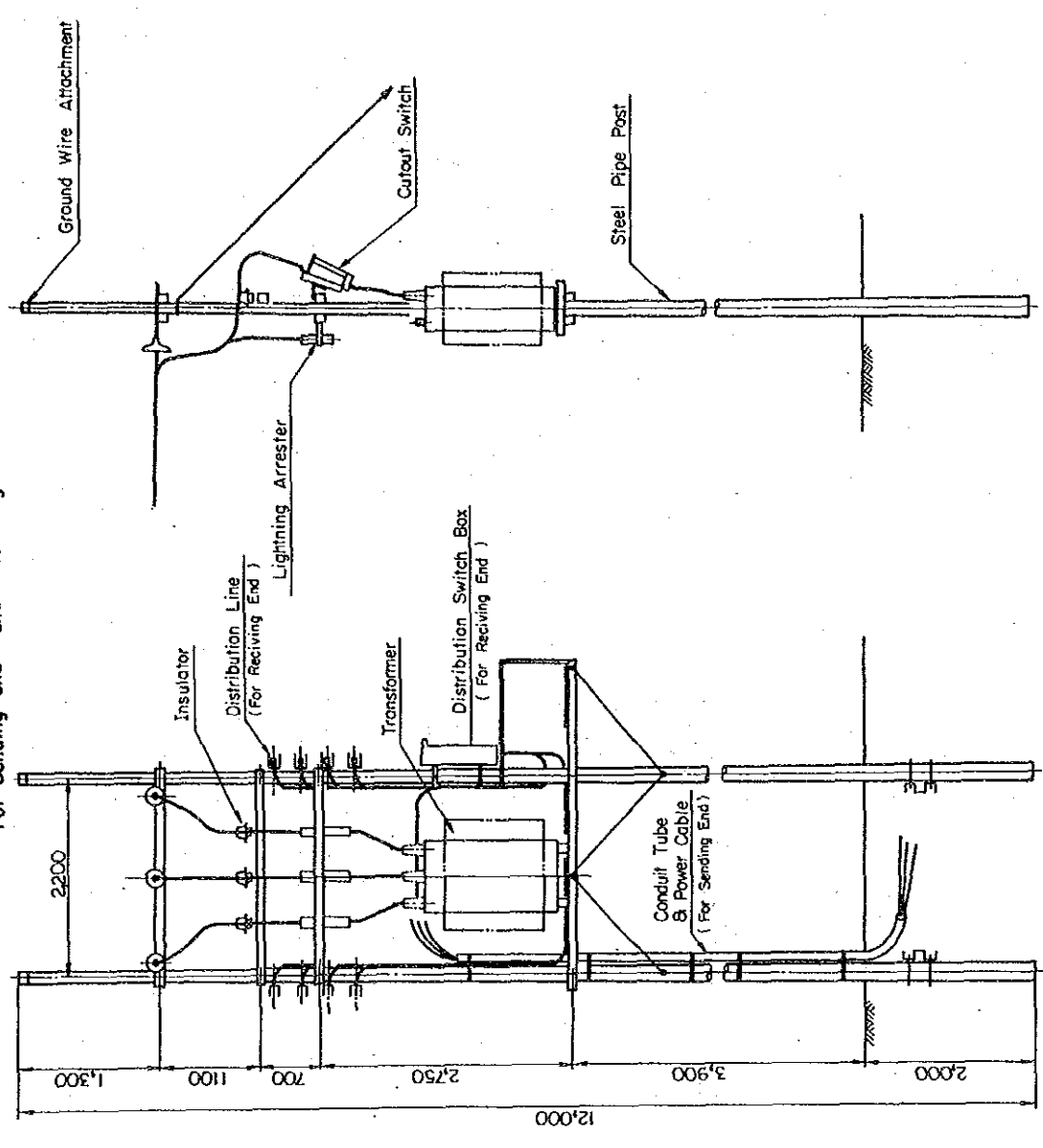
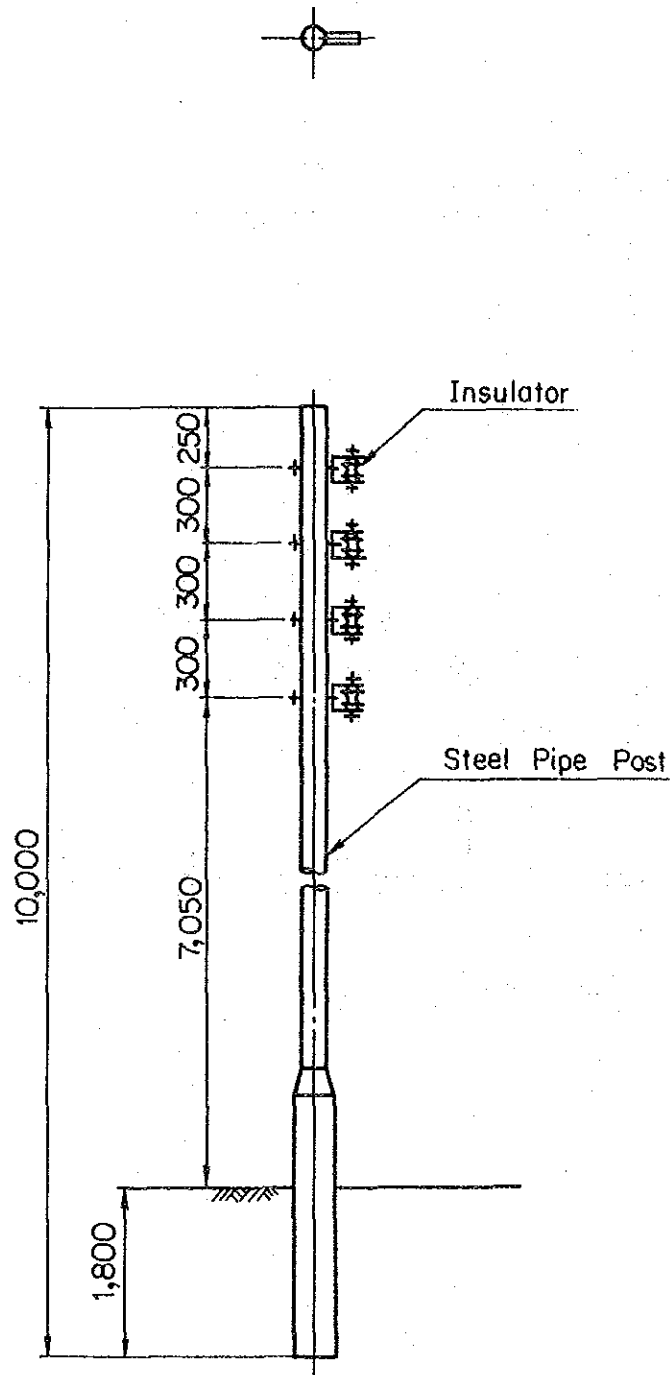


Fig. 4.6-8 400V D/L Post Arrangement



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