In this case, the crest of the spillway of consolidation dam should be positioned lower than the level of the present riverbed.

7.3 EFFECT OF SEDIMENT CONTROL FACILITIES

The effect of sediment control facilities is found as a difference of runoff sediment volume with and without facilities based on the result of riverbed fluctuation simulation as in the case of K. Mujur.

The design sediment control volume is shown on Table-7.3.

Table-7.3 Effect of Sediment Control Facilities

Type of Work	Function	Name of Facility	Control Volume (10^3 m^3)
Check Dam	Sediment yield control	BS. Kobo'an CHD-3	90
		4	660
	Runoff sediment regulation	5	90
		6	430
		7	300
		Curah Lengkong CHD-1	160
		2	80
Diversion Channel	Diversion of runoff sediment	Diversion channel	2,220
Sand Pocket	Storage of runoff sediment	K. Leprak SP-1	250
		2	730
		3	360
Total			5,370

7.4 CALCULATION OF CONSTRUCTION COST

(1) Design Standard

Design of Sediment control facilities is made on the basis of "Technical Standard for River and Sabo Works in Japan" published by River Bureau of the Ministry of Construction in Japan.

(2) Outline Work Quantity

The outline work quantity planned by the Master Plan is shown in Table-7.4.

(3) Project Cost

The project cost is calculated in the same manner as for the K. Mujur. Estimated project costs are shown in Table-7.5.

Table-7.4 Quantity of Construction

Kind of work / Facility	Concrete (m^3)	Mansory Concrete (m^3)	Excavation (m^3)	Embankment (m^3)	Rock Cleaning (m^3)	Gabion matress (m^3)	Rock basket (m^3)
Curah Kobo'an CHD-3		6,000	4,000				
4	30,000		14,000	63,000			
5		18,000	10,000				
6	121,000		69,000				
7	40,000		23,000				
C. Lengkong CHD-1		3,000	1,700				
2		10,000	6,000				
Diversion Channel	43,000	19,400	594,000	19,600	5,600	9,200	
K. Leprak SP		14,000	145,000	145,000		14,000	43,000
Dike				1002,000		26,000	
Consolidation dam		13,000	7,000				
River excavation			368,000				
Total	234,000	83,400	1241,700	1229,600	5,600	49,200	43,000

Table-7.5 Project Cost of Sediment Control Facilities of K. Rejali

Sediment Control Facilities \ Classification		Project Cost 10^6 Rp
Curah Kobo'an	CHD-3	230
	4	3,224
	5	687
	6	12,843
	7	4,246
Curah Lengkong	CHD-1	115
	2	382
Diversion work		5,930
K. Leprak	SP	3,361
K. Leprak DK-12, 13		1,227
K. Leprak DK-14 - 25		
River excavation		519
Consolidation dam		496
Total		33,260

8. SEDIMENT CONTROL PLAN OF K. GLIDIK

8.1 PRINCIPLE OF SEDIMENT CONTROL

(1) Object of Plan

Although the primary disaster takes place of the volcanic cone of Mt. Semeru along the K. Glidik, major damage to properties is aroused by the secondary disaster at the relatively lower stream of the river. In addition, the diversion work of the K. B. Kobo'an results to the inflow of sediment to the lower stream of the K. Glidik via the K. Lengkong.

Sediment control plan of the K. Glidik therefore intends to prevent the damages from the secondary disaster.

(2) Disaster Prevention Area

The disaster prevention area by this sediment control plan shall be the Zone II, III, IV and V of "Possible Disaster Area" as established already.

(3) Design Reference Point

Three(3) reference points are set up to determing sediment volume to be dealt with by this plan.

Design reference point:

It was established at the the most downstream of the Zone IV of the possible disaster area where sediment disasters take place frequently, in other words, junction of K. Manjing and K. Glidik.

Supplementary reference points:

One of them is established at the most upstream point of the valley-bottom plain where is the main area to be protected, in other words, the junction of K. Glidik and K. Lengkong. Another one is established at the just upstream of the deep valley of tertiary mountains, in other words, the Pronojiwo bridge.

(4) Design Magnitude of Plan

Design magnitude shall be established on the basis of 100 years return period as for K. Mujur and K. Rejali.

(5) Design Excess Sediment Volume

As the result of riverbed fluctuation simulation based on rainfall of 100 years return period, the design excess sediment volume ($4,500 \times 10^3$ m^3) found by deducting runoff sediment (400×10^3 m^3) at the design reference point from runoff sediment ($4,900 \times 10^3$ m^3) at the supplementary reference point shall be the planned sediment volume to be controlled.

(6) Principle of Sediment Control

There are great quantity of Lahar deposit in K. Lengkong Fan area. Therefore, those Lahar deposit should be suppressed at the first.

Sediment runoff should be regulated at the middle reach in order to protect the valley-bottom plain at the down reach from flooding.

8.2 SEDIMENT CONTROL FACILITY PLAN

Function of sediment control facilities in the K. Glidik shall be considered the same as those of the K. Mujur and the K. Rejali. Sediment control facilities in K. Glidik should be planned in accordance with the ideas shown on Table-8.1 and Fig.-8.1.

Table-8.1 Basic Ideas for Sediment Control Facility Plan in K. Glidik

Order of Construction	Main Objective of Construction Work	Sediment Control Facility to Be Constructed
First Step	Control of increase runoff sediment due to partial diversion of runoff sediment from BS. Kobo'an	Construction of Check Dam along K. Lengkong
Second Step	Reduction of inflow sediment into the valley-bottom plain of K. Glidik	Construction of Check Dam along K. Lengkong the tertiary valley
Third Step	Ditto	Construction of Check Dam along K. Glidik
Fourth Step	Prevention of local flood in the valley-bottom plain and fixing of watercourse	Construction of dike and consolidation dam work

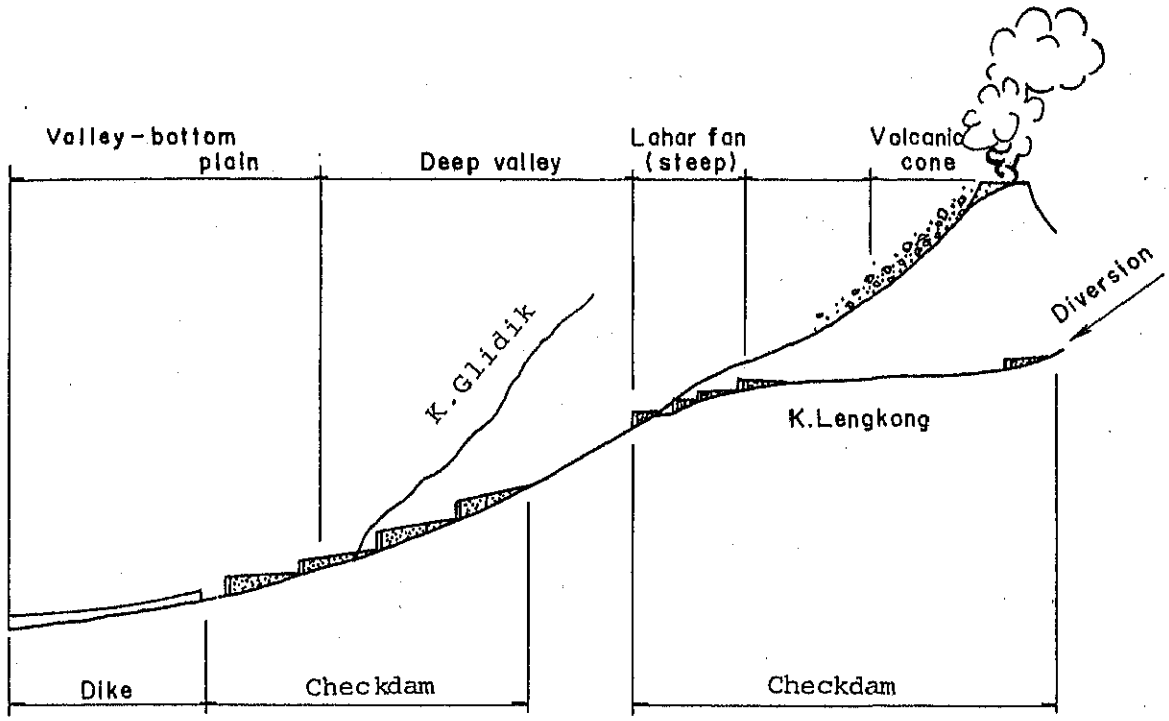


Fig.-8.1 Schematic Drawing of Sediment Control Facilities Plan in K. Glidik

Specifications of each facility is given in Table-8.2.

Table-8.2 Sedimental Control Facilities in K. Glidik

Work Step	Type of Work	Sediment Control Facilities	
		Name	Specification
1st Step (Related to Diversion)	Sabo dam	K. Lengkong CHD-7	H-10m L=145m
		" 6	H= 9m L=305m
		" 5	H= 8m L=163m
		" 4	H= 8m L=170m
		" 3	H=10m L=193m
2nd Step	Sabo dam	K. Lengkong 2	H=22m L=221m
		" 1	H=15m L=326m
3rd Step		K. Glidik 2	H=15m L=448m
		" 1	H=14m L=630m
4th Step	Dike 1-14		H= 6m L=9600m

8.3 EFFECT OF SEDIMENT CONTROL FACILITIES

The effect of sediment control facilities is found as a difference of runoff sediment volume with and without facilities based on the result of riverbed fluctuation simulation as in the case of the K. Mujur and the K. Rejali.

The design control sediment volume is shown in Table-8.3.

Table-8.3 Effect of Sediment Control Facilities

Type of Work	Function	Name of Facility	Control volume (10^3 m^3)
Check Dam	Sediment yield suppression	K. Lengkong CHD-7	2
		" 6	165
	Runoff sediment regulation	" 5	22
		" 4	12
		" 3	360
		" 2	2,100
		" 1	440
	Runoff sediment regulation	K. Glidik 2	480
		" 1	980
	Total		4,561

8.4 CALCULATION OF CONSTRUCTION COST

(1) Design Standard

Design of sediment control facilities is made on the basis of "Technical Standard for River and Sabo Works in Japan" published by River Bureau of the Ministry of Construction in Japan.

(2) Outline Work Quantity

The outline work quantity planned by the Master Plan is shown in Table-8.4.

(3) Project Cost

The project cost is calculated in the same manner as for the K. Mujur and for the K. Rejali.

Estimated project costs are shown in Table-8.5.

Table-8.4 Quantity of Construction

Sabo Facility	Concrete (10^3 m^3)	Excavation (10^3 m^3)	Embankment (10^3 m^3)	Gabion Works (10^3 m^3)
K. Glidik				
Check Dam No.1	31	18	154	
No.2	30	17	42	
K. Lengkong				
Check Dam No. 1	46	26		
2	31	18		
3	43	25		
4	7	4		
5	6	3		
6	8	5	9	
7	6	4		
K. Glidik Dike No.1 to 14	5,4	1224	1224	84
Total	213.4	1347	1432	84

Table-8.5 Project Costs of Sediment Control Facilities of K. Glidik

Facility	Project Cost (10^6 Rp)
K. Glidik Check Dam No. 1	3,400
2	3,213
K. Lengkong Check Dam No. 1	4,882
2	3,291
3	4,565
4	267
5	228
6	312
7	230
K. Glidik Dike No. 1 - 14	2,783
Total	23,872

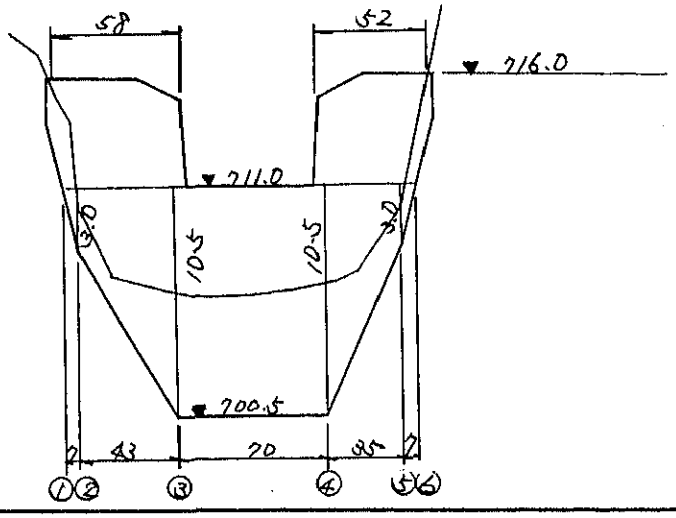
APPENDIX

CONSTRUTION QUANTITY OF MASTER PLAN

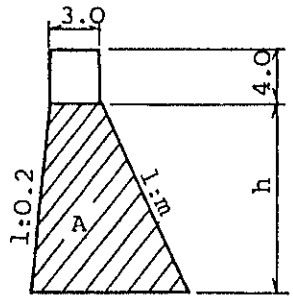
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Myin	BS. Sat	BS. Sat No273+20	BS. Sat ดักตะกอน-2	10.5 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.50

The sectional area of dam is shown as follows:

$A = 0.35\ h^2 + 3h$

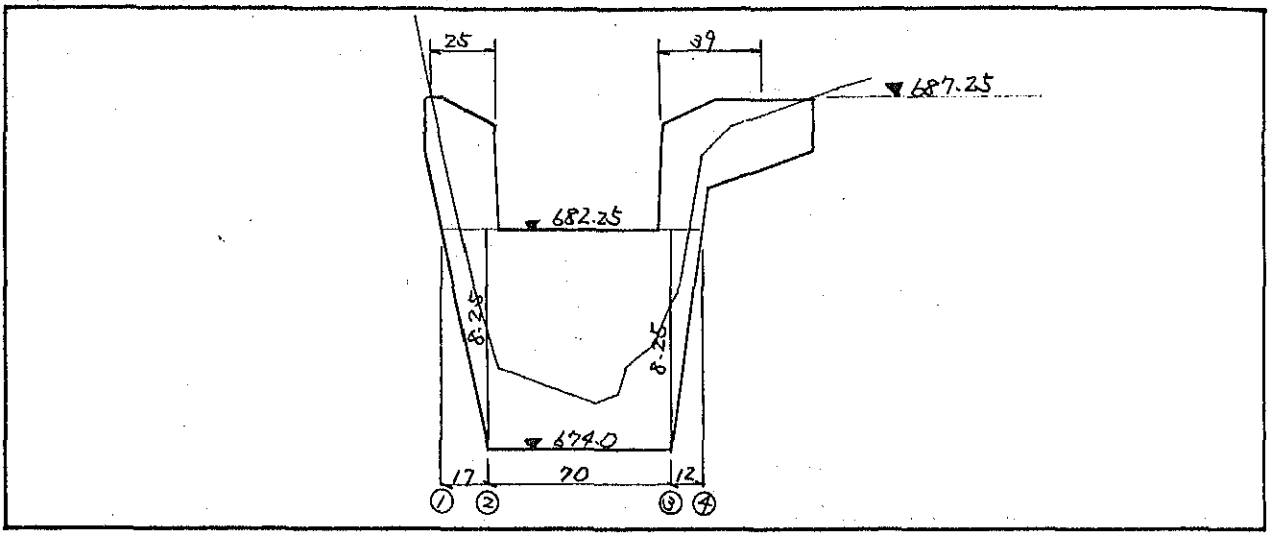
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\bar{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0	—	—	—
	②	3.0	12.2	6.10	7	40
	③	10.5	70.1	41.15	43	1,770
	④	10.5	70.1	70.10	70	4,910
	⑤	3.0	12.2	41.15	35	1,440
	⑥	0	0	6.10	7	40
	⑦					
	⑧					
	Wing	3 × 5 × (58 + 52)				1,650
	Ⓥ Sub totl					8,200
Sub dam	Ⓥ × 0.2					1,640
Total						9,840

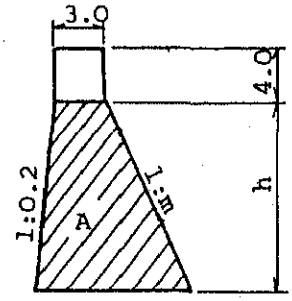
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	BS. Sat	BS. Sat No.266+25	BS. Sat CHD-3	8.0m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.45

The sectional area of dam is shown as follows:

$A = 0.025\ h^2 + 3h$

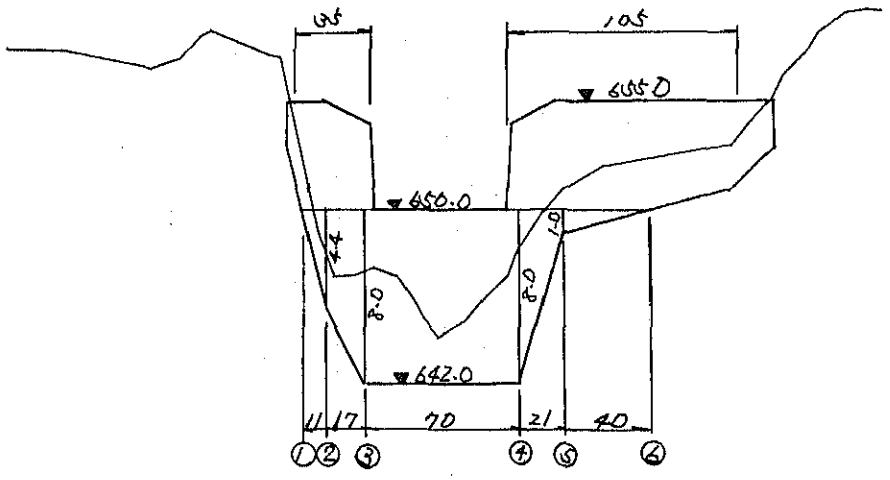
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\bar{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0	—	—	—
	②	8.25	46.9	23.45	17	400
	③	8.25	46.9	46.90	70	3,280
	④	0	0	23.45	12	280
	⑤					
	⑥					
	⑦					
	⑧					
	Wing	3 × 0.5 × (25 + 39)				960
	Ⓥ Sub totl					4,920
Sub dam	Ⓥ × 0.2					980
Total						5,900

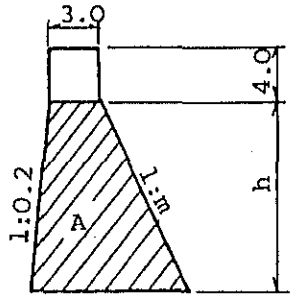
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	BS. Sat	BS. Sat No.260	BS. Sat CHD-5	8.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.45

The sectional area of dam is shown as follows:

