TRIAXIAL TEST RESULT

Material Testing Section, Geology and Soil Engineering Division, Survey and Ecology Department, EGAT.
Project LAN-TAKONG TP or BH PU-3 ,Depth = 3.10-5.00 m. ,Specimen No. = 2
Type of Specimen ,Strain rate (mm./min) = 0.1 ,Type of Test : CIU

Init.Heigh(cm.) = 20.37 ,Init.Diameter(cm) = 10.19 ,Init.Area (sq.cm.) = 81.553 V0= 1661.23
Cell Pressure = 70.00 psi., = 4.92 kg/sq.cm. ,Init.Pore Pressure rdg. = 31.200 psi. 2.19 kg/sq.cm
Back Pressure = 30.00 psi.,
Eff.Conf.Pressure = 30.00 psi., = 2.723 kg/sq.cm. ,Proving Ring Constant = 0.8259 kg/div.
Max Dry Density from Standard Proctor = 1.770 ton/cu.m at Optimum Water Content = 16.00 %
Dry Density from Compression Method = 1.693 ton/cu.m at Water Content = 18.09 % by Comp. Stress = 4.286 kgf/sq.cm
Percentage of Compression Dry Density = 95.06 % Sample Passing Sieve Number: 3/4 inch "B" Value= 95.01
Volume Change = 61.60 cc. Hc.= 20.12 cm. Vc= 1599.63 cc. Ac= 79.51 sq.cm
Preration date : 16/10/33 Saturation date : 17/10/33
Consolidation date: 18/10/33 Shearing date : 19/10/33

Deform. E0.01 mm.	Load Dial Rdg.(div)	Pore(u) *10E-1 psi	Strain %	Cor. Area sq.cm	Dev.Stress kg/sq.cm	Excess u kg/sq.cm	Nor. DS	A-Para	P1 Eff. kg/sq.cm	P3 Eff. kg/sq.cm	Eff.P KG/SQ.CM	Eff.Q KG/SQ.CM
0.0	0.0	312	0.00	79.51	0.00	0.00	0.00	0.00	2.73	2.73	2.73	0.00
5.0	9.0	317	0.02	79.53	0.09	0.04	0.03	0.38	2.79	2.69	2.74	0.05
15.0	19.0	323	0.07	79.57	0.20	0.11	0.07	0.57	2.81	2.62	2.71	0.10
25.0	42.0	344	0.12	79.61	0.44	0.22	0.16	0.52	2.94	2.50	2.72	0.22
40.0	105.0	396	0.20	79.67	1.09	0.59	0.40	0.54	3.23	2.14	2.68	0.54
55.0	139.0	432	0.27	79.73	1.44	0.84	0.53	0.59	3.32	1.88	2.60	0.72
70.0	157.0	460	0.35	79.79	1.63	1.04	0.60	0.64	3.31	1.69	2.50	0.81
90.0	173.0	487	0.45	79.87	1.79	1.23	0.66	0.69	3.29	1.50	2.39	0.89
110.0	183.0	505	0.55	79.95	1.89	1.36	0.69	0.72	3.26	1.37	2.32	0.95
130.0	188.0	521	0.65	80.03	1.94	1.47	0.71	0.76	3.20	1.26	2.23	0.97
150.0	192.0	533	0.75	80.11	1.98	1.55	0.73	0.78	3.15	1.17	2.16	0.99
170.0	193.0	544	0.85	80.19	1.99	1.63	0.73	0.82	3.08	1.10	2.09	0.99
180.0	194.0	547	0.89	80.23	2.00	1.65	0.73	0.83	3.07	1.08	2.07	1.00
200.0	195.0	556	0.99	80.31	2.01	1.72	0.74	0.86	3.02	1.01	2.02	1.00
220.0	195.0	561	1.09	80.39	2.00	1.75	0.73	0.87	2.98	0.98	1.98	1.00
240.0	196.0	566	1.19	80.47	2.01	1.79	0.74	0.89	2.95	0.94	1.95	1.01
260.0	196.0	573	1.29	80.55	2.01	1.84	0.74	0.91	2.90	0.89	1.90	1.00
300.0	196.0	581	1.49	80.72	2.01	1.89	0.74	0.94	2.84	0.84	1.84	1.00
350.0	196.0	587	1.74	80.92	2.00	1.93	0.73	0.97	2.79	0.79	1.79	1.00
400.0	195.0	590	1.99	81.12	1.99	1.95	0.73	0.98	2.76	0.77	1.77	0.99
500.0	195.0	599	2.49	81.54	1.98	2.02	0.72	1.02	2.69	0.71	1.70	0.99
600.0	195.0	605	2.98	81.96	1.97	2.06	0.72	1.05	2.63	0.67	1.65	0.98
700.0	195.0	608	3.48	82.38	1.96	2.08	0.72	1.06	2.60	0.65	1.62	0.98
900.0	197.0	612	4.47	83.23	1.95	2.11	0.72	1.08	2.57	0.62	1.60	0.98
1100.0	201.0	614	5.47	84.11	1.97	2.12	0.72	1.08	2.58	0.60	1.59	0.99
1300.0	205.0	616	6.46	85.00	1.99	2.14	0.73	1.07	2.58	0.59	1.59	1.00
1500.0	208.0	617	7.46	85.92	2.00	2.14	0.73	1.07	2.58	0.58	1.58	1.00
1700.0	212.0	616	8.45	86.85	2.02	2.14	0.74	1.06	2.61	0.59	1.60	1.01
2000.0	219.0	615	9.94	88.29	2.05	2.13	0.75	1.04	2.65	0.60	1.62	1.02
2300.0	226.0	617	11.43	89.77	2.08	2.14	0.76	1.03	2.66	0.58	1.62	1.04
2500.0	230.0	616	12.43	90.79	2.09	2.14	0.77	1.02	2.68	0.59	1.64	1.05
2700.0	235.0	617	13.42	91.84	2.11	2.14	0.77	1.01	2.70	0.58	1.64	1.06
3000.0	242.0	617	14.91	93.45	2.14	2.14	0.78	1.00	2.72	0.58	1.65	1.07
3200.0	246.0	615	15.91	94.55	2.15	2.13	0.79	0.99	2.75	0.60	1.67	1.07
3600.0	255.0	612	17.89	96.84	2.17	2.11	0.80	0.97	2.79	0.62	1.71	1.09
3900.0	260.0	612	19.39	98.63	2.18	2.11	0.80	0.97	2.80	0.62	1.71	1.09
4200.0	267.0	610	20.88	100.49	2.19	2.10	0.80	0.95	2.83	0.63	1.73	1.10
4500.0	274.0	610	22.37	102.42	2.21	2.10	0.81	0.95	2.84	0.63	1.74	1.10
5000.0	294.0	600	24.85	105.91	2.29	2.08	0.84	0.91	2.94	0.65	1.79	1.15

TRIAXIAL TEST RESULT

Material Testing Section, Geology and Soil Engineering Division, Survey and Ecology Department, EGAT.
Project LAM-TAKONG TP or BH PU-3 ,Depth = 3.10-5.00 m. ,Specimen No. = 3
Type of Specimen ,Strain rate (mm./min) = 0.1 ,Type of Test : CIU

Init.Height(cm.) = 28.37 ,Init.Diameter(cm) = 10.19 ,Init.Area (sq.cm.) = 81.553 V0= 1661.23
Cell Pressure = 90.00 psi., = 6.33 kg/sq.cm. ,Init.Pore Pressure rdg. = 29.500 psi. 2.07 kg/sq.cm
Back Pressure = 30.00 psi.,
Eff.Conf.Pressure = 60.50 psi., = 4.254 kg/sq.cm. ,Proving Ring Constant = 0.4232 kg/div.
Max Dry Density from Standard Proctor = 1.770 ton/cu.m at Optimum Water Content = 16.00 %
Dry Density from Compression Method = 1.679 ton/cu.m at Water Content = 19.16 % by Comp. Stress = 4.516 kgf/sq.cm
Percentage of Compression Dry Density = 94.86 % Sample Passing Sieve Number: 3/4 inch "B" Value= 92.28
Volume Change = 41.30 cc. Hc.= 28.20 cm. Vc= 1619.73 cc. Ac= 80.18 sq.cm
Preration date : 16/10/33 Saturation date : 17/10/33
Consolidation date: 22/10/33 Shearing date : 24/10/33

Deform. (0.01 mm.)	Load Dial Rdg.(div)	Pore(u) *10E-1 psi	Strain %	Cor. Area sq.cm	Dev.Stress kg/sq.cm	Excess u kg/sq.cm	Nor. DS	A-Para	P1 Eff. kg/sq.cm	P3 Eff. kg/sq.cm	Eff.P KG/SQ.CM	Eff.Q KG/SQ.CM
0.0	0.0	295	0.00	80.10	0.00	0.00	0.00	0.00	4.25	4.25	4.25	0.00
5.0	16.0	295	0.02	80.20	0.03	0.03	0.02	0.00	4.34	4.25	4.30	0.04
15.0	25.0	298	0.07	80.24	0.13	0.02	0.03	0.16	4.36	4.23	4.30	0.07
25.0	48.0	304	0.12	80.28	0.21	0.06	0.05	0.30	4.40	4.19	4.30	0.11
40.0	265.0	336	0.20	80.34	1.00	0.29	0.25	0.27	5.05	3.97	4.51	0.54
55.0	315.0	379	0.27	80.40	1.66	0.59	0.39	0.36	5.32	3.66	4.49	0.83
70.0	388.0	417	0.35	80.46	2.20	0.86	0.47	0.43	5.39	3.48	4.40	1.00
90.0	436.0	461	0.45	80.54	2.29	1.17	0.54	0.51	5.38	3.89	4.23	1.15
110.0	475.0	495	0.54	80.62	2.49	1.41	0.59	0.56	5.34	2.85	4.09	1.25
130.0	501.0	524	0.64	80.70	2.63	1.61	0.62	0.61	5.27	2.64	3.96	1.31
150.0	521.0	550	0.74	80.78	2.73	1.79	0.64	0.66	5.19	2.46	3.83	1.36
170.0	534.0	570	0.84	80.86	2.79	1.93	0.66	0.69	5.11	2.32	3.72	1.40
190.0	548.0	579	0.89	80.90	2.82	2.00	0.66	0.71	5.08	2.26	3.67	1.41
200.0	548.0	594	0.99	80.98	2.86	2.10	0.67	0.73	5.02	2.15	3.58	1.43
220.0	554.0	607	1.09	81.07	2.89	2.19	0.68	0.76	4.95	2.06	3.51	1.45
240.0	558.0	618	1.19	81.15	2.91	2.27	0.68	0.78	4.89	1.98	3.44	1.45
260.0	561.0	627	1.29	81.23	2.92	2.33	0.69	0.80	4.84	1.92	3.39	1.46
280.0	565.0	642	1.49	81.39	2.94	2.44	0.69	0.83	4.75	1.81	3.28	1.47
350.0	569.0	659	1.73	81.60	2.95	2.56	0.69	0.87	4.65	1.69	3.17	1.48
400.0	570.0	669	1.98	81.80	2.95	2.63	0.69	0.89	4.57	1.62	3.10	1.47
500.0	571.0	684	2.48	82.22	2.94	2.74	0.69	0.93	4.46	1.52	2.99	1.47
600.0	571.0	696	2.97	82.64	2.92	2.82	0.69	0.96	4.36	1.43	2.90	1.46
700.0	572.0	702	3.47	83.06	2.91	2.86	0.69	0.98	4.31	1.39	2.85	1.46
900.0	580.0	711	4.46	83.92	2.92	2.92	0.69	1.00	4.25	1.33	2.79	1.46
1100.0	588.0	716	5.45	84.80	2.93	2.96	0.69	1.01	4.23	1.29	2.76	1.47
1300.0	600.0	718	6.44	85.70	2.96	2.97	0.70	1.00	4.24	1.28	2.76	1.48
1500.0	610.0	719	7.43	86.61	2.98	2.98	0.70	1.00	4.25	1.27	2.76	1.49
1700.0	621.0	719	8.42	87.55	3.00	2.98	0.71	0.99	4.27	1.27	2.77	1.50
2000.0	641.0	718	9.90	88.99	3.05	2.97	0.72	0.98	4.33	1.28	2.80	1.52
2300.0	662.0	715	11.39	90.49	3.10	2.95	0.73	0.95	4.40	1.30	2.85	1.55
2500.0	675.0	713	12.38	91.51	3.12	2.94	0.73	0.94	4.44	1.31	2.88	1.56
2700.0	690.0	711	13.37	92.55	3.16	2.92	0.74	0.93	4.48	1.33	2.91	1.58
3000.0	710.0	710	14.85	94.17	3.19	2.92	0.75	0.91	4.53	1.34	2.93	1.60
3200.0	724.0	708	15.84	95.28	3.22	2.90	0.76	0.90	4.57	1.35	2.96	1.61
3600.0	751.0	705	17.82	97.57	3.26	2.88	0.77	0.88	4.63	1.37	3.00	1.63
3900.0	775.0	700	19.31	99.37	3.30	2.85	0.78	0.86	4.71	1.41	3.06	1.65
4200.0	796.0	699	20.79	101.23	3.33	2.84	0.79	0.85	4.74	1.41	3.08	1.66
4500.0	815.0	695	22.28	103.16	3.34	2.81	0.79	0.84	4.78	1.44	3.11	1.67
5000.0	849.0	691	24.75	106.56	3.37	2.78	0.79	0.83	4.84	1.47	3.16	1.69

Material Testing Section, Geology and Soil Engineering Division, Survey and Ecology Department, EGAT.

Project LAM-TAKONG TP or BH P6-3 ,Depth = 3.18-5.88 m. ,Specimen No. = 4

Type of Specimen ,Strain rate (mm./min) = 0.1 ,Type of Test : CIU

Init.Height(cm.) = 20.37 ,Init.Diameter(cm) = 10.19 ,Init.Area (sq.cm.) = 81.553 VO= 1661.23

Cell Pressure = 110.00 psi., = 7.74 kg/sq.cm. ,Init.Pore Pressure rdg. = 30.900 psi. 2.17 kg/sq.cm

Back Pressure = 30.00 psi.,

Eff.Cons.Pressure = 79.10 psi., = 5.561 kg/sq.cm. ,Proving Ring Constant = 0.4232 kg/div.

Max Dry Density from Standard Proctor = 1.770 ton/cu.m at Optimum Water Content = 16.00 %

Dry Density from Compression Method = 1.682 ton/cu.m at Water Content = 18.81 % by Comp. Stress = 5.628 kg/sq.cm

Percentage of Compression Dry Density = 95.03 % Sample Passing Sieve Number: 3/4 inch "B" Value= 98.00

Volume Change = 102.50 cc. Hc.= 19.95 cm. Vc= 1558.73 cc. Ac= 78.13 sq.cm

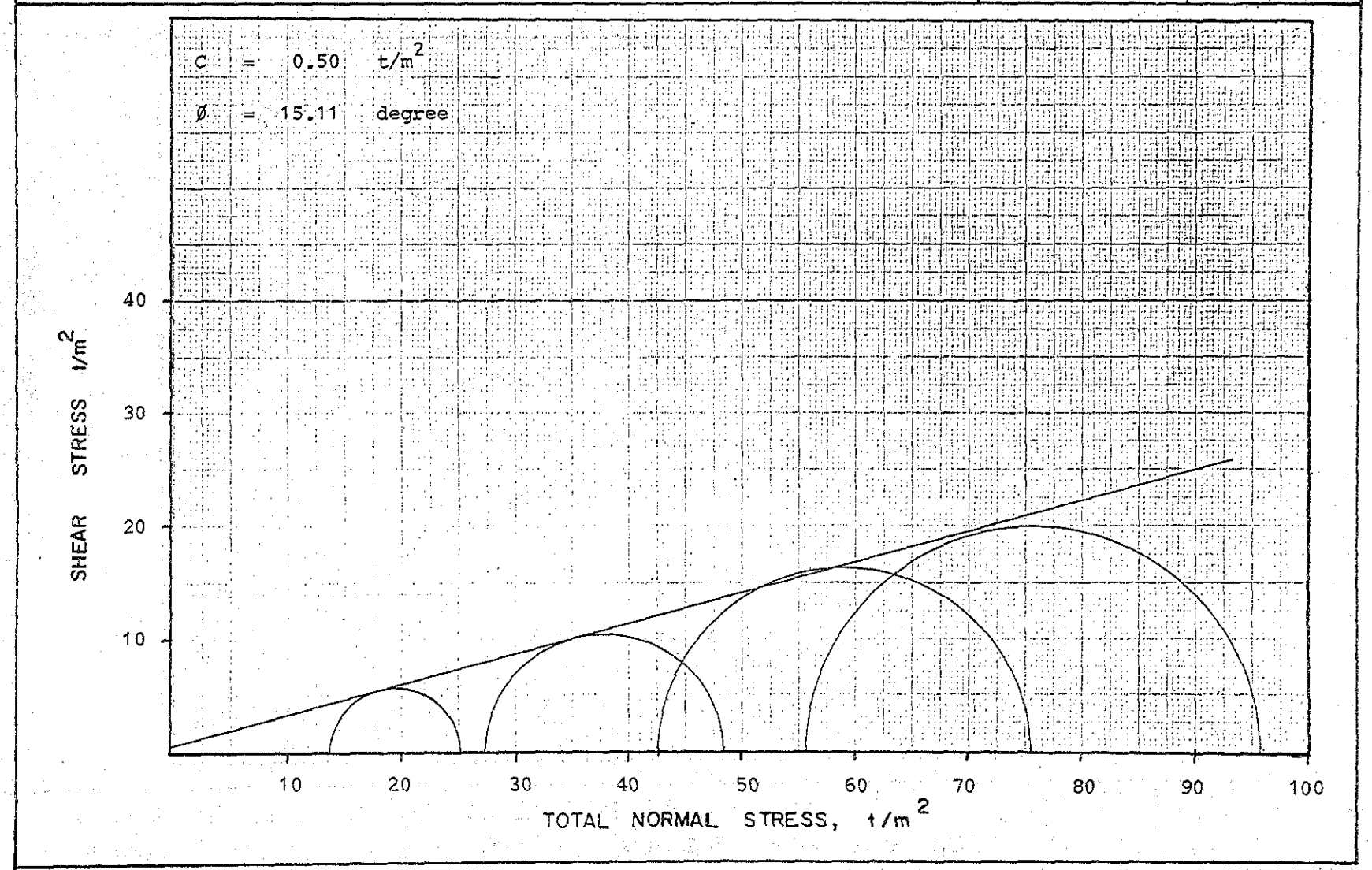
Preration date : 16/10/33 Saturation date : 17/10/33

Consolidation date: 18/10/33 Shearing date : 19/10/33

Deform. (mm.)	Load Dial Rdg.(div)	Force(W) KGS-1 psi	Strain %	Cor. Area sq.cm	Dev.Stress kg/sq.cm	Excess u kg/sq.cm	Par. BB	A-Para	Pl Eff. kg/sq.cm	P3 Eff. kg/sq.cm	Eff.P KG/SQ.CM	Eff.D KG/SQ.CM
0.0	0.0	309	0.00	78.13	0.00	0.00	0.00	0.00	5.56	5.56	5.56	0.00
5.0	49.0	312	0.25	78.15	0.27	0.06	0.05	0.74	5.76	5.50	5.63	0.13
15.0	72.0	338	0.60	78.19	0.39	0.15	0.07	0.38	5.60	5.41	5.51	0.19
25.0	91.0	343	0.13	78.23	0.49	0.24	0.09	0.49	5.81	5.32	5.57	0.25
40.0	102.0	363	0.20	78.28	0.55	0.30	0.10	0.69	5.73	5.18	5.45	0.28
55.0	111.0	379	0.28	78.34	0.60	0.49	0.11	0.82	5.67	5.07	5.37	0.30
70.0	234.0	433	0.35	78.40	1.28	0.97	0.23	0.69	5.35	4.69	5.02	0.63
90.0	418.0	536	0.45	78.48	2.25	1.60	0.41	0.71	6.27	3.97	5.09	1.13
110.0	499.0	598	0.55	78.56	2.69	2.03	0.48	0.76	6.22	3.53	4.87	1.34
130.0	548.0	643	0.65	78.64	2.95	2.35	0.53	0.80	6.16	3.21	4.69	1.47
150.0	579.0	678	0.75	78.72	3.11	2.59	0.56	0.83	6.08	2.97	4.52	1.56
170.0	602.0	705	0.85	78.80	3.23	2.76	0.58	0.86	6.01	2.78	4.39	1.62
190.0	612.0	718	0.90	78.84	3.29	2.83	0.59	0.88	5.97	2.69	4.33	1.64
210.0	625.0	739	1.00	78.92	3.35	3.02	0.60	0.90	5.89	2.54	4.21	1.68
220.0	634.0	753	1.10	79.00	3.42	3.12	0.61	0.92	5.84	2.44	4.14	1.70
240.0	642.0	767	1.20	79.08	3.43	3.22	0.62	0.94	5.77	2.34	4.05	1.71
260.0	644.0	776	1.30	79.16	3.44	3.26	0.62	0.95	5.72	2.28	4.00	1.72
280.0	650.0	794	1.50	79.32	3.47	3.41	0.62	0.98	5.62	2.15	3.89	1.73
350.0	655.0	812	1.75	79.52	3.49	3.54	0.63	1.01	5.51	2.02	3.77	1.74
400.0	657.0	823	2.00	79.73	3.49	3.61	0.63	1.04	5.44	1.95	3.69	1.74
500.0	659.0	841	2.51	80.14	3.48	3.74	0.63	1.07	5.30	1.82	3.56	1.74
600.0	660.0	851	3.01	80.55	3.47	3.81	0.62	1.10	5.22	1.75	3.48	1.73
700.0	665.0	859	3.51	80.97	3.48	3.87	0.62	1.11	5.17	1.69	3.43	1.74
900.0	675.0	867	4.51	81.82	3.49	3.92	0.63	1.12	5.13	1.64	3.38	1.75
1100.0	683.0	871	5.51	82.69	3.52	3.95	0.63	1.13	5.11	1.61	3.36	1.75
1300.0	690.0	873	6.52	83.57	3.53	3.97	0.64	1.12	5.13	1.60	3.36	1.77
1500.0	713.0	874	7.52	84.48	3.57	3.97	0.64	1.11	5.16	1.59	3.37	1.79
1700.0	726.0	876	8.52	85.40	3.60	3.99	0.65	1.11	5.17	1.57	3.37	1.80
2000.0	750.0	878	10.02	86.83	3.66	4.00	0.66	1.09	5.22	1.56	3.39	1.83
2300.0	773.0	879	11.53	88.31	3.70	4.01	0.67	1.08	5.26	1.55	3.41	1.85
2500.0	789.0	878	12.53	89.32	3.74	4.00	0.67	1.07	5.30	1.56	3.43	1.87
2700.0	803.0	877	13.53	90.36	3.78	3.99	0.68	1.06	5.35	1.57	3.46	1.89
3000.0	830.0	878	15.04	91.95	3.82	4.00	0.69	1.05	5.38	1.56	3.47	1.91
3200.0	847.0	877	16.04	93.05	3.85	3.99	0.69	1.04	5.42	1.57	3.49	1.93
3400.0	860.0	877	18.04	95.33	3.91	3.99	0.70	1.02	5.47	1.57	3.52	1.95
3700.0	926.0	877	19.55	97.11	3.95	3.99	0.71	1.01	5.52	1.57	3.54	1.97
4200.0	930.0	875	21.05	98.96	3.98	3.98	0.72	1.00	5.56	1.58	3.57	1.99
4500.0	954.0	874	22.56	100.83	4.00	3.97	0.72	0.99	5.59	1.59	3.59	2.00
5000.0	998.0	878	25.06	104.26	4.02	3.94	0.72	0.98	5.64	1.62	3.63	2.01

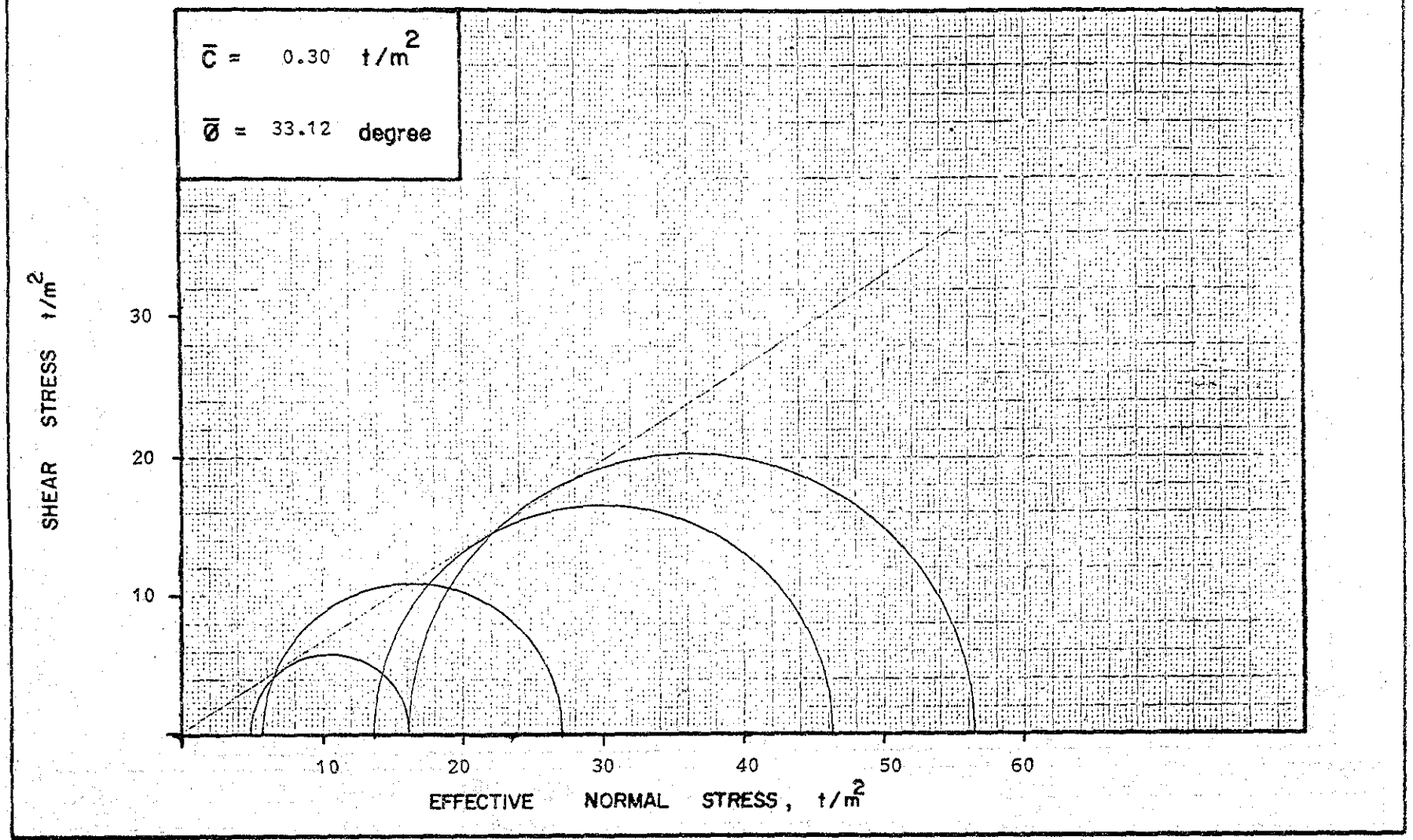
MATERIAL TESTING SECTION GEOLOGY AND SOIL ENGINEERING DIVISION
SURVEY AND ECOLOGEY DEPARTMENT, EGAT.

PROJECT	LAM TA KHONG
SAMPLE NO.	PU-3
DEPT 3.10-5.00 m.	DATE 25/10/33



MATERIAL TESTING SECTION, GEOLOGY AND SOIL ENGINEERING DIVISION
SURVEY AND ECOLOGY DEPARTMENT, EGAT.

