

Data II.3.1.1.d RECORDS OF MAXIMUM, MINIMUM AND AVERAGE TEMPERATURE (°C)
 IN PINTU POHAN (SIGURA-GURA), 1971-1975

Maximum Temperature

<u>Year</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>Jun.</u>	<u>Jul.</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Extreme</u>
1971	31.6	27.0	27.0	28.0	27.5	28.4	28.1	26.3	27.8	27.5	27.1	26.6	28.4
1972	26.3	26.4	28.0	28.4	27.8	28.8	28.7	28.3	28.0	27.9	27.8	27.6	28.8
1973	27.5	27.4	27.8	27.5	28.2	29.1	29.8	28.0	30.8	28.6	28.5	27.4	30.8
1974	27.0	28.4	27.8	28.6	28.5	29.8	28.3	28.8	27.9	29.9	27.8	27.4	29.9
1975	27.5	28.5	27.9	27.3	27.1	28.3	28.4	27.9	27.6	27.7	27.3	26.6	28.5

Minimum Temperature

<u>Year</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>Jun.</u>	<u>Jul.</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Extreme</u>
1971	11.3	12.5	12.2	13.7	15.2	14.4	14.2	13.7	11.2	14.2	14.5	14.2	11.2
1972	12.8	11.0	10.5	14.9	14.8	14.6	13.5	12.2	14.7	13.0	13.8	14.2	10.5
1973	11.2	11.3	10.9	11.2	10.7	11.7	11.2	10.7	8.2	11.5	10.2	10.2	8.2
1974	9.0	8.8	9.6	12.2	12.6	14.1	14.0	14.0	13.2	14.2	14.7	14.8	8.3
1975	10.2	12.2	12.7	14.3	14.9	14.2	14.4	15.0	14.9	14.4	14.6	14.3	10.2

Average Temperature

<u>Year</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>Jun.</u>	<u>Jul.</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Average</u>
1971	20.3	19.8	20.5	21.0	21.7	21.6	20.4	20.7	21.0	19.9	20.6	20.6	20.7
1972	21.4	21.0	21.1	21.5	21.7	21.8	22.2	21.6	21.2	20.8	21.1	20.6	21.3
1973	20.9	21.1	21.1	20.9	20.9	21.4	21.6	21.4	20.9	20.8	20.8	20.3	21.0
1974	20.0	20.6	20.8	21.0	21.2	21.4	21.0	21.5	20.4	21.8	20.6	20.7	20.9
1975	17.8	20.7	20.6	20.6	21.0	21.2	20.8	20.8	20.2	20.6	20.4	20.1	20.4
Mean	20.1	20.6	20.8	21.0	21.3	21.5	21.2	21.2	20.7	20.8	20.7	20.5	20.9

Data II.3.2 RECORDS OF MAXIMUM SURFACE WIND IN MEDAN

(Direction/speed in knots per hours)

<u>Year</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>Jun.</u>	<u>Jul.</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Extreme</u>
1975	N-W/15	N/15	N/15	N/17	N/13	N-W/19	E/12	N/14	S/15	W/13	E/10	E/12	N-W/19
1976	E/16	N-E/13	E/15	E/14	S/14	S-E/14	W/12	E/19	S-W/20	N-E/10	E/11	N-E/9	S-W/20
1977	N-E/9	S/15	N-E/15	E/11	S-E/10	E/11	S-W/11	W/16	N-W/15	S-W/12	E/10	N-E/13	N/16
1978	S-W/13	N-E/12	E/10	N-E/10	S-W/17	W/12	E/10	E/10	E/10	W/10	N/10	N-E/8	S-W/17
1979	E/11	N-E/10	N-E/10	E/10	S/12	S/15	W/18	S/18	S-W/18	N/14	-	-	-

Remarks: N: North, S: South, E: East, W: West, N-E: North East, N-W: North West,
S-E: South East, S-W: South West

Data II.3.3.a ANNUAL AND MONTHLY RAINFALL (mm), 1975 - 1979

<u>Year</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>Jun.</u>	<u>Jul.</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Annual Total</u>
1975	92	117	75	244	73	70	122	170	195	254	206	305	1,823
1976	78	46	63	48	127	141	248	116	309	194	238	199	1,807
1977	54	151	102	58	56	65	27	331	196	505	312	241	2,098
1978	177	19	106	186	123	82	220	201	288	456	222	219	2,299
1979	117	84	27	346	119	110	220	114	132	318	-	-	-
Mean	104	83	75	176	100	94	167	186	224	345	245	241	2,007