$A = 0.325\ h^2 + 3h$

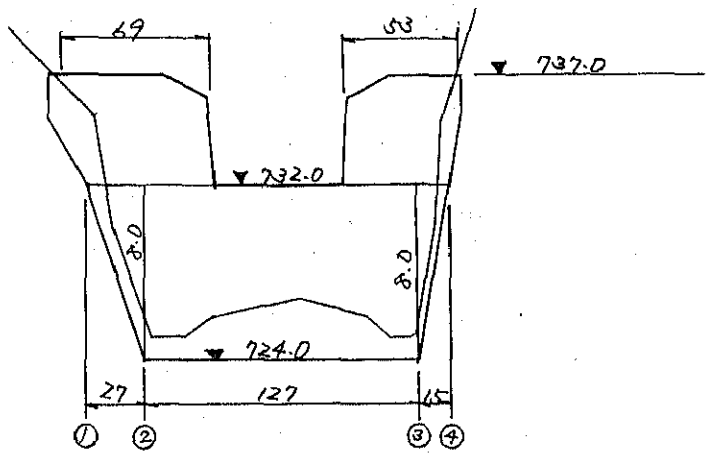
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0	—	—	—
	②	4.4	19.5	9.75	11	110
	③	8.0	44.8	32.15	17	550
	④	8.0	44.8	44.80	70	3,140
	⑤	1.0	3.3	24.05	21	510
	⑥	0	0	1.65	40	70
	⑦					
	⑧					
	Wing	3 × 5 × (35 + 105)				2,100
	Ⓥ Sub totl					6,480
Sub dam	Ⓥ × 0.2					1,300
Total						7,780

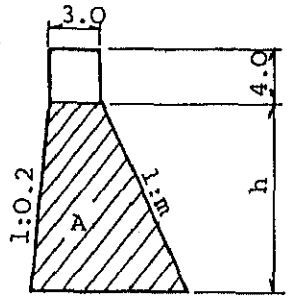
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	BS. Sat	BS. Sat No276-8/	BS. Sat CHD-6	8.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.45

The sectional area of dam is shown as follows:

$A = 0.325\ h^2 + 3h$

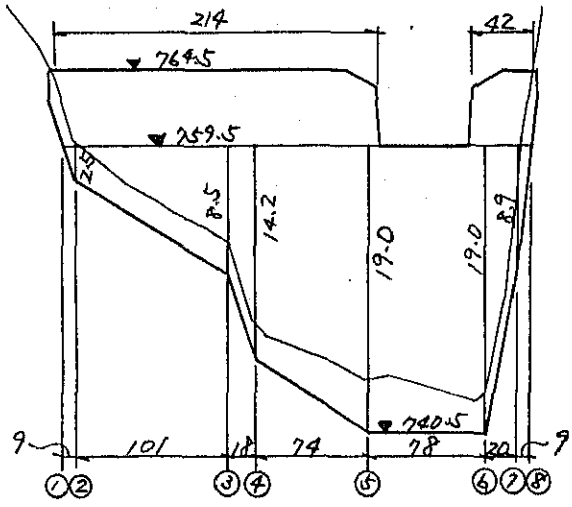
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\bar{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0	—	—	—
	②	8.0	44.8	22.40	27	600
	③	8.0	44.8	44.80	127	5,690
	④	0	0	22.40	15	340
	⑤					
	⑥					
	⑦					
	⑧					
	Wing	3 × 5 × (69 + 53)				1,830
	Ⓥ Sub totl					8,460
Sub dam	Ⓥ × 0.2					1,690
Total						10,150

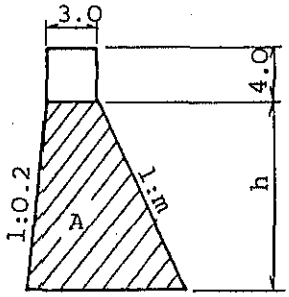
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	BS. sat	BS. sat No 277+34	BS. sat CHD-7	19.0m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.65

The sectional area of dam is shown as follows:

$A = 0.425\ h^2 + 3h$

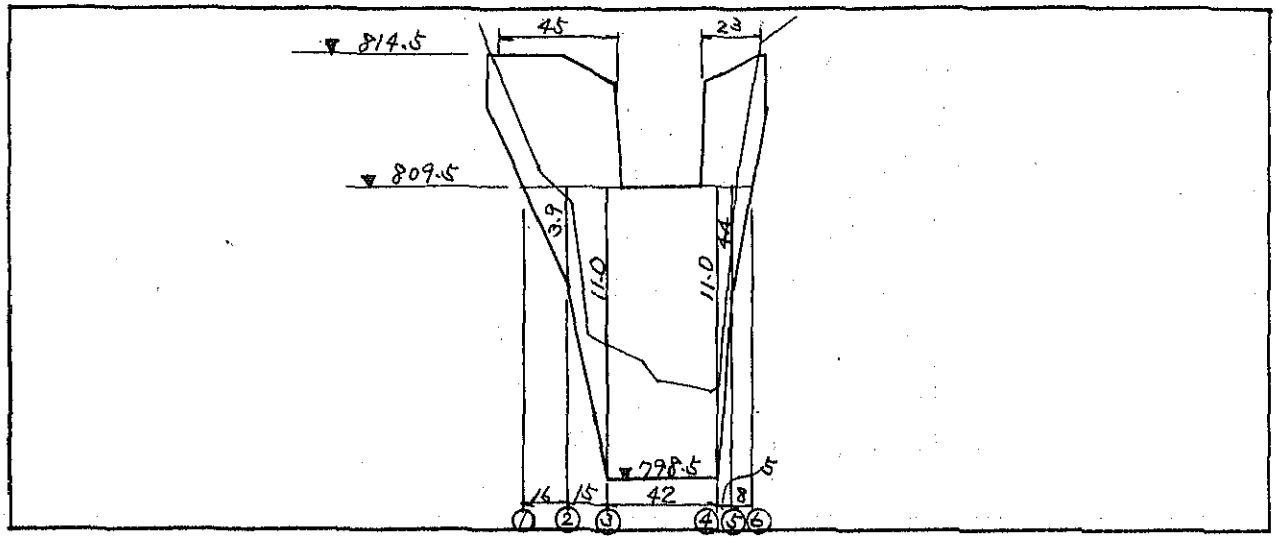
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0	—	—	—
	②	2.5	10.2	5.10	9	50
	③	8.5	56.2	33.20	101	3,350
	④	14.2	128.3	92.25	18	1,660
	⑤	19.0	210.4	169.35	74	12,530
	⑥	19.0	210.4	210.40	78	16,410
	⑦	8.9	60.4	135.40	20	2,710
	⑧	0	0	30.20	9	270
	Wing	3 x 5 x (214 + 42)				3,840
	Ⓥ Sub totl					40,820
Sub dam	Ⓥ x 0.2					8,160
Total						48,980

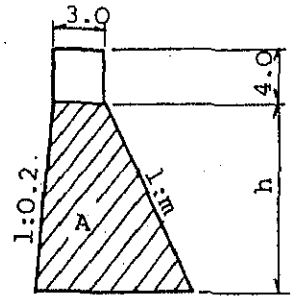
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	Bs. Sat	Bs.Sat No 288	Bs.Sat CHD-8	11.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.50

The sectional area of dam is shown as follows:

$A = 0.35\ h^2 + 3h$

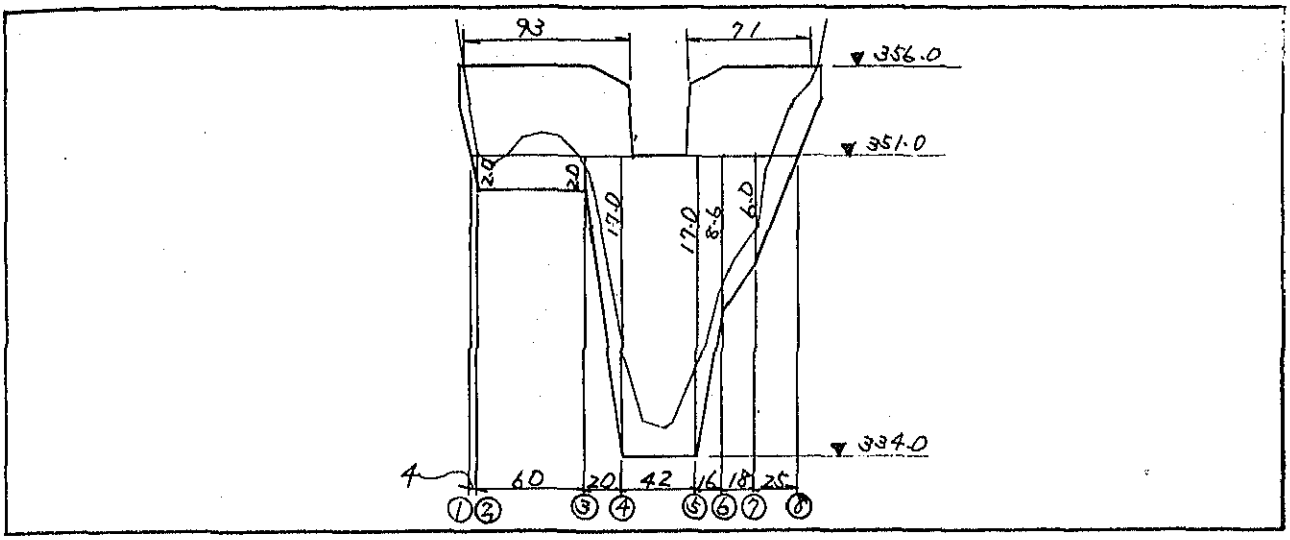
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0	—	—	—
	②	3.9	17.0	8.50	16	140
	③	11.0	75.4	46.20	15	690
	④	11.0	75.4	75.40	42	3,170
	⑤	4.4	20.0	47.70	5	240
	⑥	0	0	10.00	8	80
	⑦					
	⑧					
	Wing	3 x 5 x(45 + 23)				1,020
	Ⓥ Sub totl					5,380
Sub dam	Ⓥ x 0.2					1,070
Total						6,410

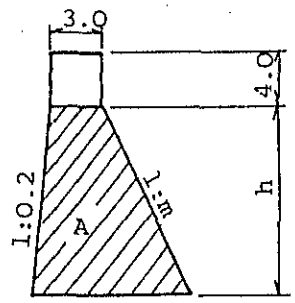
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	Bs. sat	Bs.sat No. 296	Bs. sat CHD-9	17.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.60

The sectional area of dam is shown as follows:

$A = 0.40\ h^2 + 3h$

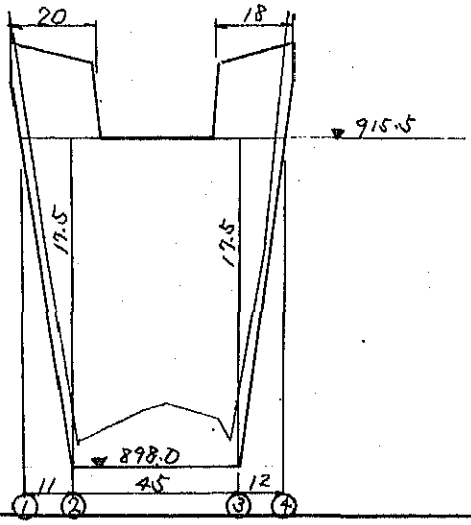
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\overline{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	0	0	—	—	—
	②	2.0	7.6	3.80	4	20
	③	2.0	7.6	7.60	60	460
	④	17.0	166.6	87.10	20	1,740
	⑤	17.0	166.6	166.60	42	7,000
	⑥	8.6	55.4	111.00	16	1,780
	⑦	6.0	32.4	43.90	18	790
	⑧	0	0	16.20	25	410
	Wing	3 x 5 x (93 + 71)				2,460
	Ⓥ Sub totl					14,660
Sub dam	Ⓥ x 0.2					2,930
Total						17,590

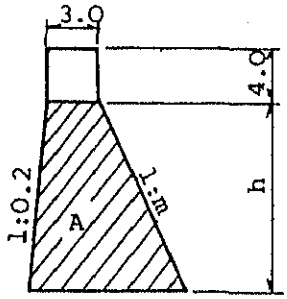
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	BS.Sat	BS.Sat No307	BS.Sat CHD-10	17.5 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.60

The sectional area of dam is shown as follows:

$A = 0.40\ h^2 + 3h$

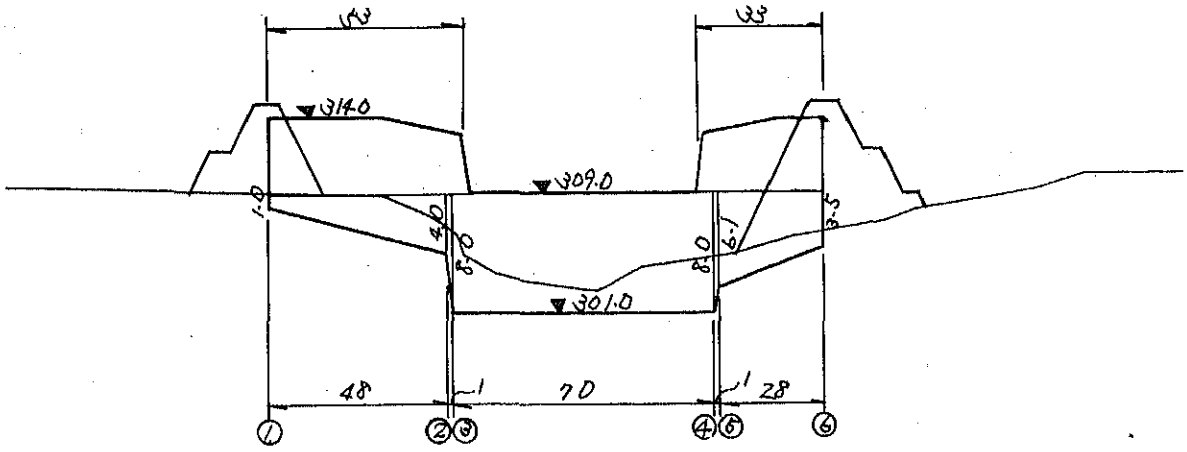
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\overline{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	0	0	—	—	—
	②	17.5	175.0	87.50	11	960
	③	17.5	175.0	175.00	45	7,880
	④	0	0	87.50	12	1,050
	⑤					
	⑥					
	⑦					
	⑧					
	Wing	3 × 4 × (20 + 18)				460
	Ⓥ Sub totl					10,350
Sub dam	Ⓥ × 0.2					2,070
Total						12,420

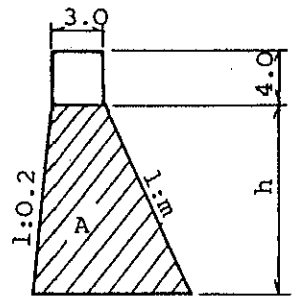
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	BS. Sat	BS. Sat No. 17+86	Kloposawit Sandpocket 1	8.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.45

The sectional area of dam is shown as follows:

$A = 0.325\ h^2 + 3h$

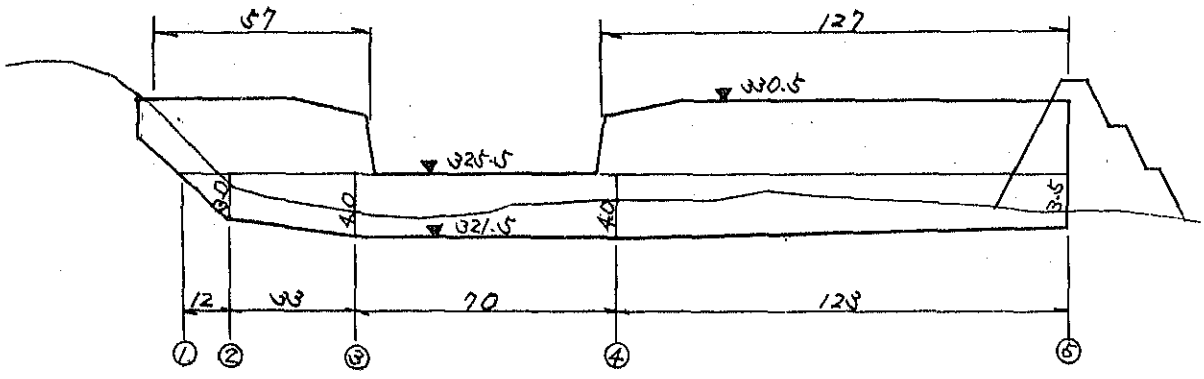
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\bar{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	1.0	3.3	—	—	—
	②	4.0	17.2	10.25	48	490
	③	8.0	44.8	31.00	1	30
	④	8.0	44.8	44.80	70	3,140
	⑤	6.1	30.4	37.60	1	40
	⑥	3.5	14.5	22.45	28	630
	⑦					
	⑧					
	Wing	3 × 5 × (52 + 33)				1,290
	Ⓥ Sub totl					5,620
Sub dam	Ⓥ × 0.2					1,120
Total						6,740

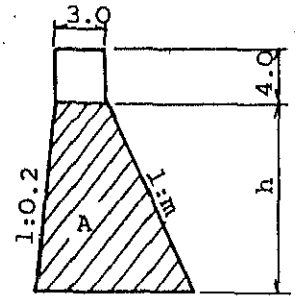
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	BD. Sat	BD. Sat No. 176	Klaposavit Sandpocket 2.	4.0m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.35

The sectional area of dam is shown as follows:

$A = 0.275\ h^2 + 3h$

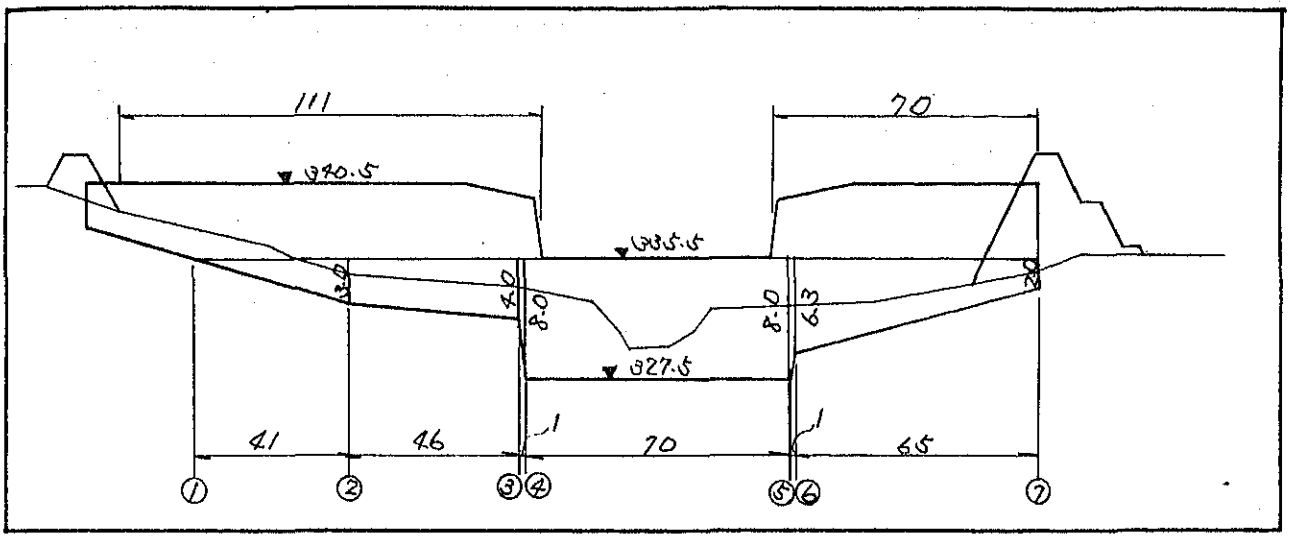
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0	—	—	—
	②	3.0	11.5	5.75	12	70
	③	4.0	16.4	13.95	33	460
	④	4.0	16.4	16.40	70	1,150
	⑤	3.5	13.9	15.15	128	1,860
	⑥					
	⑦					
	⑧					
	Wing	3 × 5 × (57 + 127)				2,760
	Ⓥ Sub totl					6,300
Sub dam	Ⓥ × 0.2					1,260
Total						7,560

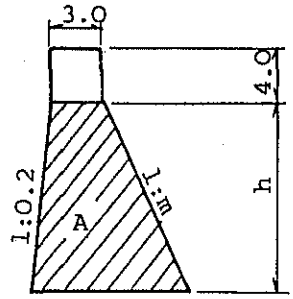
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	BS. sat	BS. Sat No.178	Khoposamit sandpocket 3	8.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.45

The sectional area of dam is shown as follows:

$A = 0.325\,h^2 + 3h$

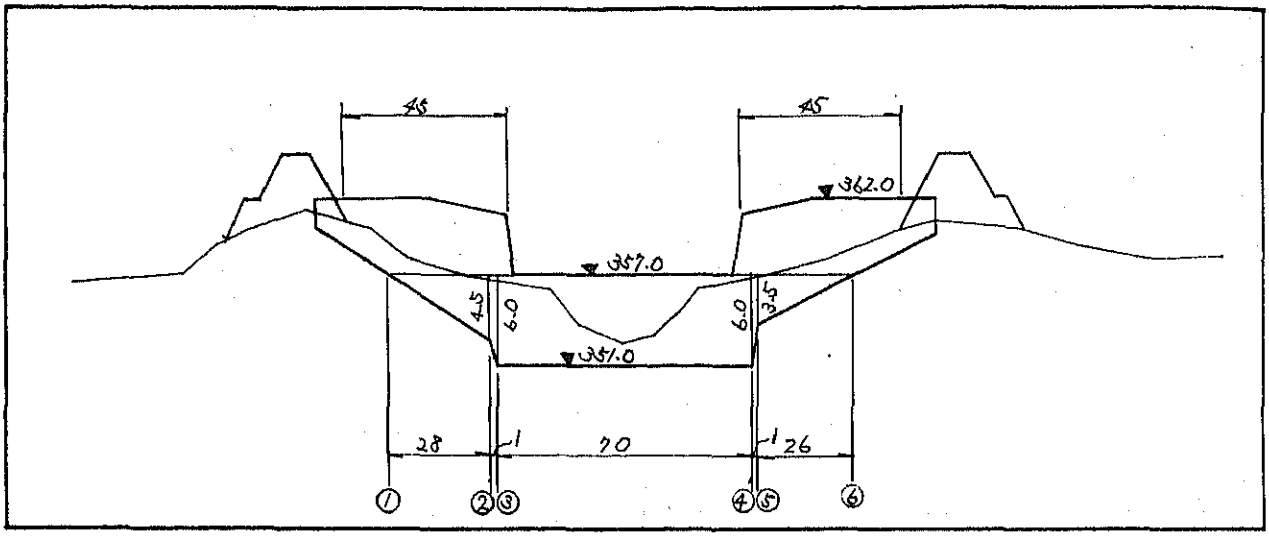
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0	—	—	—
	②	3.0	11.9	5.95	41	240
	③	4.0	17.2	14.55	46	670
	④	8.0	44.8	31.00	1	30
	⑤	8.0	44.8	44.80	70	3,140
	⑥	6.3	31.8	38.30	1	40
	⑦	2.0	7.3	19.55	65	1,270
	⑧					
	Wing	3 × 6 × (111 + 70)				2,720
	Ⓥ Sub totl					8,110
Sub dam	Ⓥ × 0.2					1,620
Total						9,730

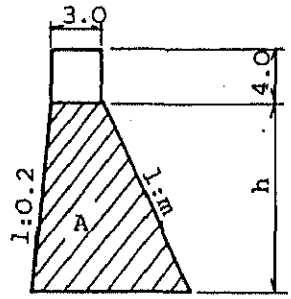
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	Bs. sat	Bs. sat No.183	Kertosari Sandpocket 1.	6.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.35

The sectional area of dam is shown as follows:

$A = 0.275\ h^2 + 3h$

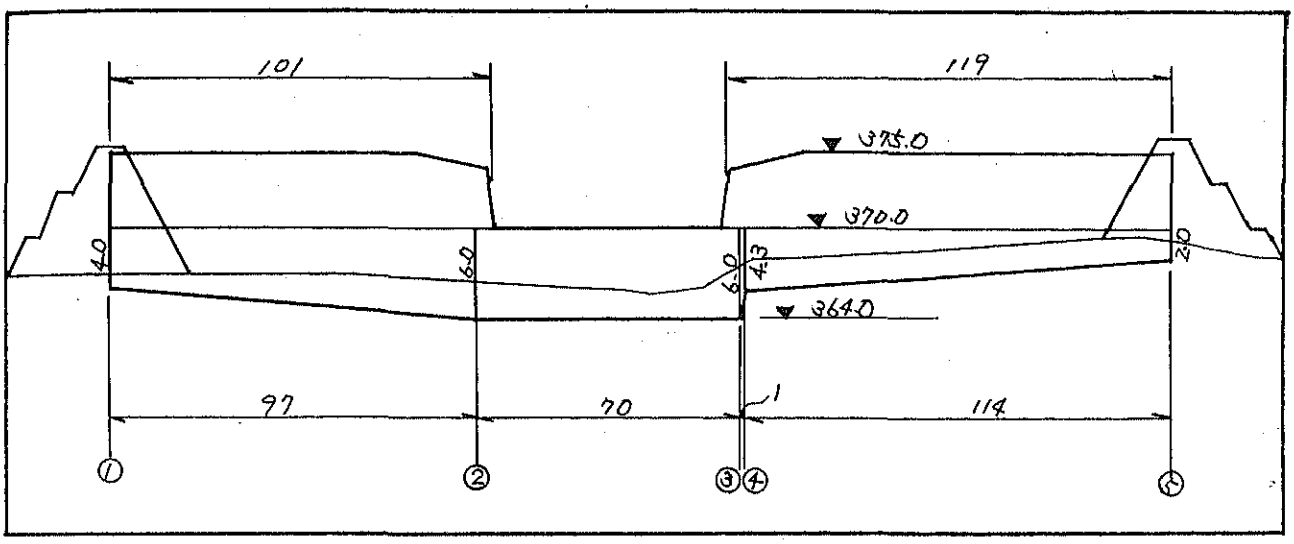
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\bar{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	0	0	—	—	—
	②	4.5	19.1	9.55	28	270
	③	6.0	27.9	23.50	1	20
	④	6.0	27.9	27.90	70	1,950
	⑤	3.5	13.9	20.90	1	20
	⑥	0	0	6.95	26	180
	⑦					
	⑧					
	Wing	3 × 5 × (4.5 + 4.5)				1,350
	Ⓥ Sub totl					3,790
Sub dam	Ⓥ × 0.2					760
Total						4,550

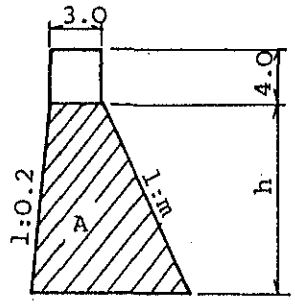
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	BS. sat	BS. sat No. 186	Kertorani Sandpocket 2.	6.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.35

The sectional area of dam is shown as follows:

$A = 0.275\ h^2 + 3h$

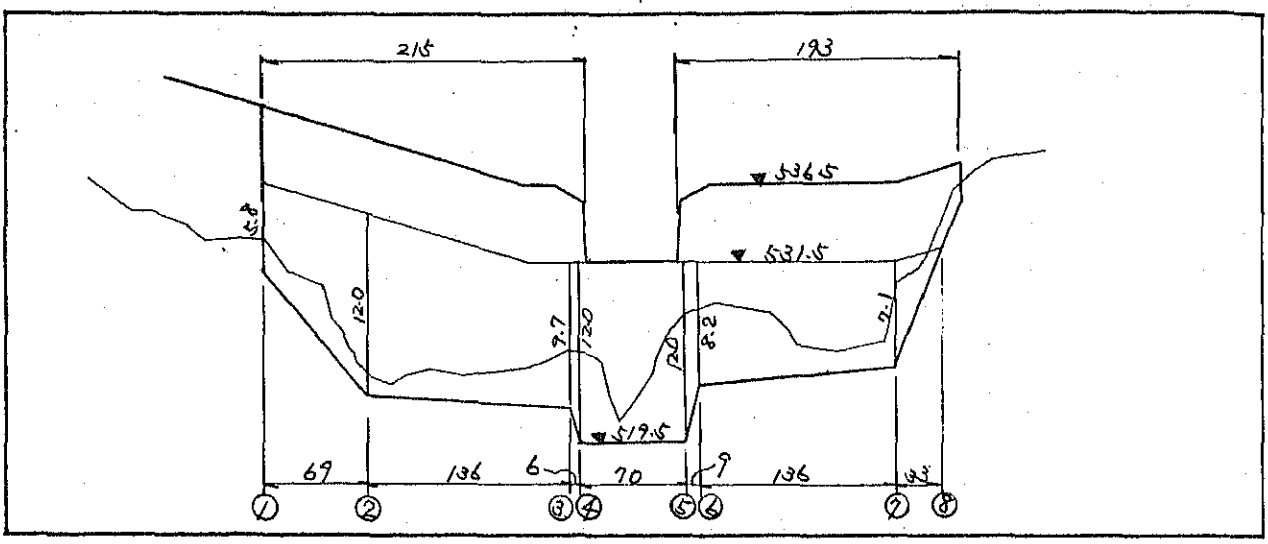
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	4.0	16.4	—	—	—
	②	6.0	27.9	22.15	97	2,150
	③	6.0	27.9	27.90	70	1,950
	④	4.3	18.0	22.95	1	20
	⑤	2.0	7.1	12.55	114	1,430
	⑥					
	⑦					
	⑧					
	Wing	3 × 5 × (101 + 119)				3,300
	Ⓥ Sub totl					8,850
Sub dam	Ⓥ × 0.2					1,770
Total						10,620

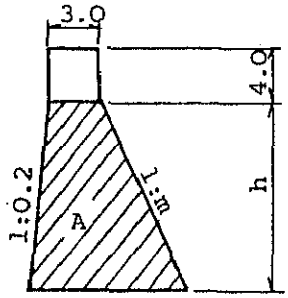
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	BS.sat	BS.sat No28/+5	Benda Sandpocket 1	12.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.55

The sectional area of dam is shown as follows:

$A = 0.375\ h^2 + 3h$

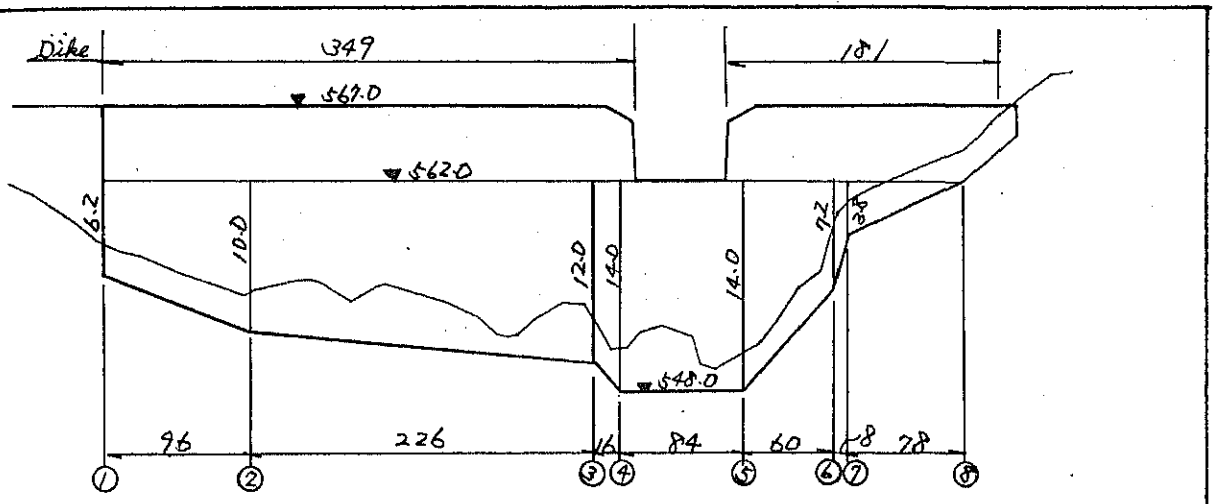
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\bar{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	5.8	30.0	—	—	—
	②	12.0	90.0	60.00	69	3,540
	③	9.7	64.4	77.20	136	10,500
	④	12.0	90.0	77.20	6	460
	⑤	12.0	90.0	90.00	70	6,300
	⑥	8.2	49.8	69.90	9	630
	⑦	7.1	40.2	45.00	136	6,120
	⑧	0	0	20.10	33	660
	Wing	3 × 5 × (215 + 193)				6,120
	Ⓥ Sub totl					34,330
Sub dam	Ⓥ × 0.2					6,870
Total						41,200

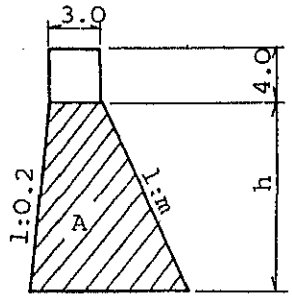
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	BS. Sat	BS. Sat No. 240	Banda Sandpocket 1'	14.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.55

The sectional area of dam is shown as follows:

$A = 0.375\ h^2 + 3h$

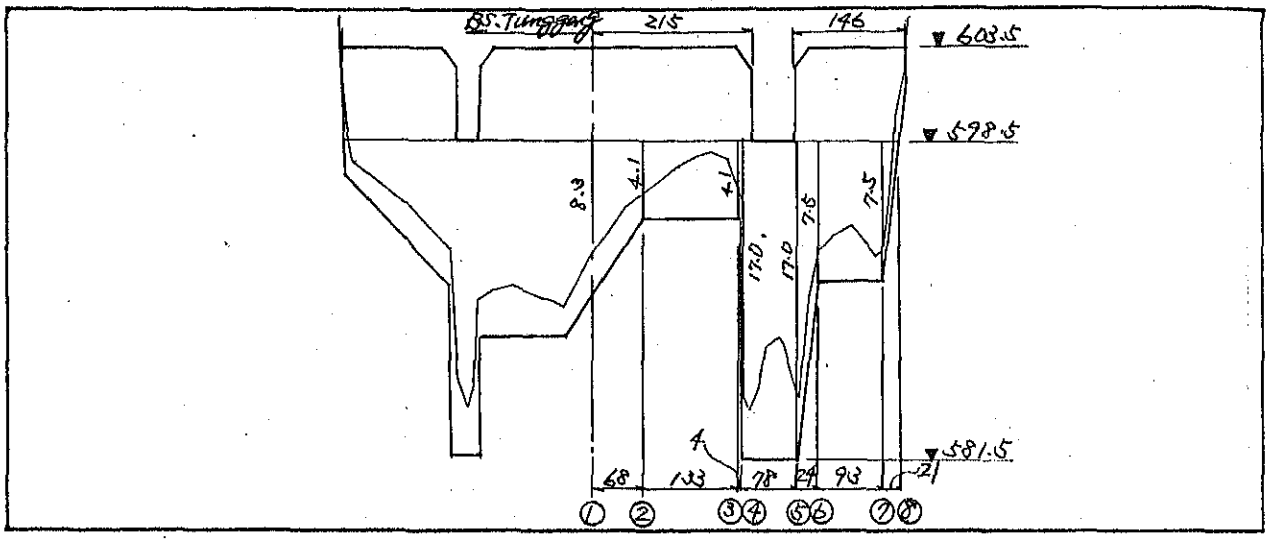
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	6.2	33.0	—	—	—
	②	10.0	67.5	50.25	96	4,820
	③	12.0	90.0	78.75	226	17,800
	④	14.0	115.5	102.75	16	1,640
	⑤	14.0	115.5	115.50	84	9,700
	⑥	7.2	41.0	78.25	60	4,700
	⑦	3.8	16.8	28.90	8	230
	⑧	0	0	8.40	78	660
	Wing	3 × 5 × (349 + 181)				7,950
	Ⓥ Sub totl					47,500
Sub dam	Ⓥ × 0.2					9,500
Total						57,000

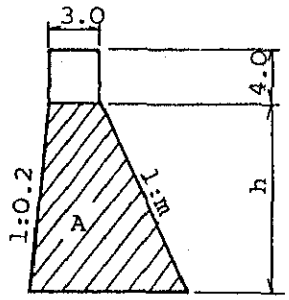
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	BS.Sat	BS.Sat No247+15	Sumberari dam	17.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.60

The sectional area of dam is shown as follows:

$A = 0.40\ h^2 + 3h$

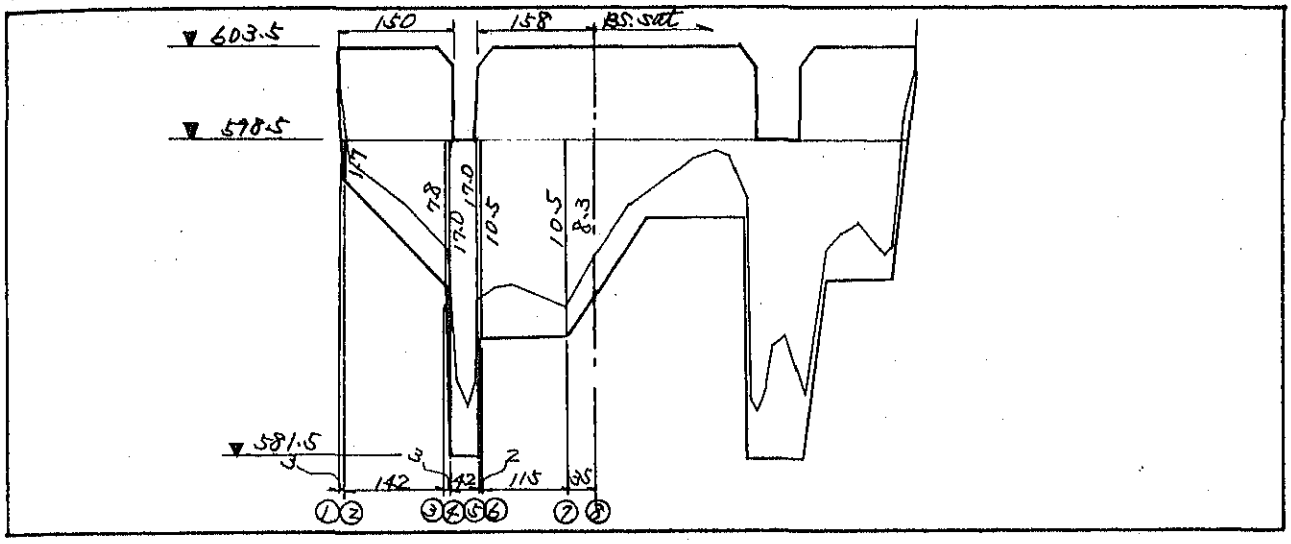
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\bar{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	8.3	52.5	—	—	—
	②	4.1	19.0	35.75	68	2,430
	③	4.1	19.0	19.00	133	2,530
	④	17.0	166.6	92.80	4	370
	⑤	17.0	166.6	166.60	78	12,990
	⑥	7.5	45.0	105.80	24	2,540
	⑦	7.5	45.0	45.00	93	4,190
	⑧	0	0	22.50	21	470
	Wing	3 × 5 × (215 + 146)				5,420
	Ⓥ Sub totl					30,940
Sub dam	Ⓥ × 0.2					6,190
Total						37,130

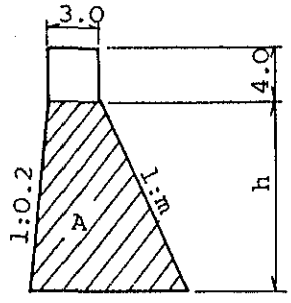
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Mujur	BS. Tunggang	BS. Tunggang No25+20	Sumbersari dam	17.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.60

The sectional area of dam is shown as follows:

$A = 0.40\ h^2 + 3h$

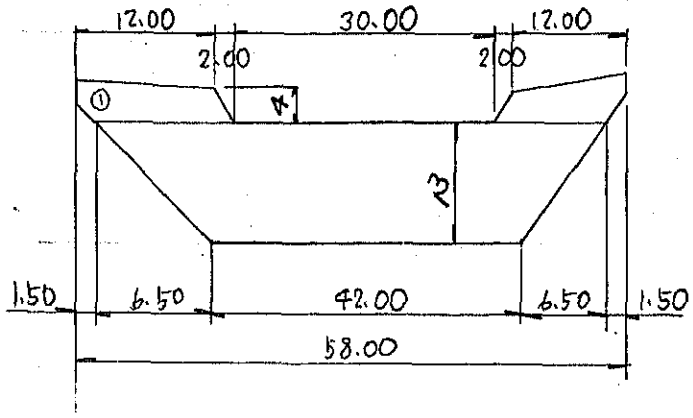
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\overline{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	0	0	—	—	—
	②	1.7	6.3	3.15	3	10
	③	7.8	47.7	27.00	142	3,830
	④	17.0	166.6	107.15	3	320
	⑤	17.0	166.6	166.60	42	7,000
	⑥	10.5	75.6	121.10	2	240
	⑦	10.5	75.6	75.60	115	8,690
	⑧	8.3	52.5	64.05	35	2,240
	Wing	3 × 5 × (150 + 158)				4,620
	Ⓥ Sub totl					26,950
Sub dam	Ⓥ × 0.2					5,390
Total						32,340

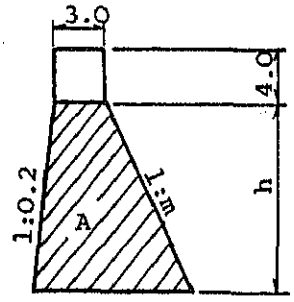
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Rejali	K. Curah Koboán		Curah Koboán CHD-3	13.0m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.55

The sectional area of dam is shown as follows:

$A = 0.375\ h^2 + 3h$

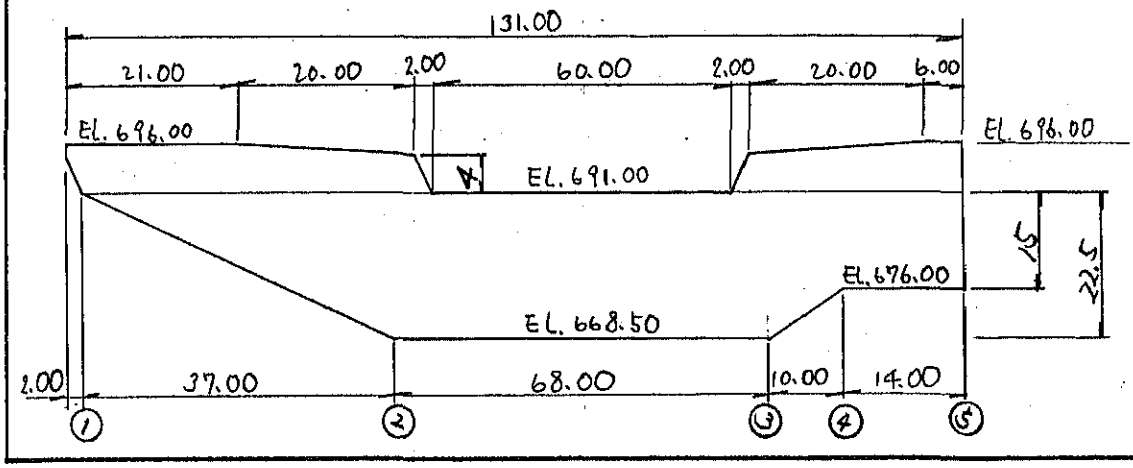
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\bar{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0			
	②	13.0	102.4	51.2	6.5	333
	③	13.0	102.4	102.4	42.0	4301
	④	0	0	51.2	6.5	333
	⑤					
	⑥					
	⑦					
	⑧					
	Wing	3 × 4 × (12 + 12)				288
	Ⓥ Sub total					5255
Sub dam	Ⓥ × 0.2					1051
Total						6306
Excavation	6300 × 0.57					3590

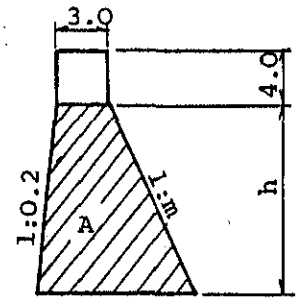
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. REJAL 1	K. Curah Koboan		Curah Koboan CHD-4 (Existing + New)	22.5 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.6

The sectional area of dam is shown as follows:

$A = 0.4\ h^2 + 3h$

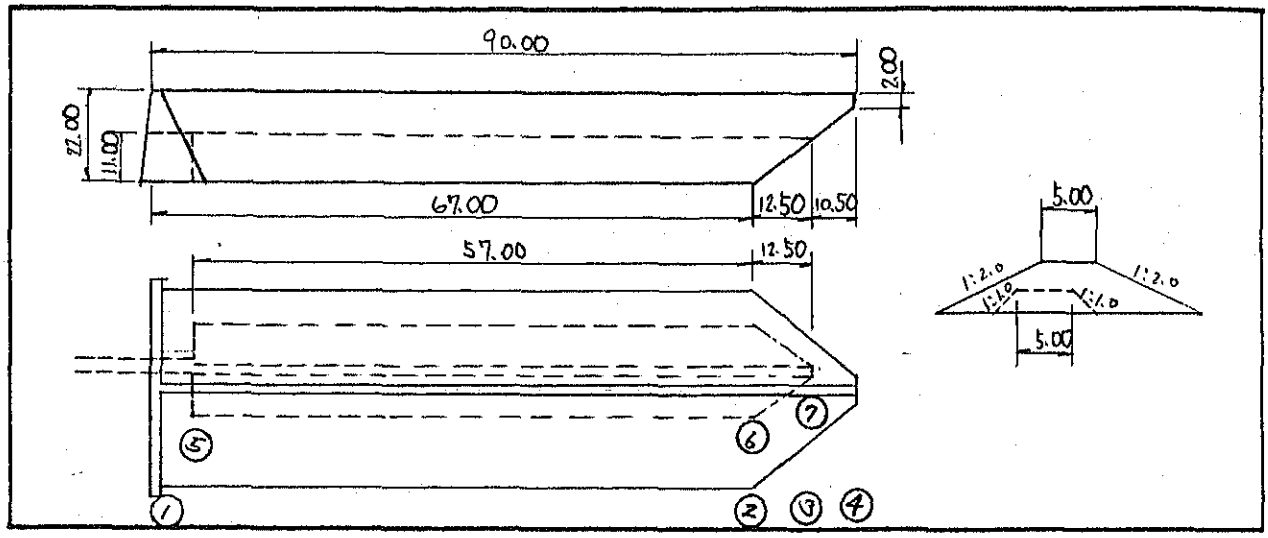
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\bar{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	0	0			
	②	22.5	270.0	135.0	37.0	4995
	③	22.5	270.0	270.0	68.0	18360
	④	15.0	135.0	202.5	10.0	2025
	⑤	15.0	135.0	135.0	14.0	1890
	Side dam	$A = \frac{1}{2}(0.5+15.9)\times 22$		108.4		
	〃	$V = \frac{1}{2}\times 108.4 \times 40 \times 2 + 108.4 \times 10$				5420
	Existing dam	Reffer to next page				-8855
	Wing	3 × 5 × (41 + 26)				1005
	Ⓥ Sub total					24840
Sub dam	(②+③+④+⑤+Wing).					5655
Total						30495

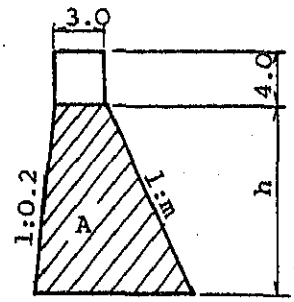
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. PEJALI	K. Curah Koboan		Curah Koboan CHD-4 (Embankment)	22 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m=

The sectional area of dam is shown as follows:

$A = h^2 + 3h$

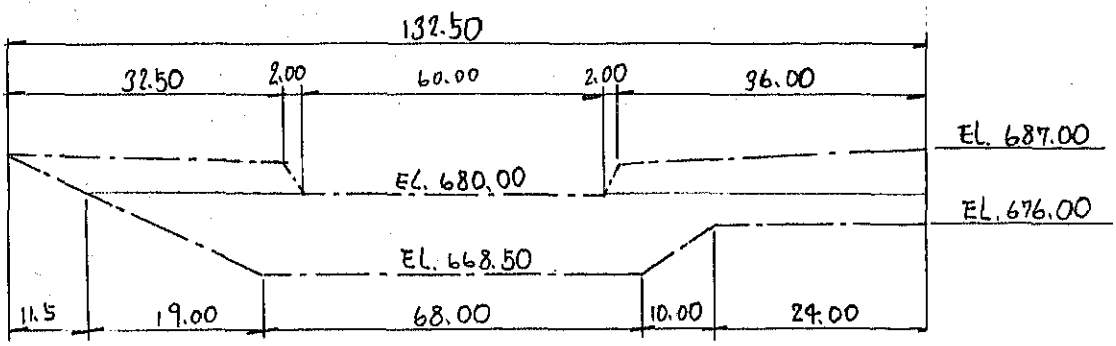
(4) Embankment VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\bar{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	(22.0)	979			
	②	(22.0)	979	979	67.0	65593
	③	11.0	297	687.5	12.5	8594
	④	2.0	18	157.5	10.5	1654
	Existing ⑤	⊖ 11.0	209			
	〃 ⑥	11.0	209	209	57.0	⊖ 11913
	〃 ⑦	0	0	104.5	12.5	⊖ 1306
	⑧					
	Wing	3 × × (· +)				
	Ⓥ Sub total					62622
Cover Concrete	$88 \times 0.894 \times 87 + 88 \times 0.894 \times 23 \times \frac{1}{2}$					6176
Total						

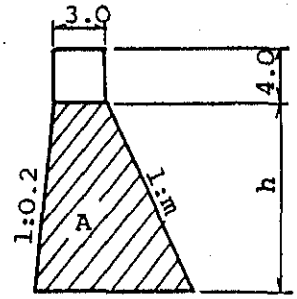
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. REJALI			Curah Koboán CHD-4 (Existing dam)	11.5 m

(2). SECTION ALONG THE AXIS



(3). CROSS SECTION



m= 0.60

The sectional area of dam is shown as follows:

$A = 0.4\ h^2 + 3h$

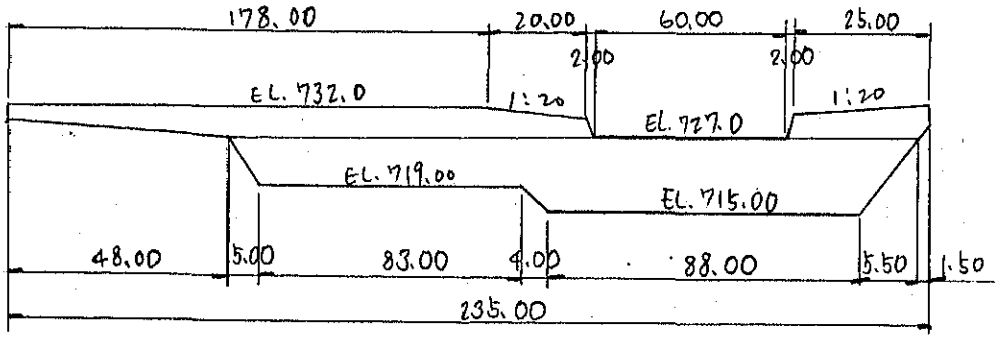
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\overline{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	0	0		0	
	②	11.5	87.4	43.7	19.0	830
	③	11.5	87.4	87.4	68.0	5943
	④	4.0	18.4	52.9	11.0	582
	⑤	4.0	18.4	18.4	24.0	442
	⑥					
	⑦					
	⑧					
	Wing	3 × 5 × (34.5 + 36.0)				1058
	Ⓥ Sub total					8855
Sub dam	Ⓥ × 0.2					0
Total						8855
Excavation 30 495 × 0.57						17 380

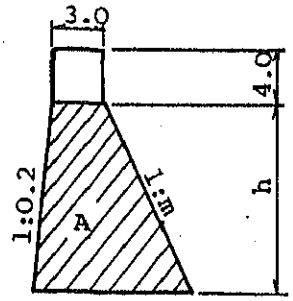
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Rejali	K. Curah Koboán		Curah Koboan CHD-5	12.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.55

The sectional area of dam is shown as follows:

$A = 0.375\ h^2 + 3h$

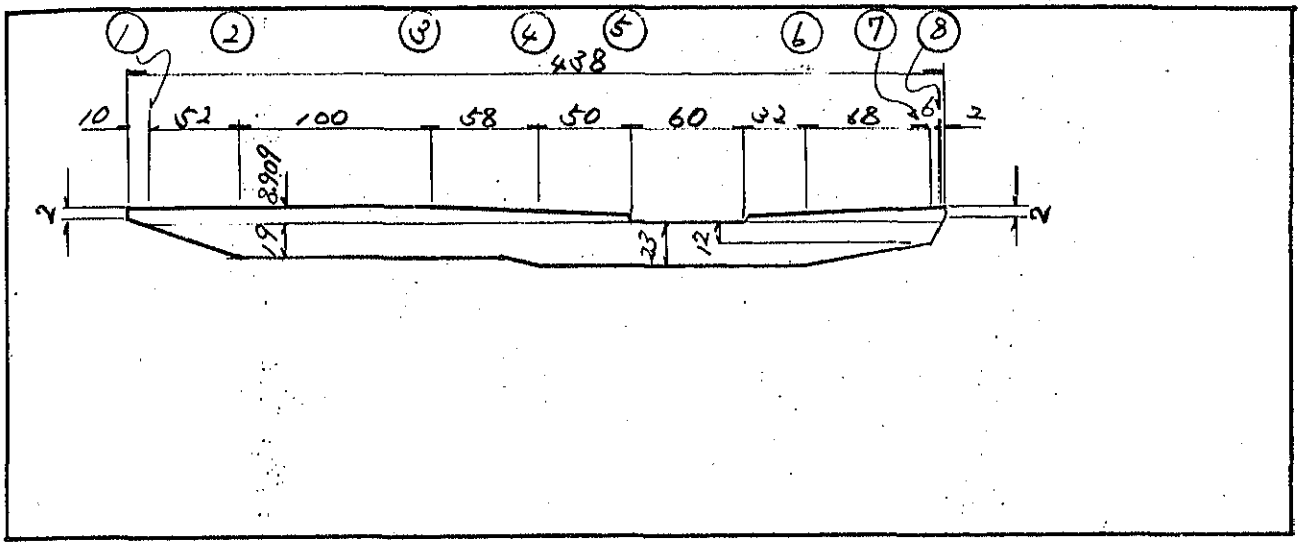
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\bar{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	0				
	②	8.0	48.0	24.00	5.0	120
	③	8.0	48.0	48.00	83.0	3984
	④	12.0	90.0	69.00	4.0	276
	⑤	12.0	90.0	90.00	88.0	7920
	⑥	0	0	45.00	5.5	248
	⑦					
	⑧					
	Wing	3 × 4 × (198 + 25)				2676
	Ⓥ Sub total					15224
Sub dam	Ⓥ × 0.2					3045
Total						18269
Excavation 18270 × 0.57						10410