PROJECT. LAM TA KHONG
SAMPLE NO. PU-3
DEPTH. 3.10-5.00 m. DATE. 25/10/33



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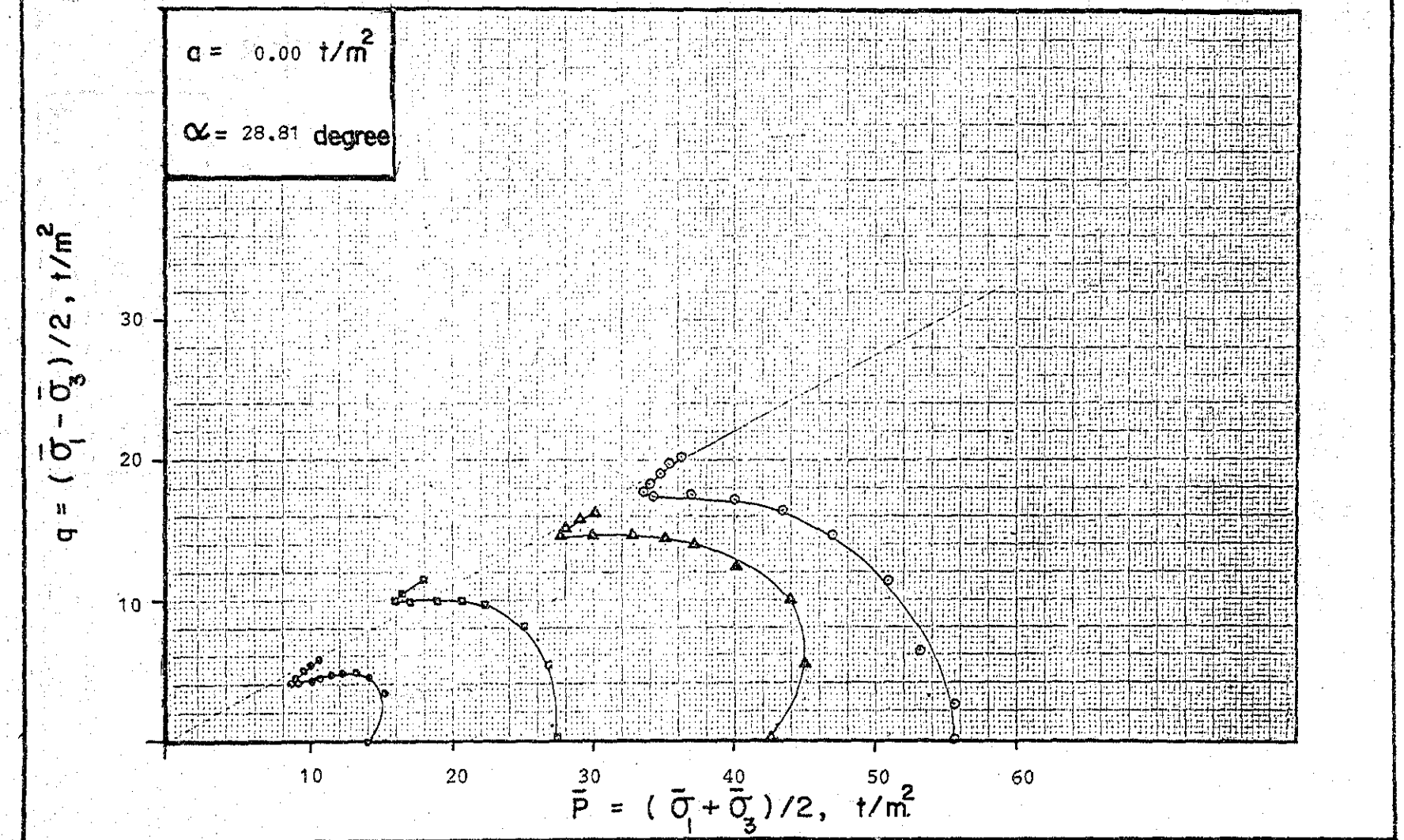
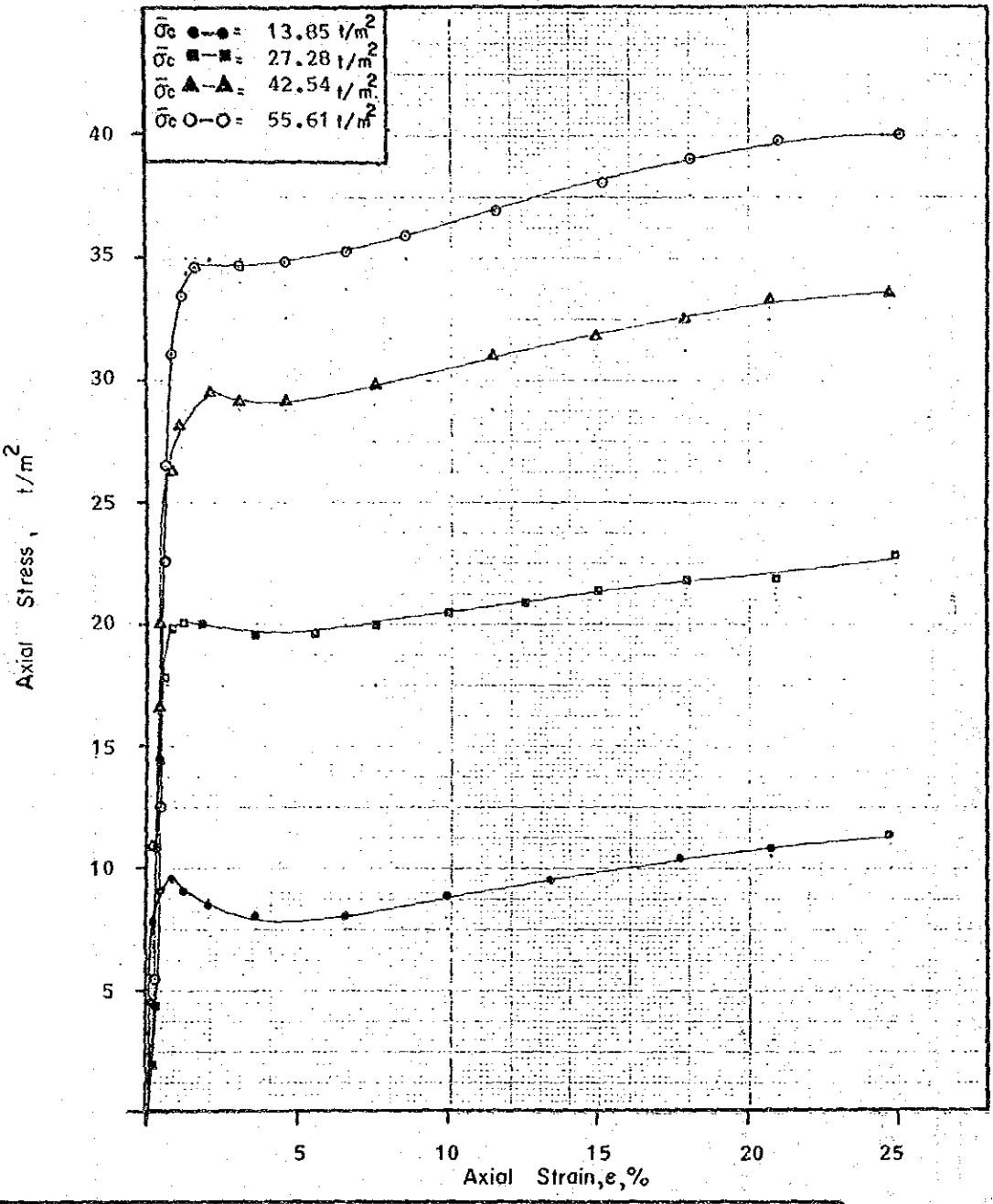
MATERIAL TESTING SECTION GEOLOGY AND SOIL ENGINEERING DIVISION.
SURVEY AND ECOLOGY DEPARTMENT, EGAT.

PROJECT. LAM TA KHONG
SAMPLE NO. PU-3 DATE. 25/10/33
DEPTH. 3.10-5.00 m.



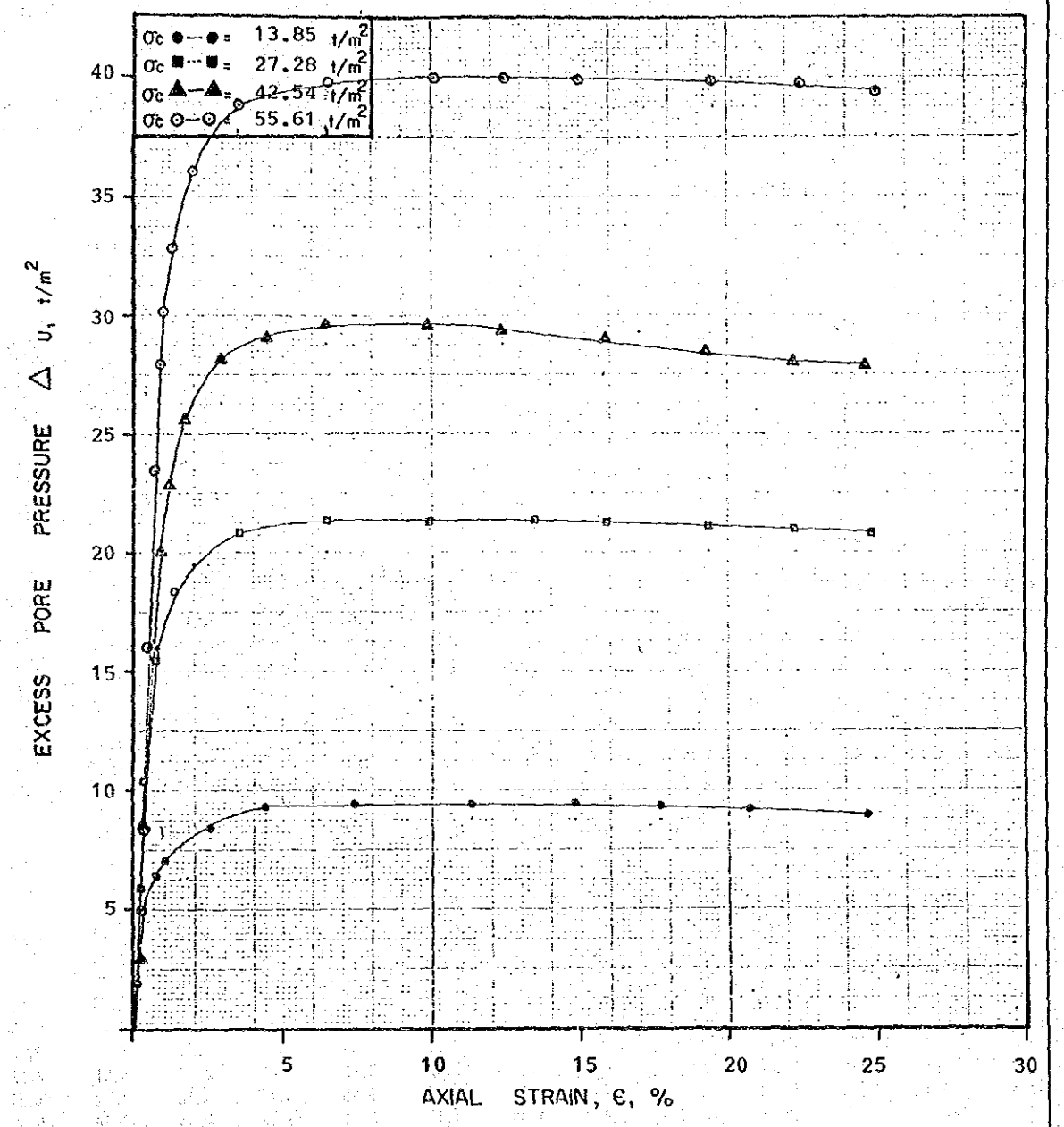
MATERIAL TESTING SECTION, GEOLOGY AND SOIL ENGINEERING DIVISION
SURVEY AND ECOLOGEY DEPARTMENT, EGAT.

STRESS – STRAIN CURVE



Project: LAM TA KHONG	Location:
Type of Test: $\overline{CIU}$	Boring No.: PU-3
Test No.:	Depth: 3.10-5.00 m.
Water Content 18.81-19.64 %	Sample Description:
Dry Unit Weight 1.671-1.683 t/m^3	By Compressi Stress $t/m.^2$

MATERIAL TESTING SECTION, GEOLOGY AND SOIL ENGINEERING DIVISION, SURVEY AND ECOLOGY DEPARTMENT, EGAT.	PORE PRESSURE VS. STRAIN



PROJECT. LAM TA KHONG	LOCATION.
TYPE OF TEST. $\overline{CIU}$	BORING NO. PU-3
TEST NO.	DEPTH 3.10-5.00 m.
WATER CONTENT. 18.81-19.64 %	SAMPLE DESCRIPTION
DRY UNIT WEIGHT. 1.671-1.683 t/m^3	TESTED BY
BY COMPRESSION STRESS t/m^2	

TRIAXIAL TEST RESULT

Material Testing Section, Geology and Soil Engineering Division, Survey and Ecology Department, EGAT.
Project LAM-TAKONG TP or RB PU-4 ,Depth = 0.00-5.00 m. ,Specimen No. = 1
Type of Specimen ,Strain rate (mm./min) = 0.1 ,Type of Test : CIU

Init.Heigh(cm.) = 20.37 ,Init.Diameter(cm) = 10.19 ,Init.Area (sq.cm.) = 81.553 VO= 1661.23
Cell Pressure = 50.00 psi., = 3.52 kg/sq.cm. ,Init.Pore Pressure rdg. = 30.300 psi. 2.13 kg/sq.cm
Back Pressure = 30.00 psi.,
Eff.Conf.Pressure = 19.70 psi., = 1.385 kg/sq.cm. ,Proving Ring Constant = 0.8259 kg/div.
Max Dry Density from Standard Proctor = 1.900 ton/cu.m at Optimum Water Content = 14.40 %
Dry Density from Compression Method = 1.792 ton/cu.m at Water Content = 17.03 % by Comp. Stress = 4.100 kgf/sq.cm
Percentage of Compression Dry Density = 94.32 % Sample Passing Sieve Number : 3/4 inch "B" Value= 96.43
Volume Change = 4.40 cc. Hc.= 20.35 cm. Vc= 1656.83 cc. Ac= 81.41 sq.cm
Preration date : 28/10/33 Saturation date : 29/10/33
Consolidation date: 29/10/33 Shearing date : 31/10/33

Deform. Load Dial		Pore(u)	Strain	Cor. Area	Dev.Stress	Excess u	Nor. DS	A-Para	Pl Eff.	P3 Eff.	Eff.P	Eff.Q
x0.01 mm. Rdg.(div)		x10E-1 psi	%	sq.cm	kg/sq.cm	kg/sq.cm			kg/sq.cm	kg/sq.cm	KG/SQ.CM	KG/SQ.CM
0.0	0.0	383	0.00	81.41	0.00	0.00	0.00	0.00	1.39	1.39	1.39	0.00
5.0	26.0	313	0.02	81.43	0.26	0.07	0.19	0.27	1.58	1.31	1.45	0.13
15.0	58.0	333	0.07	81.47	0.59	0.21	0.42	0.36	1.76	1.17	1.47	0.29
25.0	77.0	347	0.12	81.51	0.78	0.31	0.56	0.40	1.86	1.03	1.47	0.39
40.0	92.0	363	0.20	81.57	0.93	0.42	0.67	0.45	1.89	0.96	1.43	0.47
55.0	108.0	373	0.27	81.63	1.01	0.49	0.73	0.49	1.90	0.89	1.40	0.51
70.0	103.0	382	0.34	81.69	1.04	0.56	0.75	0.53	1.87	0.83	1.35	0.52
90.0	185.0	392	0.44	81.77	1.06	0.63	0.77	0.59	1.82	0.76	1.29	0.53
110.0	105.0	399	0.54	81.85	1.06	0.67	0.76	0.63	1.78	0.72	1.25	0.53
130.0	105.0	403	0.64	81.93	1.06	0.70	0.76	0.66	1.74	0.68	1.21	0.53
150.0	103.0	408	0.74	82.01	1.04	0.74	0.75	0.71	1.68	0.65	1.17	0.52
170.0	103.0	411	0.84	82.09	1.04	0.76	0.75	0.73	1.66	0.63	1.14	0.52
190.0	102.0	412	0.88	82.13	1.03	0.77	0.74	0.75	1.64	0.62	1.13	0.51
200.0	101.0	415	0.93	82.22	1.01	0.79	0.73	0.78	1.61	0.60	1.10	0.51
220.0	101.0	418	1.03	82.30	1.01	0.81	0.73	0.80	1.59	0.58	1.08	0.51
240.0	101.0	420	1.13	82.38	1.01	0.82	0.73	0.81	1.58	0.56	1.07	0.51
260.0	102.0	422	1.23	82.46	1.02	0.84	0.74	0.82	1.57	0.55	1.06	0.51
300.0	103.0	425	1.47	82.63	1.03	0.86	0.74	0.83	1.56	0.53	1.04	0.51
350.0	104.0	427	1.72	82.83	1.04	0.87	0.75	0.84	1.55	0.51	1.03	0.52
400.0	104.0	430	1.97	83.04	1.03	0.89	0.75	0.86	1.53	0.49	1.01	0.52
500.0	105.0	431	2.46	83.46	1.04	0.90	0.75	0.87	1.52	0.49	1.00	0.52
600.0	106.0	432	2.95	83.88	1.04	0.91	0.75	0.87	1.52	0.48	1.00	0.52
700.0	107.0	431	3.44	84.31	1.05	0.90	0.76	0.86	1.53	0.49	1.01	0.52
900.0	108.0	433	4.42	85.18	1.05	0.91	0.76	0.87	1.52	0.47	0.99	0.52
1100.0	110.0	434	5.40	86.06	1.06	0.92	0.76	0.87	1.52	0.46	0.99	0.53
1300.0	111.0	436	6.39	86.96	1.05	0.94	0.76	0.89	1.50	0.45	0.98	0.53
1500.0	112.0	439	7.37	87.89	1.05	0.96	0.76	0.91	1.48	0.43	0.96	0.53
1700.0	114.0	440	8.35	88.83	1.06	0.96	0.77	0.91	1.48	0.42	0.95	0.53
2000.0	116.0	443	9.83	90.28	1.06	0.98	0.77	0.93	1.46	0.40	0.93	0.53
2300.0	118.0	446	11.30	91.78	1.06	1.01	0.77	0.95	1.44	0.38	0.91	0.53
2500.0	120.0	447	12.28	92.81	1.07	1.01	0.77	0.95	1.44	0.37	0.91	0.53
2700.0	121.0	446	13.27	93.86	1.06	1.01	0.77	0.94	1.44	0.38	0.91	0.53
3000.0	125.0	449	14.74	95.48	1.08	1.03	0.78	0.95	1.44	0.36	0.90	0.54
3200.0	128.0	450	15.72	96.60	1.09	1.03	0.79	0.94	1.45	0.35	0.90	0.55
3600.0	133.0	450	17.69	98.98	1.11	1.03	0.80	0.93	1.46	0.35	0.91	0.56
3900.0	137.0	451	19.16	100.71	1.12	1.04	0.81	0.93	1.47	0.34	0.91	0.56
4200.0	140.0	451	20.64	102.53	1.13	1.04	0.81	0.92	1.47	0.34	0.91	0.56
4500.0	145.0	450	22.11	104.52	1.15	1.03	0.83	0.90	1.50	0.35	0.92	0.57
5000.0	152.0	450	24.57	107.92	1.16	1.03	0.84	0.89	1.51	0.35	0.93	0.58

TRIAXIAL TEST RESULT

Material Testing Section, Geology and Soil Engineering Division, Survey and Ecology Department, EGAT.
Project LAM-TAKONG TP or BH PB-4 ,Depth = 0.00-5.00 m. ,Specimen No. = 2
Type of Specimen - ,Strain rate (mm./min) = 0.1 ,Type of Test : CIU

Init.Heigh(cm.) = 20.37 ,Init.Diameter(cm) = 10.19 ,Init.Area (sq.cm.) = 81.553 VB= 1661.23
Cell Pressure = 70.00 psi., = 4.92 kg/sq.cm. ,Init.Pore Pressure rdg. = 29.000 psi. 2.04 kg/sq.cm
Back Pressure = 30.00 psi.,
Eff.Conf.Pressure = 41.00 psi., = 2.883 kg/sq.cm. ,Proving Ring Constant = 0.4232 kg/div.
Max Dry Density from Standard Proctor = 1.980 ton/cu.m at Optimum Water Content = 14.40 %
Dry Density from Compression Method = 1.795 ton/cu.m at Water Content = 16.91 % by Comp. Stress = 4.300 kgf/sq.cm
Percentage of Compression Dry Density = 94.47 % Sample Passing Sieve Number: 3/4 inch "B" Value= 92.97
Volume Change = 14.20 cc. Hc.= 20.31 cm. Vc= 1647.03 cc. Ac= 81.09 sq.cm
Preration date : 28/10/33 Saturation date : 29/10/33
Consolidation date: 29/10/33 Shearing date : 31/10/33

Before. Load Dial (0.01 mm.)	Dial (div)	Pore(u) KGF-1 psi	Strain %	Cor. Area sq.cm	Dev.Stress kg/sq.cm	Excess u kg/sq.cm	Nor. DS	A-Para	P1 Eff. kg/sq.cm	P3 Eff. kg/sq.cm	Eff.P KG/SQ.CM	Eff.3 KG/SQ.CM
0.0	0.0	290	0.00	81.89	0.00	0.00	0.00	0.00	2.00	2.00	2.00	0.00
5.0	33.0	291	0.02	81.11	0.17	0.01	0.06	0.04	3.05	2.03	2.96	0.09
15.0	45.0	292	0.07	81.15	0.23	0.01	0.08	0.06	3.10	2.07	2.99	0.12
25.0	50.0	293	0.12	81.19	0.26	0.02	0.09	0.08	3.12	2.08	2.99	0.13
40.0	56.0	295	0.20	81.25	0.29	0.04	0.10	0.12	3.14	2.05	2.99	0.15
55.0	61.0	297	0.27	81.31	0.32	0.05	0.11	0.16	3.15	2.03	2.99	0.16
70.0	66.0	298	0.34	81.37	0.34	0.06	0.12	0.16	3.17	2.03	3.00	0.17
90.0	65.0	299	0.44	81.45	0.34	0.06	0.12	0.19	3.16	2.02	2.99	0.17
110.0	85.0	301	0.54	81.53	0.44	0.08	0.15	0.18	3.25	2.01	3.03	0.22
130.0	202.0	322	0.64	81.61	1.05	0.22	0.36	0.21	3.71	2.66	3.18	0.52
150.0	301.0	349	0.74	81.69	1.56	0.41	0.54	0.27	4.03	2.47	3.25	0.78
170.0	354.0	378	0.84	81.77	1.83	0.56	0.64	0.31	4.15	2.32	3.24	0.92
190.0	368.0	377	0.89	81.81	1.90	0.61	0.66	0.32	4.17	2.27	3.22	0.95
210.0	389.0	398	0.98	81.89	2.01	0.70	0.70	0.35	4.19	2.18	3.18	1.01
220.0	400.0	399	1.03	81.97	2.07	0.77	0.72	0.37	4.18	2.12	3.15	1.03
240.0	402.0	405	1.13	82.06	2.07	0.81	0.72	0.39	4.15	2.07	3.11	1.04
260.0	404.0	409	1.23	82.14	2.08	0.84	0.72	0.40	4.13	2.05	3.09	1.04
300.0	407.0	414	1.48	82.38	2.09	0.87	0.73	0.42	4.10	2.01	3.06	1.05
350.0	409.0	427	1.72	82.51	2.10	0.96	0.73	0.46	4.02	1.92	2.97	1.05
400.0	411.0	431	1.97	82.72	2.10	0.99	0.73	0.47	3.99	1.89	2.94	1.05
500.0	413.0	440	2.46	83.13	2.10	1.05	0.73	0.50	3.93	1.83	2.88	1.05
600.0	415.0	449	2.95	83.55	2.10	1.12	0.73	0.53	3.87	1.76	2.82	1.05
700.0	417.0	457	3.45	83.98	2.10	1.17	0.73	0.56	3.81	1.71	2.76	1.05
900.0	423.0	475	4.43	84.85	2.11	1.30	0.73	0.62	3.69	1.58	2.64	1.05
1100.0	424.0	492	5.42	85.73	2.09	1.42	0.73	0.68	3.56	1.46	2.51	1.05
1300.0	429.0	509	6.40	86.63	2.10	1.54	0.73	0.73	3.44	1.34	2.39	1.05
1500.0	435.0	527	7.38	87.55	2.10	1.67	0.73	0.79	3.32	1.22	2.27	1.05
1700.0	440.0	544	8.37	88.49	2.10	1.79	0.73	0.85	3.20	1.10	2.15	1.05
2000.0	447.0	570	9.85	89.94	2.10	1.97	0.73	0.94	3.02	0.91	1.97	1.05
2300.0	453.0	595	11.32	91.44	2.10	2.14	0.73	1.02	2.83	0.74	1.79	1.05
2500.0	457.0	605	12.31	92.47	2.09	2.21	0.73	1.06	2.76	0.67	1.71	1.05
2700.0	464.0	609	13.29	93.52	2.10	2.24	0.73	1.07	2.74	0.64	1.69	1.05
3000.0	473.0	609	14.77	95.14	2.10	2.24	0.73	1.07	2.74	0.64	1.69	1.05
3200.0	478.0	610	15.75	96.25	2.10	2.25	0.73	1.07	2.73	0.63	1.68	1.05
3600.0	498.0	610	17.72	98.55	2.10	2.25	0.73	1.07	2.74	0.63	1.68	1.05
3900.0	496.0	609	19.20	100.36	2.09	2.24	0.73	1.07	2.73	0.64	1.69	1.05
4200.0	502.0	608	20.68	102.22	2.08	2.24	0.72	1.08	2.73	0.65	1.69	1.04
4500.0	510.0	608	22.15	104.16	2.07	2.24	0.72	1.08	2.72	0.65	1.68	1.04
5000.0	524.0	597	24.62	107.56	2.06	2.16	0.72	1.05	2.79	0.72	1.75	1.03

TRIAXIAL TEST RESULT

Material Testing Section, Geology and Soil Engineering Division, Survey and Ecology Department, EGAT.
Project LAM-TAKONG TP or BH PH-4 ,Depth = 0.60-5.00 m. ,Specimen No. = 3
Type of Specimen ,Strain rate (mm./min) = 0.1 ,Type of Test : CIU

Init.Height(cm.) = 20.37 ,Init.Diameter(cm) = 10.19 ,Init.Area (sq.cm.) = 81.553 VO= 1661.23
Cell Pressure = 90.00 psi., = 6.33 kg/sq.cm. ,Init.Pore Pressure rdg. = 28.000 psi. 2.01 kg/sq.cm
Back Pressure = 30.00 psi.,
Eff.Conf.Pressure = 61.40 psi., = 4.317 kg/sq.cm. ,Proving Ring Constant = 0.8259 kg/div.
Max Dry Density from Standard Proctor = 1.900 ton/cu.m at Optimum Water Content = 14.40 %
Dry Density from Compression Method = 1.797 ton/cu.m at Water Content = 16.60 % by Comp. Stress = 4.293 kgf/sq.cm
Percentage of Compression Dry Density = 94.58 % Sample Passing Sieve Number: 3/4 inch "B" Value= 93.25
Volume Change = 14.80 cc. Hc.= 20.31 cm. Vc= 1646.43 cc. Ac= 81.07 sq.cm
Preration date : 28/10/33 Saturation date : 28/10/33
Consolidation date: 29/10/33 Shearing date : 1/10/33

Deform. Load Dial (0.01 mm.)	Rdg.(div)	Pore(u) x10E-1 psi	Strain %	Cor. Area sq.cm	Dev.Stress kg/sq.cm	Excess u kg/sq.cm	Nor. DS	A-Para	P1 Eff. kg/sq.cm	P3 Eff. kg/sq.cm	Eff.P KG/SQ.CM	Eff.Q KG/SQ.CM
0.0	0.0	286	0.00	81.07	0.00	0.00	0.00	0.00	4.32	4.32	4.32	0.00
5.0	12.0	293	0.02	81.09	0.12	0.03	0.03	0.23	4.41	4.29	4.35	0.06
15.0	22.0	301	0.07	81.13	0.22	0.11	0.05	0.47	4.44	4.21	4.32	0.11
25.0	38.0	311	0.12	81.17	0.31	0.18	0.07	0.58	4.45	4.14	4.29	0.15
40.0	38.0	320	0.20	81.23	0.39	0.30	0.09	0.76	4.41	4.02	4.21	0.19
55.0	43.0	341	0.27	81.29	0.44	0.39	0.10	0.89	4.37	3.93	4.15	0.22
70.0	45.0	351	0.34	81.35	0.46	0.46	0.11	1.00	4.32	3.86	4.09	0.23
90.0	47.0	364	0.44	81.43	0.48	0.55	0.11	1.15	4.25	3.77	4.01	0.24
110.0	47.0	374	0.54	81.51	0.48	0.62	0.11	1.32	4.17	3.70	3.94	0.24
130.0	52.0	389	0.64	81.59	0.53	0.72	0.12	1.38	4.12	3.59	3.86	0.26
150.0	113.0	432	0.74	81.67	1.14	1.03	0.26	0.90	4.43	3.29	3.86	0.57
170.0	286.0	586	0.84	81.75	2.88	1.55	0.48	0.74	4.85	2.77	3.81	1.04
190.0	228.0	532	0.99	81.79	2.38	1.73	0.53	0.75	4.89	2.59	3.74	1.15
200.0	253.0	567	0.98	81.87	2.55	1.98	0.59	0.77	4.89	2.34	3.62	1.28
220.0	265.0	593	1.08	81.95	2.67	2.16	0.62	0.81	4.83	2.16	3.49	1.34
240.0	272.0	618	1.18	82.04	2.74	2.28	0.63	0.83	4.78	2.04	3.41	1.37
260.0	277.0	625	1.28	82.12	2.79	2.38	0.65	0.86	4.72	1.93	3.33	1.39
300.0	282.0	658	1.48	82.28	2.83	2.56	0.66	0.90	4.59	1.76	3.17	1.42
350.0	285.0	669	1.72	82.49	2.85	2.69	0.66	0.94	4.48	1.62	3.05	1.43
400.0	286.0	683	1.97	82.70	2.86	2.79	0.66	0.98	4.38	1.53	2.95	1.43
500.0	289.0	698	2.46	83.11	2.87	2.90	0.67	1.01	4.29	1.42	2.86	1.44
600.0	291.0	702	2.95	83.53	2.88	2.92	0.67	1.02	4.27	1.39	2.83	1.44
700.0	295.0	707	3.45	83.96	2.91	2.96	0.67	1.02	4.27	1.36	2.81	1.46
900.0	300.0	712	4.43	84.83	3.00	3.00	0.69	1.00	4.32	1.32	2.82	1.50
1100.0	303.0	723	5.42	85.71	2.97	3.07	0.69	1.04	4.21	1.24	2.73	1.48
1300.0	311.0	727	6.40	86.61	2.97	3.18	0.69	1.05	4.18	1.22	2.70	1.48
1500.0	317.0	730	7.39	87.53	2.99	3.12	0.69	1.04	4.19	1.28	2.69	1.50
1700.0	322.0	732	8.37	88.47	3.01	3.14	0.70	1.04	4.19	1.18	2.68	1.50
2000.0	333.0	731	9.85	89.92	3.06	3.13	0.71	1.02	4.25	1.19	2.72	1.53
2300.0	343.0	731	11.32	91.42	3.10	3.13	0.72	1.01	4.29	1.19	2.74	1.55
2500.0	351.0	732	12.31	92.45	3.14	3.14	0.73	1.00	4.32	1.18	2.75	1.57
2700.0	360.0	731	13.29	93.50	3.18	3.13	0.74	0.98	4.37	1.19	2.78	1.59
3000.0	372.0	729	14.77	95.12	3.23	3.11	0.75	0.96	4.43	1.20	2.82	1.62
3200.0	382.0	727	15.76	96.23	3.28	3.10	0.76	0.95	4.49	1.22	2.86	1.64
3600.0	397.0	724	17.73	98.53	3.33	3.00	0.77	0.93	4.57	1.24	2.90	1.66
3900.0	408.0	723	19.20	100.33	3.36	3.07	0.78	0.91	4.60	1.24	2.92	1.68
4200.0	416.0	724	20.68	102.20	3.36	3.00	0.78	0.92	4.60	1.24	2.92	1.68
4500.0	426.0	721	22.16	104.14	3.38	3.06	0.78	0.91	4.64	1.26	2.95	1.69
5000.0	442.0	720	24.62	107.54	3.39	3.05	0.79	0.90	4.66	1.27	2.96	1.70

TRIAXIAL TEST RESULT

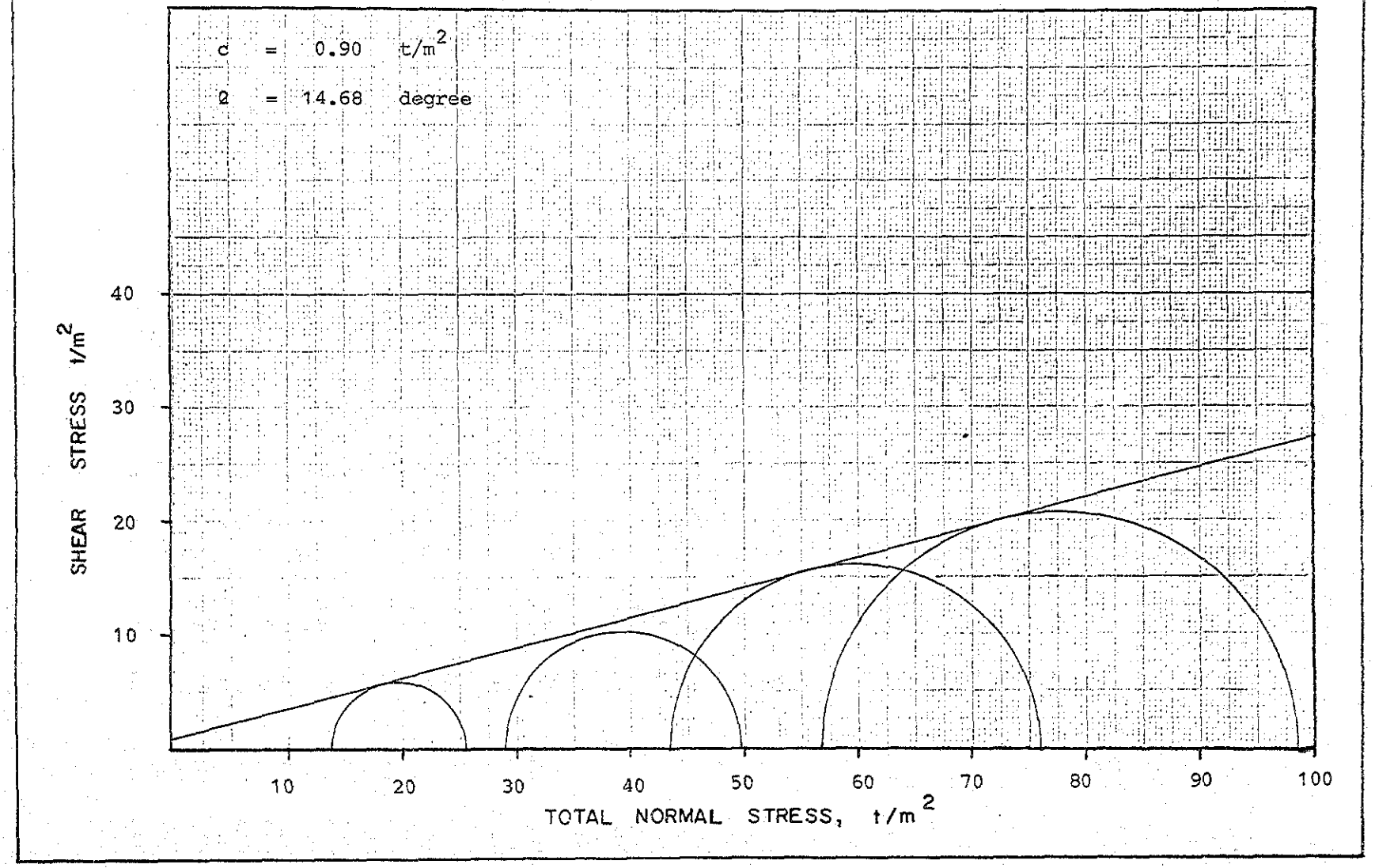
Material Testing Section, Geology and Soil Engineering Division, Survey and Ecology Department, EGAT.
Project LAM-TAKONG TP or BH PU-4 ,Depth = 0.60-5.00 m. ,Specimen No. = 4
Type of Specimen ,Strain rate (mm./min) = 0.1 ,Type of Test : CIU