T. Tinggi

<u>Year</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>Jun.</u>	<u>Jul.</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Annual Total</u>
1975	113	65	66	96	110	123	48	47	159	342	152	179	1,500
1976	32	20	43	90	175	191	-	-	-	217	98	56	-
1977	19	87	48	86	62	255	63	191	117	258	169	55	1,410
1978	71	150	51	116	83	73	100	87	121	279	162	163	1,455
1979	25	25	25	121	133	62	327	-	-	-	-	-	-
Mean	52	69	47	102	113	141	135	108	132	274	145	113	1,455

Data II.3.3.b ANNUAL AND MONTHLY RAINFALL (mm), 1975 - 1979

P. Siantar

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Total
1975	150	211	133	210	309	97	271	138	295	221	223	286	2,544
1976	57	211	247	264	222	201	269	285	320	238	356	265	2,935
1977	251	133	66	349	313	92	120	364	206	377	365	159	2,795
1978	226	107	90	243	397	138	183	112	110	200	278	225	2,309
1979	86	207	100	158	212	196	130	59	351	283	-	-	-
Mean	154	174	127	245	291	145	195	192	256	264	306	234	2,646

Kisaran

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Total
1975	104	51	227	177	180	161	65	132	361	160	110	168	1,896
1976	41	38	47	43	256	114	-	129	219	78	70	86	-
1977	53	135	75	23	54	128	63	181	229	438	245	55	1,679
1978	49	24	54	144	151	176	167	115	151	197	106	117	1,451
1979	76	66	-	87	80	147	191	57	207	106	-	-	-
Mean	65	63	101	95	144	145	122	123	233	196	133	107	1,675