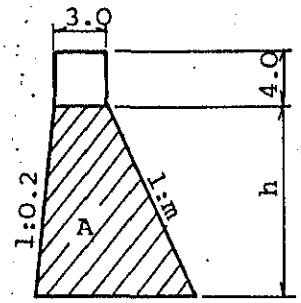
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Rejali	K. BS. Koboám		BS. Koboám CHD-6	23 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.65

The sectional area of dam is shown as follows:

$A = 0.425\ h^2 + 3h$

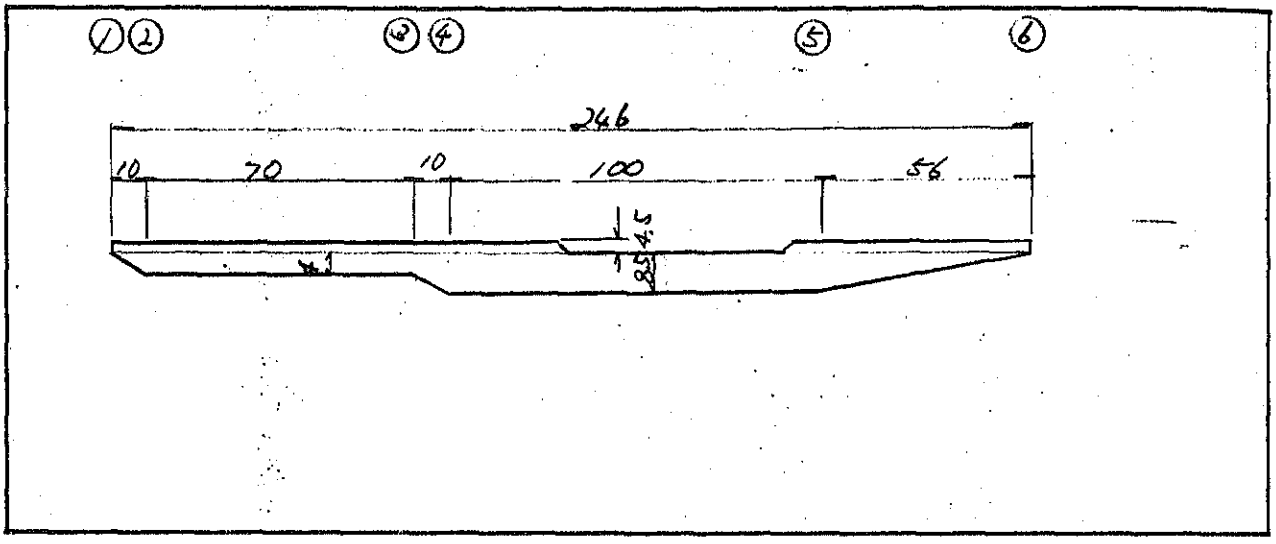
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0				
	②	19	210.4	105.2	52	5470
	③	19	210.4	210.4	100	21 040
	④	23	293.8	252.1	58	14 622
	⑤	23	293.8	293.8	50	14 690
	⑥	23	293.8	293.8	92	27 030
	⑦	12	97.2	195.5	68	13 294
	⑧	0	0	48.6	6	292
	Wing	$3\times8.909\times162 + 3\times216\times(4 + 8.909)\times\frac{1}{2}$				8 512
	Ⓥ Sub totl					104 950
Sub dam	Reffer to next page					16 100
Total						121 050

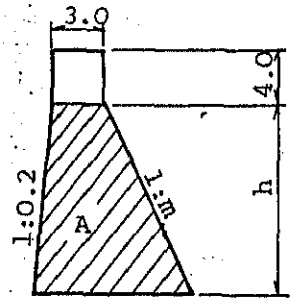
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Rejali	K.BS. Kobdan		BS. Kobdan CHD-6 (Sub dam)	8.5 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.45

The sectional area of dam is shown as follows:

$A = 0.325\,h^2 + 3h$

(4) CONCRETE VOLUME OF DAM

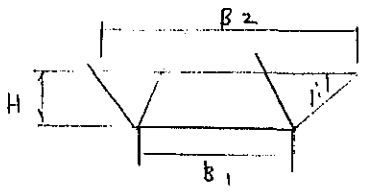
	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\bar{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	0	0			
	②	4	17.2	8.6	10	86
	③	4	17.2	17.2	70	1,204
	④	8.5	99.0	33.1	10	331
	⑤	8.5	49.0	49.0	100	4900
	⑥	0	0	24.5	56	1,372
	⑦					
	⑧					
	Wing	3 x 4.5 x (66 + 120)				2511
	⑨ Sub totl					10404
Epron	2× 73.8 × 29.3 = 4325		Side wall	$\frac{1}{2}(0.5+2.9)\times 12\times 33.6\times 2 = 1371$		
Total						16100

(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Rejali	K. Curah Koboán		Curah Koboán CHD-6 (excavation)	23 m

(2)Excavation of foundation for main dam

H	B_1	B_2	A	$\overline{A}$	D	V
6	3	15	54			
6	19.15	31.15	161	103	62	6386
2.5	"	24.15	58	103	36	3708
6.5	"	32.15	167			
10	"	39.15	292	229	65	14 918
4	"	27.15	93	192	41	7 892
3	22.55	28.55	77	85	16	1360
3	22.55	28.55	77	77	142	10 934
4	12.35	20.35	65	71	68	4 828
0	0	0	0	32	8	260
Total						50 286



(3)Excavation of foundation for sub dam

H m	B_1 m	B_2 m	A_2 m^2	$\bar{A}_2$ m^2	D m	V m^3
0	0	0	0			
5	6.5	16.5	57	28.5	10	285
4	11	14.5	42	49.5	20	3 465
4	10	18	56	49	10	490
4	10	18	56	56	100	5600
4	3.7	11.7	31	43.5	56	2436
10	2	22	120	75.5	13	982
0	0	0	0	60	15	900
Total						14158

(4)Excavation of foundation for epron

$4 \times 66 \times 16 = 4\ 224\ m^3$

(5)Total excavation volume

$50\ 286 + 14\ 158 + 4\ 224 = 68\ 668\ m^3$

By man power 6 867 m^3

By machine power 61 801 m^3

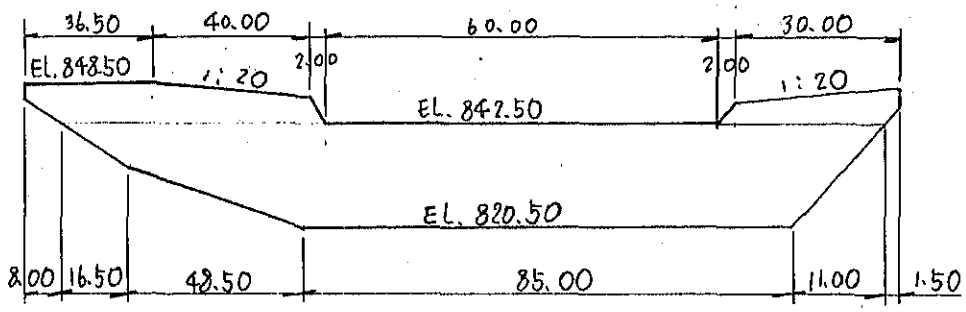
(6)Ratio of excavation volume and concrete volume

$$\beta = \frac{68\ 668}{120\ 800} = 0.57$$

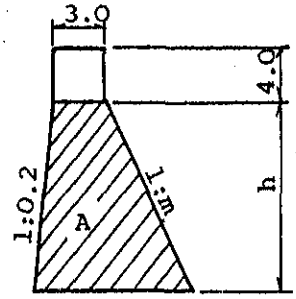
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Rejali	K. Curah Koboán		Curah Koboán CHO-7	22 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.60

The sectional area of dam is shown as follows:

$A = 0.40\ h^2 + 3h$

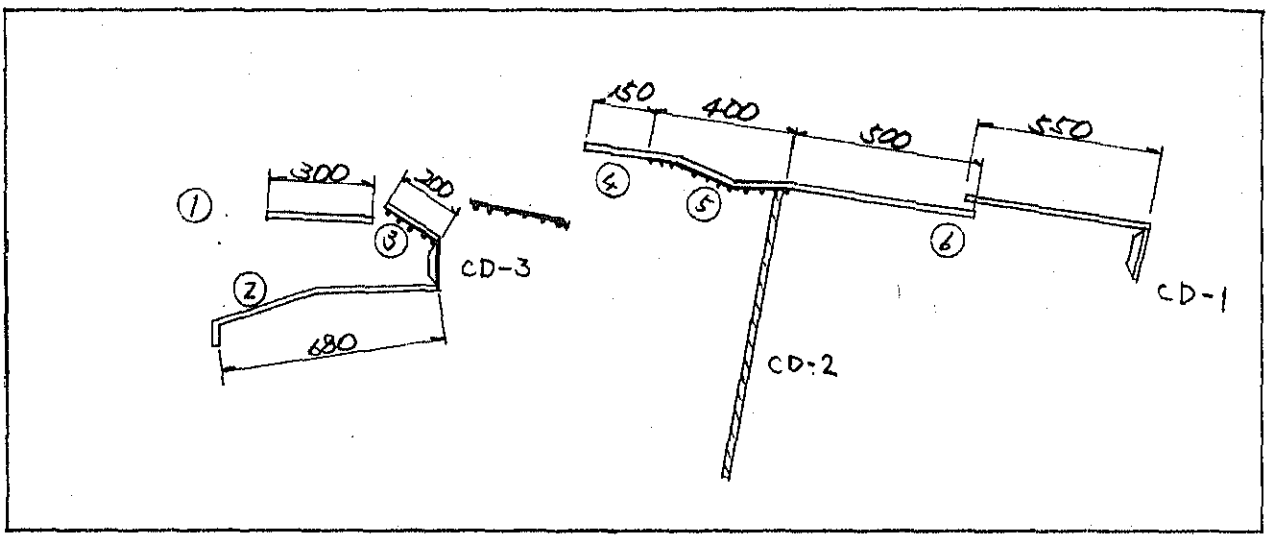
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\overline{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	0	0			
	②	8.0	62.4	31.2	16.5	515
	③	22.0	259.6	161.0	48.5	7809
	④	22.0	259.6	259.6	85.0	22066
	⑤	0	0	129.8	11.0	1428
	⑥					
	⑦					
	⑧					31818
	Wing	$3 \times \frac{1}{2} \times (78.5 + 32)$				1658
	Ⓥ Sub total					33476
Sub dam	Ⓥ × 0.2					6695
Total						40171
Excavation	40170 x 0.57					22900

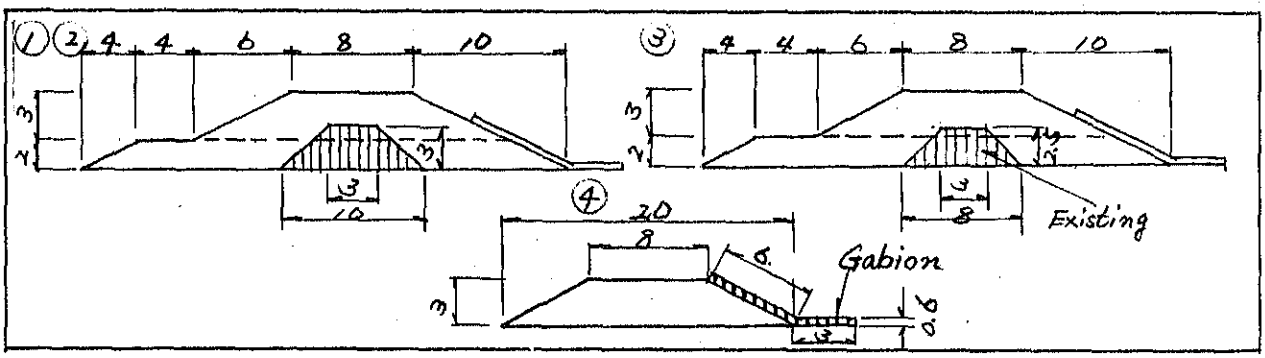
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Rejali	K. Leprak		K. Leprak sandpocket (Embankment, Gabion)	

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



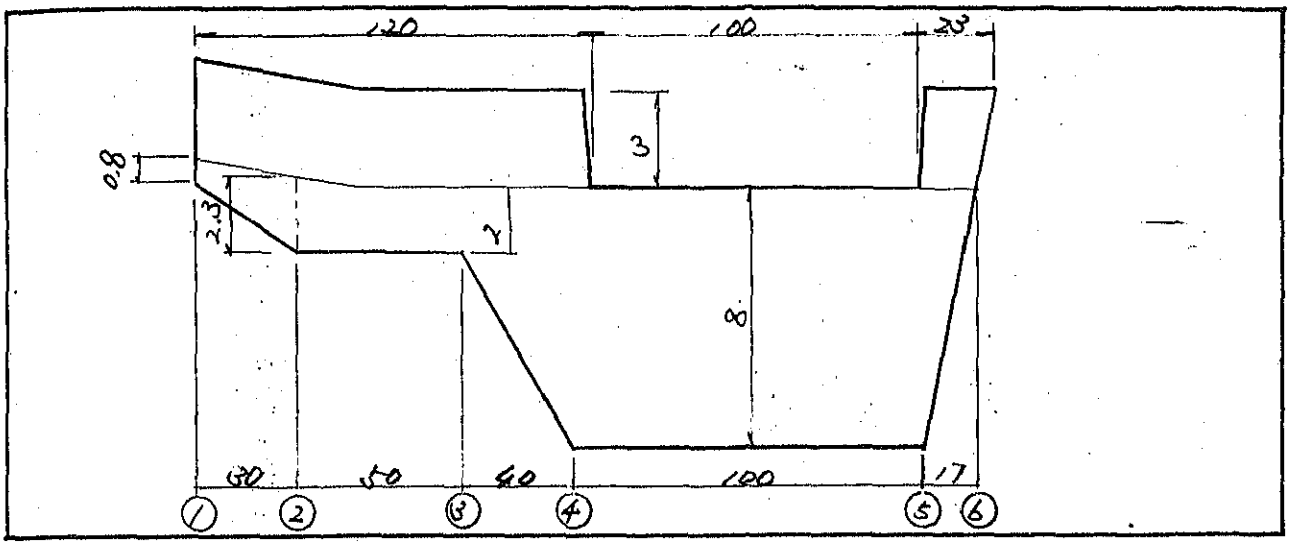
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\overline{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Embankment	①	3 ~ 4.2	42 ~ 73.7	57.85	300	17 355
	②	3 ~ 5	42 ~ 98	70	680	47 600
	③	4.2 ~ 5	54.2 ~ 78.5	66.35	200	13 270
	④	3 ~ 3.5	42 ~ 54.5	48.25	150	7 238
	⑤	3.5 ~ 5	40.25 ~ 84.25	62.5	400	25 000
	⑥	3	42	42	1 050	44 100
	⑦					
	⑧					
	Ⓥ Sub totl					15K 563
Gabion	0.6 × (6 + 3) × (300 + 200 + 680 + 150 + 400 + 500 + 550)					15 012

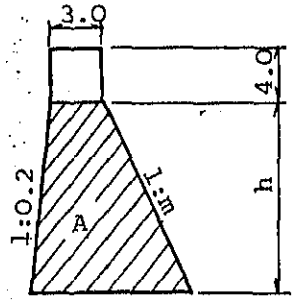
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Rajali	K. Leprak		K. Leprak sandpocket CD-1	8

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.5

The sectional area of dam is shown as follows:

$A = 0.35\ h^2 + 3h$

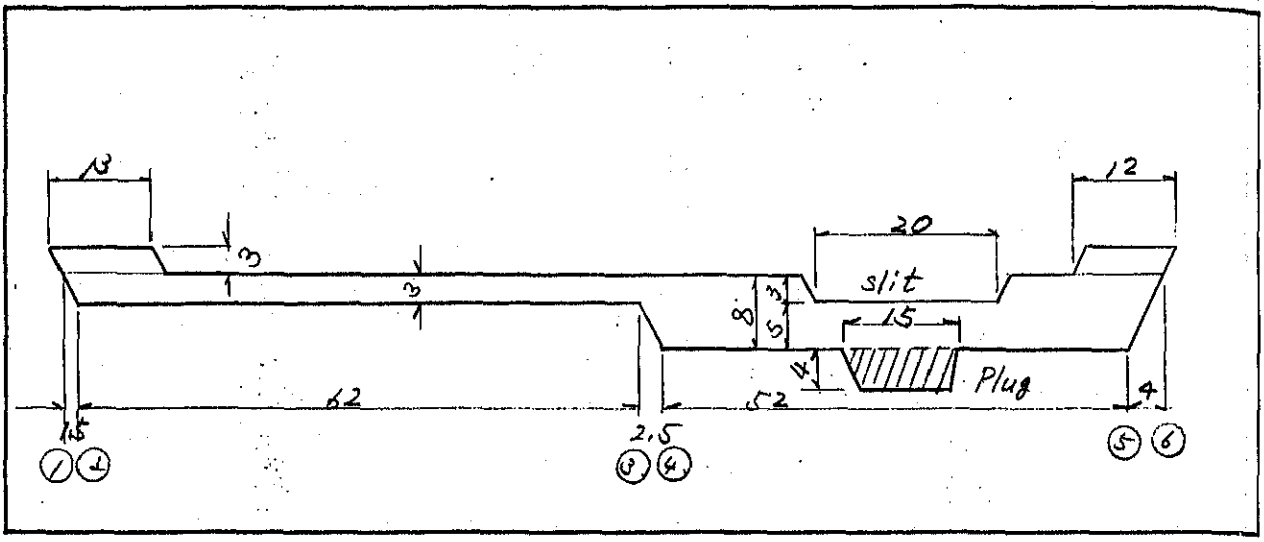
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\bar{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	0.8	2.62			
	②	2.3	8.75	5.69	30	171
	③	2	7.4	8.08	50	404
	④	8	46.4	26.9	40	1,076
	⑤	8	46.4	46.4	100	4,640
	⑥	0	0	23.2	17	394
	⑦					
	⑧					
	Wing	3 × 3 × (120 + 23)				1,287
	Ⓥ Sub tot1					7922
Sub dam	— Ⓥ × 0.2					1590
Total						9562

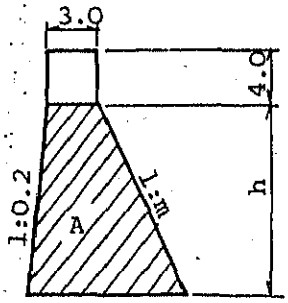
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K.Rejali	K.Leprak		K.Leprak sandpocket CD-3	8