Init.Heigh(cm.) = 20.37 ,Init.Diameter(cm) = 10.19 ,Init.Area (sq.cm.) = 81.553 V0= 1661.23
Cell Pressure = 110.00 psi., = 7.74 kg/sq.cm. ,Init.Pore Pressure rdg. = 29.400 psi. 2.07 kg/sq.cm
Back Pressure = 30.00 psi.,
Eff.Conf.Pressure = 80.68 psi., = 5.667 kg/sq.cm. ,Proving Ring Constant = 0.4232 kg/div.
Max Dry Density from Standard Procter = 1.900 ton/cu.m at Optimum Water Content = 14.40 %
Dry Density from Compression Method = 1.793 ton/cu.m at Water Content = 17.03 % by Comp. Stress = 4.378 kgf/sq.cm
Percentage of Compression Dry Density = 94.37 % Sample Passing Sieve Number: 3/4 inch "B" Value= 92.55
Volume Change = 35.86 cc. Hc.= 20.22 cm. Vc= 1625.43 cc. Ac= 80.37 sq.cm
Preration date : 28/10/33 Saturation date : 28/10/33
Consolidation date: 29/10/33 Shearing date : 1/10/33

Before: Load Dial kg/0.01 sq.Rdg.(div)	Pore(u) X10E-1 psi	Strain %	Cor. Area sq.cm	Dev.Stress kg/sq.cm	Excess u kg/sq.cm	Nor. BS	A-Para	P1 Eff. kg/sq.cm	P3 Eff. kg/sq.cm	Eff.P KG/SQ.CM	Eff.Q KG/SQ.CM
0.0	0.0	294	0.00	80.37	0.00	0.00	0.00	0.00	5.67	5.67	5.67	0.00
5.0	36.0	303	0.02	80.39	0.19	0.04	0.03	0.22	5.81	5.62	5.72	0.09
15.0	255.0	329	0.07	80.43	1.34	0.25	0.24	0.18	6.76	5.42	6.09	0.67
25.0	455.0	373	0.12	80.47	2.39	0.56	0.42	0.23	7.50	5.11	6.31	1.20
40.0	588.0	436	0.20	80.53	3.07	1.00	0.55	0.32	7.75	4.67	6.21	1.54
55.0	654.0	493	0.27	80.59	3.43	1.46	0.61	0.41	7.70	4.27	5.98	1.72
70.0	692.0	540	0.35	80.65	3.63	1.73	0.64	0.48	7.57	3.94	5.75	1.82
90.0	724.0	589	0.45	80.73	3.80	2.07	0.67	0.55	7.39	3.59	5.49	1.90
110.0	743.0	628	0.54	80.81	3.89	2.35	0.69	0.60	7.21	3.32	5.26	1.95
130.0	753.0	663	0.66	80.89	3.94	2.59	0.70	0.66	7.01	3.07	5.04	1.97
150.0	762.0	704	0.74	80.97	3.98	2.80	0.70	0.72	6.77	2.78	4.78	1.99
170.0	765.0	725	0.84	81.05	3.99	3.03	0.70	0.76	6.63	2.64	4.63	2.00
190.0	766.0	737	0.89	81.09	4.00	3.11	0.71	0.78	6.55	2.55	4.55	2.00
210.0	767.0	750	0.99	81.18	4.00	3.21	0.71	0.80	6.46	2.46	4.46	2.00
230.0	767.0	766	1.09	81.26	3.99	3.32	0.70	0.83	6.34	2.35	4.35	2.00
250.0	767.0	776	1.19	81.34	3.99	3.39	0.70	0.85	6.27	2.28	4.27	2.00
270.0	765.0	786	1.29	81.42	3.98	3.46	0.70	0.87	6.18	2.21	4.20	1.99
300.0	759.0	816	1.48	81.58	3.94	3.67	0.69	0.93	5.93	2.00	3.97	1.97
350.0	756.0	825	1.73	81.79	3.91	3.73	0.69	0.95	5.85	1.93	3.89	1.96
400.0	753.0	833	1.98	81.99	3.89	3.79	0.69	0.98	5.76	1.88	3.82	1.94
500.0	749.0	842	2.47	82.41	3.85	3.85	0.68	1.00	5.66	1.81	3.74	1.92
600.0	748.0	852	2.97	82.83	3.82	3.92	0.67	1.03	5.57	1.74	3.65	1.91
700.0	749.0	860	3.46	83.25	3.81	3.98	0.67	1.05	5.49	1.69	3.59	1.90
900.0	755.0	869	4.45	84.12	3.88	4.04	0.67	1.06	5.42	1.62	3.52	1.90
1100.0	766.0	874	5.44	85.00	3.81	4.08	0.67	1.07	5.48	1.59	3.53	1.91
1300.0	782.0	876	6.43	85.89	3.85	4.09	0.68	1.06	5.43	1.57	3.50	1.93
1500.0	800.0	878	7.42	86.81	3.90	4.11	0.69	1.05	5.46	1.56	3.51	1.95
1700.0	817.0	879	8.41	87.75	3.94	4.11	0.70	1.04	5.49	1.55	3.52	1.97
2000.0	845.0	879	9.89	89.19	4.01	4.11	0.71	1.03	5.56	1.55	3.56	2.00
2300.0	871.0	881	11.37	90.69	4.06	4.13	0.72	1.02	5.60	1.54	3.57	2.03
2500.0	889.0	888	12.36	91.71	4.10	4.12	0.72	1.00	5.65	1.55	3.60	2.05
2700.0	910.0	888	13.35	92.76	4.15	4.12	0.73	0.99	5.70	1.55	3.62	2.08
3000.0	933.0	877	14.83	94.37	4.18	4.10	0.74	0.98	5.75	1.57	3.66	2.09
3200.0	950.0	876	15.82	95.48	4.21	4.09	0.74	0.97	5.79	1.57	3.68	2.11
3600.0	972.0	875	17.80	97.78	4.21	4.08	0.74	0.97	5.79	1.58	3.69	2.10
3900.0	990.0	876	19.28	99.57	4.21	4.09	0.74	0.97	5.78	1.57	3.68	2.10
4200.0	1000.0	874	20.77	101.44	4.17	4.03	0.74	0.98	5.76	1.59	3.67	2.09
4500.0	1016.0	872	22.25	103.37	4.16	4.06	0.73	0.98	5.76	1.68	3.69	2.08
5000.0	1029.0	872	24.72	106.77	4.08	4.06	0.72	1.00	5.68	1.68	3.64	2.04

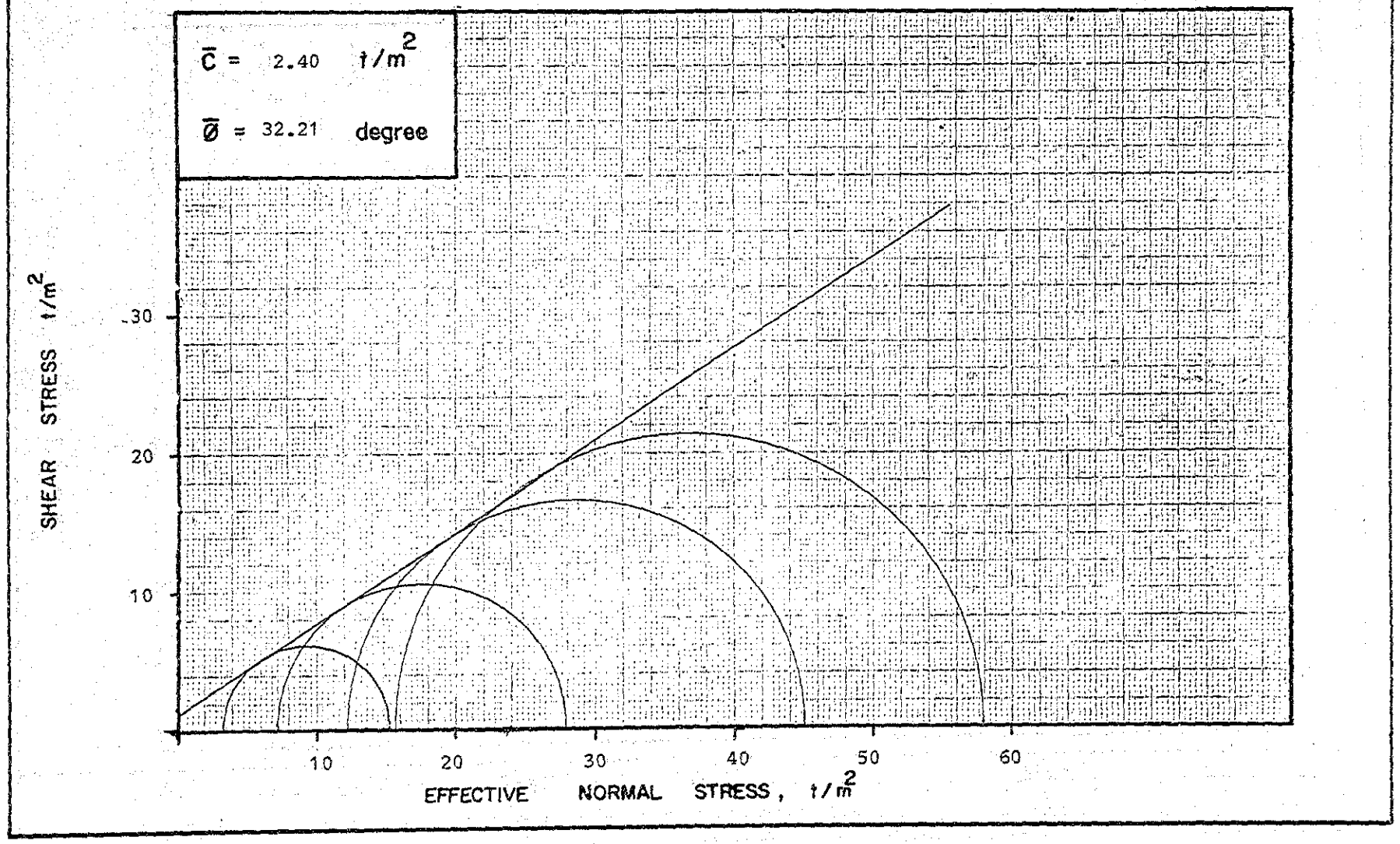
MATERIAL TESTING SECTION GEOLOGY AND SOIL ENGINEERING DIVISION
SURVEY AND ECOLOGEY DEPARTMENT, EGAT.

PROJECT	LAM TA KHONG
SAMPLE NO.	PU-4
DEPT 0.60-5.00 m.	DATE. 2/11/33



MATERIAL TESTING SECTION, GEOLOGY AND SOIL ENGINEERING DIVISION
SURVEY AND ECOLOGY DEPARTMENT, EGAT.

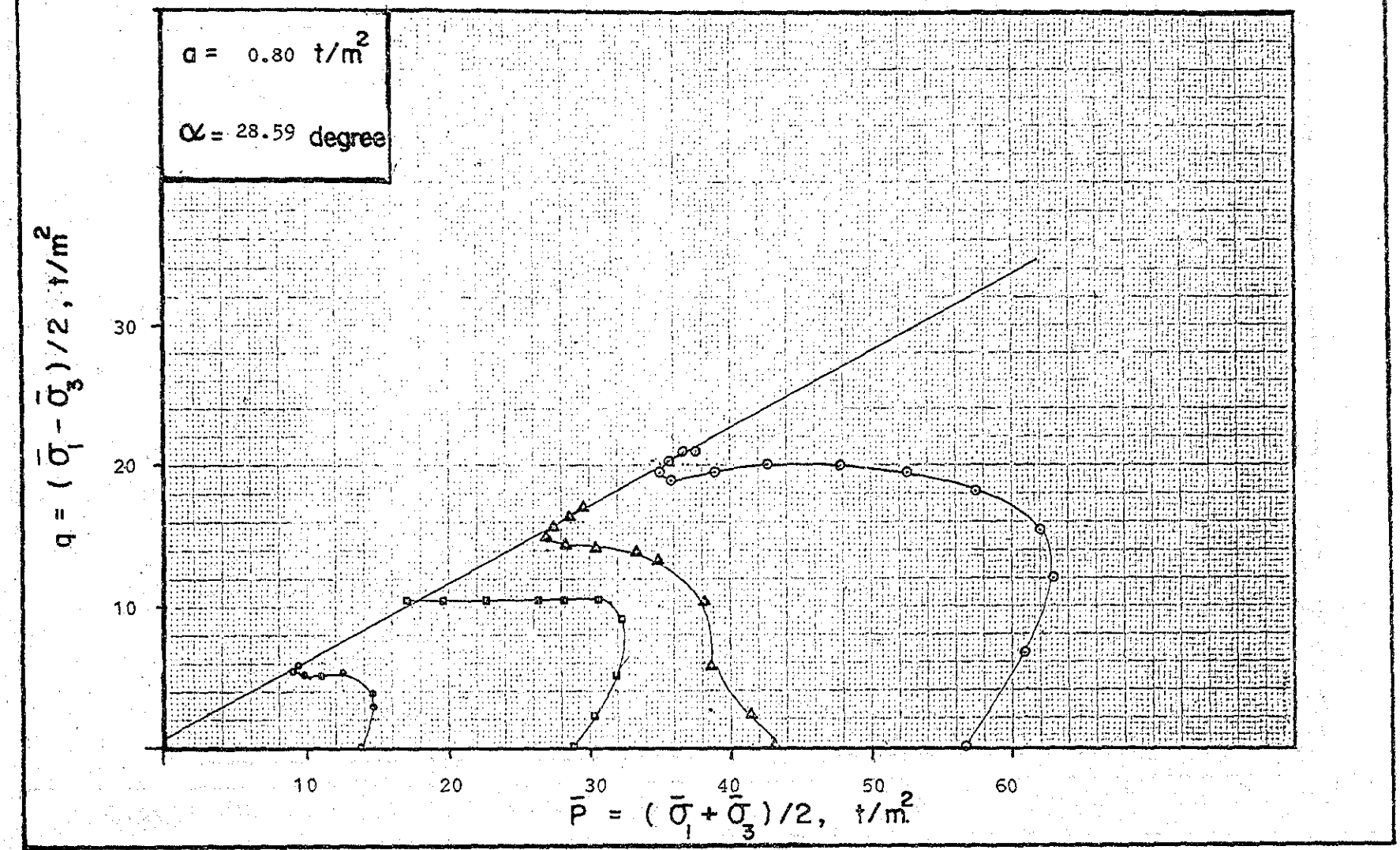
PROJECT. LAM TA KHONG
SAMPLE NO. PU-4
DEPTH 0.60-5.00m. DATE. 2/11/33



TR - 5

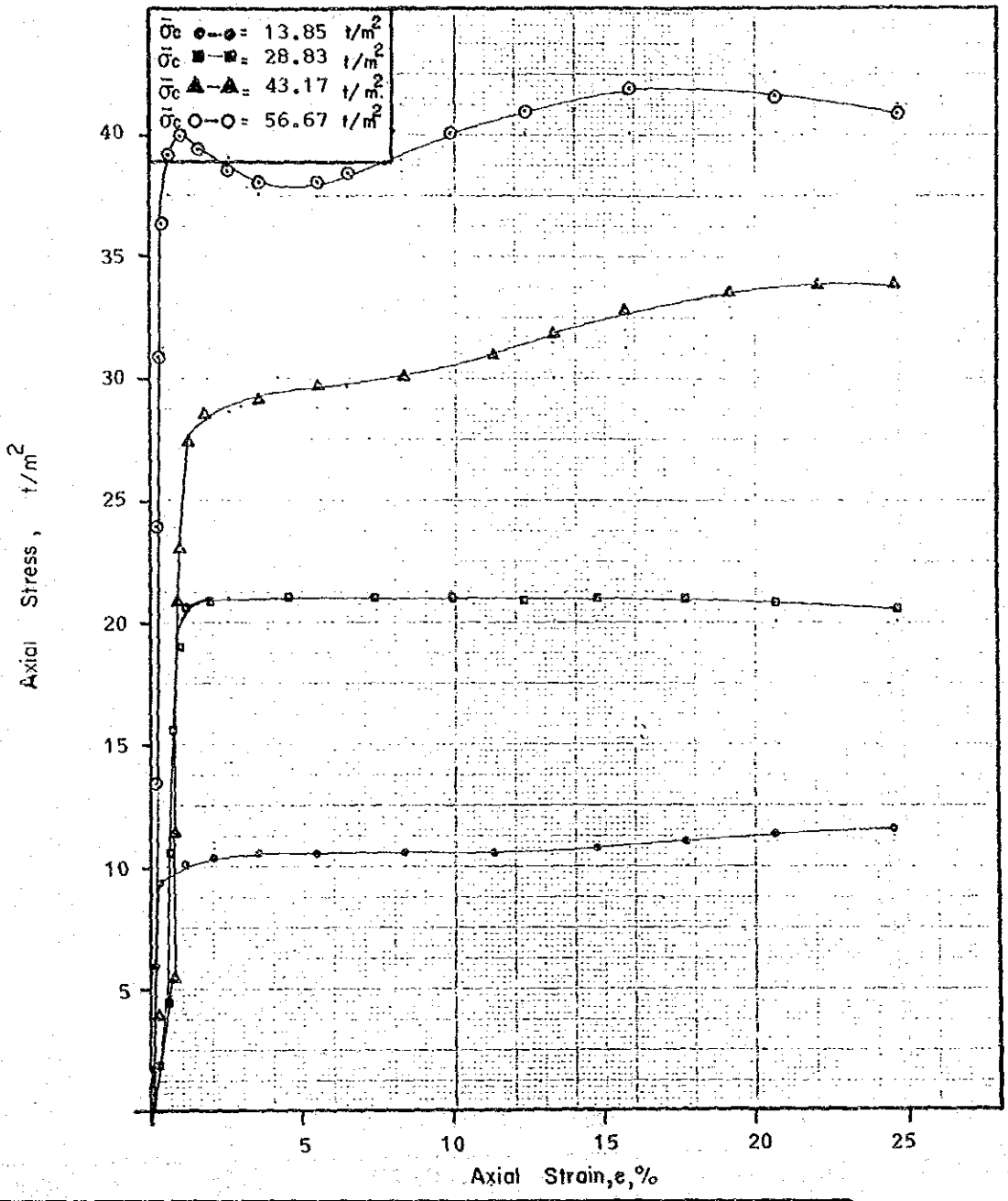
MATERIAL TESTING SECTION GEOLOGY AND SOIL ENGINEERING DIVISION.
SURVEY AND ECOLOGY DEPARTMENT, EGAT.

PROJECT.	LAM TA KHONG
SAMPLE NO.	PU-4
DATE	12/11/33
DEPTH.	m.



MATERIAL TESTING SECTION, GEOLOGY AND SOIL ENGINEERING DIVISION
SURVEY AND ECOLOGEY DEPARTMENT, EGAT.

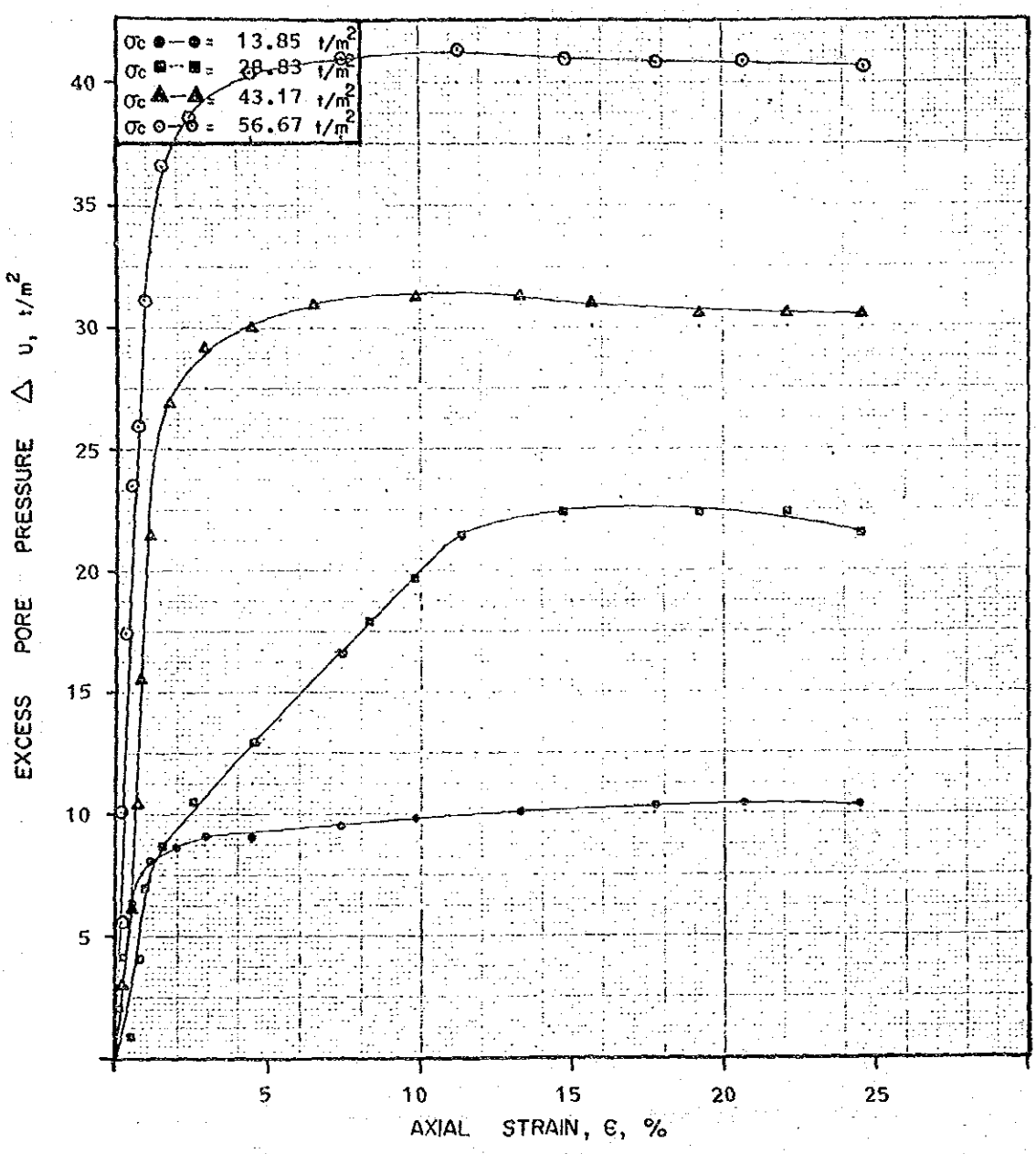
STRESS – STRAIN CURVE



Project: LAM TA KHONG	Location:
Type of Test: $\overline{CIU}$	Boring No.: PU-4
Test No.:	Depth.: 0.60-5.00 m.
Water Content 16.68-17.03 %	Sample Description:
Dry Unit Weight 1.792-1.797 t/m^3	By Compressi Stress t/m^2

MATERIAL TESTING SECTION,
GEOLOGY AND SOIL ENGINEERING DIVISION,
SURVEY AND ECOLOGY DEPARTMENT, EGAT.

PORE PRESSURE VS. STRAIN



PROJECT. LAM TA KHONG	LOCATION.
TYPE OF TEST. $\overline{CIU}$	BORING NO. PU-4
TEST NO.	DEPTH 0.60-5.00 m.
WATER CONTENT. 16.68-17.03 %	SAMPLE DESCRIPTION
DRY UNIT WEIGHT. 1.792-1.797 t/m³	TESTED BY
BY COMPRESSION STRESS t/m²	

A-10 TEST DATA FOR CONCRETE AGGREGATE

A-10-(1) SPECIFIC GRAVITY AND ABSORPTION
A-10-(2) GRAIN SIZE DISTRIBUTION
A-10-(3) ABRASION TEST DATA
A-10-(4) SOUNDNESS TEST DATA
A-10-(5) CRUSHING VALUE TEST DATA

MATERIAL TESTING SECTION
GEOLOGY & SOIL ENG. DIV.
PROJECT PLANNING & INVEST. DEPARTMENT.
EGAT

SPECIFIC GRAVITY, ABSORPTION

Project LAM TA KHONG Date 5/8/33.

Sample Description DOLOMITIC LIMESTONE Tested by สุรพล

Location SILA SAKOL PATANA QUARRY Checked by ประสิทธิ์

Sample No. SA-1

Data : Weight of basket (1) 2309.8 gm.

Weight of basket + dry sample (2) 9458.81 gm.

Weight of basket in water (3) 2019 gm.

Weight of basket in water + Sat. sample in water (4) 6552 gm.

Weight of basket + Sat. surface-dry sample (5) 9518.9 gm.

Result : Weight of dry sample (2) - (1) = A 7149.01 gm.

Weight of sat. surface-dry sample (5) - (1) = B 7209.1 gm.

Weight of sat. sample in water (4) - (3) = C 4533 gm.

Bulk sp. gr. $\frac{A}{B-C}$ 2.67

Bulk sp. gr. (Sat. surface-dry basis) $\frac{B}{B-C}$ 2.69

Apparent sp. gr. $\frac{A}{A-C}$ 2.73

% Absorption $\frac{B-A}{A} \times 100$ 0.84 %

MATERIAL TESTING SECTION
GEOLOGY & SOIL ENG. DIV.
PROJECT PLANNING & INVEST. DEPARTMENT.
EGAT

SPECIFIC GRAVITY, ABSORPTION

Project LAM TAKHONG Date 13/12/33

Sample Description SANDSTONE Tested by ประมวล

Location SANDSSTONE QUARRY Checked by ประสิทธิ์

Sample No. SA-2

Data : Weight of basket (1) 2308.69 gm.

Weight of basket + dry sample (2) 9177.34 gm.

Weight of basket in water (3) 2020.00 gm.

Weight of basket in water + Sat. sample in water (4) 6151.0 gm.

Weight of basket + Sat. surface-dry sample (5) 9367.1 gm.

Result : Weight of dry sample (2) - (1) = A 6868.65 gm.

Weight of sat. surface-dry sample (5) - (1) = B 7058.41 gm.

Weight of sat. sample in water (4) - (3) = C 4131.0 gm.

Bulk sp. gr. $\frac{A}{B-C}$ 2.35

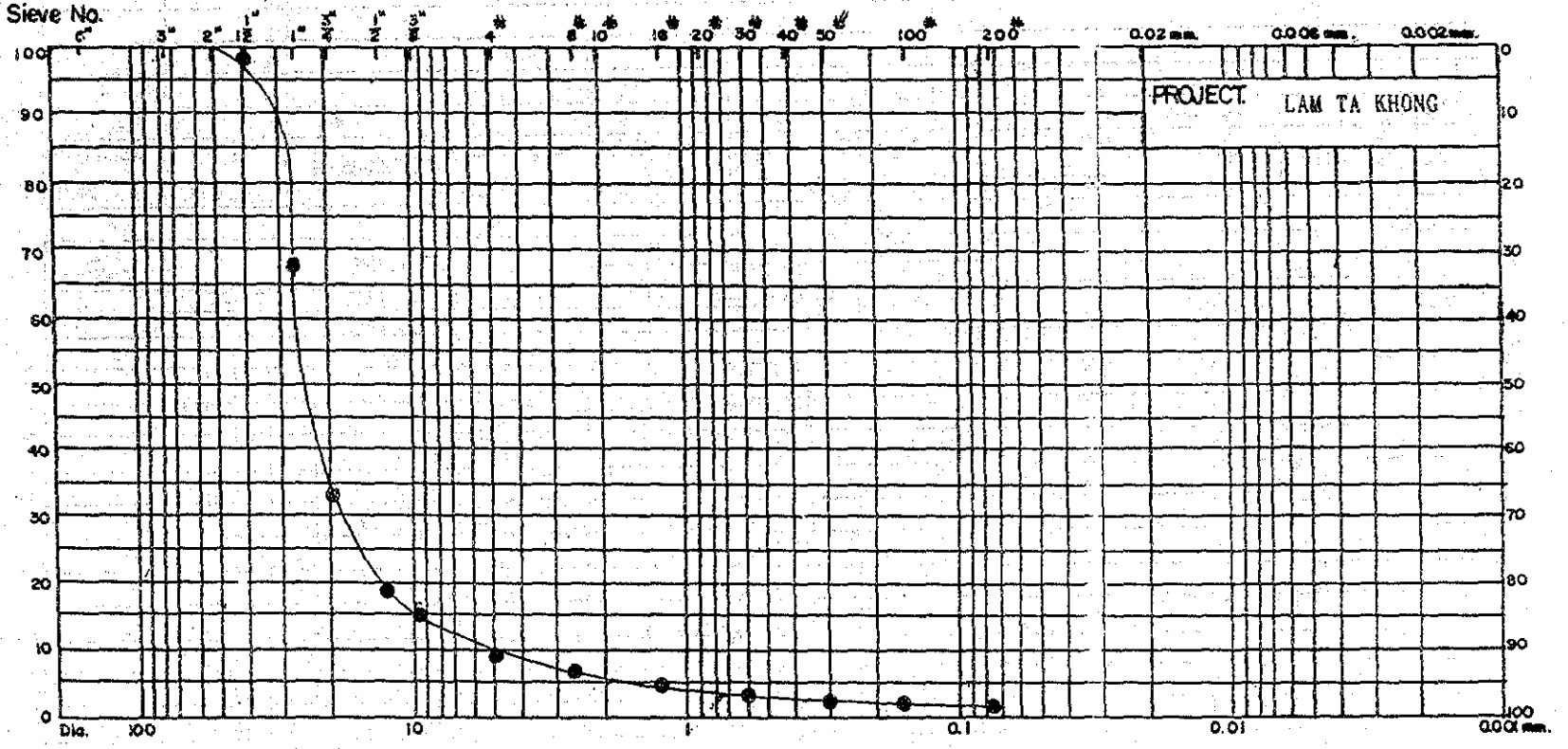
Bulk sp. gr. (Sat. surface-dry basis) $\frac{B}{B-C}$ 2.41

Apparent sp. gr. $\frac{A}{A-C}$ 2.51

% Absorption $\frac{B-A}{A} \times 100$ 2.76 %

Fig. Grain Size Distribution

Material testing section. EGAT.