Data II.3.3.c ANNUAL AND MONTHLY RAINFALL (mm), 1975 - 1979

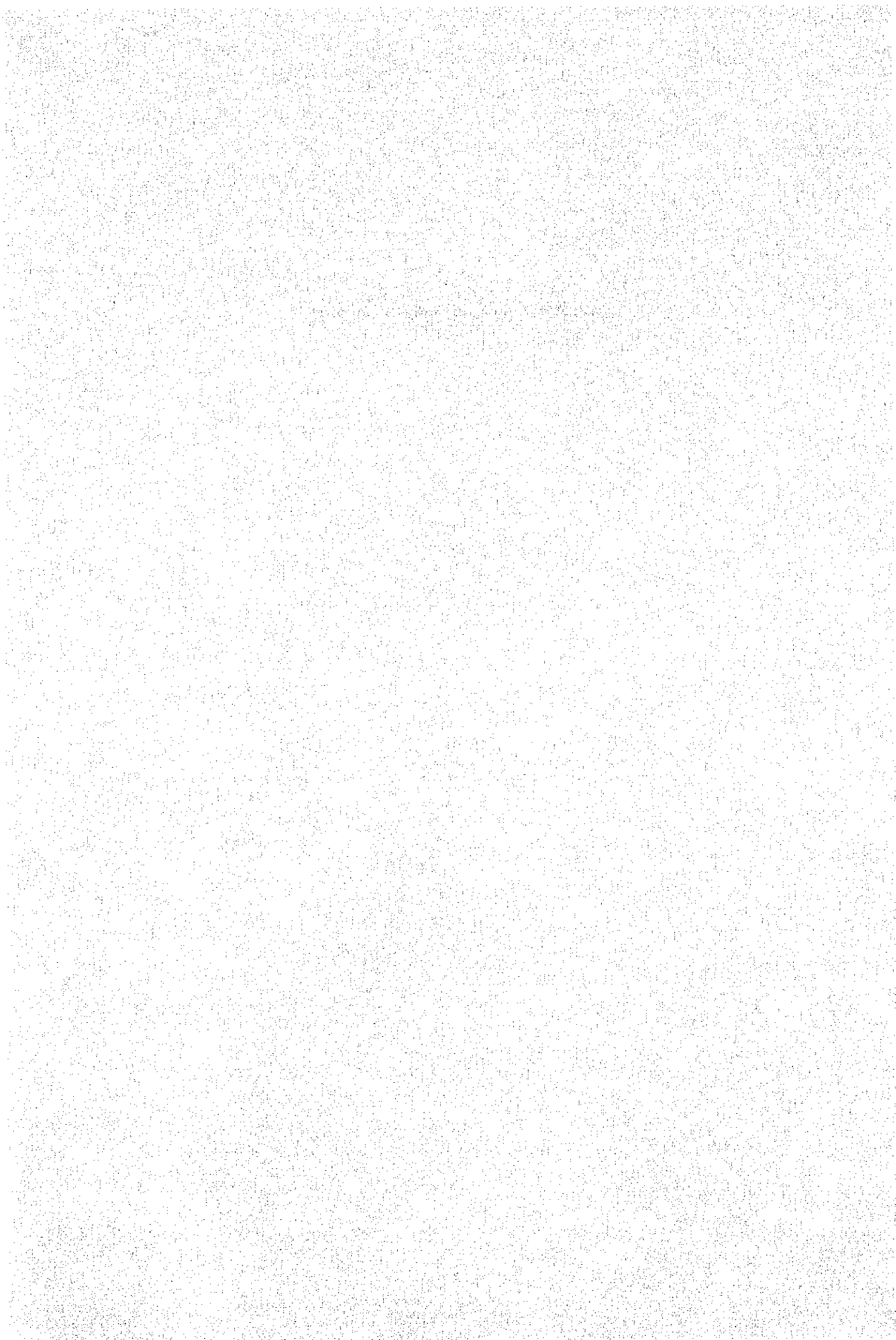
K. Tanjung

<u>Year</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>Jun.</u>	<u>Jul.</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Annual Total</u>
1975	17	78	155	70	157	-	85	80	200	-	230	262	-
1976	12	39	68	96	134	55	128	113	178	163	149	59	1,194
1977	33	89	53	90	48	156	22	100	169	244	276	87	1,422
1978	93	40	6	120	143	147	32	66	145	169	96	227	1,284
1979	40	76	33	184	109	31	-	101	253	-	-	-	-
Mean	39	64	63	112	118	97	67	92	189	192	188	159	1,300

Data II.3.4 NUMBER OF THUNDERSTORM DAYS IN MEDAN, 1975 - 1979

<u>Year</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>Jun.</u>	<u>Jul.</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Total</u>
1975	-	-	-	-	-	4	4	4	2	6	7	7	34
1976	1	1	1	6	8	1	2	4	8	6	4	6	48
1977	1	4	3	5	4	8	6	14	11	16	9	4	85
1978	4	2	6	6	8	7	6	9	12	10	8	2	80
1979	5	4	3	9	8	7	7	8	4	22	-	-	77

APPENDIX-III FINANCIAL ANALYSIS



APPENDIX III FINANCIAL ANALYSIS

Financial analysis for the Project is made on the following assumptions:-

- a) Power rate for the electricity supplied by the Project at the secondary bus of substations as of the end of 1980 is assumed on the basis of the fuel cost of diesel plants which is computed by fuel price and fuel consumption rate. Four different power rates are assumed as follows:-

Case I $US\$0.0528/kWh = 0.28 \text{ liter/kWh} \times US\$30/\text{barrel}$

Case II $US\$0.0352/kWh = 0.28 \text{ liter/kWh} \times US\$20/\text{barrel}$

Case III $US\$0.0299/kWh = 0.28 \text{ liter/kWh} \times US\$17/\text{barrel}$

Case IV $US\$0.0264/kWh = 0.28 \text{ liter/kWh} \times US\$15/\text{barrel}$

Price escalation for the power rates is assumed at 6 % p.a. for all the cases.

- b) Power rate for the electricity supplied by INALUM at Kuala Tanjung is assumed at US\$0.0161/kWh in 1983. Afterwards, price escalation of 6 % p.a. is applied.
- c) Price escalation for the construction and operation and maintenance costs of the Project is assumed at 6 % p.a.
- d) For the convenience of the analysis, price escalation is applied only up to 1990. Afterwards, no escalation is applied both for revenues and expenditures. The financial internal rate of return (FIRR) of the Project thus obtained gives a conservative value.