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.5

The sectional area of dam is shown as follows:

$A = 0.35\ h^2 + 3h$

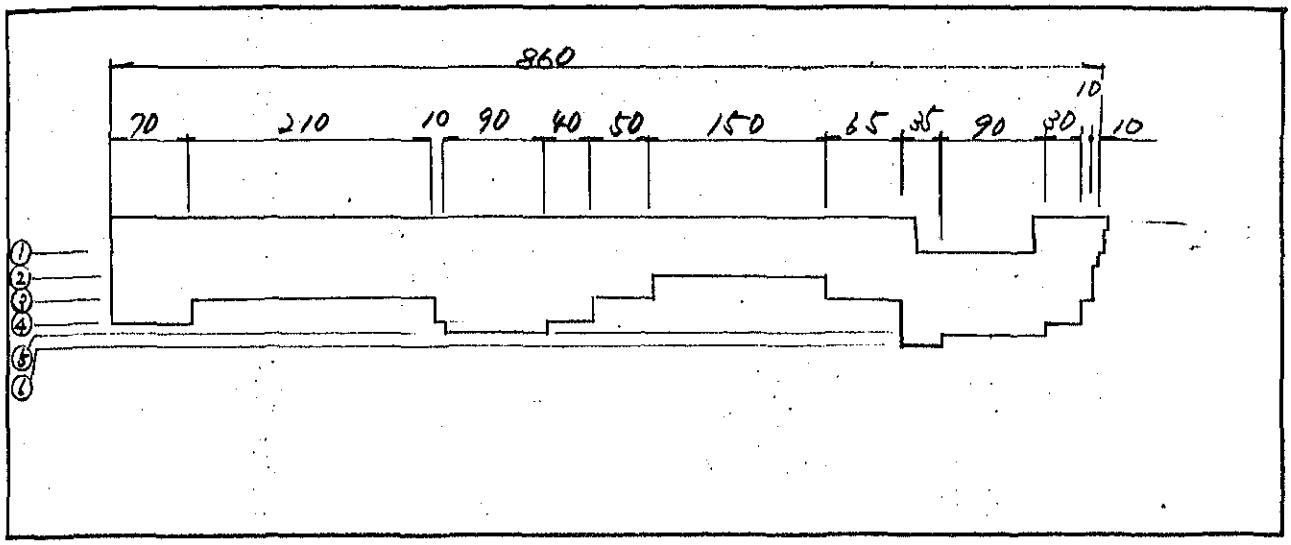
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0			
	②	3	12.15	6.075	1.5	9
	③	3	12.15	12.15	62.0	753
	④	8	46.4	29.28	2.5	73
	⑤	8	46.4	46.4	52.0	2 413
	⑥	0	0	23.2	4.0	93
	slit	-3		12.15	20	- 243
	Plug			42.4	15	636
	Wing	3 × 3 × (13 + 12)				225
	Ⓥ Sub totl					3959
Sub dam	Ⓥ × 0.2					792
Total						4 751

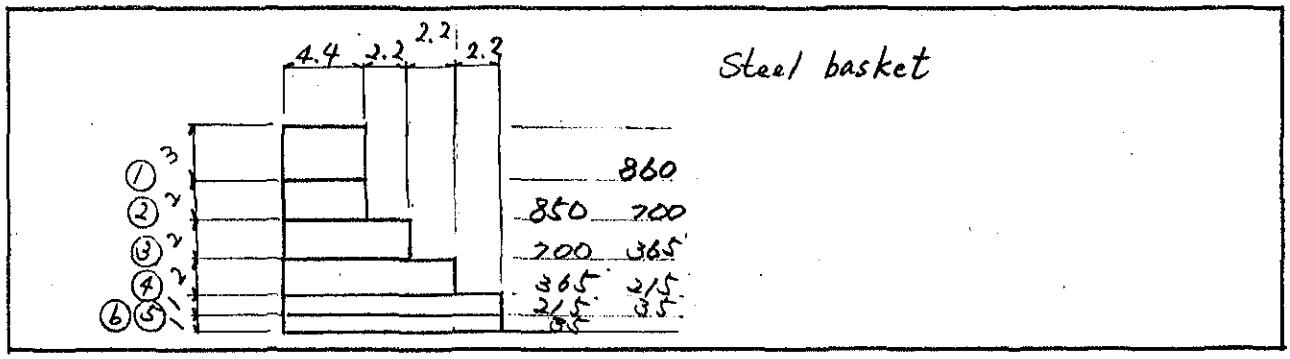
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Rejali	K. Leprak		K. Leprak sandpocket CD-2	8

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



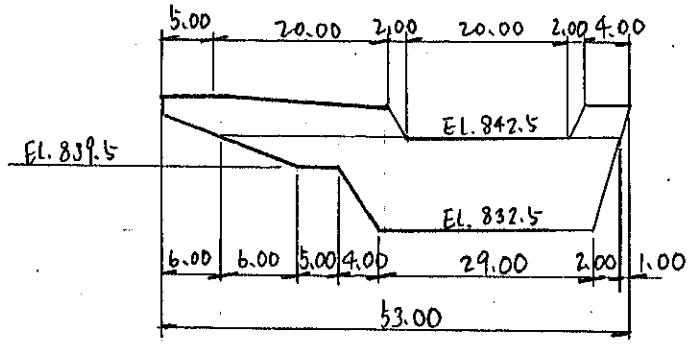
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\overline{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	4.4	3784			
	②	4.4 6.6	3740 4620	3762	2	7524
	③	6.6 8.8	4620 3212	4620	2	9240
	④	8.8 11.0	3212 2365	3212	2	6424
	⑤	11.0	2365 385	2365	1	2365
	⑥	11.0	385	385	1	385
	⑦					
	⑧					
	Wing	3 × 4.4 × (685 + 50)				9702
	Ⓥ Sub totl					35640
Sub dam	—	Ⓥ × 0.2				7128
Total						42768

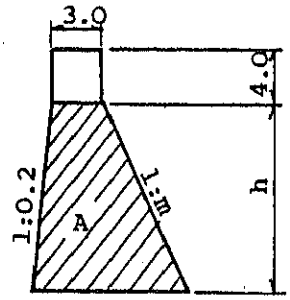
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Rejali	Curah Leng kong		Curah Lengkong CHD-1	10 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.50

The sectional area of dam is shown as follows:

$A = 0.35\ h^2 + 3h$

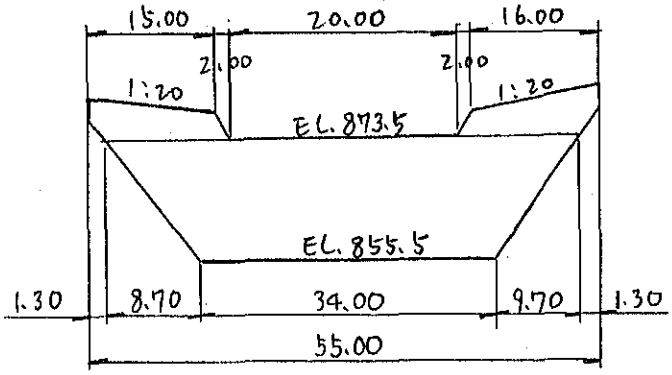
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0			
	②	3.0	12.15	6.08	6.0	36
	③	3.0	12.15	12.15	5.0	61
	④	10.0	65.00	38.58	4.0	154
	⑤	10.0	65.00	65.00	29.0	1885
	⑥	0	0	32.50	2.0	65
	⑦					
	⑧					
	Wing	3 × 4 × (2.5 + 4)				348
	Ⓥ Sub total					2549
Sub dam	Ⓥ × 0.2					510
Total						3059
Excavation	3060 x 0.57					1740

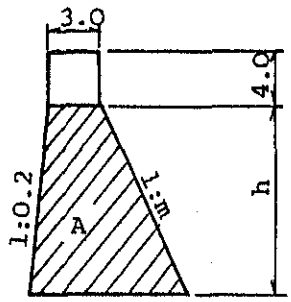
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Rejoli	Curah Leng Kong		Curah Lengkong CHD-2	18.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.6

The sectional area of dam is shown as follows:

$A = 0.40\ h^2 + 3h$

(4) CONCRETE VOLUME OF DAM

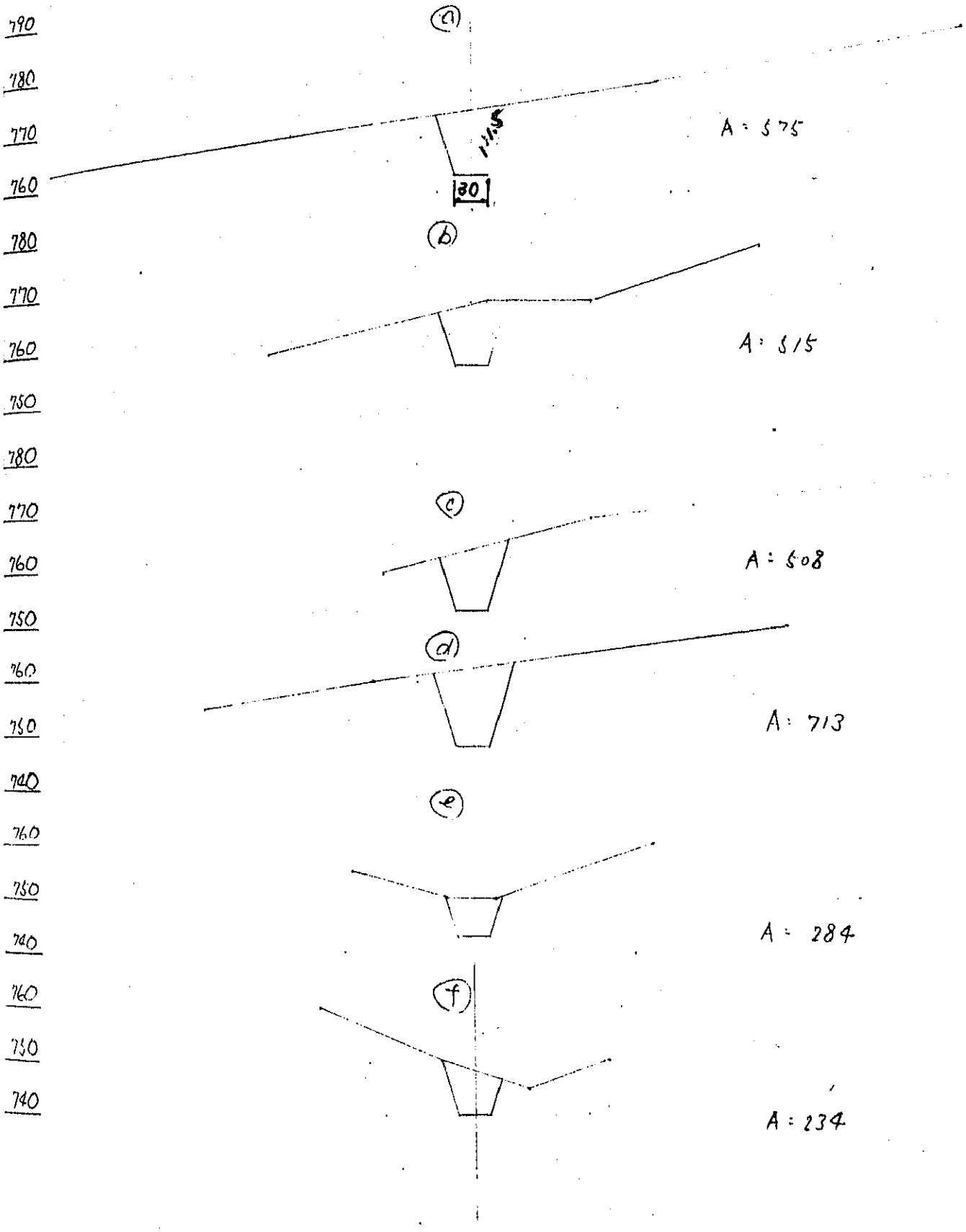
	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0			
	②	18.0	183.6	91.8	8.7	799
	③	18.0	183.6	183.6	34.0	6242
	④	0	0	91.8	9.7	890
	⑤					
	⑥					
	⑦					
	⑧					
	Wing	3 × 4.4 × (15 + 16)				409
	Ⓥ Sub total					8340
Sub dam	Ⓥ × 0.2					1668
Total						10008
Excavation	10008 x 0.57					5700

Diversion channel

(1) Excavation volume

	A (m^2)	A (m^2)	L (m)	V (m^3)
o	0			
a	575	288	200	57,600
b	515	545	"	109,000
c	508	512	"	102,400
d	713	611	"	122,200
e	284	499	"	99,800
f	234	259	"	51,800
g	0	117	"	23,400
Total				566,200

diversion channel No. 1



(2) Gabion work and Cocrete works

(1) Gabion work

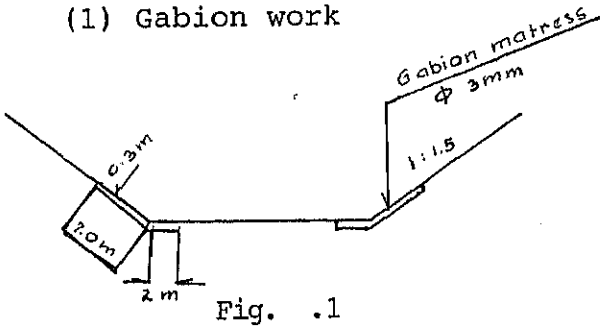
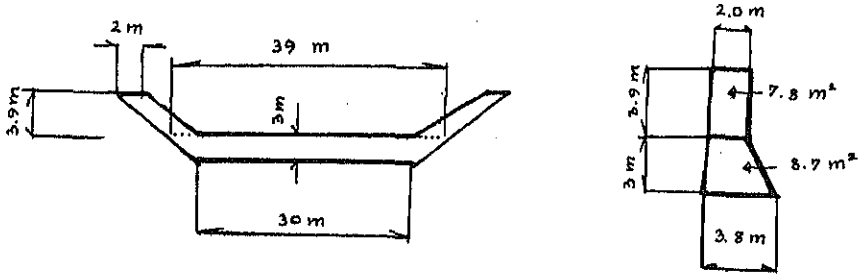


Fig. .1

Gabion matress per 1 m
= (7+2)x0.3x2 = 5.4 m^3
Total vulume :
+ 5.4 x (1350) =7,290 m^3

(2) Concrete works

Consolidation dams are constructed at intervals of 200 meters.
Specification of a consolidation dam is shown in Fig. - 1.2



concrete volume/unit = ½(39+30)x8.7+2x½(2+3)x7.8
= 339 m^3

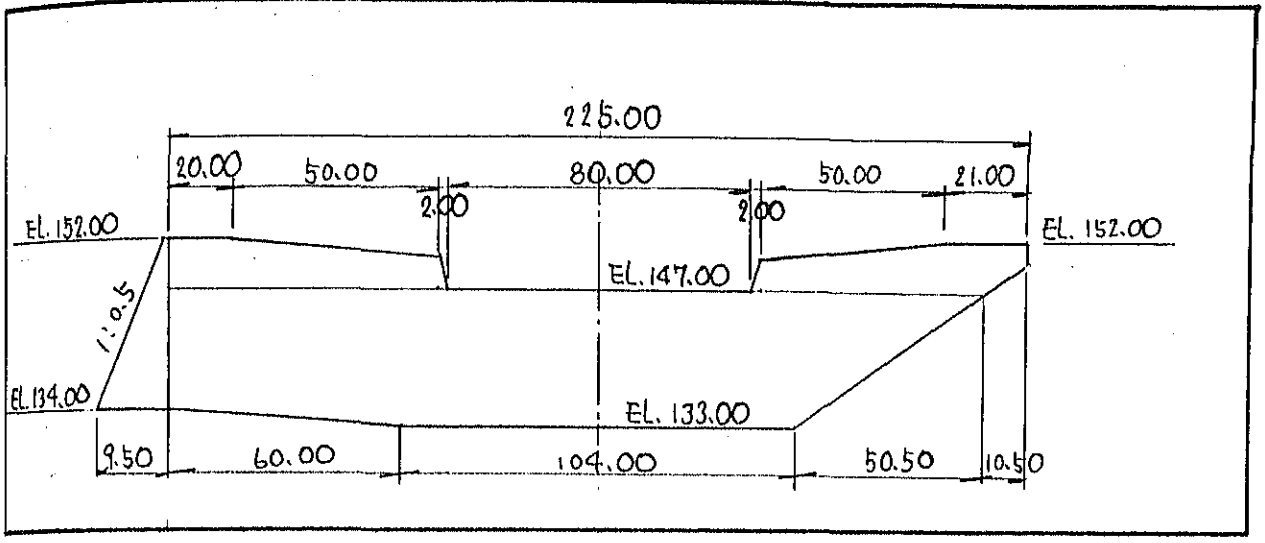
Quantity of consolidation dam = $\frac{1350}{200}$ = 6.75 ≒ 7

Total concrete volume = 339 × 7 = 2373 m^3

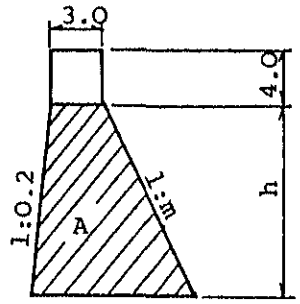
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K.GLIDIK	K.GLIDIK		K.Gliaik CHD - 1 -(1)	14 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.55

The sectional area of dam is shown as follows:

$A = 0.375\ h^2 + 3h$

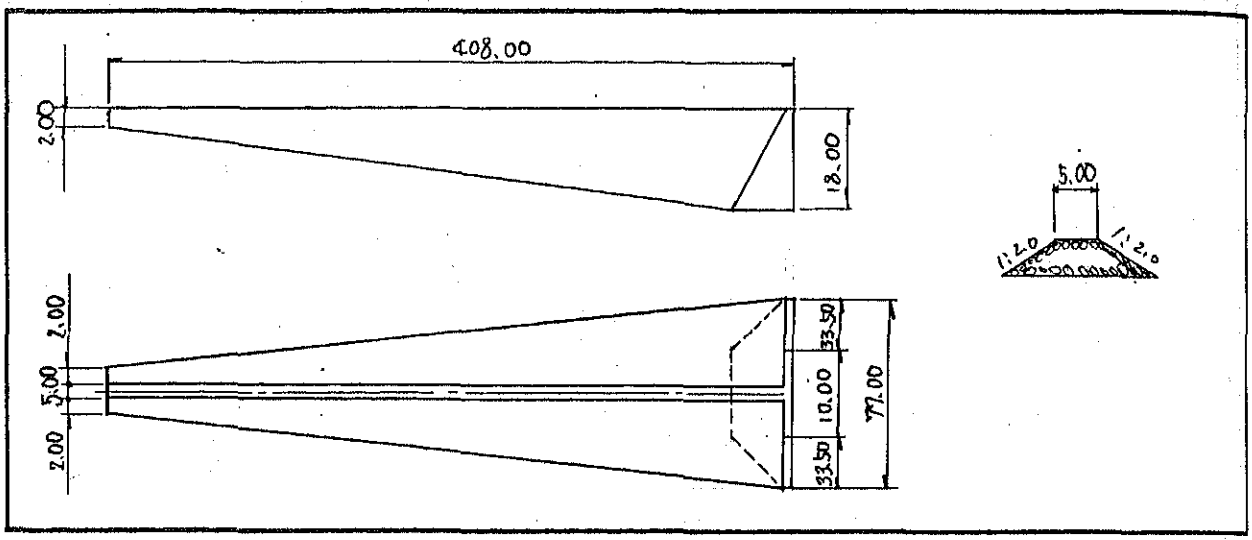
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\overline{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	13.0	102.4			
	②	14.0	115.5	108.95	60.0	6537
	③	14.0	115.5	115.50	104.0	12012
	④	0	0	57.75	50.5	2916
	⑤					
	⑥	Wing Dam (H=13.0) $A = \frac{1}{2} \times (0.50 + 9.50) \times 13.0$		= 65.00 m²		
	⑦	V = 65.00 × 10.0 + 65.00 × 36.0		= 2990		2990
	⑧					
	Wing	3 × 5 × (⑦2 + ⑦3)				2175
	Ⓥ Sub total					23640
Sub dam	Ⓥ × 0.2					4728
	Total					31358

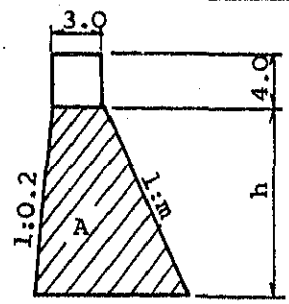
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. GLIDIK	K. GLIDIK		K. GLIDIK CH 0 ~ 1 -(2)	14 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m=

The sectional area of dam is shown as follows:

A= h^2 + 3h

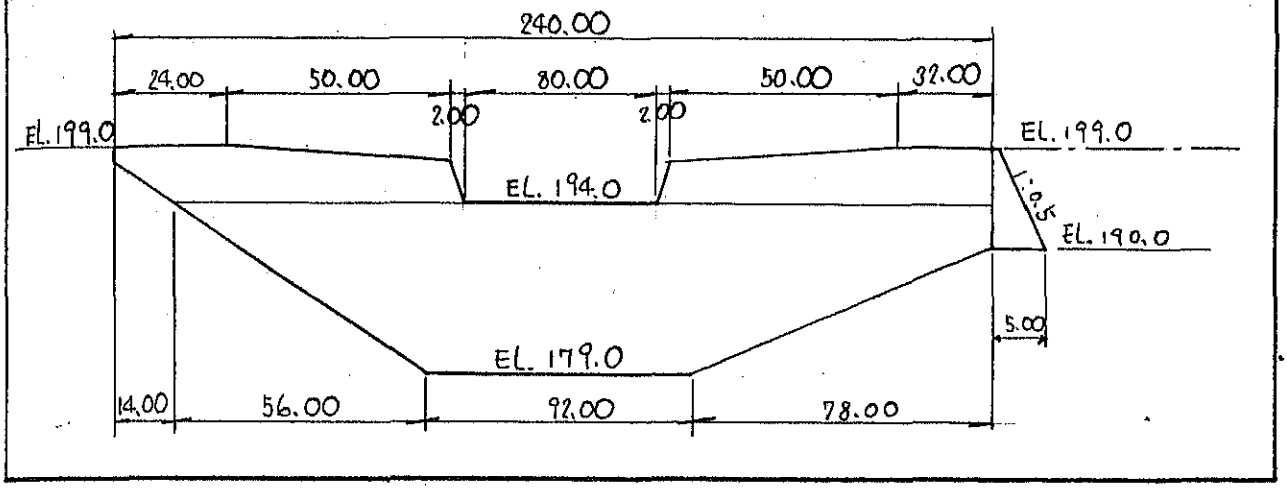
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	18.0	738.0			
	②	2.0	18.0	378.00	408.0	154.224
	③					
	④					
	⑤					
	⑥					
	⑦					
	⑧					
	Wing	3 x x(· +)				
	Ⓥ Sub total					
Sub dam	Ⓥ x 0.2					
Total						154.224

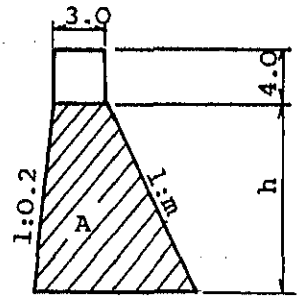
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K.GLIDIK	K.GLIDIK		K.Glidik CHD - 2 (1)	15 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.6

The sectional area of dam is shown as follows:

$A = 0.40\ h^2 + 3h$

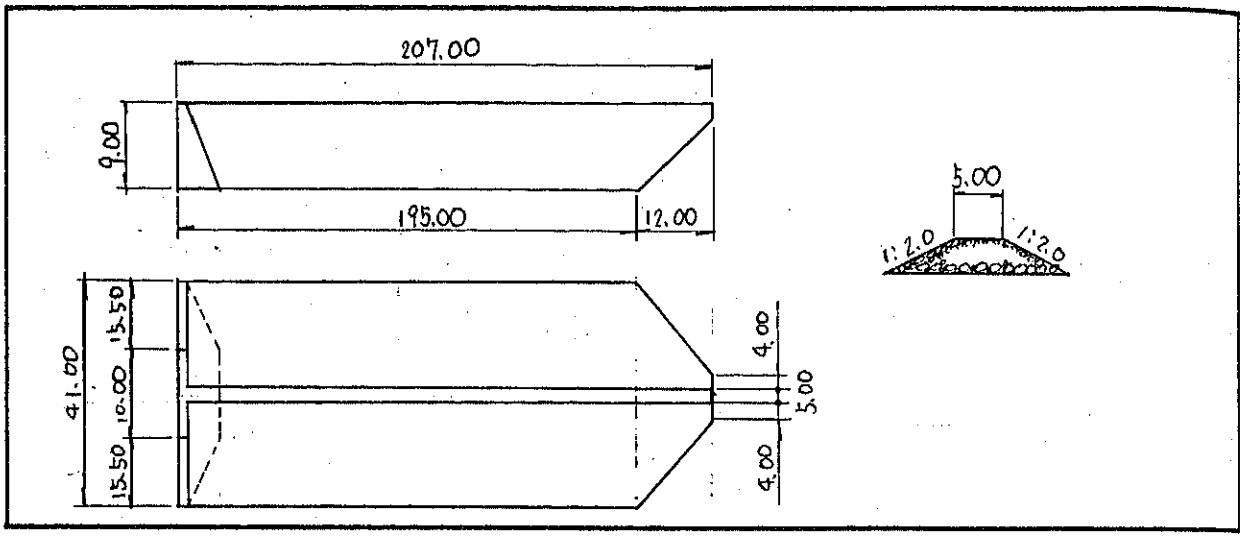
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\bar{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0			
	②	15.0	135.0	67.50	56.0	3780
	③	15.0	135.0	135.00	92.0	12420
	④	9.0	18.4	76.70	78.0	5983
	⑤					
	⑥	Wing Dam (H= 9.0 m) $A = \frac{1}{2} \times (0.5 + 5.00) \times 9.0 = 24.75\ m^2$				
	⑦	$V = 24.75 \times 10.0 + 24.75 \times 18.0 =$		693		693
	⑧					
	Wing	3 × 5.0 × (76 + 84)				2400
	Ⓥ Sub total					24583
Sub dam	Ⓥ × 0.2					4917
Total						30193

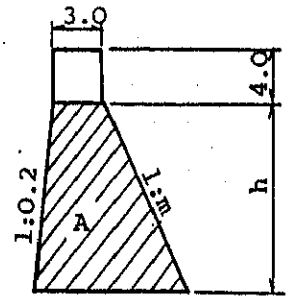
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K.GLIDIK	K.GLIDIK		K.GLIDIK CHD - 2 (2)	15 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m=

The sectional area of dam is shown as follows:

$A = h^2 + 3h$

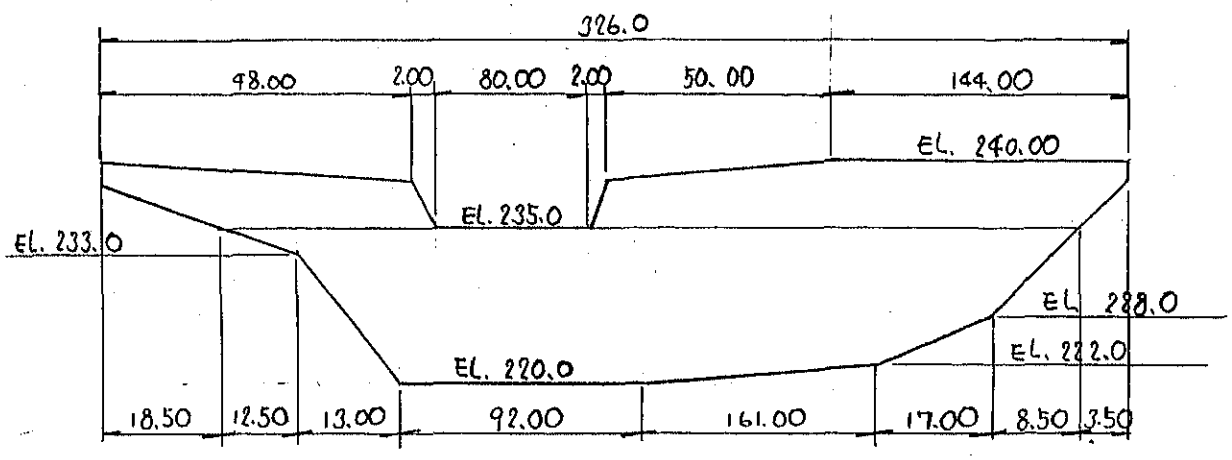
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	9.0	207.0			
	②	9.0	"	207.0	195.0	40365
	③	2.0	18.0	112.5	12.0	1350
	④					
	⑤					
	⑥					
	⑦					
	⑧					
	Wing	3 × × (· +)				
	Ⓥ Sub total					
Sub dam	Ⓥ × 0.2					
Total						41715

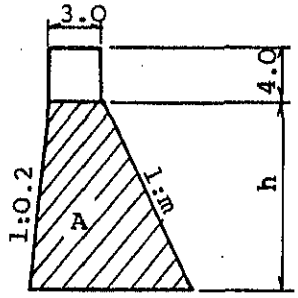
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. GLIDIK	K.LENGKONG		K. Lengkong CHD-1	15 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.6

The sectional area of dam is shown as follows:

$A = 0.40\ h^2 + 3h$

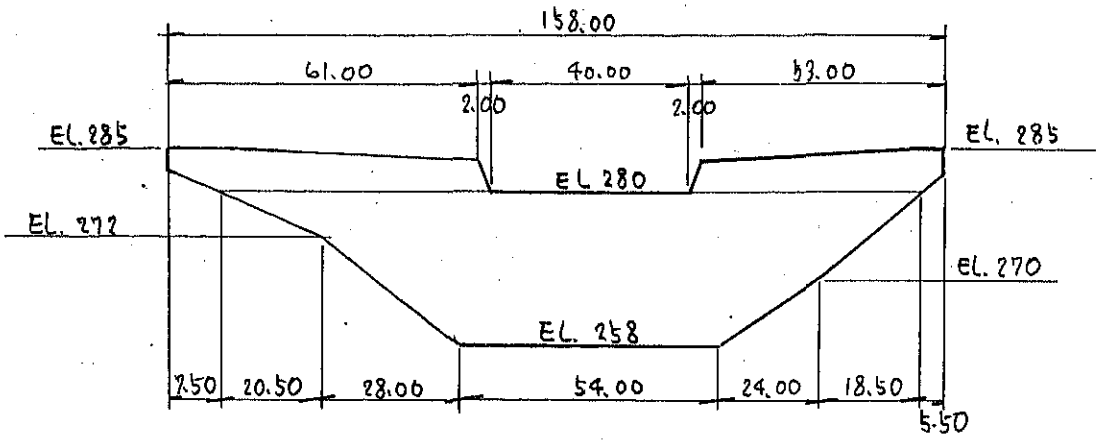
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\overline{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	0	0			
	②	2.0	7.6	3.80	12.5	48
	③	15.0	135.0	71.30	13.0	927
	④	15.0	135.0	135.00	92.0	12420
	⑤	13.0	106.6	120.80	161.0	19449
	⑥	7.0	40.6	73.60	17.0	1251
	⑦	0	0	20.30	8.5	173
	⑧					
	Wing	3 × 5 × (50 + 194)				3660
	Ⓥ Sub total					37928
Sub dam	Ⓥ × 0.2					7586
Total						45514

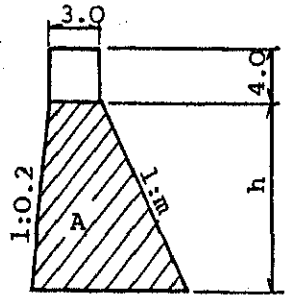
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. GLIDIK	K.LENG KONG		K.Leng Kong CHD - 2	22 m

(2) SECTION ALONG THE AXIS



(3). CROSS SECTION



m= 0.60

The sectional area of dam is shown as follows:

$A = 0.40\ h^2 + 3h$

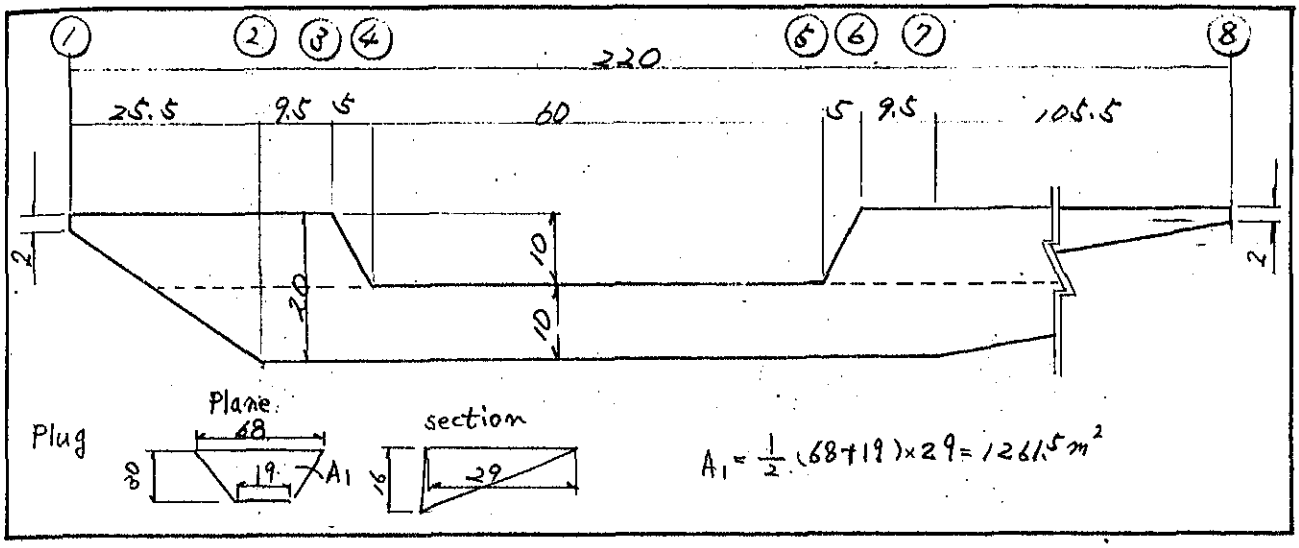
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0			
	②	8.0	49.6	24.8	20.5	508
	③	22.0	259.6	154.6	28.0	4329
	④	22.0	259.6	259.6	54.0	14018
	⑤	12.0	93.6	176.6	24.0	4238
	⑥	0	0	46.8	18.5	866
	⑦					
	⑧					
	Wing	3 × 5 × (63 + 55)				1770
	Ⓥ Sub total					25729
Sub dam	Ⓥ × 0.2					5146
Total						30875

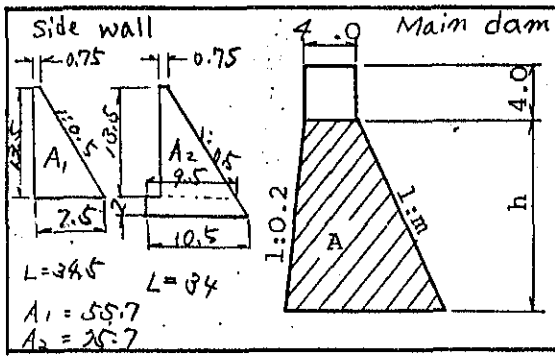
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K.Glidik	K.Lengkong		K.Lengkong CHD-3 (Prambanan dam)	10.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.7

The sectional area of dam is shown as follows:

$A = 0.45\ h^2 + 3h$

(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\bar{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①		4.4			
	②	10	115	59.7	25.5	1522
	③	10	115	115	9.5	1093
	④	10	85	100	5	500
	⑤	10	85	85	60	5100
	⑥	10	115	100	5	500
	⑦	10	115	115	9.5	1093
	⑧		4.4	59.7	105.5	6298
	Wing	included in Main dam quantity				
	Ⓥ Sub totl					16106
Sub dam	$\frac{1}{2}(4+6.8)\times3.5\times74 = 1400\ m^3$	Eprom	$34.5\times89\times2 = 6140\ m^3$	Plug	$\frac{1}{2}\times1261.5\times16 = 10090$	
Side wall	$(55.7\times34.5 + 25.7\times84)\times2 = 8990$			Total		42726
Excavation	42700 x 0.57					24300