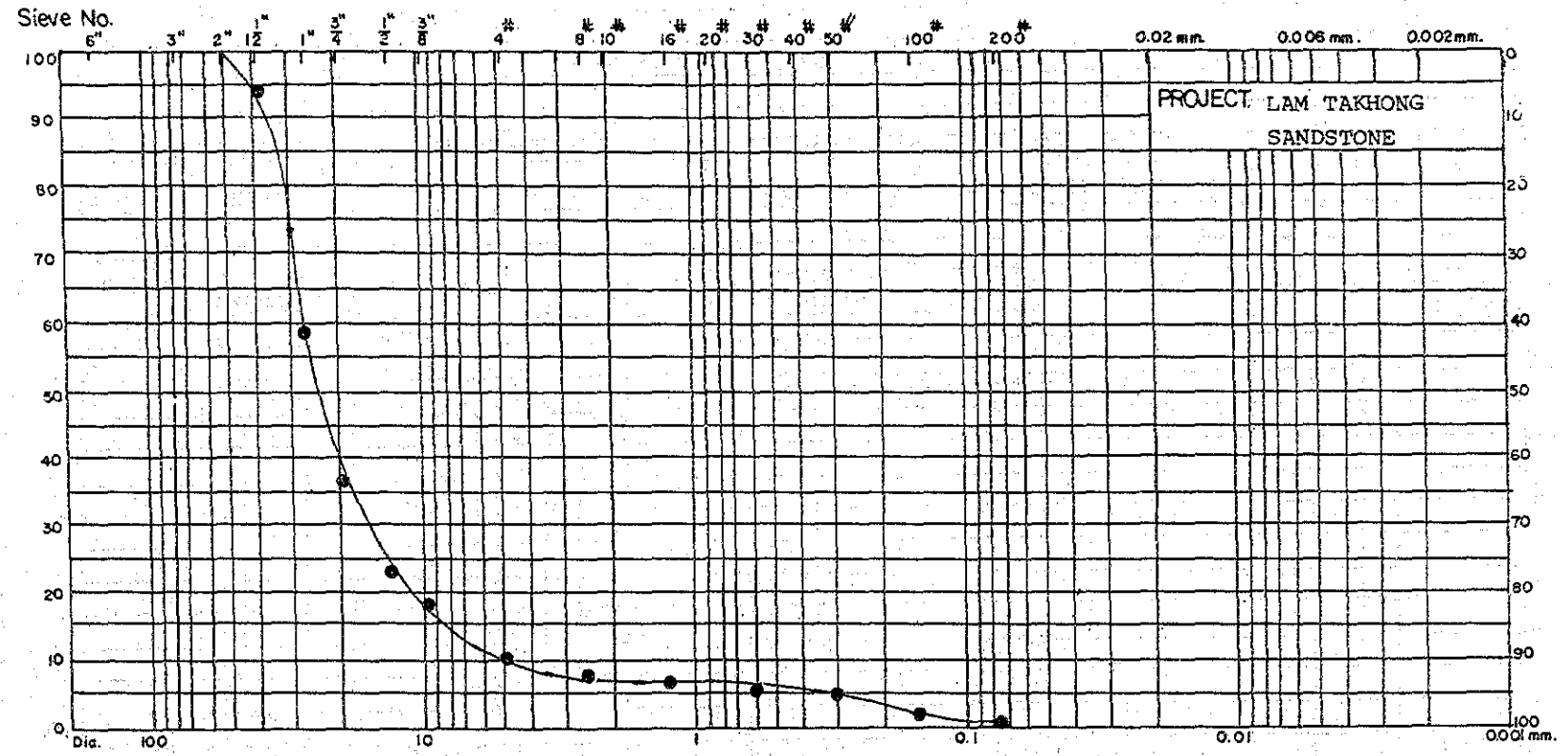


M.I.T	GRAVEL			SAND			SILT	CLAY
	Coarse	Medium	Fine	Coarse	Medium	Fine		
AASHO ASTM	GRAVEL			SAND			SILT	CLAY
				Coarse		Fine		

SAMPLE NUMBER	DEPTH. (m)	SYMBOL	SOIL CLASSIFICATION	SPECIFIC GRAVITY	ORGANIC IMPURITY TEST COLOR	SOUNDNESS % LOSS	Cu	Cc	FM
SA-1		●	GW	2.73			5.40	2.40	7.22
			PERCENTAGE OF PASSING SIEVE # 200 = 2.47 %						

Fig Grain Size Distribution

Material testing section. EGAT.



M.I.T	GRAVEL			SAND			SILT	CLAY
	Coarse	Medium	Fine	Coarse	Medium	Fine		
AASHO ASTM	GRAVEL			SAND			SILT	CLAY
				Coarse		Fine		

SAMPLE NUMBER	DEPTH (m)	SYMBOL	SOIL CLASSIFICATION	SPECIFIC GRAVITY	ORGANIC IMPURITY TEST COLOR	SOUNDNESS % LOSS	Cu	Cc	FM
SA-2		●	GW	2.35			5.71	2.11	7.14

ABRASION TEST OF COARSE AGGREGATE BY LOS ANGELES MACHINE

MATERIAL TESTING SECTION
GEOLOGY AND SOIL ENGINEERING DIV
SURVER & ECOLOGY
DEPARTMENT. EGAT

MATERIAL SA-1 DOLOMITIC LIMESTONE
LOCATION SILA SAKOL PATANA QUARRY
GRADING A
NUMBER OF ABRASIVE CHARGE 12

TEST BY สุรพล
DATE 8/8/33
TEST NO 1 OF
NUMBER OF REVOLUTIONS 500
WEIGHT OF CHARGE 5000 gm

Sieve Size		Weight (gm)	Accumulated Wt. (gm.)	Remark
Passing	Retained on			
1½"	1"	1251.3	1251.3	-
1"	3/4"	1250.0	2501.3	-
3/4"	1/2"	1250.7	3752.0	-
1/2"	3/8"	1250.48	5002.48	-
Total Weights of Sample 5002.48 gm.				

Original weight of sample (W_0) = 5002.48 gm.
Weight of sample (W_{100}) = 4730.49 gm.
Weight of sample (W_f) = 3775.79 gm.
Percentage of wear $\frac{(W_0 - W_f)}{W_0} \times 100$ = 24.52 %
Uniform hardness factor $\frac{W_0 - W_{100}}{W_0 - W_f}$ = 0.22

ABRASION TEST OF COARSE AGGREGATE BY LOS ANGELES MACHINE

MATERIAL TESTING SECTION
GEOLOGY AND SOIL ENGINEERING DIV
SURVER & ECOLOGY
DEPARTMENT. EGAT

MATERIAL SANDSTONE, SA-2 LAM TAKHONG
LOCATION SANDSTONE QUARRY
GRADING A
NUMBER OF ABRASIVE CHARGE 12

TEST BY ประมวล
DATE 21/12/33
TEST NO. 1 OF 3
NUMBER OF REVOLUTIONS 500
WEIGHT OF CHARGE 5000 gm

Sieve Size		Weight (gm)	Accumulated Wt. (gm.)	Remark
Passing	Retained on			
1½"	1"	1249.32	1249.32	-
1"	3/4"	1251.04	2500.36	-
3/4"	1/2"	1251.24	3751.60	-
1/2"	3/8"	1250.28	5001.88	-
Total Weights of Sample 5001.88 gm.				

Original weight of sample (W_o) = 5001.88 gm.
Weight of sample (W_{100}) = 4633.91 gm.
Weight of sample (W_f) = 3248.21 gm.
Percentage of wear $\frac{(W_o - W_f)}{W_o} \times 100$ = 35.06 %
Uniform hardness factor $\frac{W_o - W_{100}}{W_o - W_f}$ = 0.21

ABRASION TEST OF COARSE AGGREGATE BY LOS ANGELES MACHINE

MATERIAL TESTING SECTION
GEOLOGY AND SOIL ENGINEERING DIV
SURVER & ECOLOGY
DEPARTMENT. EGAT

MATERIAL SANDSSTONE, SA-2 LAM TAKHONG
LOCATION SANDSTONE QUARRY
GRADING A
NUMBER OF ABRASIVE CHARGE 12

TEST BY ประมวล
DATE 21/12/33
TEST NO 2 OF 3
NUMBER OF REVOLUTIONS 500
WEIGHT OF CHARGE 5000 gm

Sieve Size		Weight (gm)	Accumulated Wt. (gm.)	Remark
Passing	Retained on			
1½"	1"	1251.96	1251.96	-
1"	3/4"	1249.53	2501.49	-
3/4"	1/2"	1251.77	3753.26	-
1/2"	3/8"	1250.19	5003.45	-
Total Weights of Sample 5003.45 gm.				

Original weight of sample (W_o) = 5003.45 gm.
Weight of sample (W_{100}) = 4653.86 gm.
Weight of sample (W_f) = 3291.46 gm.
Percentage of wear $\frac{(W_o - W_f)}{W_o} \times 100$ = 34.22 %
Uniform hardness factor $\frac{W_o - W_{100}}{W_o - W_f}$ = 0.20

ABRASION TEST OF COARSE AGGREGATE BY LOS ANGELES MACHINE

MATERIAL TESTING SECTION
GEOLOGY AND SOIL ENGINEERING DIV
SURVER & ECOLOGY
DEPARTMENT. EGAT

MATERIAL SANDSTONE, SA-2
LAM TAKHONG

LOCATION SANDSTONE QUARRY

GRADING A

NUMBER OF ABRASIVE CHARGE 12

TEST BY ประมวล

DATE 21/12/33

TEST NO 3 OF 3

NUMBER OF REVOLUTIONS 500

WEIGHT OF CHARGE 5000 gm

Sieve Size		Weight (gm)	Accumulated Wt. (gm.)	Remark
Passing	Retained on			
1½"	1"	1252.77	1252.77	-
1"	3/4"	1250.91	2503.68	-
3/4"	1/2"	1250.83	3754.51	-
1/2"	3/8"	1250.33	5004.84	-
Total Weights of Sample 5004.84 gm.				

Original weight of sample (W_o) = 5004.84 gm.

Weight of sample (W_{100}) = 4652.76 gm.

Weight of sample (W_f) = 3297.96 gm.

Percentage of wear $\frac{(W_o - W_f)}{W_o} \times 100$ = 34.10 %

Uniform hardness factor $\frac{W_o - W_{100}}{W_o - W_f}$ = 0.21

MATERIAL TESTING SECTION
GEOLOGY & SOIL ENGINEERING DIV.
SURVER & ECOLOGY
DEPARTMENT. EGAT.

SOUNDNESS TEST

PROJECT LAM TA KHONG
LOCATION SILA SAKOL PATANA QUARRY
SAMPLE SA-1

USED SOLUTION SODIUM SULFATE
DATE 9/8/33
TESTED BY สุรพล

Sieve size		(A) Original	Wt. of test fraction	Wt. retaining on designated	Wt. of actual	(B) Actual	Corrected weighted
Passing	Retain on	Grading (%)	Before test (gm)	Sieve after test (gm)	loss (gm)	loss %	percentageloss $C=\frac{AB}{100}$
		0.96	-	-	-	2.11	0.02
1 1/2"	1"	31.34	1000.06	979.0	21.06	2.11	0.66
1"	3/4"	34.47	500.11	484.55	15.56	3.11	1.07
3/4"	1/2"	13.78	669.42	643.2	26.22	3.92	0.54
1/2"	3/8"	3.59	330.77	314.11	16.66	5.04	0.18
3/8"	4"	6.22	300.42	285.25	15.17	5.05	0.31
		9.64	-	-	-	5.05	0.49
Total		100	2800.78				3.27

Constituent	No of Particles	Splitting	Crumbling	Cracking	Flaking	Sound	Total
1 1/2"-1"	21	1	-	-	-	20	21
1"-3/4"	20	1	-	-	-	19	20

SOUNDNESS TEST

MATERIAL TESTING SECTION
GEOLOGY & SOIL ENGINEERING DIV.
SURVER & ECOLOGY
DEPARTMENT. EGAT.

PROJECT LAM TAKHONG
LOCATION SANDSTONE QUARRY
SAMPLE SANDSTONE, SA-2

USED SOLUTION SODIUM SULFATE
DATE 17/12/33
TESTED BY ประมวล

Sieve size		(A) Original	Wt. of test fraction	Wt. retaining on designated	Wt. of actual	(B) Actual	Corrected weighted
Passing	Retain on	Grading (%)	Before test (gm)	Sieve after test (gm)	loss (gm)	loss %	percentageloss $C=\frac{AB}{100}$
2"	1½"	5.48	-	-	-	-	0.01
1½"	1"	35.74	1023.60	1022.15	1.45	0.14	0.05
1"	¾"	22.38	507.85	506.37	1.48	0.29	0.07
¾"	½"	13.57	670.72	658.82	1.90	0.28	0.04
½"	⅜"	5.14	331.28	328.11	3.17	0.96	0.05
⅜"	4"	6.95	301.68	306.77	0.91	0.30	0.02
4"	PAN	10.74	-	-	-	-	0.03
Total		100	2835.13				0.27

Constituent	No of Particles	Splitting	Crumbling	Cracking	Flaking	Sound	Total
1½"-1"	23	-	-	-	5	18	23
1"-¾"	33	-	-	-	6	27	33

CRUSHING VALUE TEST - BS 812

Job..LAM TAKHONG..... Date..19/12/33.....

Material..SANDSTONE, SA-2..... Tested by..ประมาณ.....

Location..SANDSTONE QUARRY.....

Wt. of mold.....	(gm)	10649.7	10649.7
Wt. of mold + rock.....	(gm)	12978.8	12936.4
Wt. of rock (A).....	(gm)	2329.1	2286.7
Wt. of container.....	(gm)	-	-
Wt. of container + rock fragment finer than # 8 sieve.....	(gm)	-	-
		1785.46	1758.9
Wt. of rock fragment finer than # 8 sieve (B).....	(gm)	543.64	528.1
Percentage fines = $\frac{B}{A}$ x 100.....	%	23.34	23.
Crushing Value.....	%	23.22 %	

ข้อแนะนำ

๑. การกระทุ้งหินตัวอย่างขั้นละ ๒๕ ครั้ง นั้นควรยกก้านกระทุ้งสูง ๕ ซม.

๒. การหาน้ำหนักส่วนที่ละเอียดผ่านตะแกรง # ๘ อาจหาได้จากการคำนวณโดยใช้น้ำหนักตัวอย่างทั้งหมดที่ใช้ลบด้วยน้ำหนักหินที่ค้างตะแกรง # ๘

๓. ขนาดหินตัวอย่างที่ใช้ทดสอบต้องผ่านตะแกรง ๕/๘" และค้าง ๓/๘"

*** FLATNESS AND SLENDERNESS TEST ***

PROJECT. LAMTA KHONG
LOCATION QUARRY SANDSTONE
TESTED BY:PBC

SAMPLE SIZE(inch) 4# - 3/8
NOMINAL SIZE , NS 7.125 mm
DATE 22/12/90

No.	Length a.	Width b.	Thickness c.	a/b	c/b	a/NS	c/NS	EL	FK	REMARK
1	21.80	8.80	8.10	2.48	0.92	3.06	1.14	1	0	NS =
2	23.90	13.90	7.00	1.72	0.50	3.35	0.98	1	0	NOMINAL
3	26.00	12.00	4.80	2.17	0.40	3.65	0.67	1	0	SIZE OF
4	19.50	11.10	5.00	1.76	0.45	2.74	0.70	1	0	PARTICLE
5	20.90	5.50	5.20	3.80	0.95	2.93	0.73	1	0	
6	24.10	9.10	2.90	2.65	0.32	3.38	0.41	1	1	
7	20.00	7.20	7.00	2.78	0.97	2.81	0.98	1	0	
8	18.40	9.50	2.50	1.94	0.26	2.58	0.35	1	1	
9	19.50	8.50	5.60	2.29	0.66	2.74	0.79	1	0	
10	18.50	7.00	3.90	2.64	0.56	2.60	0.55	1	1	
11	25.30	9.30	5.20	2.72	0.56	3.55	0.73	1	0	
12	16.10	15.50	7.20	1.04	0.46	2.26	1.01	1	0	
13	19.60	10.00	4.50	1.96	0.45	2.75	0.63	1	0	
14	20.20	10.20	6.00	1.98	0.59	2.84	0.84	1	0	
15	17.00	9.80	5.50	1.73	0.56	2.39	0.77	1	0	
16	18.70	11.10	3.20	1.68	0.29	2.62	0.45	1	1	
17	21.10	8.00	3.90	2.64	0.49	2.96	0.55	1	1	
18	18.90	8.10	7.50	2.33	8.10	2.65	1.05	1	0	
19	17.50	11.80	3.20	1.48	0.27	2.46	0.45	1	1	
20	19.50	9.20	4.40	2.12	0.48	2.74	0.62	1	0	
21	24.00	11.50	4.20	2.09	0.37	3.37	0.59	1	1	
22	37.50	11.50	5.20	3.26	0.45	5.26	0.73	1	0	
23	26.00	11.50	3.40	2.26	0.30	3.65	0.48	1	1	
24	19.80	9.20	4.50	2.15	0.49	2.78	0.63	1	0	
25	21.40	10.80	5.00	1.98	0.46	3.00	0.70	1	0	
26	17.50	12.20	2.70	1.43	0.22	2.46	0.38	1	1	
27	22.80	9.50	6.20	2.40	0.65	3.20	0.87	1	0	
28	23.10	7.30	5.80	3.16	0.79	3.24	0.81	1	0	
29	22.40	7.10	4.00	3.15	0.56	3.14	0.56	1	1	
30	21.00	9.50	7.00	2.21	0.74	2.95	0.98	1	0	
TOTAL	642.00	295.70	150.60	68.02	23.27			30	10	
AVERAGE	21.40	9.86	5.02	2.27	0.78	3.00	0.70			
MAX				3.80	8.10					
MIN				1.04	0.22					
STDEV				0.60	1.40			EL INDEX	FK INDEX	
COUNTING				30	30			1.00	0.33	

*** FLATNESS AND SLENDERNESS TEST ***

PROJECT: LANTA KHONG
LOCATION QUARRY SANDSTONE
TESTED BY: PBC

SAMPLE SIZE(inch) 3/8 - 5/8
NOMINAL SIZE , NS 12.75 mm
DATE 22/12/90

No.	Length a.	Width b.	Thickness c.	a/b	c/b	a/NS	c/NS	EL	FK	REMARK
1	27.00	16.00	4.20	1.69	0.26	2.12	0.33	1	1	NS =
2	28.80	16.20	9.80	1.78	0.60	2.26	0.77	1	0	NOMINAL
3	25.80	17.00	4.80	1.52	0.28	2.02	0.38	1	1	SIZE OF
4	26.00	17.20	11.30	1.51	0.66	2.04	0.89	1	0	PARTICLE
5	32.10	20.00	7.90	1.61	0.40	2.52	0.62	1	0	
6	23.20	17.30	4.40	1.34	0.25	1.82	0.35	1	1	
7	30.20	18.80	6.40	1.61	0.34	2.37	0.50	1	1	
8	26.00	15.40	10.10	1.69	0.66	2.04	0.79	1	0	
9	34.20	19.70	7.80	1.74	0.40	2.68	0.61	1	0	
10	25.20	15.10	7.20	1.67	0.48	1.98	0.56	1	1	
11	30.80	17.80	9.00	1.73	0.51	2.42	0.71	1	0	
12	24.50	11.00	4.20	2.23	0.38	1.92	0.33	1	1	
13	29.30	18.00	10.40	1.63	0.58	2.30	0.82	1	0	
14	28.50	17.60	4.00	1.62	0.23	2.24	0.31	1	1	
15	27.00	18.00	12.30	1.50	0.68	2.12	0.96	1	0	
16	28.00	14.20	12.80	1.97	0.90	2.20	1.00	1	0	
17	27.50	17.90	13.10	1.54	0.73	2.16	1.03	1	0	
18	32.60	18.00	8.20	1.81	8.10	2.56	0.64	1	0	
19	29.50	19.20	9.40	1.54	0.49	2.31	0.74	1	0	
20	33.50	15.50	7.50	2.16	0.48	2.63	0.59	1	1	
21	30.10	16.80	11.30	1.79	0.67	2.36	0.89	1	0	
22	28.20	18.10	8.50	1.56	0.47	2.21	0.67	1	0	
23	35.80	18.30	12.10	1.96	0.66	2.81	0.95	1	0	
24	38.50	17.40	11.30	2.21	0.65	3.02	0.89	1	0	
25	34.10	18.10	9.00	1.88	0.50	2.67	0.71	1	0	
26	38.50	16.50	11.80	2.33	0.72	3.02	0.93	1	0	
27	39.50	17.80	8.50	2.22	0.48	3.10	0.67	1	0	
28	37.50	15.20	12.10	2.47	0.80	2.94	0.95	1	0	
29	34.50	18.00	11.50	1.92	0.64	2.71	0.90	1	0	
30	36.50	14.00	11.20	2.61	0.80	2.86	0.88	1	0	
TOTAL	922.90	510.10	272.10	54.81	23.79			30	8	
AVERAGE	30.76	17.00	9.07	1.83	0.79	2.41	0.71			
MAX				2.61	8.10					
MIN				1.34	0.23					
STDEV				0.32	1.39			EL INDEX	FK INDEX	
COUNTING				30	30			1.00	0.27	

*** FLATNESS AND SLENDERNESS TEST ***

PROJECT. LAMTA KHONG
LOCATION QUARRY SANDSTONE
TESTED BY:PEC

SAMPLE SIZE(inch) 5/8 - 3/4
NOMINAL SIZE , NS 17.46 mm
DATE 22/12/90

No.	Length a.	Width b.	Thickness c.	a/b	c/b	a/NS	c/NS	EL	FK	REMARK
1	32.00	20.00	11.80	1.60	0.59	1.83	0.68	1	0	NS =
2	33.30	20.20	7.10	1.65	0.35	1.91	0.41	1	1	NOMINAL
3	31.30	23.00	6.80	1.36	0.30	1.79	0.39	0	1	SIZE OF
4	33.50	24.00	10.10	1.40	0.42	1.92	0.58	1	1	PARTICLE
5	34.00	12.40	6.50	2.74	0.52	1.95	0.37	1	1	
6	31.50	27.20	12.30	1.16	0.45	1.80	0.70	1	0	
7	29.50	16.80	16.50	1.76	0.98	1.69	0.95	0	0	
8	32.30	26.20	7.40	1.23	0.28	1.85	0.42	1	1	
9	31.50	19.80	15.90	1.59	0.80	1.80	0.91	1	0	
10	27.20	17.20	17.00	1.58	0.99	1.56	0.97	0	0	
11	27.50	21.20	11.50	1.30	0.54	1.58	0.66	0	0	
12	32.20	16.00	15.90	2.01	0.99	1.84	0.91	1	0	
13	30.10	20.00	11.00	1.51	0.55	1.72	0.63	0	0	
14	36.10	21.50	7.80	1.68	0.36	2.07	0.45	1	1	
15	38.20	20.80	16.80	1.84	0.81	2.19	0.96	1	0	
16	34.00	21.60	15.00	1.57	0.69	1.95	0.86	1	0	
17	34.00	20.20	15.80	1.68	0.78	1.95	0.90	1	0	
18	36.70	26.50	13.80	1.38	8.10	2.10	0.79	1	0	
19	33.80	25.10	15.20	1.35	0.61	1.94	0.87	1	0	
20	34.00	24.00	9.50	1.42	0.40	1.95	0.54	1	1	
21	35.30	22.70	11.50	1.56	0.51	2.02	0.66	1	0	
22	36.20	19.40	15.80	1.87	0.81	2.07	0.90	1	0	
23	39.20	21.50	12.20	1.82	0.57	2.25	0.70	1	0	
24	35.50	22.40	10.50	1.58	0.47	2.03	0.60	1	0	
25	44.10	16.50	7.70	2.67	0.47	2.53	0.44	1	1	
26	40.20	18.20	15.50	2.21	0.85	2.30	0.89	1	0	
27	40.00	18.50	11.50	2.16	0.62	2.29	0.66	1	0	
28	46.40	21.30	8.50	2.18	0.40	2.66	0.49	1	1	
29	44.20	24.70	18.50	1.79	0.75	2.53	1.06	1	0	
30	51.90	25.80	9.50	2.01	0.37	2.97	0.54	1	1	
TOTAL	1065.70	634.70	364.90	51.65	25.34			25	10	
AVERAGE	35.52	21.16	12.16	1.72	0.84	2.03	0.70			
MAX				2.74	8.10					
MIN				1.16	0.28					
STDEV				0.39	1.39			EL INDEX	FK INDEX	
COUNTING				30	30			0.83	0.33	

*** FLATNESS AND SLENDERNESS TEST ***

PROJECT. LAMTA KHONG
LOCATION QUARRY SANDSTONE
TESTED BY:PBC

SAMPLE SIZE(inch) 3/4 - 1
NOMINAL SIZE , NS 22.2 mm
DATE 22/12/90

No.	Length a.	Width b.	Thickness c.	a/b	c/b	a/NS	c/NS	EL	FK	REMARK
1	65.00	22.50	21.60	2.89	0.96	2.93	0.97	1	0	NS =
2	57.80	28.90	16.70	2.00	0.58	2.60	0.76	1	0	NOMINAL
3	51.80	28.70	18.90	1.80	0.66	2.33	0.85	1	0	SIZE OF
4	52.10	24.80	17.50	2.10	0.71	2.35	0.79	1	0	PARTICLE
5	50.30	31.00	19.00	1.62	0.61	2.27	0.86	1	0	
6	47.70	27.10	16.00	1.76	0.59	2.15	0.72	1	0	
7	47.30	20.90	14.70	2.26	0.70	2.13	0.66	1	0	
8	48.30	30.00	14.80	1.61	0.49	2.18	0.67	1	0	
9	46.80	28.00	17.10	1.74	0.61	2.20	0.77	1	0	
10	40.00	23.20	22.00	1.72	0.95	1.80	0.99	1	0	
11	44.10	23.70	14.40	1.86	0.61	1.99	0.65	1	0	
12	39.50	22.00	18.70	1.80	0.85	1.78	0.84	0	0	
13	42.50	23.80	17.90	1.79	0.75	1.91	0.81	1	0	
14	48.90	26.00	17.10	1.88	0.66	2.20	0.77	1	0	
15	40.50	27.50	13.70	1.47	0.50	1.82	0.62	1	0	
16	42.40	25.00	16.50	1.70	0.66	1.91	0.74	1	0	
17	52.20	28.70	21.00	1.82	0.73	2.35	0.95	1	0	
18	44.60	24.90	13.10	1.79	0.10	2.01	0.59	1	1	
19	45.20	28.00	20.80	1.61	0.74	2.04	0.94	1	0	
20	48.40	34.60	7.50	1.40	0.22	2.18	0.34	1	1	
21	37.20	23.40	15.00	1.59	0.64	1.68	0.68	0	0	
22	40.10	27.70	12.40	1.45	0.45	1.81	0.56	1	1	
23	43.40	27.50	8.80	1.58	0.32	1.95	0.40	1	1	
24	47.30	30.20	4.10	1.57	0.14	2.13	0.18	1	1	
25	45.10	21.90	14.40	2.06	0.66	2.03	0.65	1	0	
26	39.40	23.10	18.90	1.71	0.82	1.77	0.85	0	0	
27	36.40	28.22	11.90	1.29	0.42	1.64	0.54	0	1	
28	44.40	31.80	9.90	1.40	0.31	2.00	0.45	1	1	
29	42.00	24.30	17.50	1.73	0.72	1.89	0.79	1	0	
30	35.50	23.40	9.80	1.52	0.42	1.60	0.44	0	1	
TOTAL	1368.20	790.82	461.90	52.51	25.58			25	8	
AVERAGE	45.61	26.36	15.40	1.75	0.85	2.05	0.69			
MAX				2.89	0.10					
MIN				1.29	0.14					
STDEV				3.06	1.38			EL INDEX	FK INDEX	
COUNTING				30	30			0.83	0.27	

*** FLATNESS AND SLENDERNESS TEST ***

PROJECT. LANTA KHONG
LOCATION QUARRY SANDSTONE
TESTED BY:PBC

SAMPLE SIZE(inch) 1 - 1 1/4
NOMINAL SIZE , NS 28.45 mm
DATE 22/12/90

No.	Length a.	Width b.	Thickness c.	a/b	c/b	a/NS	c/NS	EL	FK	REMARK
1	79.00	40.00	13.45	1.98	0.34	2.78	0.47	1	1	NS =
2	62.00	40.50	15.00	1.53	0.37	2.18	0.53	1	1	NOMINAL
3	64.45	31.85	19.95	2.02	0.63	2.27	0.70	1	0	SIZE OF
4	63.45	41.00	14.75	1.55	0.36	2.23	0.52	1	1	PARTICLE
5	56.60	31.85	19.30	1.78	0.61	1.99	0.68	1	0	
6	75.20	37.20	9.10	2.02	0.24	2.64	0.32	1	1	
7	56.60	38.00	27.50	1.49	0.72	1.99	0.97	1	0	
8	56.00	32.00	28.50	1.75	0.89	1.97	1.00	1	0	
9	62.20	37.00	14.20	1.68	0.38	2.19	0.50	1	1	
10	60.25	39.80	21.20	1.51	0.53	2.12	0.75	1	0	
11	52.40	31.00	19.00	1.69	0.61	1.84	0.67	1	0	
12	55.20	32.40	22.40	1.70	0.69	1.94	0.79	1	0	
13	51.10	28.90	18.70	1.77	0.65	1.80	0.66	0	0	
14	50.50	30.10	15.30	1.68	0.51	1.78	0.54	0	1	
15	47.30	32.00	15.15	1.48	0.47	1.66	0.53	0	1	
16	46.00	37.10	10.90	1.24	0.29	1.62	0.38	0	1	
17	49.60	41.80	11.00	1.19	0.26	1.74	0.39	0	1	
18	50.00	33.95	16.20	1.47	0.10	1.76	0.57	0	1	
19	46.20	32.00	21.00	1.44	0.66	1.62	0.74	0	0	
20	37.35	32.30	13.50	1.16	0.42	1.31	0.47	0	1	
21	42.40	33.80	19.60	1.25	0.58	1.49	0.69	0	0	
22	45.80	34.00	23.40	1.35	0.69	1.61	0.82	0	0	
23	43.30	34.60	24.10	1.25	0.70	1.52	0.85	0	0	
24	43.60	39.00	13.50	1.12	0.35	1.53	0.48	0	1	
25	5.00	31.20	13.40	0.16	0.43	0.18	0.47	0	1	
26	51.80	28.40	22.30	1.82	0.79	1.82	0.78	1	0	
27	38.50	33.50	17.90	1.15	0.53	1.35	0.63	0	0	
28	51.10	32.20	27.70	1.59	0.86	1.80	0.97	0	0	
29	44.30	34.50	13.90	1.28	0.40	1.56	0.49	0	1	
30	40.70	39.10	14.80	1.04	0.38	1.43	0.52	0	1	
TOTAL	1527.90	1041.05	536.80	44.14	23.44			13	15	
AVERAGE	50.93	34.70	17.89	1.47	0.78	1.79	0.63			
MAX				2.02	8.10					
MIN				0.16	0.24					
STDEV				0.37	1.39			EL INDEX	FK INDEX	
COUNTING				30	30			0.43	0.50	

*** FLATNESS AND SLENDERNESS TEST ***

PROJECT. LAMTA KHONG
LOCATION QUARRY SANDSTONE
TESTED BY:PBC

SAMPLE SIZE(inch) 1 1/4 - 1 1/2
NOMINAL SIZE , NS 34.8 mm
DATE 22/12/90

No.	Length a.	Width b.	Thickness c.	a/b	c/b	a/NS	c/NS	EL	FK	REMARK
1	65.20	47.35	20.10	1.80	0.42	2.45	0.58	1	1	NS =
2	61.15	35.00	30.25	1.75	0.86	1.76	0.87	0	0	NOMINAL
3	61.30	39.15	15.70	1.57	0.40	1.76	0.45	0	1	SIZE OF
4	63.90	38.10	23.20	1.68	0.61	1.84	0.67	1	0	PARTICLE
5	61.95	41.80	21.90	1.48	0.52	1.78	0.63	0	0	
6	59.30	46.70	20.60	1.27	0.44	1.70	0.59	0	1	
7	52.00	39.00	19.20	1.33	0.49	1.49	0.55	0	1	
8	71.10	36.30	21.10	1.96	0.58	2.04	0.61	1	0	
9	62.80	48.40	20.60	1.30	0.43	1.80	0.59	1	1	
10	62.70	36.40	19.00	1.72	0.52	1.80	0.55	1	1	
11	59.20	42.80	27.70	1.38	0.65	1.70	0.80	0	0	
12	52.20	46.40	25.35	1.13	0.56	1.50	0.74	0	0	
13	54.70	37.10	30.00	1.47	0.81	1.57	0.86	0	0	
14	46.25	38.55	29.95	1.20	0.78	1.33	0.86	0	0	
15	70.45	45.10	11.60	1.56	0.26	2.02	0.33	1	1	
16	51.10	43.90	30.30	1.16	0.69	1.47	0.87	0	0	
17	81.35	52.70	23.25	1.54	0.44	2.34	0.67	1	0	
18	55.70	42.60	15.20	1.31	0.10	1.60	0.44	0	1	
19	69.50	44.00	15.80	1.58	0.36	2.00	0.45	1	1	
20	66.20	36.60	20.00	1.81	0.55	1.90	0.57	1	1	
21	51.30	37.30	20.45	1.38	0.55	1.47	0.59	0	1	
22	64.50	43.35	15.55	1.50	0.36	1.85	0.45	1	1	
23	60.25	30.50	29.85	1.98	0.98	1.73	0.86	0	0	
24	54.35	37.45	16.35	1.45	0.44	1.56	0.48	0	1	
25	52.30	49.45	27.80	1.06	0.56	1.50	0.80	0	0	
26	62.80	40.50	16.20	1.55	0.40	1.80	0.47	1	1	
27	47.20	39.65	31.05	1.19	0.78	1.36	0.89	0	0	
28	55.95	43.35	20.45	1.28	0.47	1.61	0.59	0	1	
29	59.30	41.45	17.00	1.43	0.41	1.70	0.49	0	1	
30	59.30	45.35	26.70	1.32	0.59	1.70	0.77	0	0	
TOTAL	1815.30	1246.20	663.10	44.12	24.02			11	16	
AVERAGE	60.51	41.54	22.10	1.47	0.80	1.74	0.64			
MAX				1.98	8.10					
MIN				1.06	0.26					
STDEV				2.40	1.39			EL INDEX	FK INDEX	
COUNTING				30	30			0.37	0.53	

*** FLATNESS AND SLENDERNESS TEST ***

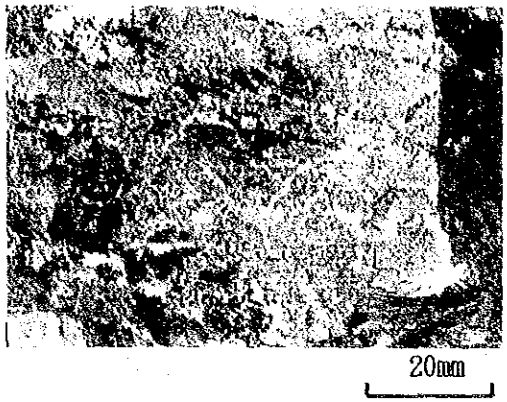
PROJECT: LANTA KHONG
LOCATION QUARRY SANDSTONE
TESTED BY:PBC

SAMPLE SIZE(inch) 1 1/2 - 2
NOMINAL SIZE , NS 44.45 mm
DATE 22/12/90

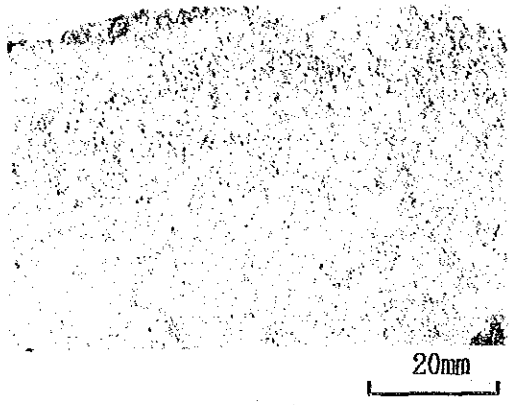
No.	Length a.	Width b.	Thickness c.	a/b	c/b	a/NS	c/NS	EL	FK	REMARK
1	110.50	40.59	10.59	2.72	0.26	2.49	0.24	1	1	NS =
2	100.69	50.20	24.00	2.01	0.48	2.27	0.54	1	1	NOMINAL
3	68.10	55.60	19.50	1.22	0.35	1.53	0.44	0	1	SIZE OF
4	73.30	55.25	25.10	1.33	0.45	1.65	0.56	0	1	PARTICLE
5	79.30	64.80	22.00	1.22	0.34	1.78	0.49	0	1	
6	75.20	44.70	21.75	1.68	0.49	1.69	0.49	0	1	
7	84.50	55.80	28.45	1.51	0.51	1.90	0.64	1	0	
8	67.70	53.00	22.35	1.28	0.42	1.52	0.50	0	1	
9	89.00	54.40	31.25	1.64	0.57	2.00	0.70	1	0	
10	69.30	48.75	29.00	1.42	0.59	1.56	0.65	0	0	
11	73.00	53.15	18.00	1.37	0.34	1.64	0.40	0	1	
12	62.00	54.50	21.10	1.14	0.39	1.39	0.47	0	1	
13	76.15	63.85	31.35	1.19	0.49	1.71	0.71	0	0	
14	75.25	63.00	29.50	1.19	0.47	1.69	0.66	0	0	
15	64.75	54.75	19.20	1.18	0.35	1.46	0.43	0	1	
16	81.85	63.65	26.90	1.29	0.42	1.84	0.61	1	0	
17	72.70	59.80	27.20	1.22	0.45	1.64	0.61	0	0	
18	73.85	51.80	28.10	1.43	8.10	1.66	0.63	0	0	
19	65.80	58.85	29.10	1.12	0.49	1.48	0.65	0	0	
20	70.30	49.00	31.00	1.43	0.63	1.58	0.70	0	0	
21	74.05	61.10	17.75	1.21	0.29	1.67	0.40	0	1	
22	81.85	42.10	29.60	1.94	0.70	1.84	0.67	1	0	
23	113.40	60.45	25.90	1.88	0.43	2.55	0.58	1	1	
24	66.65	53.85	16.70	1.24	0.31	1.50	0.38	0	1	
25	64.30	59.45	25.00	1.08	0.42	1.45	0.56	0	1	
26	79.30	60.30	20.75	1.32	0.34	1.78	0.47	0	1	
27	63.35	58.30	26.00	1.09	0.45	1.43	0.58	0	1	
28	68.50	55.80	22.30	1.23	0.40	1.54	0.50	0	1	
29	70.05	51.20	21.00	1.37	0.41	1.58	0.47	0	1	
30	56.10	51.00	25.30	1.10	0.50	1.26	0.57	0	1	
TOTAL	2270.79	1648.99	725.64	42.04	20.36			7	19	
AVERAGE	75.69	54.97	24.19	1.40	0.70	1.70	0.54			
MAX				2.72	8.10					
MIN				1.08	0.26					
S"DEV				0.35	1.40			EL INDEX	FK INDEX	
COUNTING				30	30			0.23	0.63	

A-11 MINERALOGICAL ANALYSIS DATA FOR CONCRETE AGGREGATE

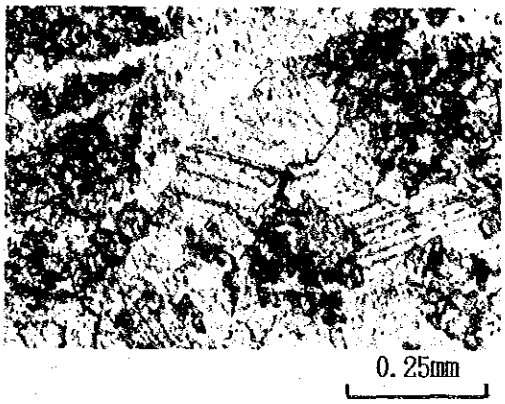
A-11-(1) PHOTOGRAPHS OF SAMPLES
A-11-(2) X-RAY DIFFRACTION CHART



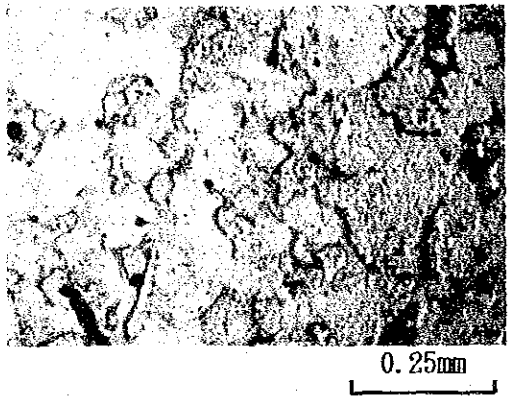
SA-1 Dolomitic Limestone



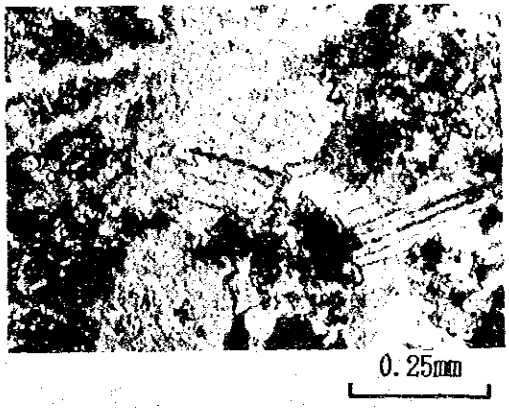
SA-2 Coarse-Grained Sandstone



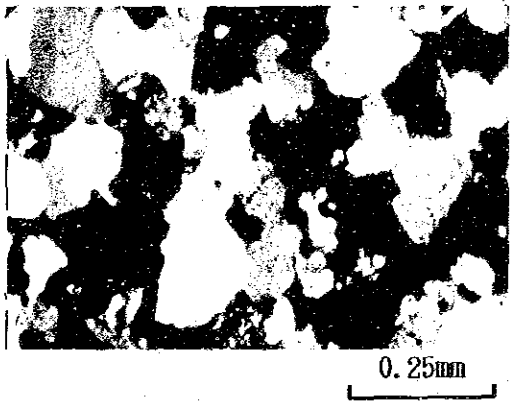
SA-1 Thin Section (Open Polar)



SA-2 Thin Section (Open Polar)



SA-1 Thin Section (Cross Polar)

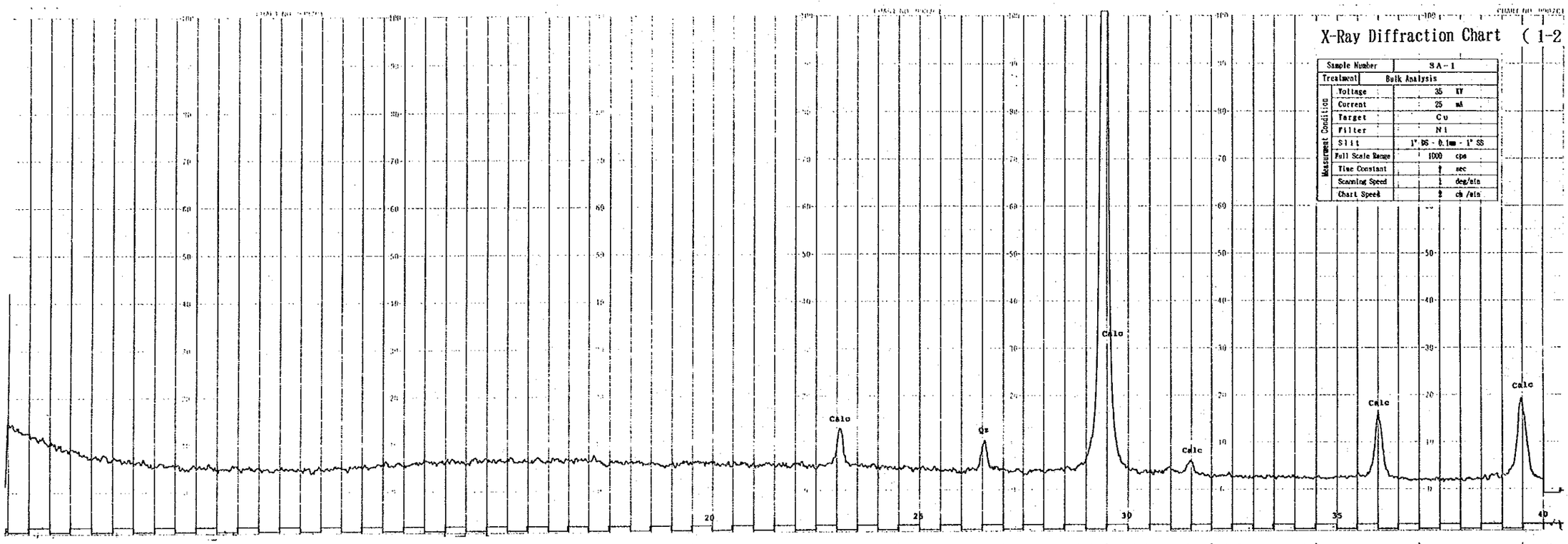


SA-2 Thin Section (Cross Polar)

Photographs of Samples

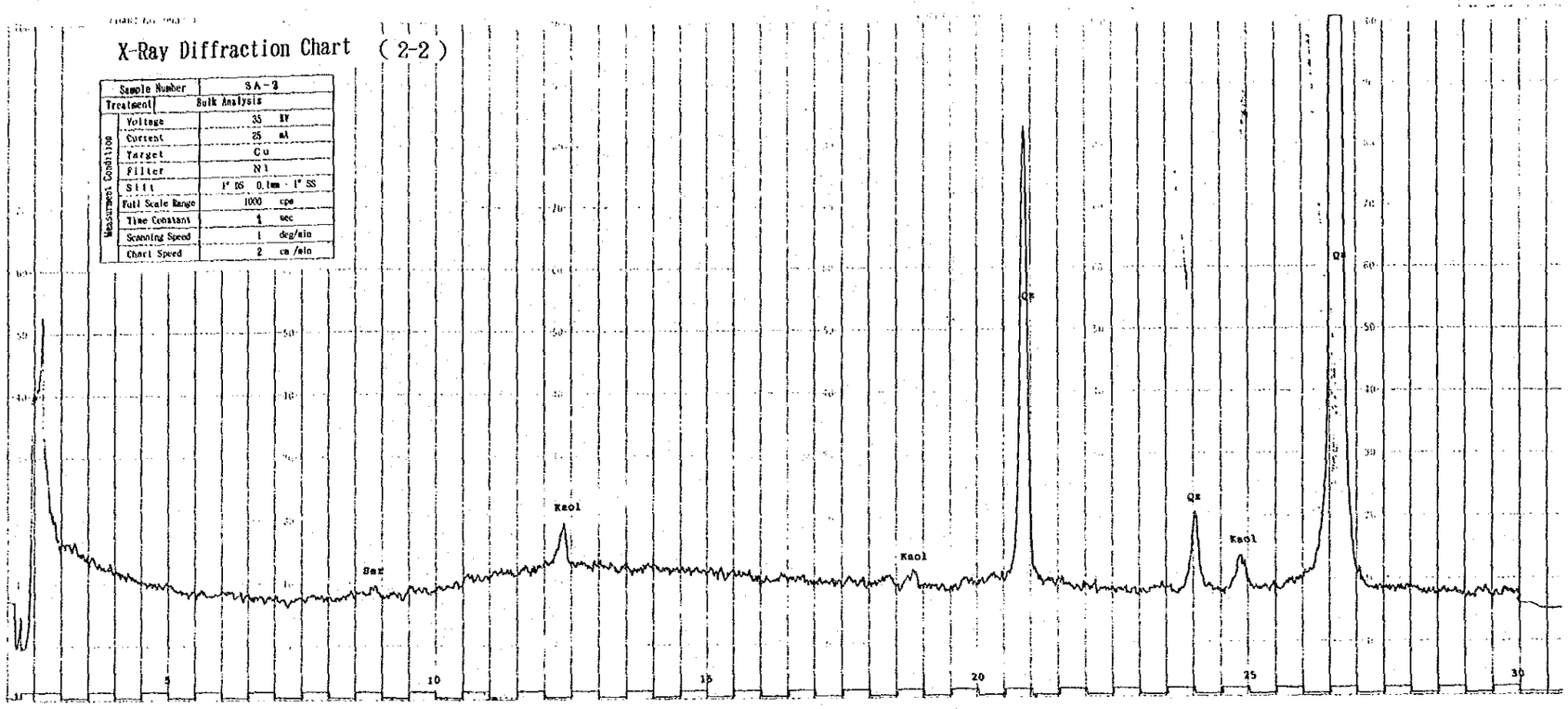
X-Ray Diffraction Chart (1-2)

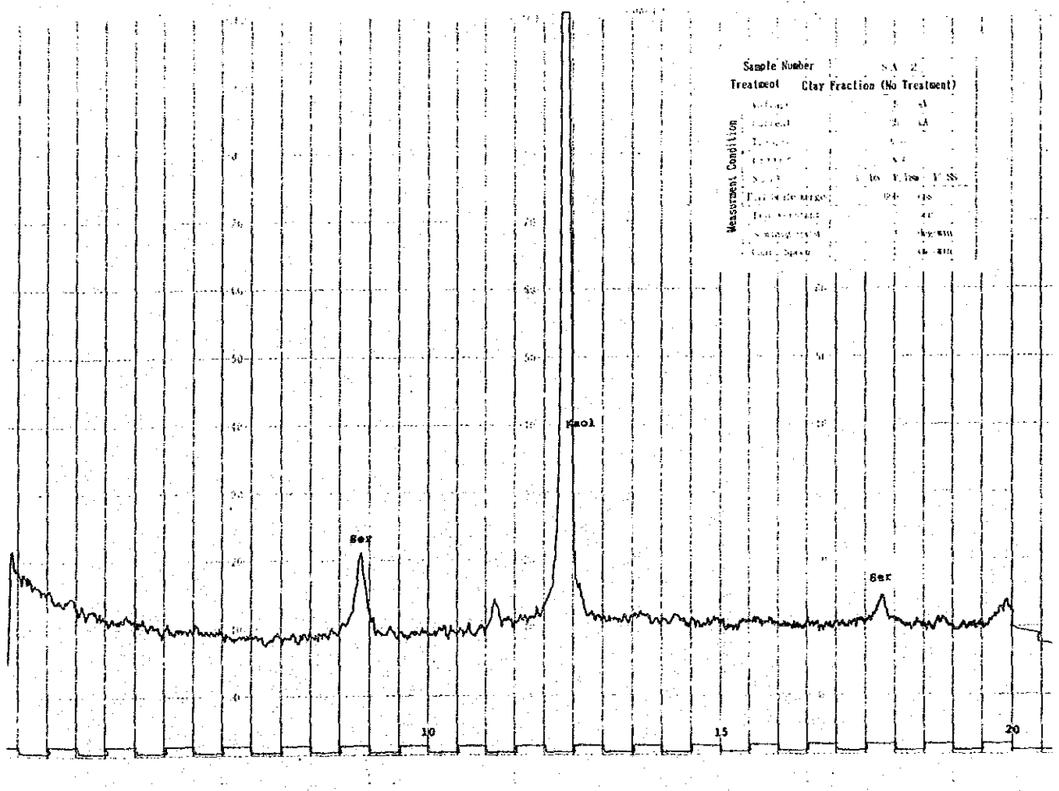
Sample Number		SA-1
Treatment		Bulk Analysis
Measurement Condition	Voltage	35 KV
	Current	25 mA
	Target	Cu
	Filter	Ni
	Slit	1° DS - 0.1mm - 1° SS
	Full Scale Range	1000 cps
	Time Constant	1 sec
	Scanning Speed	1 deg/min
	Chart Speed	2 cm /min



X-Ray Diffraction Chart (2-2)

Sample Number		SA-3
Treatment		Bulk Analysis
Measurement Condition	Voltage	35 kV
	Current	25 mA
	Target	Cu
	Filter	Ni
	Slit	1° RS 0.1mm - 1° SS
	Full Scale Range	1000 cps
	Time Constant	1 sec
	Scanning Speed	1 deg/min
	Chart Speed	2 cm /min





APPENDIX — B

DEVELOPMENT PLAN

APPENDIX-B DEVELOPMENT PLAN

CONTENTS

B-1 CONTINUOUS GENERATING CAPABILITY OF PUMPED STORAGE POWER PLANT IN JAPAN

Appendix B-1

Continuous Generating Capability of Pumped Storage Power Plants in Japan

Continuous generating capability is defined as follows:

$$T = \frac{V}{Q \times 3600}$$

T: Continuous generating capability (hours)
Q: Max. power discharge (m^3/s)
V: Effective storage capacity (10^6 m^3)

The value "T" of projects in Japan is in the range of 4-17 hours shown in Table.

The values of "T" were determined taking into account the required daily peak hours (6-8 hours) of the power system, possibility of weekend pumping operation, economics of the project by using the optimization methodology (B-C, B/C).

Considering the uncertain factors for future operation of the power plants, higher value of "T" is better for operation.

After studying the above, "T"s of 4-8 hours for daily pumping operation only and "10-17" hours for daily and weekly pumping operation were adopted.

Table-1 Continuous Generating Capability of Pumped Storage Power Plants in Japan

Name	Installed Capacity (MW)	Continuous Generating Capability (hrs)	Effective Storage (10^6 m^3)	Max. Power Discharge (M^3/s)	Year of Commercial Operation
Shintakasegawa	1,280	7.0	16.2	644	1979
Tanbara	1,200	6.5	6.5	276	1982
Imaichi	1,050	7.2	6.2	240	(*)
Sabigawa	900	6.5	7.6	324	(*)
Okukiyotsu	1,000	12.2	11.4	260	1978
Shintoyone	1,125	17.4	40.4	645	1972
Shimogo	1,000	8.9	10.0	314	1991
Numappara	675	6.8	4.2	173	1973
Takane No. 1	340	5.0	5.3	300	1969
Okumino	1,500	6.7	9.0	250	(*)
Kisenyama	466	5.9	5.3	248	1970
Okutataragi	1,212	12.8	17.4	376	1975
Okuyoshino	1,206	12.1	12.5	288	1980
Okawachi	1,280	6.0	8.3	382	(*)
Honkawa	600	10.0	5.1	140	1984
Ohira	500	8.7	3.7	118	1975
Tenzan	600	6.4	3.0	129	1987

(Note) * : under construction

B-2 OVERALL EFFICIENCY OF THE PROJECT

Appendix B-2

Overall Efficiency of the Project

Overall efficiencies for the typical operating condition are estimated as follows.

Case 1 Two Units Operation in One Waterway

Water Level Condition

(1) Water Levels of Reservoirs

Upper reservoir	654 El.m	
Lower reservoir	276 El.m	
Static head	378 m	

(2) Net Head for Generating Operation

Static head	378 m	
Loss head	21 m	(at Q = 165 m^3/s)
Net head (Hg)	357 m	

(3) Total Head for Pumping

Static head	378 m	
Loss head	11 m	(at Q = 120 m^3/s)
Total head (Hp)	389 m	

Estimation of Overall Efficiency

(1) Efficiencies Related to the Condition Above

Turbine efficiency (η t)	0.885	
Pump efficiency (η p)	0.885	(-1.5% from η pmax)
Generator efficiency (η g)	0.980	
Motor efficiency (η m)	0.980	

(2) Overall Efficiency (η all)

$$\eta ov2 = [9.8 * \eta t * \eta g * Hg] / [9.8 / \eta p / \eta m * Hp]$$
$$= 0.690$$

Case 2 One Unit Operation in One Waterway

Condition

(1) Water Levels of Reservoirs

Upper reservoir	654 El.m
Lower reservoir	276 El.m
Static head	378 m

(2) Net Head for Generating Operation

Static head	378 m	
Loss head	4.7 m	(at Q ≒ 77.7 m^3/s)
Net head (Hg)	373.3 m	

(3) Total Head for Pumping Operation

Static head	378 m	
Loss head	3 m	(at Q ≒ 62.1 m^3/s)
Total head (Hp)	381 m	

Estimation of Overall Efficiency

(1) Efficiencies Related to the Condition Above

Turbine efficiency (η t)	0.897	(+1.2% from η gHnor)
Pump efficiency (η p)	0.890	(-1.0% from η pmax)
Generator efficiency (η g)	0.980	
Motor efficiency (η m)	0.980	

(2) Overall Efficiency (η all)

$$\eta \text{ ov1} = [9.8 * \eta \text{ t} * \eta \text{ g} * \text{Hg}] \; / \; [9.8 / \eta \text{ p} / \eta \text{ m} * \text{Hp}]$$
$$= 0.751$$

Case 3 Weighed Average Efficiency

$$\eta \text{ ov} = (2 * \eta \text{ ov2} + \eta \text{ ov1}) / 3$$
$$= 0.71$$

B-3 PEAK DURATION HOURS REQUIRED FROM POWER SYSTEM, POSSIBLE PUMPING HOURS AND GENERATING HOURS OF HYDRO POWER PLANTS

Appendix B-3

Peak Duration Hours Required from Power System, Possible Pumping Hours and Generating Hours of Hydro Power Plants.

(1) Peak Duration Hours in Load Curve

Benefit of a pumped storage power plant is calculated from fixed cost and variable cost of alterative thermal plants. The fixed cost is calculated from maximum capacity (P_0), reservoir storage capacity (T_0) and equivalent peak duration hours (I, hereinafter "peak hours").

The peak hours (I) is the minimum time period which is required for hydro power plants as an electric supply facility in the load duration curve of EGAT power system. The peak hours (I) is defined such that the hydro plant is operated constantly at the full power supply level (max. output).

The peak hours (I) is estimated by following method (a) and (b) using load duration curves of 3 April 2000, 25 September 2000, 22 September 2003.

(a) This is a concept that all of the hydro plants having regulating capability will supply the power on the whole for the peak portion of the load duration curve. Peak portions in the duration curve hydro plants shown in Fig. 1 and Fig. 2 for 3 April 2000 and 25 September 2000 respectively.

The peak hours (I) is in the range of 5 ~ 7 hours.

3 April 2000 ..... I = 7.2 hours
25 September 2000 ..... I = 4.8 hours

Therefore, hydro plants newly planned is evaluated for the peak hours of 5 ~ 7 hours.

(b) This is a concept that existing hydro plant is allocated to the portion of the load duration curve, and then planned hydro plants is allocated to the peaking portion of the deficit. The peak hours (I) is determined for the portions.

The deficit portion after allocating the existing power plant and the portion for planned hydro is shown in Fig. 3 and 4.

The peak hours (I) are 2 hours

Considering (a) and (b) equivalent peak duration hours (I) of 6 hours in the concept (a) is adopted in this study because of the following reason.

EGAT system will have hydro plants having regulating capacity of 2,640 MW in 2000 in which Srinagarind No.1, 2 and 3 (Total 360 MW), Ta Tung Na (38 MW), Srikit (375 MW), Bhumibol No.1 ~ 7 (535 MW), Khao Laem (300 MW) are operated with irrigation purpose. It can be said that the degree of freedom to use hydro power plants and their dams is low from an independent power plants' operation viewpoint. Therefore, as the concept (a) in which all of the hydro power are operated on the whole is reasonable for Lam Ta Khong project.

(2) Daily Possible Pumping Hours and Daily Possible Generating Hours (J)

As seen in Fig. 5, daily possible pumping hours (J) for pumped storage's energy is 7 to 10 hours. In this study, daily possible pumping hours of 8 hours is adopted for economic comparison for Investigation Stage of the study, and 9 hours for Feasibility Design Stage of the main report. Daily possible generating hours are as follows considering the pumping efficiency of about 70%.