(5) ROCK CREANING

Main dam

$$A = \frac{1}{2} (13 + 4) \times 240 = 2040 \ m^2 = 2\ 000 \ m^2$$

Epron

$$A = 95.6 \times 37.7 = 3\ 600 \ m^2$$

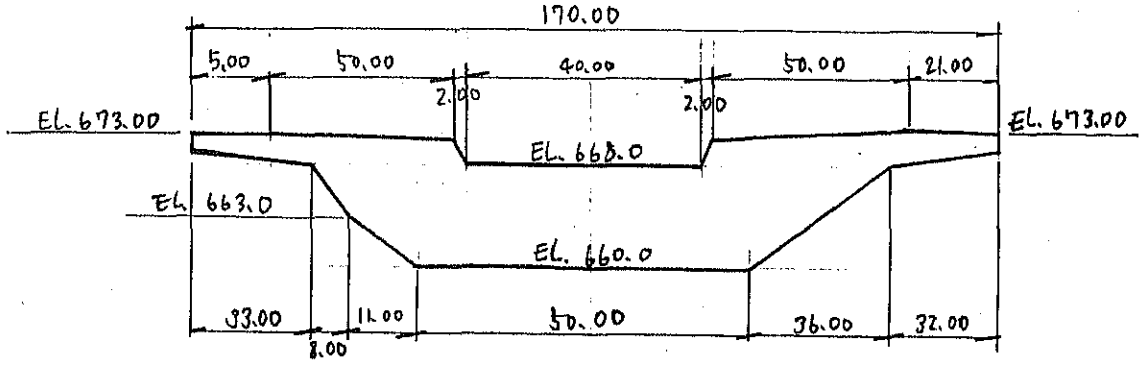
Total

$$A = 5\ 600 \ m^2$$

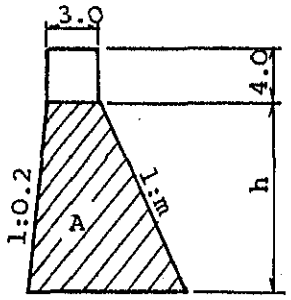
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K.GLIDIK	K.Lengkong		K.LengKong.CHD-4	8 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.45

The sectional area of dam is shown as follows:

$A = 0.325\ h^2 + 3h$

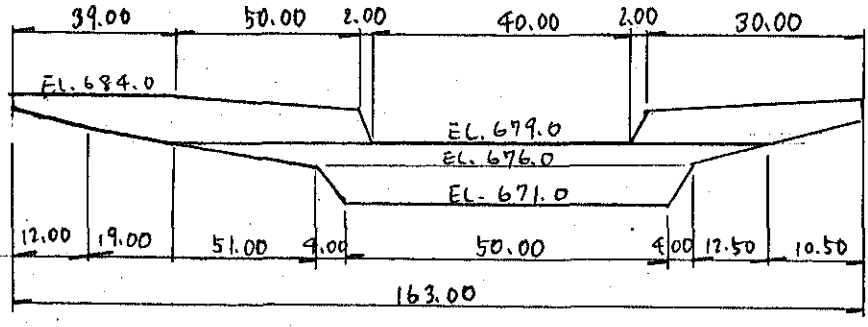
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0			
	②	5.0	23.1	11.55	8.0	92
	③	8.0	44.8	33.95	11.0	373
	④	8.0	44.8	44.80	50.0	2240
	⑤	0	0	22.40	36.0	806
	⑥					
	⑦					
	⑧					
	Wing	3 × 5 × (57 + 73)				1950
	Ⓥ Sub total					5461
Sub dam	Ⓥ × 0.2					1092
Total						6553

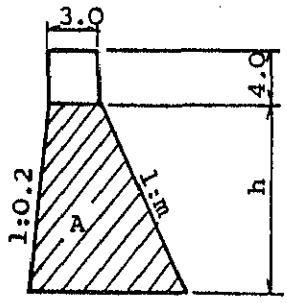
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. GLIDIK	K. Lengkong		K. Lengkong CHD-5	8.0 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.45

The sectional area of dam is shown as follows:

$A = 0.325\ h^2 + 3h$

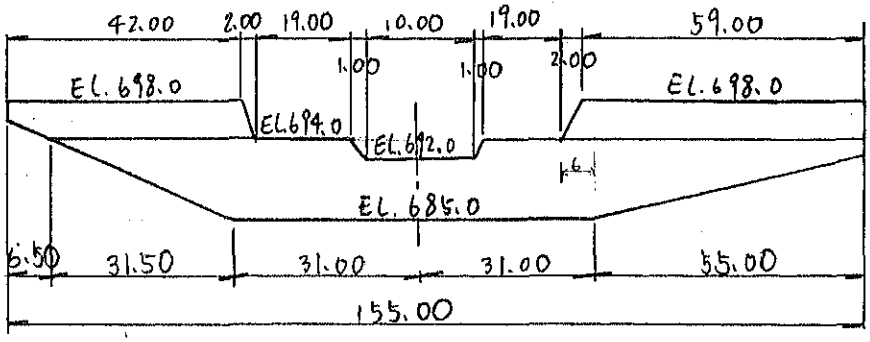
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m²)	Mean sectional area $\overline{A}$(m²)	Distance L(m)	Concrete volume V(m³)
Main dam	①	0	0			
	②	3.0	11.9	5.95	51.0	303
	③	9.0	53.3	32.60	4.0	130
	④	9.0	53.3	53.30	50.0	2665
	⑤	3.0	11.9	32.60	4.0	130
	⑥	0	0	5.95	12.5	74
	⑦					
	⑧					
	Wing	3 × 5 × (91 + 32)				1845
	Ⓥ Sub total					5147
Sub dam	Ⓥ × 0.2					1029
Total						6176

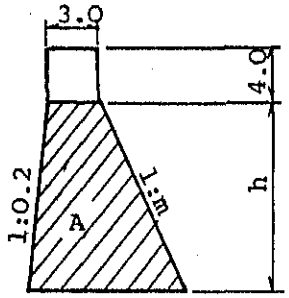
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. GLIDIK	K. Long kong		K. Long kong CHB – 6 (1)	9.0 m

(2). SECTION ALONG THE AXIS



(3). CROSS SECTION



m= 0.45

The sectional area of dam is shown as follows:

$A = 0.325\ h^2 + 3h$

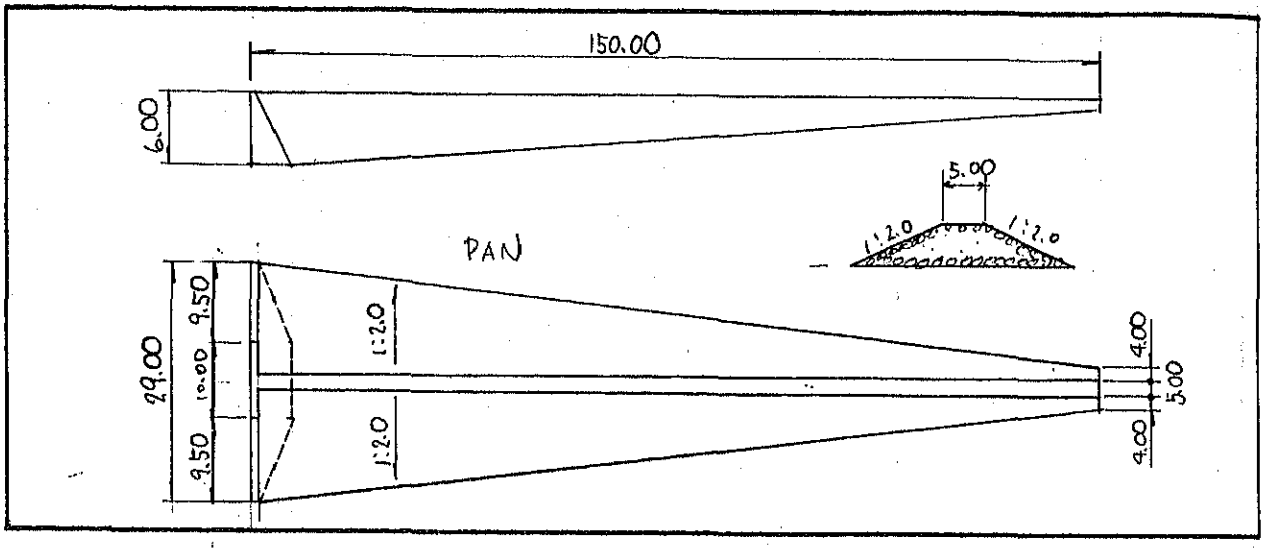
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\bar{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0			
	②	9.0	53.3	26.65	31.5	839
	③	9.0	53.3	53.30	25.0	1333
	④	7.0	46.0	49.65	1.0	50
	⑤	7.0	46.0	46.00	10.0	460
	⑥	9.0	53.3	49.65	1.0	50
	⑦	9.0	53.3	53.30	25.0	1333
	⑧	2.0	0	26.65	55.0	1466
	Wing	3 × 4 × (46 + 59)				1260
	Ⓥ Sub total					6791
Sub dam	Ⓥ × 0.2					1358
Total						8149

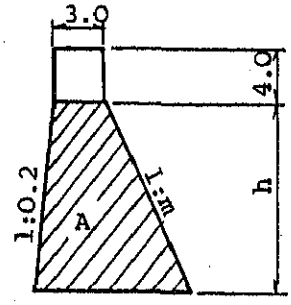
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K.GLIDIK	K.Leng kong		K. Leng Kong CHD- 6 (2)	9m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m=

The sectional area of dam is shown as follows:

$A = h^2 + 3h$

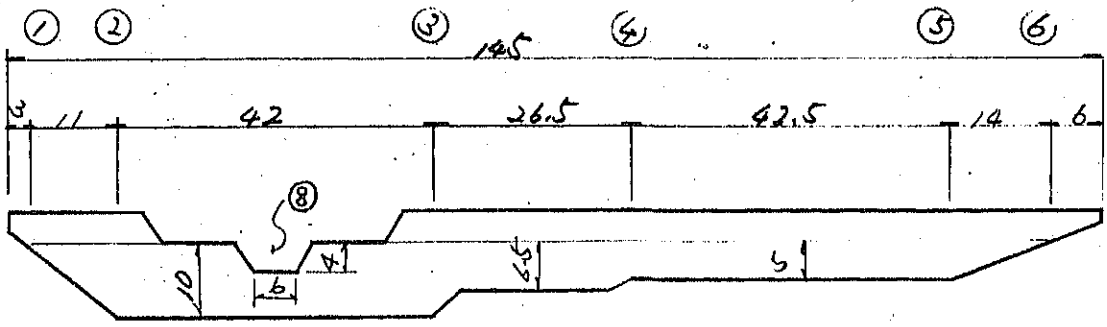
(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	6.0	102.0			
	②	2.0	18.0	60.0	150.0	9000
	③					
	④					
	⑤					
	⑥					
	⑦					
	⑧					
	Wing	3 × × (· +)				
	Ⓥ Sub total					
Sub dam	Ⓥ × 0.2					
Total						9000

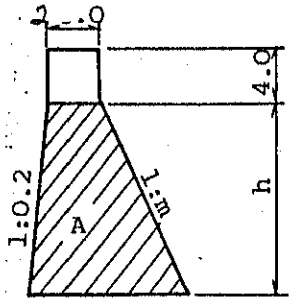
(1) SABO FACILITY

River system	Tributary	Location NO	Sabo facility	Dam height
K. Glidik	K. Longkong		K. Longkong CHD-7	10 m

(2) SECTION ALONG THE AXIS



(3) CROSS SECTION



m= 0.5

The sectional area of dam is shown as follows:

$A = 0.35\ h^2 + 2\ h$

(4) CONCRETE VOLUME OF DAM

	Section NO	Height above ground lebel h(m)	Sectional area A(m^2)	Mean sectional area $\overline{A}$(m^2)	Distance L(m)	Concrete volume V(m^3)
Main dam	①	0	0			
	②	10	55	27.5	11	303
	③	10	55	55	42	2310
	④	5	18.8	36.9	26.5	978
	⑤	5	18.8	18.8	42.5	799
	⑥	0	0	9.4	14	132
	⑦					
	⑧			13.6	8	- 109
	Wing	2 × 4 × (23.5 + 98.5)				976
	Ⓥ Sub totl					5389
Sub dam	Ⓥ × 0.2					1078
Total						6467
Excavation	6470 x 0.57					3690


JOKARTO
GESANG
PULO
JATISAR
KEC. TEMPEH
INT. Kelerek
INT Kedungcaping
K. DUREN
CD-3 (H=2m)
CD-4 (H=2m)
CD-5 (H=3m)
CD-6 (H=2m)
No 70
No 80
No 90
No 100
No 110
No 120
No 130
TUMPENG
SEMEMU
MADUREJA
NGUTER
L U M A J A N G
KEC. PASIRIAN
KEC. CANDIPURO


CANDRO
KEC. PASIRIAN
JUWANG
NGUTER
SEMEMO
MADUREJA
KEC. TEMPEH
SELOKAWAR-AWAR
KEC. PASIRIAN
SEMPENI
K. DUREN
KEC. GESANG

REPUBLIC OF INDONESIA

THE FEASIBILITY STUDY ON THE VOLCANIC DEBRIS CONTROL AND WATER CONSERVATION PROJECT IN THE SOUTH EASTERN SLOPE OF MT. SEMERU

SCALE 1 : 10000

LOCATION MAP OF SEDIMENT CONTROL FACIUTY ON K. MUJUR (1)

SMF I I

JAPAN INTERNATIONAL COOPERATION AGENCY

DRAWN	CHECKED	APPROVED

KEC. SENDURO

LUMAJANG

KEC. SENDUPO

KEC. CANDIPURO

KEC. CANDIPURO

SUMBERMAUJUR

G. PAKIS

G. LIPAPAK

G. TOTOGANMALANG

G. KUKER

No 320

No 310

No 300

No 290

No 280

No 270

No 40

BS Sal CHD-6
H = 8 m

BS Sal CHD-7
H = 19 m

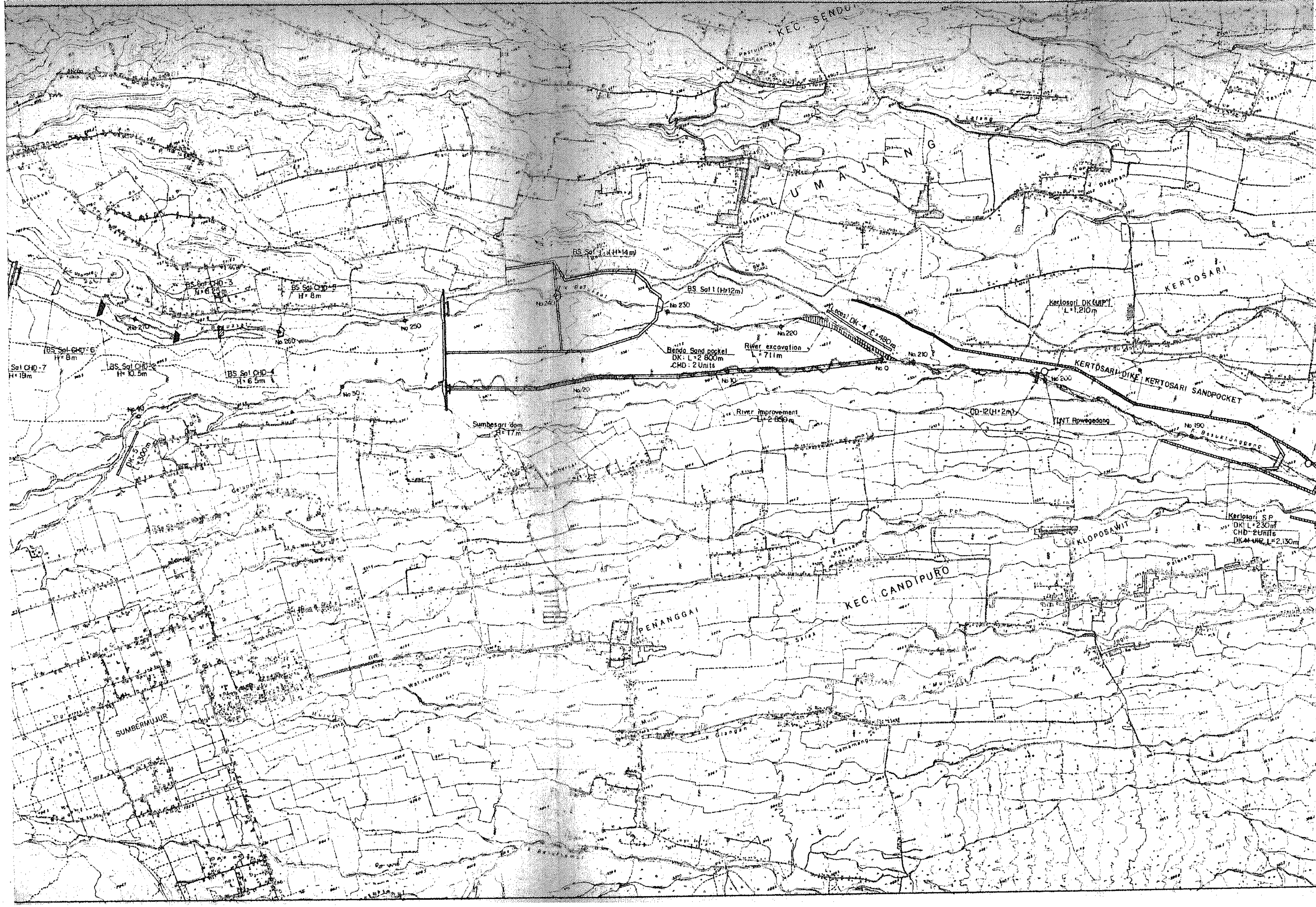
BS Sal CHD-8
H = 11 m

BS Sal CHD-9
H = 17 m

BS Sal CHD-10
H = 17 m

BS Sal CHD-5
H = 10.5 m

DKC-1
(+3000 m)


KEC. SENDURI
L U M A J A N G
KERTOSARI
Kertosari DK (UIP)
L=1,210m
BS Sat 1 (H=14m)
BS Sat 1 (H=12m)
BS Sat CHD-3
H=6.25m
BS Sat CHD-5
H=8m
BS Sat CHD-6
H=8m
Sat CHD-7
H=19m
BS Sat CHD-2
H=10.5m
BS Sat CHD-4
H=6.5m
Bendo Sand pocket
DK: L=2 800m
CHD: 2 Units
River excavation
L=711m
DK-4 L=480m
KERTOSARI DIKE
KERTOSARI SANDPOCKET
River improvement
L=2 850m
Sumbesari dam
H=17m
CD-12 (H=2m)
TINT Rowogedang
Kertosari S.P
DK L=230m
CHD 2 Units
KLOPOSAWIT
KEC. CANDIPURO
PENANGGAI
SUMBERMUJUR
DK-5
L=300m