Daily Pumping Hours	Daily Generating Hours
8	5.6 (= 8 x 0.7)
9	6.3 (= 9 x 0.7)

Load Duration Curve on 3 April 2000 (Monday)

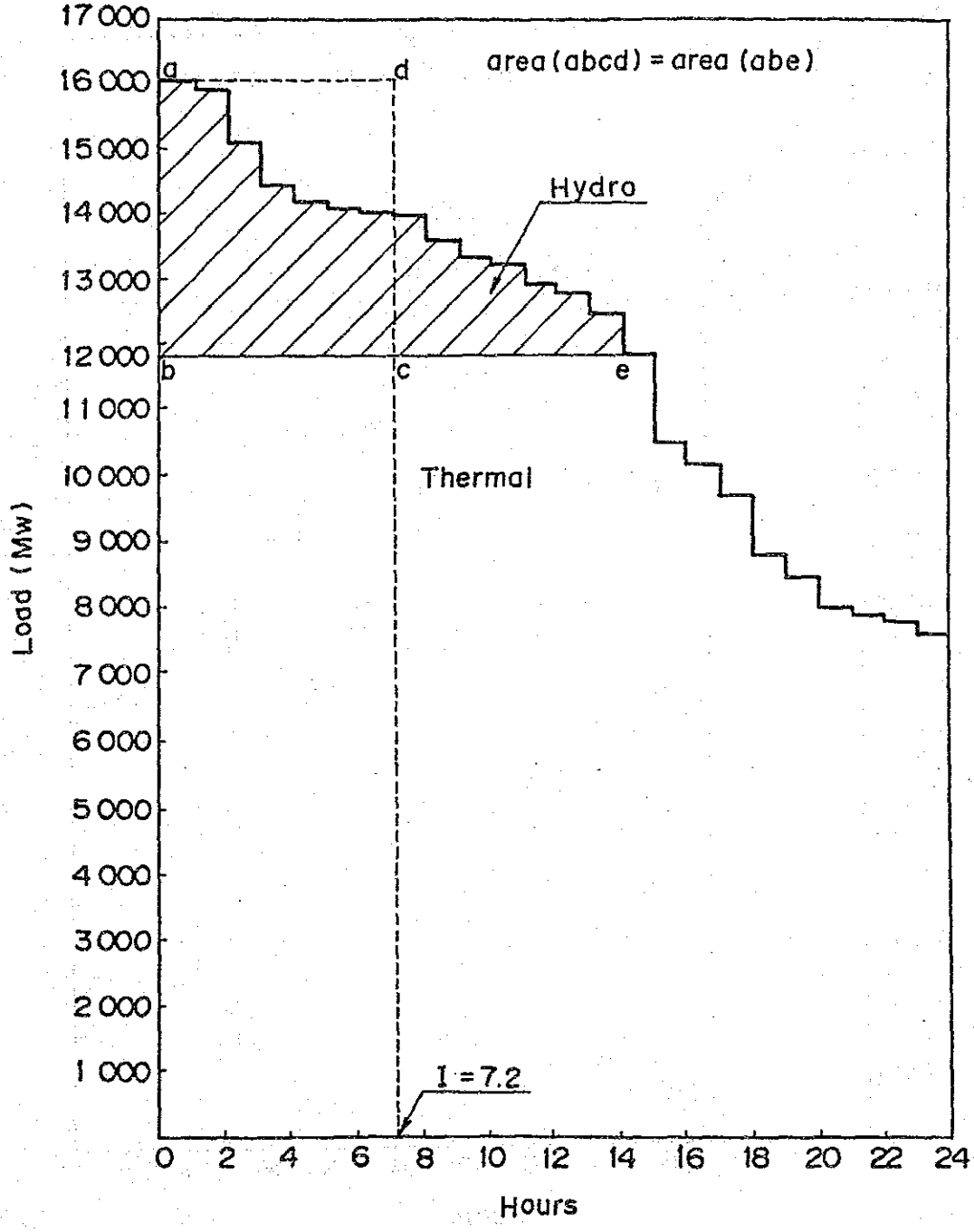


Fig.1 Equivalent Peak Duration Hours (I)

Load Duration Curve on 25 September 2000 (Monday)

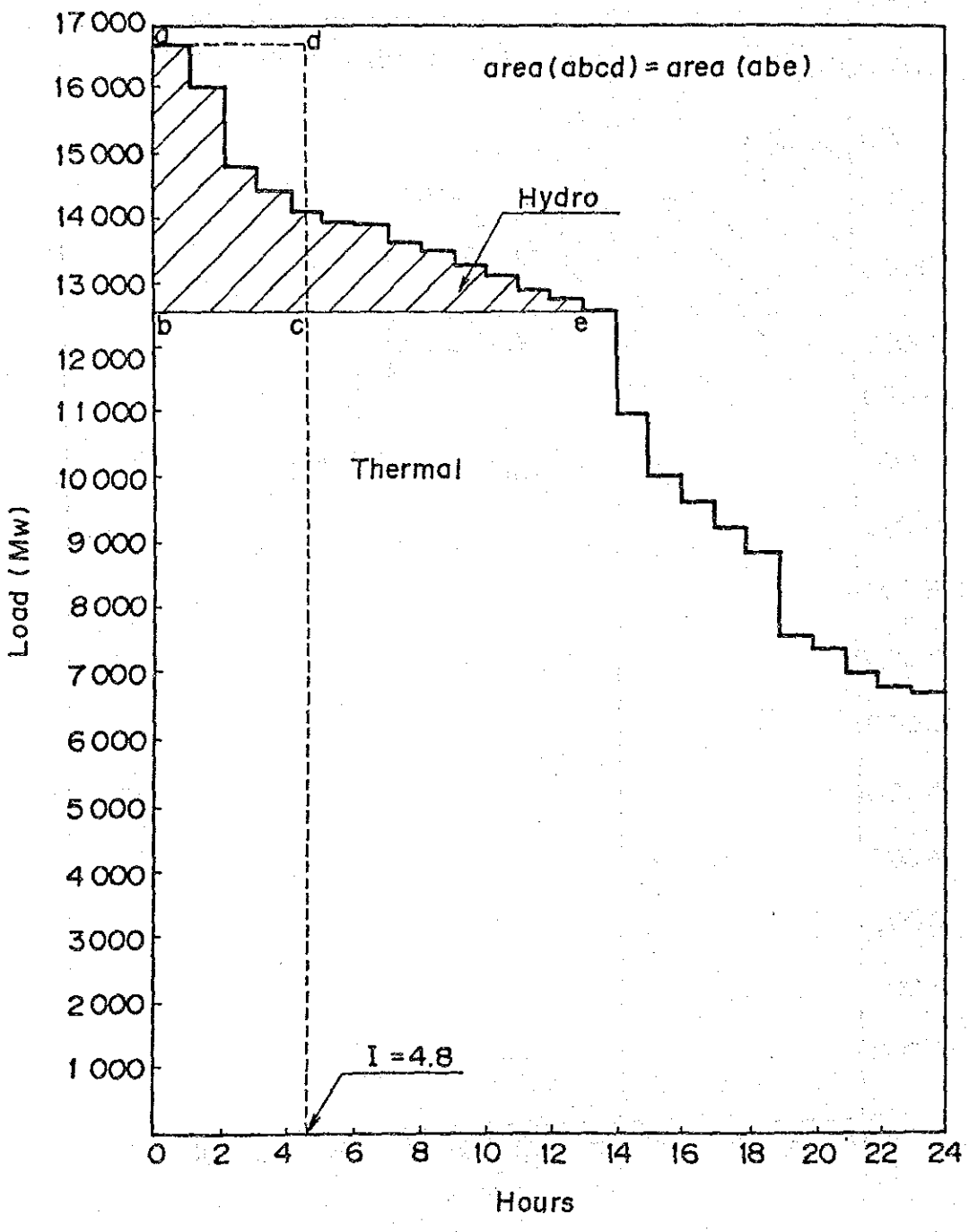
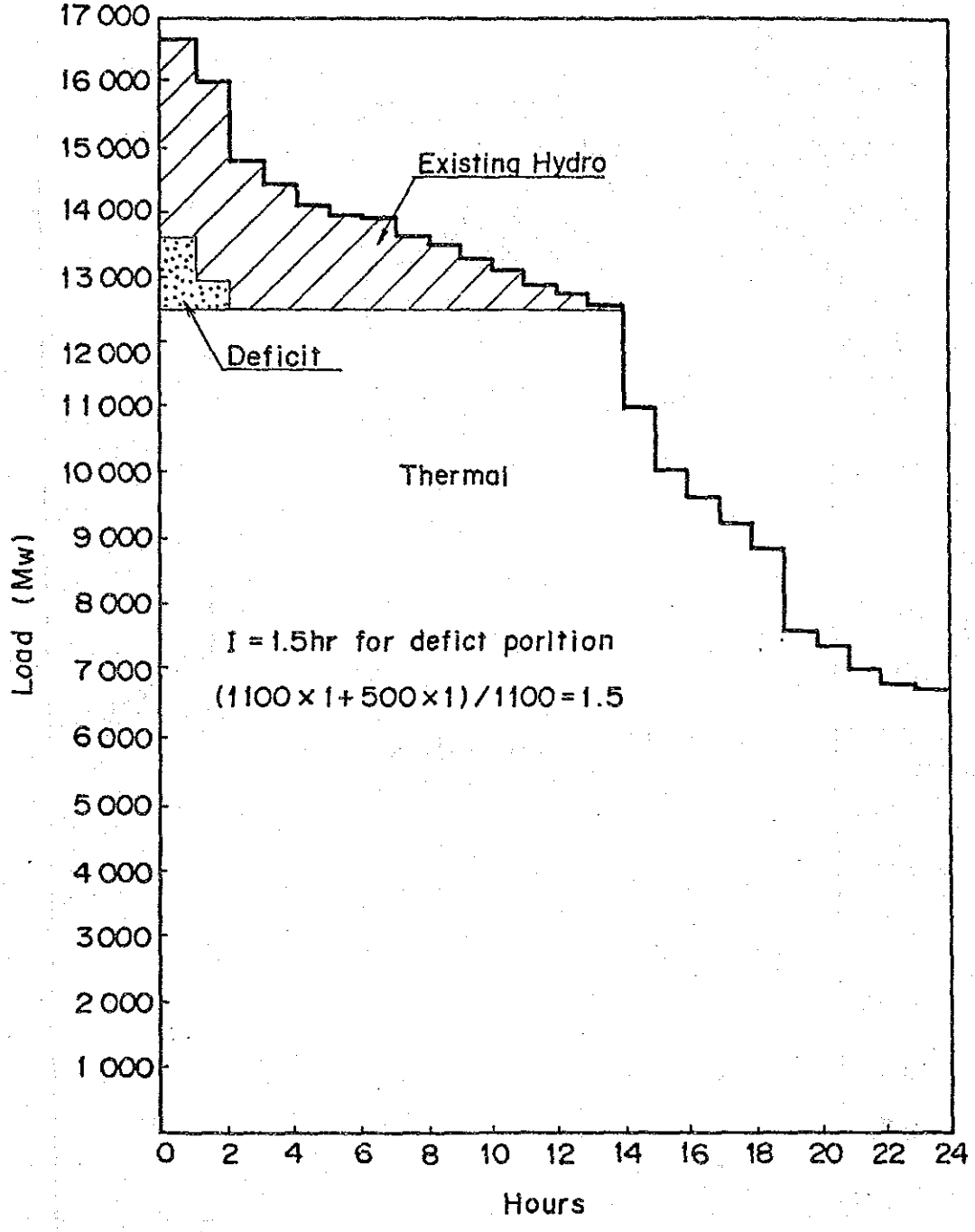


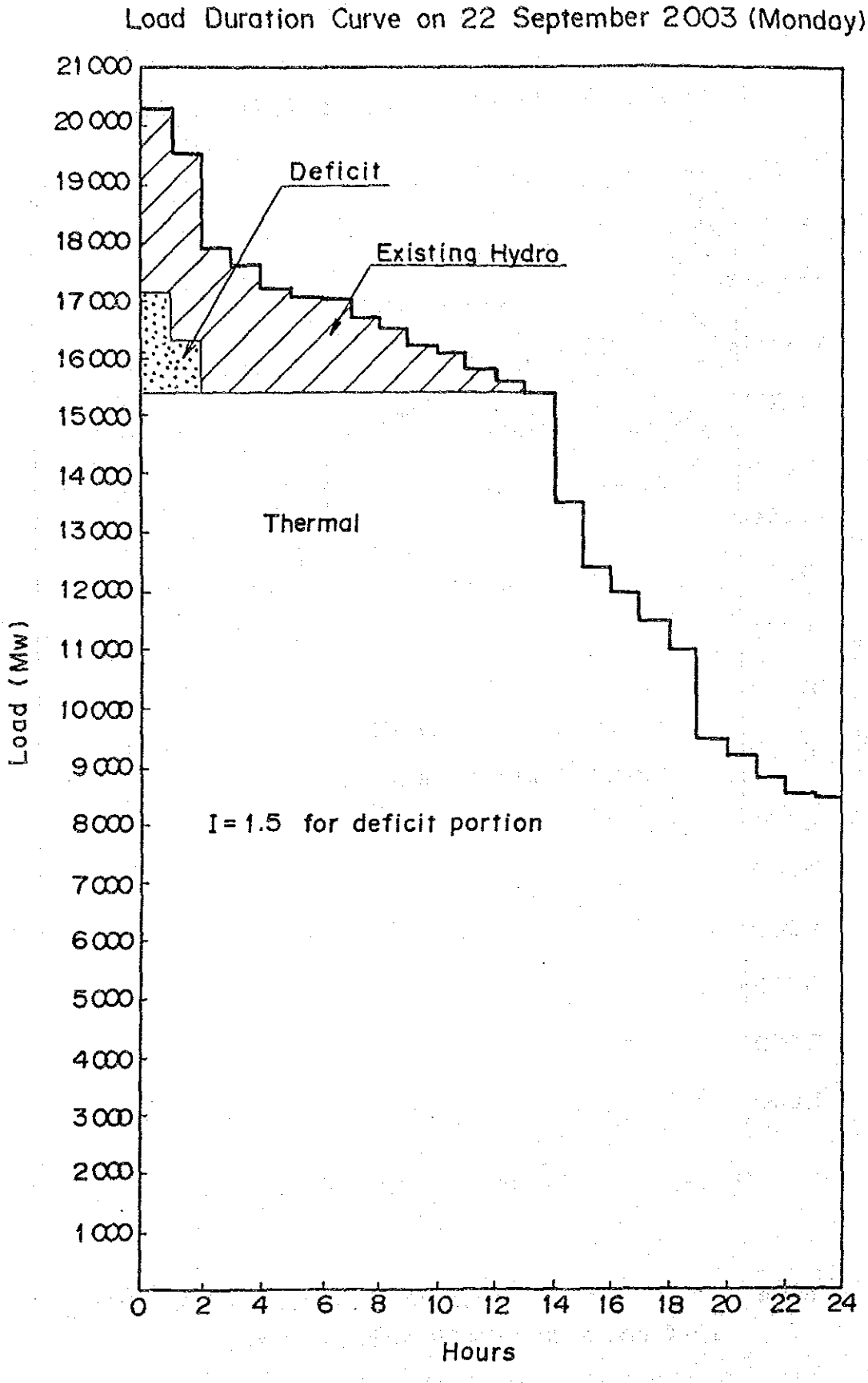
Fig. 2 Equivalent Peak Duration Hours (I)

Load Duration Curve on 25 September 2000 (Monday)



Note: about four hours operation is considered for Srinagarind No.4 and 5, and Bhumibol No.8 plans.

Fig.3 Equivalent Peak Duration Hours (I)



Note: about four hours operation is considered for Srinagarind No.4, No.5 and Bhumibol No.8 plans.

Fig.4 Equivalent Peak Duration Hours (I)

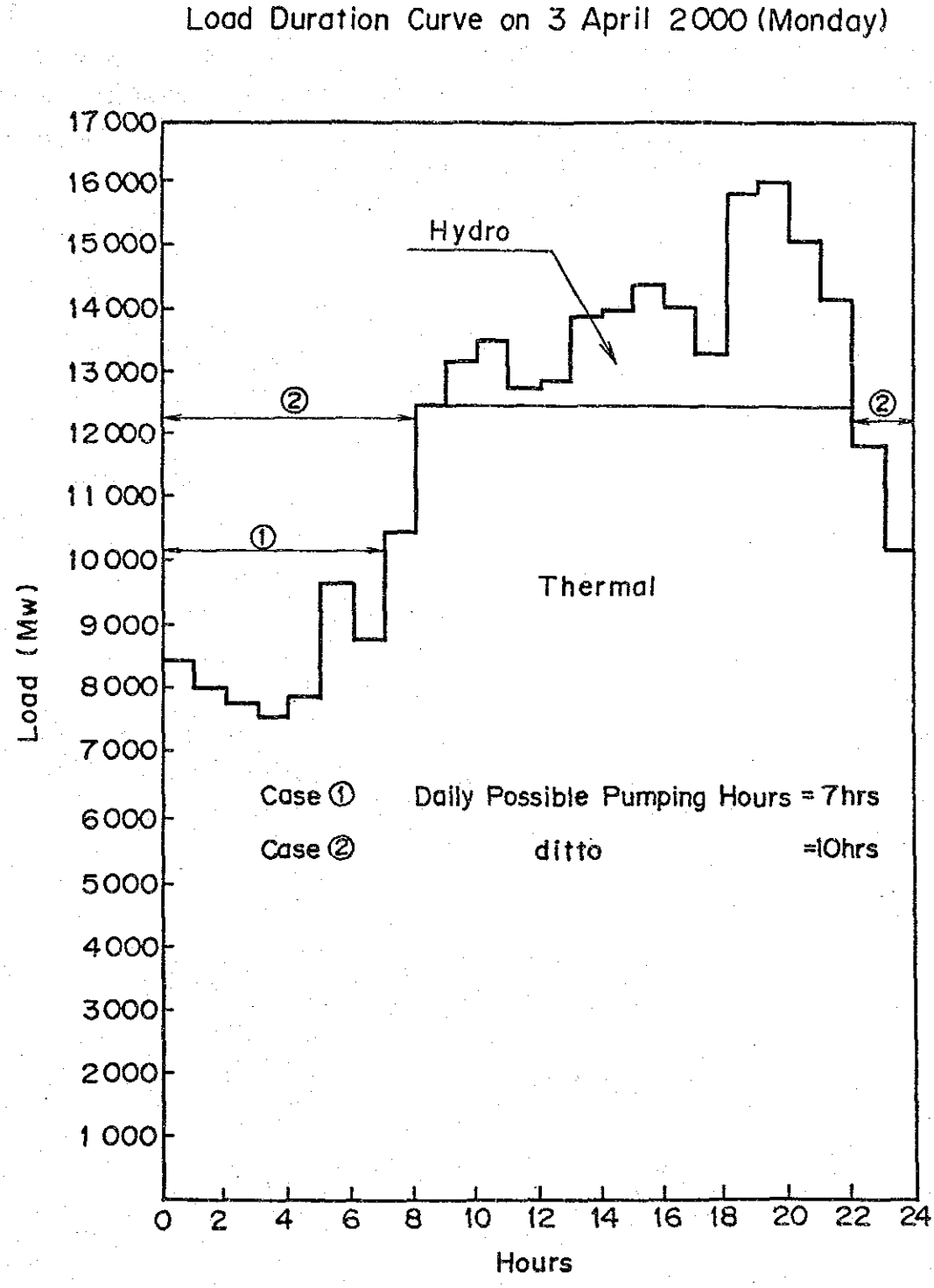


Fig.5 Daily Possible Pumping Hours

Number of Operating Day using Weekly Regulating Storage

The Lam Ta Khong power plant is planned so that it generates the power for 5 days from Monday to Friday in which four days in a week need the weekly reservoir storage capacity. The other one day does not need the weekly capacity but it is operated with daily pumping only.

B-4 HYDRO POWER RATIO AND PUMPED STORAGE RATIO TO TOTAL POWER FACILITY IN JAPAN

Appendix B-4

Hydro Power Ratio and Pumped Storage Ratio to Total Power Facility in Japan

(1) Hydro Power Ratio

The total installed capacity and the ratio of each facility such as hydro power, thermal and nuclear power are shown in Table 1.

As seen in Table-1, the ratio of hydro power having regulating capability to total power facilities is in the range of 18 ~ 24% (30% exceptional).

According to EGAT's PDP 90-01, the total installed capacity in year of 2000 is 17,734 MW in which hydro power capacity having regulating capability is 3,856 MW including Lam Ta Khong project of 600 MW. The hydro power ratio is 21.7%.

(2) Pumped Storage Ratio

The optimum ratio of pumped storage to total facility in Japan depends on electric companies, and in the range of 10 ~ 15%. According to the analysis for overall Japanese system studied by MITI, 12% is the optimum ratio of pumped storage. In case the value of 12% is adopted to Thailand, the pumped storage of 2130 MW can be used in the system in year 2000.

Srinagarind #4, #5	360 MW
Sirikit	125 MW
Bhumibol	175 MW
Lam Ta Khong	500 MW
	1160 MW

Facilities' Ratio in Japan

As of 1989

Name of Electric Power Power Company	(MW)	Hydro (%) Conventional	Pumped-Storage	Thermal (%) Oil	Coal	L.N.G	Nuclear & Others (%)
Hokkaido	4,876	2 + 17*	6 (10)	32	31	-	11
		23		63			
Tohoku	10,137	4 + 16*	5 (-)	23	13	27	6
		21		68			
Tokyo	44,437	1 + 6*	13 (10 ~ 15)	19	3	33	22
		19		55			
Chubu	22,075	1 + 9*	12 (10 ~ 15)	36	1	28	13
		21		65			
Hokuriku	3,954	12 + 28*	2 (-)	41	10	-	7
		30		51			
Kansai	30,173	1 + 9*	10 (11)	40	-	15	25
		19		55			
Chugoku	9,219	1 + 7*	13 (15)	31	27	-	21
		20		58			
Shikoku	5,423	1 + 12*	12 (10)	43	9	4	19
		24		56			
Kyushu	13,360	1 + 10*	8 (10)	29	9	22	20
		18		60			

(Note) * Hydro having regulating capability of reservoir
( ) Optimum pumped storage's ratio to total facilities.
Including facilities of Electric Power Development Co.

B-5 CONSTRUCTION COST OF ALTERNATIVES

Appendix B-5 Construction Cost of Alternatives

Construction Cost (P=500MW)

Refer to Table 10-3 (Main Report)

Reservoir Capacity	4	6	8	10	12	14	
1. Preliminary Works	100	100	103	120	120	130	
2. Environmental Mitigation	110	120	120	120	120	130	
3. Civil Works	1,840	1,940	2,065	2,220	2,360	2,510	
1) Upper reservoir	850	950	1,075	1,230	1,370	1,520	
2) Intake	27	27	27	27	27	27	
3) Penstock	181	181	181	181	181	181	
4) Powerhouse	398	398	398	398	398	398	
5) Tailrace	378	378	378	378	378	378	
6) Switchyard	6	6	6	6	6	6	
7) Contingency	0	0	0	0	0	0	
4. Hydraulic Equipment	713	713	713	713	713	713	
5. Electrical Equipment	2,348	2,348	2,348	2,348	2,348	2,348	
6. Transmission Line	180	180	180	180	180	180	
7. EGAT Administration	160	170	170	180	180	190	
8. Engineering Service	160	170	170	180	180	190	
9. Physical Contingency	499	509	511	549	559	579	
Total Economic Cost	6,110	6,250	6,380	6,610	6,760	6,970	

Construction Cost (P=600MW)

Reservoir Capacity	4	6	8	10	12	14	
1.Preliminary Works	110	110	120	130	140	150	
2.Environmental Mitigation	140	140	150	150	160	160	
3.Civil Works	2,050	2,180	2,350	2,520	2,680	2,910	
1)Upper reservoir	900	1,030	1,200	1,370	1,530	1,760	
2)Intake	32	32	32	32	32	32	
3)Penstock	192	192	192	192	192	192	
4)Powerhouse	422	422	422	422	422	422	
5)Tailrace	495	495	495	495	495	495	
6)Switchyard	6	6	6	6	6	6	
7)Contingency	3	3	3	3	3	3	
4.Hydraulic Equipment	850	850	850	850	850	850	
5.Electrical Equipment	2,820	2,820	2,820	2,820	2,820	2,820	
6.Transmission Line	700	700	700	700	700	700	
7.EGAT Administration	210	210	210	220	230	230	
8.Engineering Service	210	210	210	220	230	230	
9.Physical Contingency	610	620	640	660	680	700	
Total Economic Cost	7,700	7,840	8,050	8,270	8,490	8,750	

Construction Cost (P=800MW)

Reservoir Capacity	4	6	8	10	12	14	
1. Preliminary Works	120	130	140	150	170	180	
2. Environmental Mitigation	170	180	180	190	190	200	
3. Civil Works	2,290	2,510	2,740	2,990	3,300	3,590	
1) Upper reservoir	980	1,200	1,430	1,680	1,990	2,280	
2) Intake	38	38	38	38	38	38	
3) Penstock	214	214	214	214	214	214	
4) Powerhouse	456	456	456	456	456	456	
5) Tailrace	595	595	595	595	595	595	
6) Switchyard	6	6	6	6	6	6	
7) Contingency	1	1	1	1	1	1	
4. Hydraulic Equipment	1,090	1,090	1,090	1,090	1,090	1,090	
5. Electrical Equipment	3,760	3,760	3,760	3,760	3,760	3,760	
6. Transmission Line	700	700	700	700	700	700	
7. EGAT Administration	250	260	260	270	280	290	
8. Engineering Service	250	260	260	270	280	290	
9. Physical Contingency	730	760	780	810	850	880	
Total Economic Cost	9,360	9,650	9,910	10,230	10,620	10,980	

Construction Cost (P=1,000MW)

Reservoir Capacity	4	6	8	10	12	14	
1.Preliminary Works	130	150	156	180	200	220	
2.Environmental Mitigation	200	210	210	220	230	240	
3.Civil Works	2,530	2,810	3,115	3,510	3,940	4,370	
1)Upper reservoir	1,090	1,370	1,683	2,070	2,500	2,930	
2)Intake	49	49	49	49	49	49	
3)Penstock	234	234	234	234	234	234	
4)Powerhouse	476	476	476	476	476	476	
5)Tailrace	667	667	667	667	667	667	
6)Switchyard	6	6	6	6	6	6	
7)Contingency	8	8	0	8	8	8	
4.Hydraulic Equipment	1,359	1,359	1,359	1,359	1,359	1,359	
5.Electrical Equipment	4,696	4,696	4,696	4,696	4,696	4,696	
6.Transmission Line	700	700	700	700	700	700	
7.EGAT Administration	290	300	310	320	340	350	
8.Engineering Service	290	300	310	320	340	350	
9.Physical Contingency	865	905	924	975	1,025	1,075	
Total Economic Cost	11,060	11,430	11,780	12,280	12,830	13,360	

Construction Cost (P=1,200MW)

Reservoir Capacity	4	6	8	10	12	14	
1.Preliminary Works	140	160	180	210	230	260	
2.Environmental Mitigation	250	250	260	270	280	300	
3.Civil Works	2,800	3,140	3,590	4,100	4,600	5,200	
1)Upper reservoir	1,200	1,540	1,990	2,500	3,000	3,600	
2)Intake	59	59	59	59	59	59	
3)Penstock	252	252	252	252	252	252	
4)Powerhouse	492	492	492	492	492	492	
5)Tailrace	790	790	790	790	790	790	
6)Switchyard	6	6	6	6	6	6	
7)Contingency	1	1	1	1	1	1	
4.Hydraulic Equipment	1,650	1,650	1,650	1,650	1,650	1,650	
5.Electrical Equipment	5,640	5,640	5,640	5,640	5,640	5,640	
6.Transmission Line	1,200	1,200	1,200	1,200	1,200	1,200	
7.EGAT Administration	360	370	380	400	410	430	
8.Engineering Service	360	370	380	400	410	430	
9.Physical Contingency	1,040	1,080	1,130	1,190	1,240	1,310	
Total Economic Cost	13,440	13,860	14,410	15,060	15,660	16,420	

B-6 CALCULATION OF ECONOMICS

Appendix B-6 (1) Case (1) (1st Stage)

(Unit: Million B)

Serial Number	No. after Completion	Cost					Benefit					B - C
		Investment Cost	O&M Cost	Fuel Cost for Pumping	Total	Total (N.P.V.)	Investment Cost	O&M Cost	Fuel Cost	Total	Total (N.P.V.)	
0		0.0			0.0	0.0	0.0			0.0	0.0	0.0
1		105.5			105.5	94.2	0.0			0.0	0.0	-105.5
2		827.7			827.7	659.8	0.0			0.0	0.0	-827.7
3		1131.1			1131.1	805.1	0.0			0.0	0.0	-1131.1
4		2315.3			2315.3	1471.4	0.0			0.0	0.0	-2315.3
5		1858.4			1858.4	1054.5	1317.5			1317.5	747.6	-541.0
6		228.1			228.1	115.6	5269.8			5269.8	2669.9	5041.7
7	1		104.0	237.1	341.1	154.3		197.6	332.9	530.5	240.0	189.4
8	2		104.0	237.1	341.1	137.8		197.6	332.9	530.5	214.3	189.4
9	3		104.0	237.1	341.1	123.0		197.6	332.9	530.5	191.3	189.4
10	4		104.0	237.1	341.1	109.8		197.6	332.9	530.5	170.8	189.4
11	5		104.0	237.1	341.1	98.1		197.6	332.9	530.5	152.5	189.4
12	6		104.0	237.1	341.1	87.6		197.6	332.9	530.5	136.2	189.4
13	7		104.0	237.1	341.1	78.2		197.6	332.9	530.5	121.6	189.4
14	8		104.0	237.1	341.1	69.8		197.6	332.9	530.5	108.6	189.4
15	9		104.0	237.1	341.1	62.3		197.6	332.9	530.5	96.9	189.4
16	10		104.0	237.1	341.1	55.6		197.6	332.9	530.5	86.5	189.4
17	11		104.0	237.1	341.1	49.7		197.6	332.9	530.5	77.3	189.4
18	12		104.0	237.1	341.1	44.4		197.6	332.9	530.5	69.0	189.4
19	13		104.0	237.1	341.1	39.6		197.6	332.9	530.5	61.6	189.4
20	14		104.0	237.1	341.1	35.4		197.6	332.9	530.5	55.0	189.4
21	15		104.0	237.1	341.1	31.6		197.6	332.9	530.5	49.1	189.4
22	16		104.0	237.1	341.1	28.2		197.6	332.9	530.5	43.8	189.4
23	17		104.0	237.1	341.1	25.2		197.6	332.9	530.5	39.1	189.4
24	18		104.0	237.1	341.1	22.5		197.6	332.9	530.5	35.0	189.4
25	19		104.0	237.1	341.1	20.1	1317.5	197.6	332.9	1848.0	108.7	1506.9
26	20		104.0	237.1	341.1	17.9	5269.8	197.6	332.9	5800.3	304.6	5459.2
27	21	223.0	104.0	237.1	564.1	26.5		197.6	332.9	530.5	24.9	-33.6
28	22	0.0	104.0	237.1	341.1	14.3		197.6	332.9	530.5	22.2	189.4
29	23	931.4	104.0	237.1	1272.5	47.6		197.6	332.9	530.5	19.8	-742.0
30	24	1245.9	104.0	237.1	1587.0	53.0		197.6	332.9	530.5	17.7	-1056.5
31	25	223.0	104.0	237.1	564.1	16.8		197.6	332.9	530.5	15.8	-33.6
32	26		104.0	237.1	341.1	9.1		197.6	332.9	530.5	14.1	189.4
33	27		104.0	237.1	341.1	8.1		197.6	332.9	530.5	12.6	189.4
34	28		104.0	237.1	341.1	7.2		197.6	332.9	530.5	11.3	189.4
35	29		104.0	237.1	341.1	6.5		197.6	332.9	530.5	10.0	189.4
36	30		104.0	237.1	341.1	5.8		197.6	332.9	530.5	9.0	189.4
37	31		104.0	237.1	341.1	5.2		197.6	332.9	530.5	8.0	189.4
38	32		104.0	237.1	341.1	4.6		197.6	332.9	530.5	7.2	189.4
39	33		104.0	237.1	341.1	4.1		197.6	332.9	530.5	6.4	189.4
40	34		104.0	237.1	341.1	3.7		197.6	332.9	530.5	5.7	189.4
41	35		104.0	237.1	341.1	3.3		197.6	332.9	530.5	5.1	189.4
42	36		104.0	237.1	341.1	2.9		197.6	332.9	530.5	4.5	189.4
43	37		104.0	237.1	341.1	2.6		197.6	332.9	530.5	4.1	189.4
44	38	81.7	104.0	237.1	422.8	2.9		197.6	332.9	530.5	3.6	107.7
45	39	122.5	104.0	237.1	463.6	2.8	1317.5	197.6	332.9	1848.0	11.3	1384.4
46	40		104.0	237.1	341.1	1.9	5269.8	197.6	332.9	5800.3	31.6	5459.2
47	41		104.0	237.1	341.1	1.7		197.6	332.9	530.5	2.6	189.4
48	42		104.0	237.1	341.1	1.5		197.6	332.9	530.5	2.3	189.4
49	43		104.0	237.1	341.1	1.3		197.6	332.9	530.5	2.1	189.4
50	44		104.0	237.1	341.1	1.2		197.6	332.9	530.5	1.8	189.4
51	45		104.0	237.1	341.1	1.1		197.6	332.9	530.5	1.6	189.4
52	46		104.0	237.1	341.1	0.9		197.6	332.9	530.5	1.5	189.4
53	47		104.0	237.1	341.1	0.8		197.6	332.9	530.5	1.3	189.4
54	48		104.0	237.1	341.1	0.8		197.6	332.9	530.5	1.2	189.4
55	49		104.0	237.1	341.1	0.7		197.6	332.9	530.5	1.0	189.4
56	50		104.0	237.1	341.1	0.6		197.6	332.9	530.5	0.9	189.4
		9293.6	5200.6	11854.9	26349.0	5730.5	19761.9	9881.0	16644.0	46286.9	6040.4	19937.9

B - C	309.89259
B / C	1.0540776
E D R	0.1368551

Appendix B-6 (2) Case (1) (1st + 2nd Stage)

(Unit: Million B)

Serial Number	No. after Completion	Cost					Benefit					B - C
		Investment Cost	O&M Cost	Fuel Cost for Pumping	Total	Total (N.P.V.)	Investment Cost	O&M Cost	Fuel Cost	Total	Total (N.P.V.)	
0		0.0			0.0	0.0	0.0			0.0	0.0	0.0
1		105.5			105.5	94.2	0.0			0.0	0.0	-105.5
2		827.7			827.7	659.8	0.0			0.0	0.0	-827.7
3		1131.1			1131.1	805.1	0.0			0.0	0.0	-1131.1
4		2315.3			2315.3	1471.4	0.0			0.0	0.0	-2315.3
5		1858.4			1858.4	1054.5	1317.5			1317.5	747.6	-541.0
6		228.1			228.1	115.6	5269.8			5269.8	2669.9	5041.7
7	1		104.0	237.1	341.1	154.3		197.6	332.9	530.5	240.0	189.4
8	2		104.0	237.1	341.1	137.8		197.6	332.9	530.5	214.3	189.4
9	3		104.0	237.1	341.1	123.0		197.6	332.9	530.5	191.3	189.4
10	4		104.0	237.1	341.1	109.8		197.6	332.9	530.5	170.8	189.4
11	5	105.5	104.0	237.1	446.6	128.4		197.6	332.9	530.5	152.5	83.9
12	6	686.5	104.0	237.1	1027.6	263.1		197.6	332.9	530.5	136.2	-497.1
13	7	915.6	104.0	237.1	1256.7	288.0		197.6	332.9	530.5	121.6	-726.2
14	8	2228.6	104.0	237.1	2569.7	525.8		197.6	332.9	530.5	108.6	-2039.2
15	9	2007.8	104.0	237.1	2348.9	429.1	1317.5	197.6	332.9	1848.0	337.6	-501.0
16	10	225.7	104.0	237.1	566.8	92.5	5269.8	197.6	332.9	5800.3	946.2	5233.6
17	11		203.1	237.1	440.2	64.1		395.2	332.9	728.1	106.0	287.9
18	12		203.1	237.1	440.2	57.2		395.2	332.9	728.1	94.7	287.9
19	13		203.1	237.1	440.2	51.1		395.2	332.9	728.1	84.5	287.9
20	14		203.1	237.1	440.2	45.6		395.2	332.9	728.1	75.5	287.9
21	15		203.1	237.1	440.2	40.7		395.2	332.9	728.1	67.4	287.9
22	16		203.1	237.1	440.2	36.4		395.2	332.9	728.1	60.2	287.9
23	17		203.1	237.1	440.2	32.5		395.2	332.9	728.1	53.7	287.9
24	18		203.1	237.1	440.2	29.0		395.2	332.9	728.1	48.0	287.9
25	19		203.1	237.1	440.2	25.9	1317.5	395.2	332.9	2045.6	120.3	1605.4
26	20		203.1	237.1	440.2	23.1	5269.8	395.2	332.9	5998.0	315.0	5557.8
27	21	223.0	203.1	237.1	663.2	31.1		395.2	332.9	728.1	34.1	64.9
28	22	0.0	203.1	237.1	440.2	18.4		395.2	332.9	728.1	30.5	287.9
29	23	931.4	203.1	237.1	1371.6	51.3		395.2	332.9	728.1	27.2	-643.5
30	24	1245.9	203.1	237.1	1686.1	56.3		395.2	332.9	728.1	24.3	-958.0
31	25	223.0	203.1	237.1	663.2	19.8		395.2	332.9	728.1	21.7	64.9
32	26		203.1	237.1	440.2	11.7		395.2	332.9	728.1	19.4	287.9
33	27		203.1	237.1	440.2	10.5		395.2	332.9	728.1	17.3	287.9
34	28		203.1	237.1	440.2	9.3		395.2	332.9	728.1	15.4	287.9
35	29		203.1	237.1	440.2	8.3	1317.5	395.2	332.9	2045.6	38.7	1605.4
36	30		203.1	237.1	440.2	7.4	5269.8	395.2	332.9	5998.0	101.4	5557.8
37	31	211.3	203.1	237.1	651.5	9.8		395.2	332.9	728.1	11.0	76.6
38	32	0.0	203.1	237.1	440.2	5.9		395.2	332.9	728.1	9.8	287.9
39	33	883.4	203.1	237.1	1323.6	15.9		395.2	332.9	728.1	8.8	-595.5
40	34	1187.5	203.1	237.1	1627.7	17.5		395.2	332.9	728.1	7.8	-899.6
41	35	211.3	203.1	237.1	651.6	6.3		395.2	332.9	728.1	7.0	76.6
42	36		203.1	237.1	440.2	3.8		395.2	332.9	728.1	6.2	287.9
43	37		203.1	237.1	440.2	3.4		395.2	332.9	728.1	5.6	287.9
44	38	81.7	203.1	237.1	521.9	3.6		395.2	332.9	728.1	5.0	206.2
45	39	122.5	203.1	237.1	562.7	3.4	1317.5	395.2	332.9	2045.6	12.5	1482.9
46	40		203.1	237.1	440.2	2.4	5269.8	395.2	332.9	5998.0	32.7	5557.8
47	41		203.1	237.1	440.2	2.1		395.2	332.9	728.1	3.5	287.9
48	42		203.1	237.1	440.2	1.9		395.2	332.9	728.1	3.2	287.9
49	43		203.1	237.1	440.2	1.7		395.2	332.9	728.1	2.8	287.9
50	44		203.1	237.1	440.2	1.5		395.2	332.9	728.1	2.5	287.9
51	45		203.1	237.1	440.2	1.4		395.2	332.9	728.1	2.2	287.9
52	46		203.1	237.1	440.2	1.2		395.2	332.9	728.1	2.0	287.9
53	47		203.1	237.1	440.2	1.1		395.2	332.9	728.1	1.8	287.9
54	48	276.7	203.1	237.1	717.0	1.6		395.2	332.9	728.1	1.6	11.2
55	49	415.1	203.1	237.1	855.3	1.7		395.2	332.9	728.1	1.4	-127.2
56	50		203.1	237.1	440.2	0.8		395.2	332.9	728.1	1.3	287.9
		18648.6	9164.5	11854.9	39667.9	7169.8	32936.5	17785.7	16644.0	67366.3	7520.5	27698.3

B - C 350.74126
B / C 1.0489192
E D R 0.1354487

Appendix B-6 (3) Case (2) (1st Stage)

(Unit: Million B)

Serial Number	No. after Completion	Cost					Benefit					B - C
		Investment Cost	O&M Cost	Fuel Cost for Pumping	Total	Total (N.P.V.)	Investment Cost	O&M Cost	Fuel Cost	Total	Total (N.P.V.)	
0		0.0			0.0	0.0	0.0			0.0	0.0	0.0
1		106.6			106.6	95.2	0.0			0.0	0.0	-106.6
2		1016.0			1016.0	810.0	0.0			0.0	0.0	-1016.0
3		1431.2			1431.2	1018.7	0.0			0.0	0.0	-1431.2
4		2563.2			2563.2	1629.0	0.0			0.0	0.0	-2563.2
5		1919.0			1919.0	1088.9	1317.5			1317.5	747.6	-601.6
6		224.9			224.9	114.0	5269.8			5269.8	2669.9	5044.9
7	1		111.3	237.1	348.4	157.6		197.6	332.9	530.5	240.0	182.1
8	2		111.3	237.1	348.4	140.7		197.6	332.9	530.5	214.3	182.1
9	3		111.3	237.1	348.4	125.6		197.6	332.9	530.5	191.3	182.1
10	4		111.3	237.1	348.4	112.2		197.6	332.9	530.5	170.8	182.1
11	5		111.3	237.1	348.4	100.2		197.6	332.9	530.5	152.5	182.1
12	6		111.3	237.1	348.4	89.4		197.6	332.9	530.5	136.2	182.1
13	7		111.3	237.1	348.4	79.8		197.6	332.9	530.5	121.6	182.1
14	8		111.3	237.1	348.4	71.3		197.6	332.9	530.5	108.6	182.1
15	9		111.3	237.1	348.4	63.7		197.6	332.9	530.5	96.9	182.1
16	10		111.3	237.1	348.4	56.8		197.6	332.9	530.5	86.5	182.1
17	11		111.3	237.1	348.4	50.7		197.6	332.9	530.5	77.3	182.1
18	12		111.3	237.1	348.4	45.3		197.6	332.9	530.5	69.0	182.1
19	13		111.3	237.1	348.4	40.5		197.6	332.9	530.5	61.6	182.1
20	14		111.3	237.1	348.4	36.1		197.6	332.9	530.5	55.0	182.1
21	15		111.3	237.1	348.4	32.2		197.6	332.9	530.5	49.1	182.1
22	16		111.3	237.1	348.4	28.8		197.6	332.9	530.5	43.8	182.1
23	17		111.3	237.1	348.4	25.7		197.6	332.9	530.5	39.1	182.1
24	18		111.3	237.1	348.4	23.0		197.6	332.9	530.5	35.0	182.1
25	19		111.3	237.1	348.4	20.5	1317.5	197.6	332.9	1848.0	108.7	1499.5
26	20		111.3	237.1	348.4	18.3	5269.8	197.6	332.9	5800.3	304.6	5451.9
27	21	219.2	111.3	237.1	567.6	26.6		197.6	332.9	530.5	24.9	-37.1
28	22	0.0	111.3	237.1	348.4	14.6		197.6	332.9	530.5	22.2	182.1
29	23	915.6	111.3	237.1	1264.0	47.3		197.6	332.9	530.5	19.8	-733.5
30	24	1226.7	111.3	237.1	1575.1	52.6		197.6	332.9	530.5	17.7	-1044.6
31	25	219.2	111.3	237.1	567.6	16.9		197.6	332.9	530.5	15.8	-37.1
32	26		111.3	237.1	348.4	9.3		197.6	332.9	530.5	14.1	182.1
33	27		111.3	237.1	348.4	8.3		197.6	332.9	530.5	12.6	182.1
34	28		111.3	237.1	348.4	7.4		197.6	332.9	530.5	11.3	182.1
35	29		111.3	237.1	348.4	6.6		197.6	332.9	530.5	10.0	182.1
36	30		111.3	237.1	348.4	5.9		197.6	332.9	530.5	9.0	182.1
37	31		111.3	237.1	348.4	5.3		197.6	332.9	530.5	8.0	182.1
38	32		111.3	237.1	348.4	4.7		197.6	332.9	530.5	7.2	182.1
39	33		111.3	237.1	348.4	4.2		197.6	332.9	530.5	6.4	182.1
40	34		111.3	237.1	348.4	3.7		197.6	332.9	530.5	5.7	182.1
41	35		111.3	237.1	348.4	3.3		197.6	332.9	530.5	5.1	182.1
42	36		111.3	237.1	348.4	3.0		197.6	332.9	530.5	4.5	182.1
43	37		111.3	237.1	348.4	2.7		197.6	332.9	530.5	4.1	182.1
44	38	81.7	111.3	237.1	430.1	2.9		197.6	332.9	530.5	3.6	100.4
45	39	122.5	111.3	237.1	470.9	2.9	1317.5	197.6	332.9	1848.0	11.3	1377.0
46	40		111.3	237.1	348.4	1.9	5269.8	197.6	332.9	5800.3	31.6	5451.9
47	41		111.3	237.1	348.4	1.7		197.6	332.9	530.5	2.6	182.1
48	42		111.3	237.1	348.4	1.5		197.6	332.9	530.5	2.3	182.1
49	43		111.3	237.1	348.4	1.4		197.6	332.9	530.5	2.1	182.1
50	44		111.3	237.1	348.4	1.2		197.6	332.9	530.5	1.8	182.1
51	45		111.3	237.1	348.4	1.1		197.6	332.9	530.5	1.6	182.1
52	46		111.3	237.1	348.4	1.0		197.6	332.9	530.5	1.5	182.1
53	47		111.3	237.1	348.4	0.9		197.6	332.9	530.5	1.3	182.1
54	48		111.3	237.1	348.4	0.8		197.6	332.9	530.5	1.2	182.1
55	49		111.3	237.1	348.4	0.7		197.6	332.9	530.5	1.0	182.1
56	50		111.3	237.1	348.4	0.6		197.6	332.9	530.5	0.9	182.1
		10045.8	5566.0	11854.9	27466.6	6314.9	19761.9	9881.0	16644.0	46286.9	6040.4	13820.3

B - C	-274.4479
B / C	0.9565393
E D R	0.1078030

Appendix B-6 (4) Case (2) (1st + 2nd Stage)

(Unit: Million B)

Serial Number	No. after Completion	Cost					Benefit					B - C
		Investment Cost	O&M Cost	Fuel Cost For Pumping	Total	Total (N.P.V.)	Investment Cost	O&M Cost	Fuel Cost	Total	Total (N.P.V.)	
0		0.0			0.0	0.0	0.0			0.0	0.0	0.0
1		106.6			106.6	96.2	0.0			0.0	0.0	-106.6
2		1016.0			1016.0	810.0	0.0			0.0	0.0	-1016.0
3		1431.2			1431.2	1018.7	0.0			0.0	0.0	-1431.2
4		2563.2			2563.2	1629.9	0.0			0.0	0.0	-2563.2
5		1919.0			1919.0	1088.9	1317.5			1317.5	747.6	-601.6
6		224.9			224.9	114.0	5269.8			5269.8	2669.9	5044.9
7	1		111.3	237.1	348.4	157.6		197.6	332.9	530.5	240.0	182.1
8	2		111.3	237.1	348.4	140.7		197.6	332.9	530.5	214.3	182.1
9	3		111.3	237.1	348.4	125.6		197.6	332.9	530.5	191.3	182.1
10	4		111.3	237.1	348.4	112.2		197.6	332.9	530.5	170.8	182.1
11	5	64.4	111.3	237.1	412.8	118.7		197.6	332.9	530.5	152.5	117.7
12	6	360.8	111.3	237.1	709.2	182.0		197.6	332.9	530.5	136.2	-178.7
13	7	396.2	111.3	237.1	744.6	170.7		197.6	332.9	530.5	121.6	-214.1
14	8	1729.3	111.3	237.1	2077.7	425.1		197.6	332.9	530.5	108.6	-1547.2
15	9	1831.4	111.3	237.1	2179.8	398.2	1317.5	197.6	332.9	1848.0	337.6	-331.8
16	10	217.5	111.3	237.1	566.0	92.3	5269.8	197.6	332.9	5800.3	946.2	5234.4
17	11		193.4	237.1	430.5	62.7		395.2	332.9	728.1	106.0	297.6
18	12		193.4	237.1	430.5	56.0		395.2	332.9	728.1	94.7	297.6
19	13		193.4	237.1	430.5	50.0		395.2	332.9	728.1	84.5	297.6
20	14		193.4	237.1	430.5	44.6		395.2	332.9	728.1	75.5	297.6
21	15		193.4	237.1	430.5	39.9		395.2	332.9	728.1	67.4	297.6
22	16		193.4	237.1	430.5	35.6		395.2	332.9	728.1	60.2	297.6
23	17		193.4	237.1	430.5	31.8		395.2	332.9	728.1	53.7	297.6
24	18		193.4	237.1	430.5	28.4		395.2	332.9	728.1	48.0	297.6
25	19		193.4	237.1	430.5	25.3	1317.5	395.2	332.9	2045.6	120.3	1615.0
26	20		193.4	237.1	430.5	22.6	5269.8	395.2	332.9	5998.0	315.0	5567.4
27	21	219.2	193.4	237.1	649.7	30.5		395.2	332.9	728.1	34.1	78.4
28	22	0.0	193.4	237.1	430.5	18.0		395.2	332.9	728.1	30.5	297.6
29	23	915.6	193.4	237.1	1346.1	50.3		395.2	332.9	728.1	27.2	-618.0
30	24	1226.7	193.4	237.1	1657.2	55.3		395.2	332.9	728.1	24.3	-929.1
31	25	219.2	193.4	237.1	649.7	19.4		395.2	332.9	728.1	21.7	78.4
32	26		193.4	237.1	430.5	11.5		395.2	332.9	728.1	19.4	297.6
33	27		193.4	237.1	430.5	10.2		395.2	332.9	728.1	17.3	297.6
34	28		193.4	237.1	430.5	9.1		395.2	332.9	728.1	15.4	297.6
35	29		193.4	237.1	430.5	8.2	1317.5	395.2	332.9	2045.6	38.7	1615.0
36	30		193.4	237.1	430.5	7.3	5269.8	395.2	332.9	5998.0	101.4	5567.4
37	31	203.7	193.4	237.1	634.2	9.6		395.2	332.9	728.1	11.0	93.9
38	32	0.0	193.4	237.1	430.5	5.8		395.2	332.9	728.1	9.8	297.6
39	33	851.8	193.4	237.1	1282.3	15.4		395.2	332.9	728.1	8.8	-554.2
40	34	1149.0	193.4	237.1	1579.6	17.0		395.2	332.9	728.1	7.8	-851.5
41	35	192.1	193.4	237.1	622.7	6.0		395.2	332.9	728.1	7.0	105.5
42	36		193.4	237.1	430.5	3.7		395.2	332.9	728.1	6.2	297.6
43	37		193.4	237.1	430.5	3.3		395.2	332.9	728.1	5.6	297.6
44	38	81.7	193.4	237.1	512.2	3.5		395.2	332.9	728.1	5.0	215.9
45	39	122.5	193.4	237.1	553.0	3.4	1317.5	395.2	332.9	2045.6	12.5	1492.6
46	40		193.4	237.1	430.5	2.3	5269.8	395.2	332.9	5998.0	32.7	5567.4
47	41		193.4	237.1	430.5	2.1		395.2	332.9	728.1	3.5	297.6
48	42		193.4	237.1	430.5	1.9		395.2	332.9	728.1	3.2	297.6
49	43		193.4	237.1	430.5	1.7		395.2	332.9	728.1	2.8	297.6
50	44		193.4	237.1	430.5	1.5		395.2	332.9	728.1	2.5	297.6
51	45		193.4	237.1	430.5	1.3		395.2	332.9	728.1	2.2	297.6
52	46		193.4	237.1	430.5	1.2		395.2	332.9	728.1	2.0	297.6
53	47		193.4	237.1	430.5	1.1		395.2	332.9	728.1	1.8	297.6
54	48	276.7	193.4	237.1	707.3	1.6		395.2	332.9	728.1	1.6	20.8
55	49	415.1	193.4	237.1	845.7	1.7		395.2	332.9	728.1	1.4	-117.5
56	50		193.4	237.1	430.5	0.8		395.2	332.9	728.1	1.3	297.6
		17733.8	8850.7	11854.9	38439.4	7380.1	32936.5	17785.7	16644.0	67366.3	7520.5	28926.9

B - C	140.48295
B / C	1.0190354
E D R	0.1250203

Appendix B-6 (5) Case (3) (1st Stage)

(Unit: Million B)

Serial Number	No. after Completion	Cost					Benefit					B - C
		Investment Cost	O&M Cost	Fuel Cost for Pumping	Total	Total (N.P.V.)	Investment Cost	O&M Cost	Fuel Cost	Total	Total (N.P.V.)	
0		0.0			0.0	0.0	0.0			0.0	0.0	0.0
1		108.9			108.9	97.2	0.0			0.0	0.0	-108.9
2		1129.1			1129.1	900.1	0.0			0.0	0.0	-1129.1
3		1700.8			1700.8	1210.6	0.0			0.0	0.0	-1700.8
4		3109.8			3109.8	1976.3	0.0			0.0	0.0	-3109.8
5		2191.7			2191.7	1243.6	1317.5			1317.5	747.6	-874.2
6		225.3			225.3	114.1	5269.8			5269.8	2669.9	5044.6
7	1		123.3	237.1	360.4	163.0		197.6	332.9	530.5	240.0	170.1
8	2		123.3	237.1	360.4	145.6		197.6	332.9	530.5	214.3	170.1
9	3		123.3	237.1	360.4	130.0		197.6	332.9	530.5	191.3	170.1
10	4		123.3	237.1	360.4	116.0		197.6	332.9	530.5	170.8	170.1
11	5		123.3	237.1	360.4	103.6		197.6	332.9	530.5	152.5	170.1
12	6		123.3	237.1	360.4	92.5		197.6	332.9	530.5	136.2	170.1
13	7		123.3	237.1	360.4	82.6		197.6	332.9	530.5	121.6	170.1
14	8		123.3	237.1	360.4	73.8		197.6	332.9	530.5	108.6	170.1
15	9		123.3	237.1	360.4	65.8		197.6	332.9	530.5	96.9	170.1
16	10		123.3	237.1	360.4	58.8		197.6	332.9	530.5	86.5	170.1
17	11		123.3	237.1	360.4	52.5		197.6	332.9	530.5	77.3	170.1
18	12		123.3	237.1	360.4	46.9		197.6	332.9	530.5	69.0	170.1
19	13		123.3	237.1	360.4	41.8		197.6	332.9	530.5	61.6	170.1
20	14		123.3	237.1	360.4	37.4		197.6	332.9	530.5	55.0	170.1
21	15		123.3	237.1	360.4	33.4		197.6	332.9	530.5	49.1	170.1
22	16		123.3	237.1	360.4	29.8		197.6	332.9	530.5	43.8	170.1
23	17		123.3	237.1	360.4	26.6		197.6	332.9	530.5	39.1	170.1
24	18		123.3	237.1	360.4	23.7		197.6	332.9	530.5	35.0	170.1
25	19		123.3	237.1	360.4	21.2	1317.5	197.6	332.9	1848.0	108.7	1487.5
26	20		123.3	237.1	360.4	18.9	5269.8	197.6	332.9	5800.3	304.6	5439.9
27	21	219.0	123.3	237.1	579.4	27.2		197.6	332.9	530.5	24.9	-48.9
28	22	0.0	123.3	237.1	360.4	15.1		197.6	332.9	530.5	22.2	170.1
29	23	914.8	123.3	237.1	1275.2	47.7		197.6	332.9	530.5	19.8	-744.7
30	24	1225.7	123.3	237.1	1586.1	52.9		197.6	332.9	530.5	17.7	-1055.6
31	25	219.0	123.3	237.1	579.4	17.3		197.6	332.9	530.5	15.8	-48.9
32	26		123.3	237.1	360.4	9.6		197.6	332.9	530.5	14.1	170.1
33	27		123.3	237.1	360.4	8.6		197.6	332.9	530.5	12.6	170.1
34	28		123.3	237.1	360.4	7.6		197.6	332.9	530.5	11.3	170.1
35	29		123.3	237.1	360.4	6.8		197.6	332.9	530.5	10.0	170.1
36	30		123.3	237.1	360.4	6.1		197.6	332.9	530.5	9.0	170.1
37	31		123.3	237.1	360.4	5.4		197.6	332.9	530.5	8.0	170.1
38	32		123.3	237.1	360.4	4.9		197.6	332.9	530.5	7.2	170.1
39	33		123.3	237.1	360.4	4.3		197.6	332.9	530.5	6.4	170.1
40	34		123.3	237.1	360.4	3.9		197.6	332.9	530.5	5.7	170.1
41	35		123.3	237.1	360.4	3.5		197.6	332.9	530.5	5.1	170.1
42	36		123.3	237.1	360.4	3.1		197.6	332.9	530.5	4.5	170.1
43	37		123.3	237.1	360.4	2.8		197.6	332.9	530.5	4.1	170.1
44	38	81.7	123.3	237.1	442.1	3.0		197.6	332.9	530.5	3.6	88.4
45	39	122.5	123.3	237.1	482.9	2.9	1317.5	197.6	332.9	1848.0	11.3	1365.0
46	40		123.3	237.1	360.4	2.0	5269.8	197.6	332.9	5800.3	31.6	5439.9
47	41		123.3	237.1	360.4	1.8		197.6	332.9	530.5	2.6	170.1
48	42		123.3	237.1	360.4	1.6		197.6	332.9	530.5	2.3	170.1
49	43		123.3	237.1	360.4	1.4		197.6	332.9	530.5	2.1	170.1
50	44		123.3	237.1	360.4	1.2		197.6	332.9	530.5	1.8	170.1
51	45		123.3	237.1	360.4	1.1		197.6	332.9	530.5	1.6	170.1
52	46		123.3	237.1	360.4	1.0		197.6	332.9	530.5	1.5	170.1
53	47		123.3	237.1	360.4	0.9		197.6	332.9	530.5	1.3	170.1
54	48		123.3	237.1	360.4	0.8		197.6	332.9	530.5	1.2	170.1
55	49		123.3	237.1	360.4	0.7		197.6	332.9	530.5	1.0	170.1
56	50		123.3	237.1	360.4	0.6		197.6	332.9	530.5	0.9	170.1
		11248.0	5166.5	11854.9	29269.4	7151.5	19761.9	9881.0	16644.0	46286.9	6040.4	17017.5

B - C	-1111.098
B / C	0.8446343
E D R	0.0303380

Appendix B-6 (6) Case (3) (1st + 2nd Stage)

(Unit: Million B)

Serial Number	No. after Completion	Cost					Benefit					B - C
		Investment Cost	O&M Cost	Fuel Cost for Pumping	Total	Total (N.P.V.)	Investment Cost	O&M Cost	Fuel Cost	Total	Total (N.P.V.)	
0		0.0			0.0	0.0	0.0			0.0	0.0	0.0
1		108.9			108.9	97.2	0.0			0.0	0.0	-108.9
2		1129.1			1129.1	900.1	0.0			0.0	0.0	-1129.1
3		1700.8			1700.8	1210.6	0.0			0.0	0.0	-1700.8
4		3109.8			3109.8	1976.3	0.0			0.0	0.0	-3109.8
5		2191.7			2191.7	1243.6	1317.5			1317.5	747.6	-874.2
6		225.3			225.3	114.1	5269.8			5269.8	2669.9	5044.6
7	1		123.3	237.1	360.4	163.0		197.6	332.9	530.5	240.0	170.1
8	2		123.3	237.1	360.4	145.6		197.6	332.9	530.5	214.3	170.1
9	3		123.3	237.1	360.4	130.0		197.6	332.9	530.5	191.3	170.1
10	4		123.3	237.1	360.4	116.0		197.6	332.9	530.5	170.8	170.1
11	5		123.3	237.1	360.4	103.6		197.6	332.9	530.5	152.5	170.1
12	6	17.8	123.3	237.1	378.2	97.1		197.6	332.9	530.5	136.2	152.3
13	7	247.2	123.3	237.1	607.6	139.3		197.6	332.9	530.5	121.6	-77.1
14	8	909.4	123.3	237.1	1269.9	259.8		197.6	332.9	530.5	108.6	-739.4
15	9	1561.2	123.3	237.1	1921.6	351.1	1317.5	197.6	332.9	1848.0	337.6	-73.7
16	10	231.1	123.3	237.1	591.6	96.5	5269.8	197.6	332.9	5800.3	946.2	5208.8
17	11		185.0	237.1	422.1	61.5		395.2	332.9	728.1	106.0	306.0
18	12		185.0	237.1	422.1	54.9		395.2	332.9	728.1	94.7	306.0
19	13		185.0	237.1	422.1	49.0		395.2	332.9	728.1	84.5	306.0
20	14		185.0	237.1	422.1	43.8		395.2	332.9	728.1	75.5	306.0
21	15		185.0	237.1	422.1	39.1		395.2	332.9	728.1	67.4	306.0
22	16		185.0	237.1	422.1	34.9		395.2	332.9	728.1	60.2	306.0
23	17		185.0	237.1	422.1	31.1		395.2	332.9	728.1	53.7	306.0
24	18		185.0	237.1	422.1	27.8		395.2	332.9	728.1	48.0	306.0
25	19		185.0	237.1	422.1	24.8	1317.5	395.2	332.9	2045.6	120.3	1623.5
26	20		185.0	237.1	422.1	22.2	5269.8	395.2	332.9	5998.0	315.0	5575.9
27	21	219.0	185.0	237.1	641.1	30.1		395.2	332.9	728.1	34.1	87.0
28	22	0.0	185.0	237.1	422.1	17.7		395.2	332.9	728.1	30.5	306.0
29	23	914.8	185.0	237.1	1336.9	50.0		395.2	332.9	728.1	27.2	-608.8
30	24	1225.7	185.0	237.1	1647.8	55.0		395.2	332.9	728.1	24.3	-919.7
31	25	219.0	185.0	237.1	641.1	19.1		395.2	332.9	728.1	21.7	87.0
32	26		185.0	237.1	422.1	11.2		395.2	332.9	728.1	19.4	306.0
33	27		185.0	237.1	422.1	10.0		395.2	332.9	728.1	17.3	306.0
34	28		185.0	237.1	422.1	9.0		395.2	332.9	728.1	15.4	306.0
35	29		185.0	237.1	422.1	8.0	1317.5	395.2	332.9	2045.6	38.7	1623.5
36	30		185.0	237.1	422.1	7.1	5269.8	395.2	332.9	5998.0	101.4	5575.9
37	31		185.0	237.1	422.1	6.4		395.2	332.9	728.1	11.0	306.0
38	32	198.8	185.0	237.1	620.9	8.4		395.2	332.9	728.1	9.8	107.2
39	33	611.0	185.0	237.1	1033.1	12.4		395.2	332.9	728.1	8.8	-305.0
40	34	1124.9	185.0	237.1	1547.0	16.6		395.2	332.9	728.1	7.8	-818.9
41	35	198.8	185.0	237.1	620.9	6.0		395.2	332.9	728.1	7.0	107.2
42	36		185.0	237.1	422.1	3.6		395.2	332.9	728.1	6.2	306.0
43	37		185.0	237.1	422.1	3.2		395.2	332.9	728.1	5.6	306.0
44	38	81.7	185.0	237.1	503.8	3.4		395.2	332.9	728.1	5.0	224.4
45	39	122.5	185.0	237.1	544.6	3.3	1317.5	395.2	332.9	2045.6	12.5	1501.0
46	40		185.0	237.1	422.1	2.3	5269.8	395.2	332.9	5998.0	32.7	5575.9
47	41		185.0	237.1	422.1	2.1		395.2	332.9	728.1	3.5	306.0
48	42		185.0	237.1	422.1	1.8		395.2	332.9	728.1	3.2	306.0
49	43		185.0	237.1	422.1	1.6		395.2	332.9	728.1	2.8	306.0
50	44		185.0	237.1	422.1	1.5		395.2	332.9	728.1	2.5	306.0
51	45		185.0	237.1	422.1	1.3		395.2	332.9	728.1	2.2	306.0
52	46		185.0	237.1	422.1	1.2		395.2	332.9	728.1	2.0	306.0
53	47		185.0	237.1	422.1	1.0		395.2	332.9	728.1	1.8	306.0
54	48	276.7	185.0	237.1	698.8	1.5		395.2	332.9	728.1	1.6	29.3
55	49	415.1	185.0	237.1	837.2	1.6		395.2	332.9	728.1	1.4	-109.1
56	50		185.0	237.1	422.1	0.7		395.2	332.9	728.1	1.3	306.0
		17040.2	8633.4	11854.9	37528.4	7830.1	32936.5	17785.7	16644.0	67366.3	7520.5	29837.8

B - C	-309.5897
B / C	0.9604617
E D R	0.1110792

Appendix B-6 (7) Case (4)

(Unit: Million B)

Serial Number	No. after Completion	Cost					Benefit					B - C
		Investment Cost	O&M Cost	Fuel Cost for Pumping	Total	Total (N.P.V.)	Investment Cost	O&M Cost	Fuel Cost	Total	Total (N.P.V.)	
0		0.0			0.0	0.0	0.0			0.0	0.0	0.0
1		114.5			114.5	102.2	0.0			0.0	0.0	-114.5
2		1326.0			1326.0	1057.0	0.0			0.0	0.0	-1326.0
3		1754.0			1754.0	1248.4	0.0			0.0	0.0	-1754.0
4		4110.5			4110.5	2612.3	0.0			0.0	0.0	-4110.5
5		3550.5			3550.5	2014.6	2634.9			2634.9	1495.1	-915.5
6		398.9			398.9	202.1	10539.7			10539.7	5339.7	10140.8
7	1		182.9	237.1	420.0	190.0		395.2	332.9	728.1	329.4	308.1
8	2		182.9	237.1	420.0	169.6		395.2	332.9	728.1	294.1	308.1
9	3		182.9	237.1	420.0	151.4		395.2	332.9	728.1	262.6	308.1
10	4		182.9	237.1	420.0	135.2		395.2	332.9	728.1	234.4	308.1
11	5		182.9	237.1	420.0	120.7		395.2	332.9	728.1	209.3	308.1
12	6		182.9	237.1	420.0	107.8		395.2	332.9	728.1	186.9	308.1
13	7		182.9	237.1	420.0	96.2		395.2	332.9	728.1	166.9	308.1
14	8		182.9	237.1	420.0	85.9		395.2	332.9	728.1	149.0	308.1
15	9		182.9	237.1	420.0	76.7		395.2	332.9	728.1	133.0	308.1
16	10		182.9	237.1	420.0	68.5		395.2	332.9	728.1	118.8	308.1
17	11		182.9	237.1	420.0	61.2		395.2	332.9	728.1	106.0	308.1
18	12		182.9	237.1	420.0	54.6		395.2	332.9	728.1	94.7	308.1
19	13		182.9	237.1	420.0	48.8		395.2	332.9	728.1	84.5	308.1
20	14		182.9	237.1	420.0	43.5		395.2	332.9	728.1	75.5	308.1
21	15		182.9	237.1	420.0	38.9		395.2	332.9	728.1	67.4	308.1
22	16		182.9	237.1	420.0	34.7		395.2	332.9	728.1	60.2	308.1
23	17		182.9	237.1	420.0	31.0		395.2	332.9	728.1	53.7	308.1
24	18		182.9	237.1	420.0	27.7		395.2	332.9	728.1	48.0	308.1
25	19		182.9	237.1	420.0	24.7	2634.9	395.2	332.9	3363.0	197.8	2943.1
26	20		182.9	237.1	420.0	22.1	10539.7	395.2	332.9	11267.8	591.8	10847.8
27	21	395.8	182.9	237.1	815.8	38.3		395.2	332.9	728.1	34.1	-87.7
28	22	0.0	182.9	237.1	420.0	17.6		395.2	332.9	728.1	30.5	308.1
29	23	1656.3	182.9	237.1	2076.3	77.6		395.2	332.9	728.1	27.2	-1348.2
30	24	2240.6	182.9	237.1	2660.6	88.8		395.2	332.9	728.1	24.3	-1932.5
31	25	395.8	182.9	237.1	815.8	24.3		395.2	332.9	728.1	21.7	-87.7
32	26		182.9	237.1	420.0	11.2		395.2	332.9	728.1	19.4	308.1
33	27		182.9	237.1	420.0	10.0		395.2	332.9	728.1	17.3	308.1
34	28		182.9	237.1	420.0	8.9		395.2	332.9	728.1	15.4	308.1
35	29		182.9	237.1	420.0	8.0		395.2	332.9	728.1	13.8	308.1
36	30		182.9	237.1	420.0	7.1		395.2	332.9	728.1	12.3	308.1
37	31		182.9	237.1	420.0	6.3		395.2	332.9	728.1	11.0	308.1
38	32		182.9	237.1	420.0	5.7		395.2	332.9	728.1	9.8	308.1
39	33		182.9	237.1	420.0	5.1		395.2	332.9	728.1	8.8	308.1
40	34		182.9	237.1	420.0	4.5		395.2	332.9	728.1	7.8	308.1
41	35		182.9	237.1	420.0	4.0		395.2	332.9	728.1	7.0	308.1
42	36		182.9	237.1	420.0	3.6		395.2	332.9	728.1	6.2	308.1
43	37		182.9	237.1	420.0	3.2		395.2	332.9	728.1	5.6	308.1
44	38	317.6	182.9	237.1	737.5	5.0		395.2	332.9	728.1	5.0	-9.4
45	39	476.4	182.9	237.1	896.3	5.5	2634.9	395.2	332.9	3363.0	20.5	2466.7
46	40		182.9	237.1	420.0	2.8	10539.7	395.2	332.9	11267.8	61.3	10847.8
47	41		182.9	237.1	420.0	2.0		395.2	332.9	728.1	3.5	308.1
48	42		182.9	237.1	420.0	1.8		395.2	332.9	728.1	3.2	308.1
49	43		182.9	237.1	420.0	1.6		395.2	332.9	728.1	2.8	308.1
50	44		182.9	237.1	420.0	1.5		395.2	332.9	728.1	2.5	308.1
51	45		182.9	237.1	420.0	1.3		395.2	332.9	728.1	2.2	308.1
52	46		182.9	237.1	420.0	1.2		395.2	332.9	728.1	2.0	308.1
53	47		182.9	237.1	420.0	1.0		395.2	332.9	728.1	1.8	308.1
54	48		182.9	237.1	420.0	0.9		395.2	332.9	728.1	1.6	308.1
55	49		182.9	237.1	420.0	0.8		395.2	332.9	728.1	1.4	308.1
56	50		182.9	237.1	420.0	0.7		395.2	332.9	728.1	1.3	308.1
		16736.8	9143.6	11854.9	37735.2	9175.8	39523.8	19761.9	16644.0	75929.8	10680.3	38194.6

B - C	1504.4661
B / C	1.1639598
E D R	0.1744519

APPENDIX — C

PRELIMINARY DESIGN

APPENDIX-C PRELIMINARY DESIGN

CONTENTS

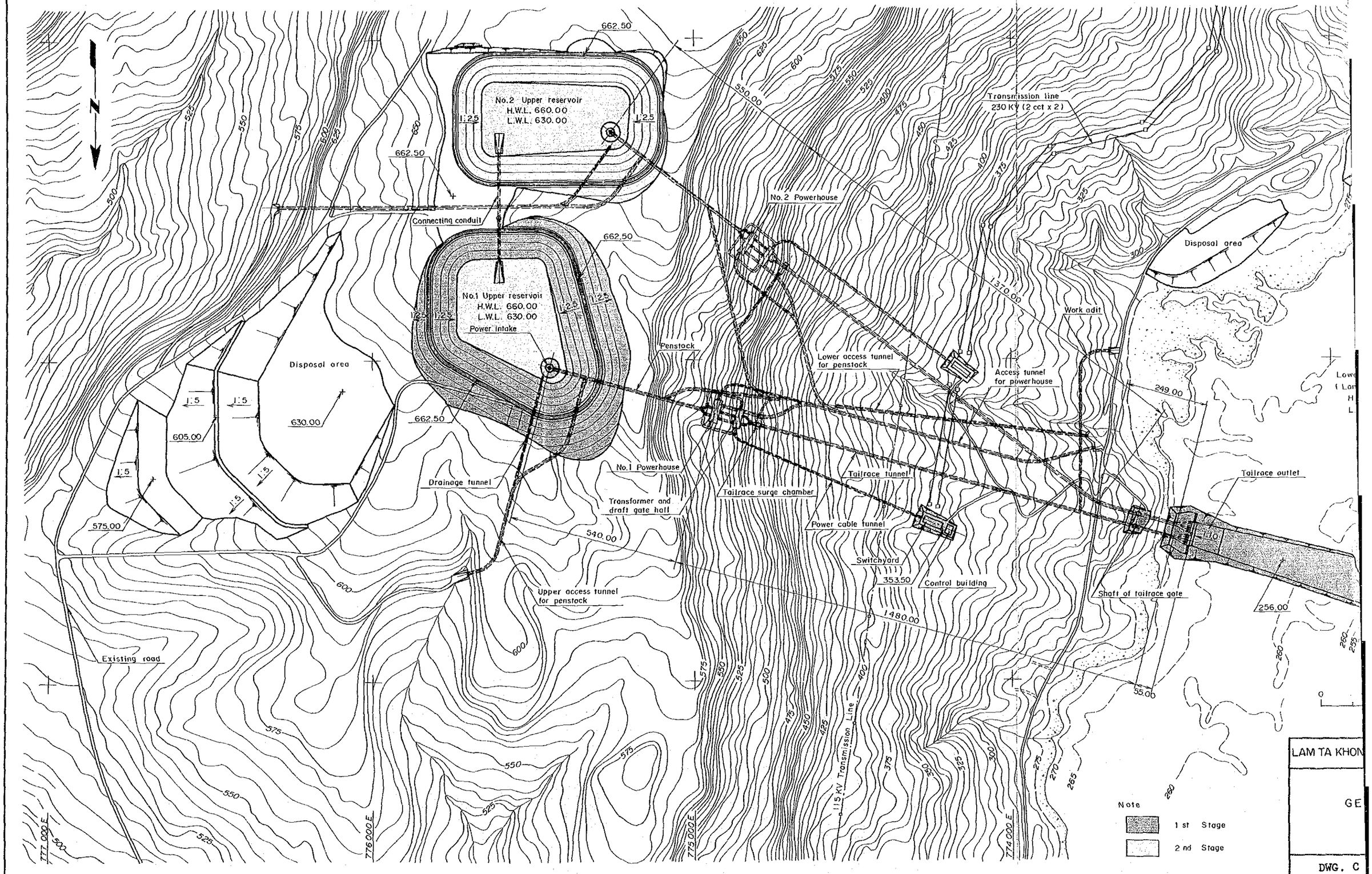
C-1 PRELIMINARY DESIGN OF CASE 1

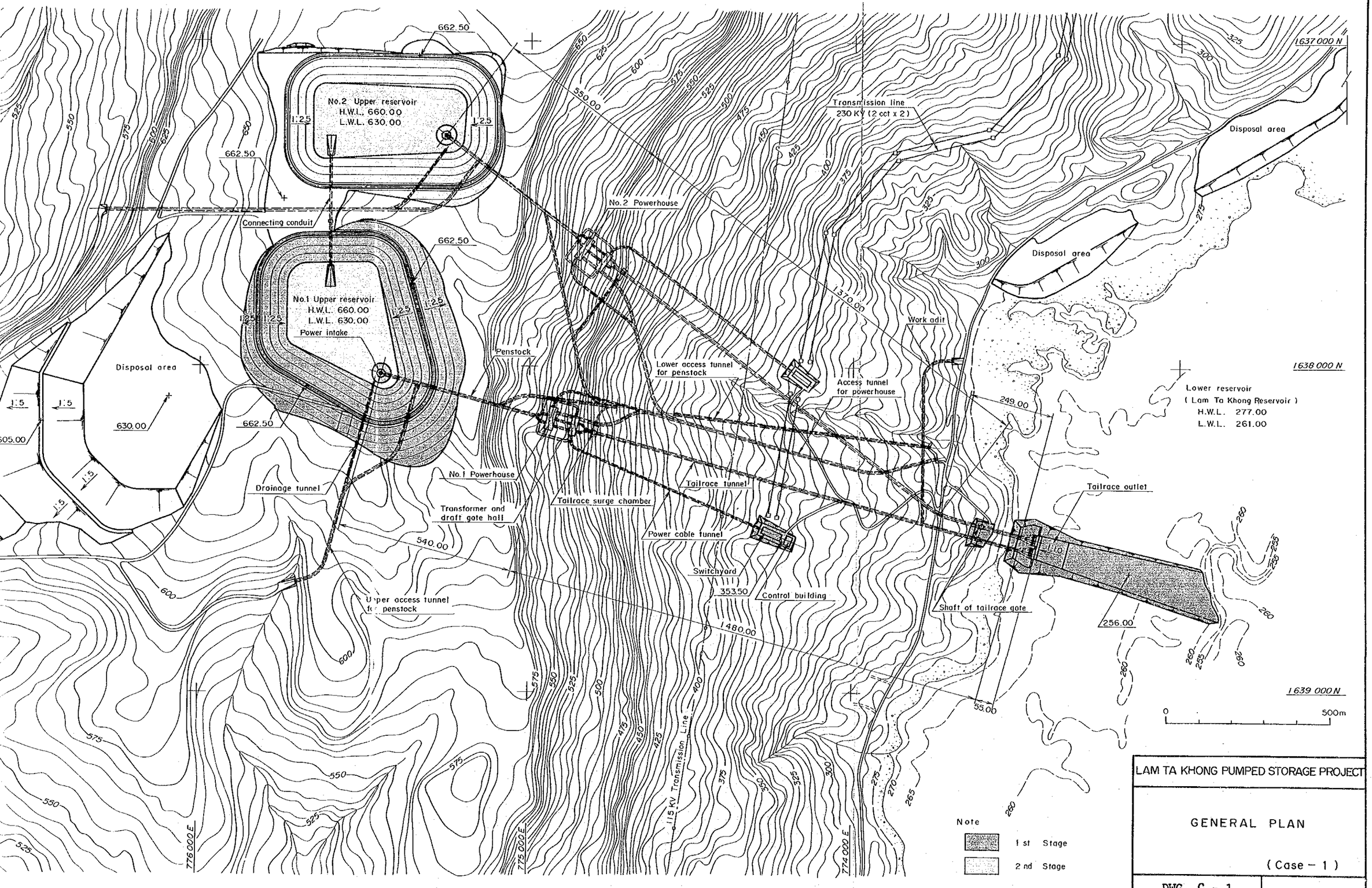
Table－1　Case －1

Item	Unit.	Statistics	
		1st Stage	2nd Stage
1. Hydroelectric Developement Plan			
Rated Intake Water Level	m.MSL.	653.00	653.00
Rated Tailwater Level	m.MSL.	276.00	276.00
Total head	m	377.00	377.00
Loss Head	m	20.00	20.00
Effective Head	m	357.00	357.00
Discharge at Maximum Power Generating	m^3/sec	170	170
Maximum Output	MW	500	500
2. Upper Reservoir			
Dam Type		Rockfill Dam with Asphalt Facing	
Dam Height* Crest Length	m * m	57 * 1,980	25 * 1,860
Dam Volume	$*10^3 m^3$	4,520	690
High Water Level	m.MSL.	660.00	660.00
Low Water Level	m.MSL.	630.00	630.00
Effective Storage Capacity at H.W.L	$*10^3 m^3$	4,980	4,970
Surfase Area at H.W.L	$*10^3 m^2$	223	224
3. Lower Reservoir		(Lam Ta Khong Reservoir)	
Dam Type		Homogeneous Earth-fill Dam (Lam Ta Khong Dam)	
Dam Height* Crest Length	m * m	40.3 * 527	
Dam Volume	$*10^3 m^3$	853	
High Water Level	m.MSL.	277.00	
Low Water Level	m.MSL.	261.00 (L.L.W.L 259.00)	

Effective Storage Capacity at H.W.L	$*10^3 m^3$	290,000	
Surfase Area at H.W.L	$k m^2$	44	
4. Power Intake			
Type		Morning-glory Shape	
Inside Diameter * Length * Number of Set	m*m*-	(18.00~5.80D) * 65.00 * 1	(18.00~5.80D) * 65.00 * 1
5. Penstock			
Type		Inclined Shaft Embedded Steel	
Inside Diameter * Length * Number of Set	m*m*-	(5.80 ~2.60D) * 683.00 * 1	(5.80 ~2.60D) * 700.00 * 1
Gradient	°	51	51
Approximately Weight	t	3,770	3,800
6. Tailrace Tunnel			
Type		Concrete Lined Pressure Type	
Inside Diameter * Length * Number of Set	m*m*-	(4.90 ~6.60D) * (1,470+ 210) * 1	(4.90 ~6.60D) * 1,400 * 1
7. Tailrace Surge Chamber			
Type		Chamber Surge Tank	
-Set	-	1	1
-Shaft Chamber	m * m	(D) (H) 8.90 * 107.00	(D) (H) 8.90 * 107.00
-Upper Chamber	m*m*m	(W) (H) (L) 10.00 *10.00 * 35.00	(W) (H) (L) 10.00 *10.00 * 35.00
8. Tailrace Outlet			
Type		4 Continuous Box Culbert	
Length	m	55.00	——
Width * Height * Number of Set	m * m	(6.60 ~30.00)* (6.60~10.00) * 2	——

9. Powerhouse			
Type		Underground Type	
Width * Length * Height	m*m*m	22.00*71.50*45.70	22.00*72.50*45.70
10. Transformer Hall			
Type		Underground Type	
Width * Length * Height	m*m*m	20.00*59.70*25.50	20.00*63.50*25.50
11. Gate			
-Draft Gate			
-Type		Bonnet type	
-Size * Number of Set	m * -	ϕ 4.90 * 2	ϕ 4.90 * 2
-Tailrace Gate			
-Type		Roller Gate	
-Size * Number of Set	m*m*-	5.20*6.60*1	5.20*6.60*1


662.50
No.2 Upper reservoir
H.W.L. 660.00
L.W.L. 630.00
1:2.5
662.50
Connecting conduit
662.50
No.1 Upper reservoir
H.W.L. 660.00
L.W.L. 630.00
Power intake
1:2.5
Disposal area
630.00
1:5
605.00
575.00
662.50
No.1 Powerhouse
Drainage tunnel
Transformer and draft gate hall
540.00
Upper access tunnel for penstock
Existing road
No.2 Powerhouse
Penstock
Lower access tunnel for penstock
Transmission line
230 KV (2 cct x 2)
1370.00
Work adit
Disposal area
Access tunnel for powerhouse
249.00
Tailrace tunnel
Tailrace surge chamber
Power cable tunnel
Switchyard
353.50
Control building
1480.00
Tailrace outlet
Shaft of tailrace gate
256.00
55.00
115 KV Transmission Line
Note
1 st Stage
2 nd Stage
776 000 E
775 000 E
774 000 E
777 000 E
LAM TA KHON
GE
DWG. C



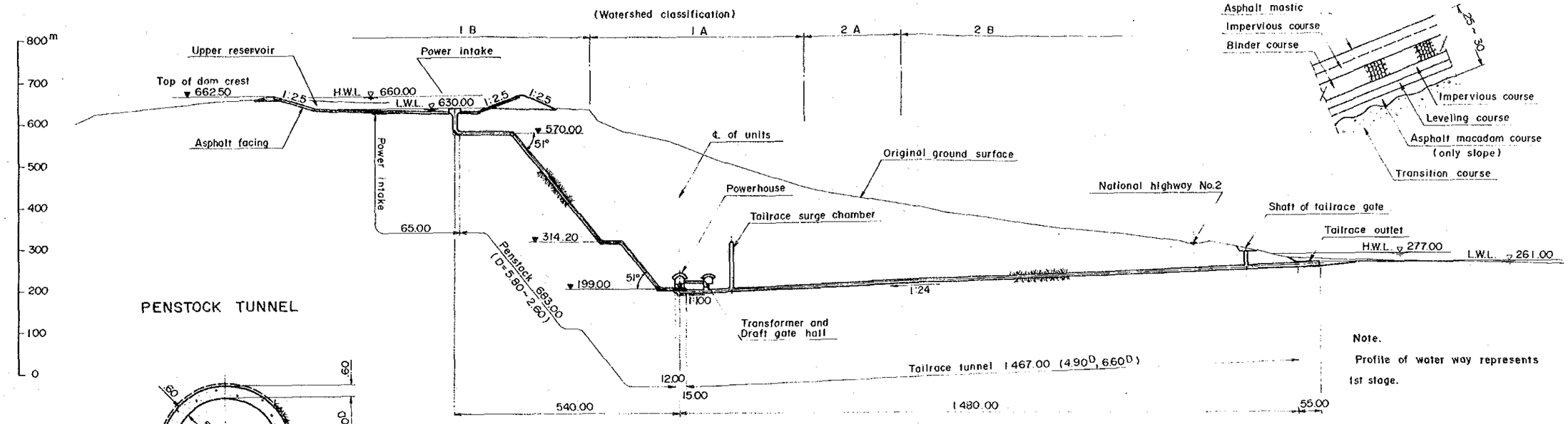
LAM TA KHONG PUMPED STORAGE PROJECT

GENERAL PLAN

(Case – 1)

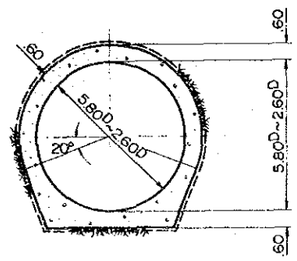
DWG. C - 1

PROFILE OF WATER WAY



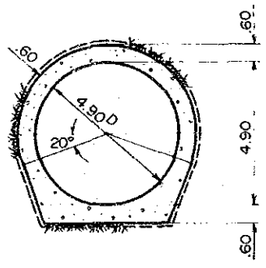
Composition of asphalt facing

PENSTOCK TUNNEL

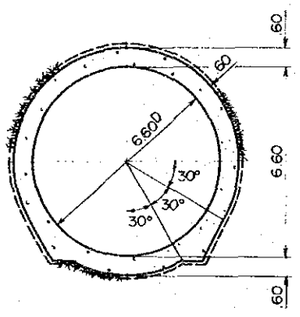


TYPICAL CROSS SECTION

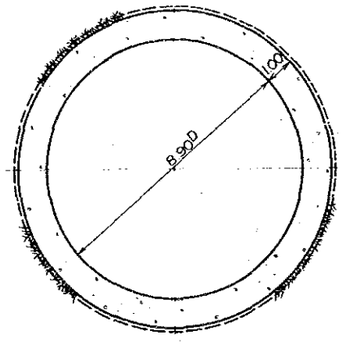
TAILRACE TUNNEL (4.90D)



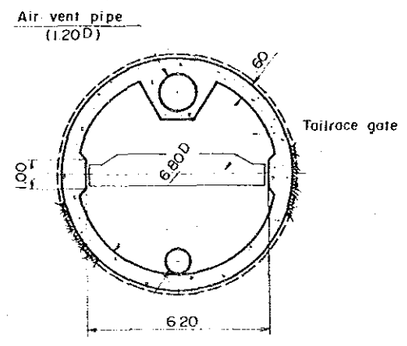
TAILRACE TUNNEL (6.60D)



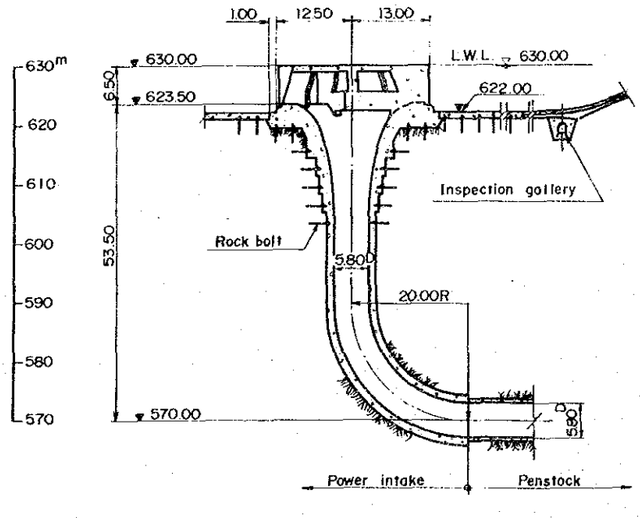
SHAFT OF TAILRACE SURGE CHAMBER



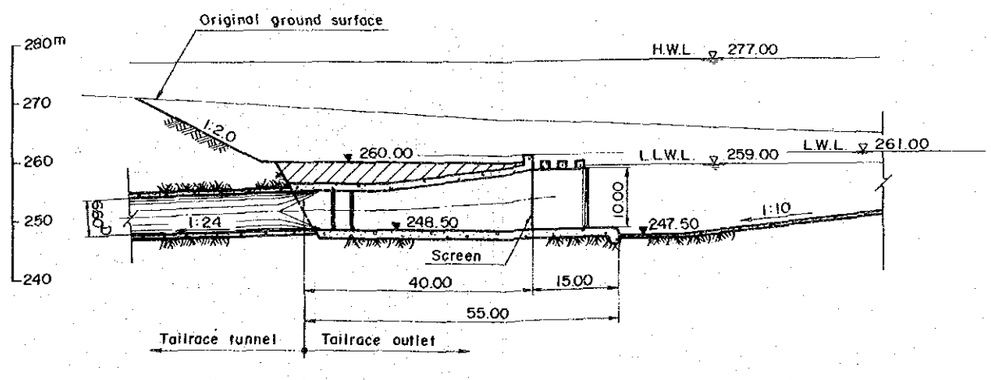
SHAFT OF TAILRACE GATE



SECTION OF POWER INTAKE



SECTION OF TAILRACE OUTLET



Note.
Profile of water way represents 1st stage.

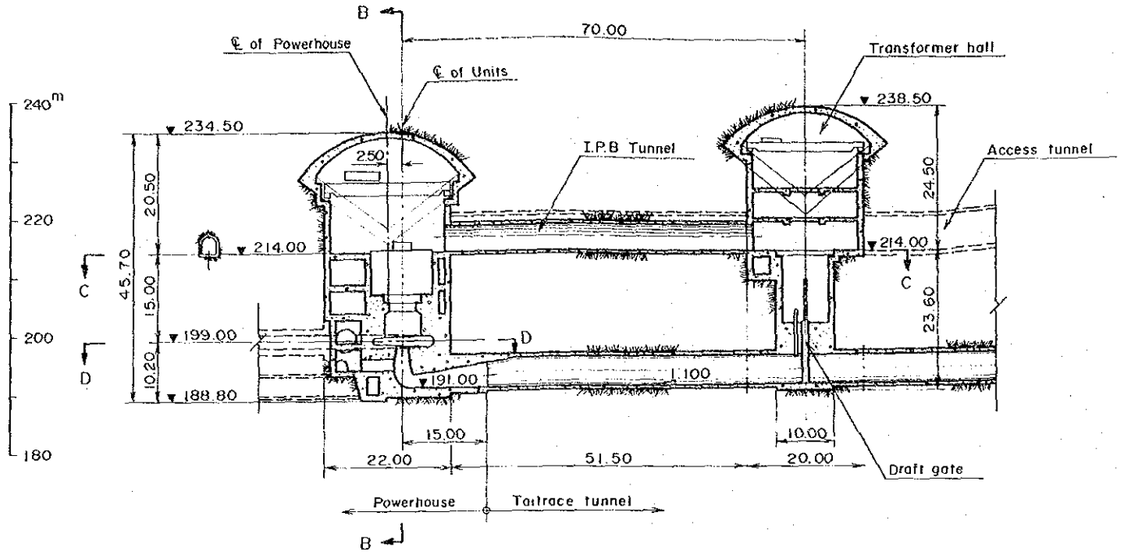
0 10m (TYPICAL SECTION)
0 50m (SECTION OF POWER INTAKE, TAILRACE OUTLET)
0 500m (PROFILE)

LAM TA KHONG PUMPED STORAGE PROJECT

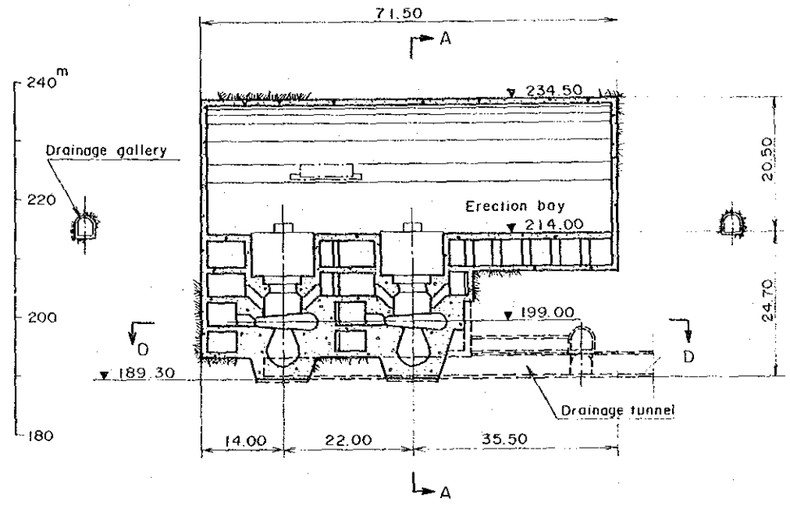
WATER WAY
PROFILE AND SECTION
(CASE – 1)

DWG. C-2

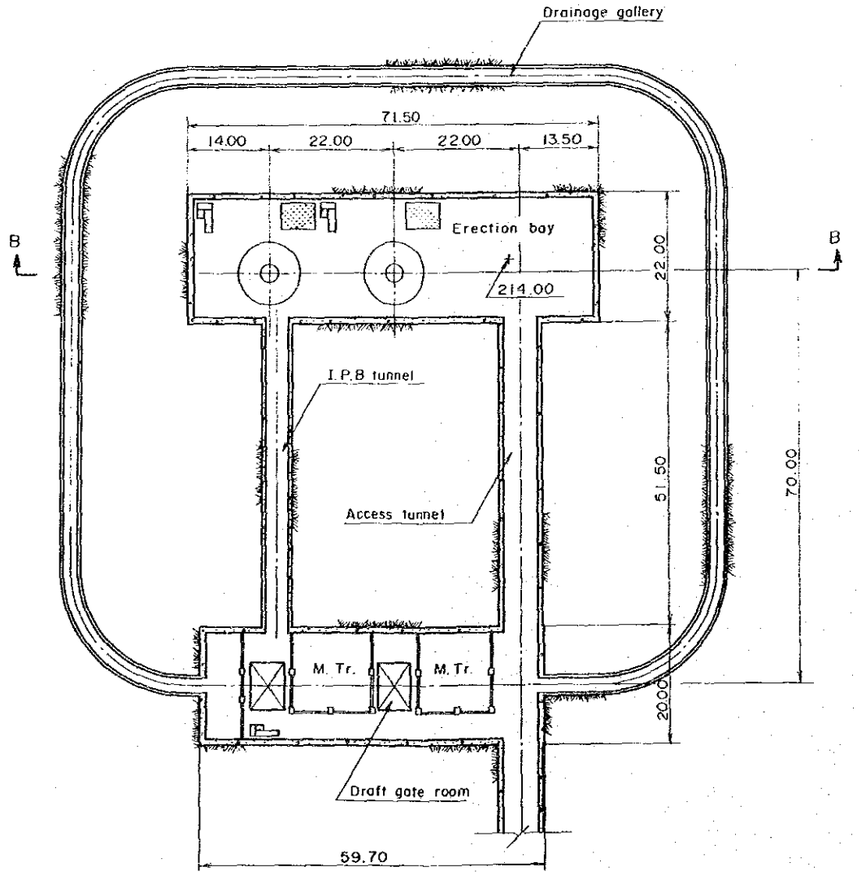
SECTION A – A



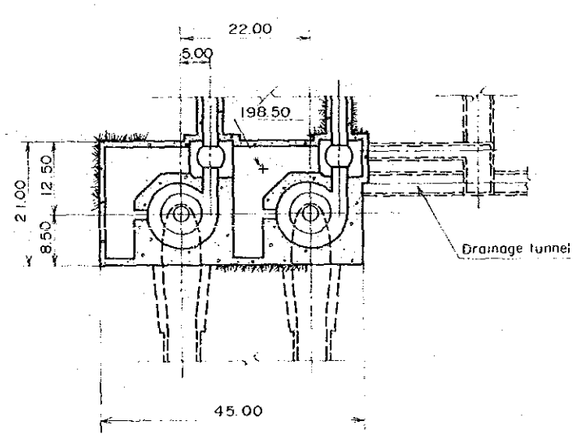
SECTION B – B



SECTION C – C



SECTION D – D



0 50 m

Note;
This drawing represents No.1 Powerhouse.

LAM TA KHONG PUMPED STORAGE PROJECT

POWERHOUSE

SECTION

(Case – 1)

DWG. C-3