FIRR of the Project is obtained on the basis of the net revenues and construction and operation and maintenance costs of the Project, which is shown in Table III.1 for Case I with discount rate of 10 %. FIRR of the Project for the four cases is tabulated below and illustrated in Figure III.1.

Case I	22.2 %
Case II	19.4 %
Case III	10.1 %
Case IV	7.6 %

Considering that the interest charges paid by PLN are estimated at 9 % of the average long-term debt outstanding each year, it is concluded that the Project is financially feasible for Case I, Case II, and Case III, while the Project may be considered infeasible for Case IV.

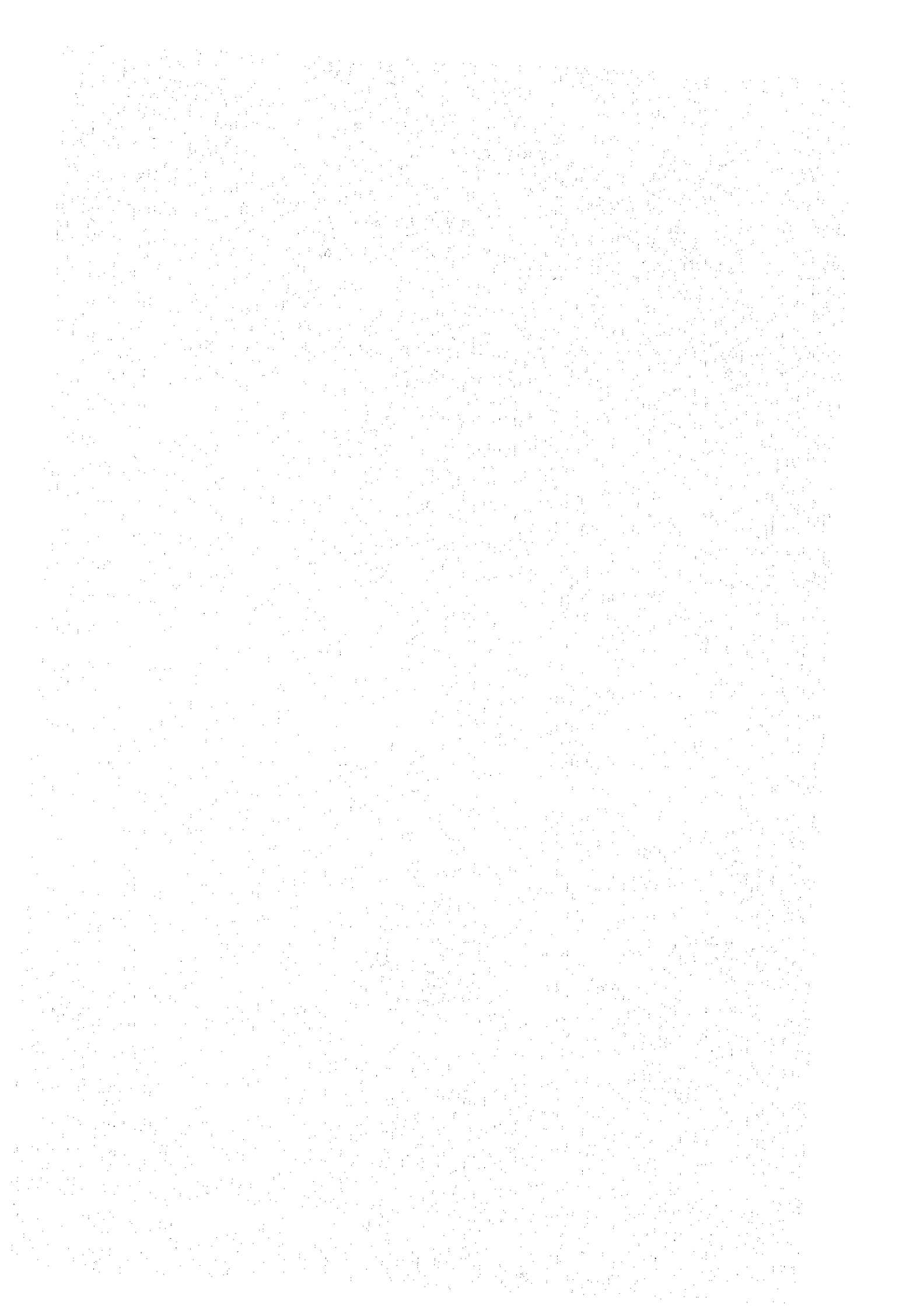
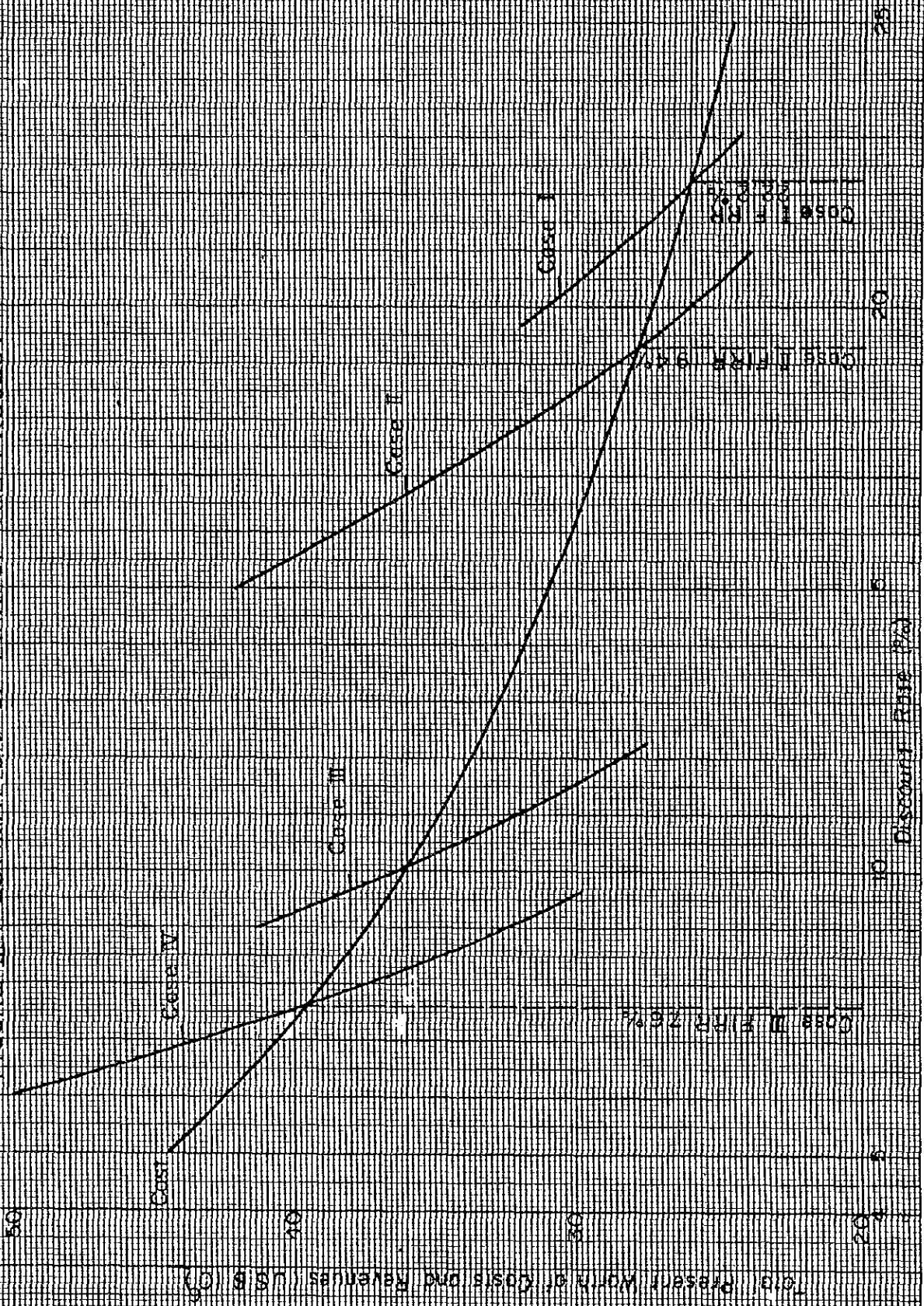
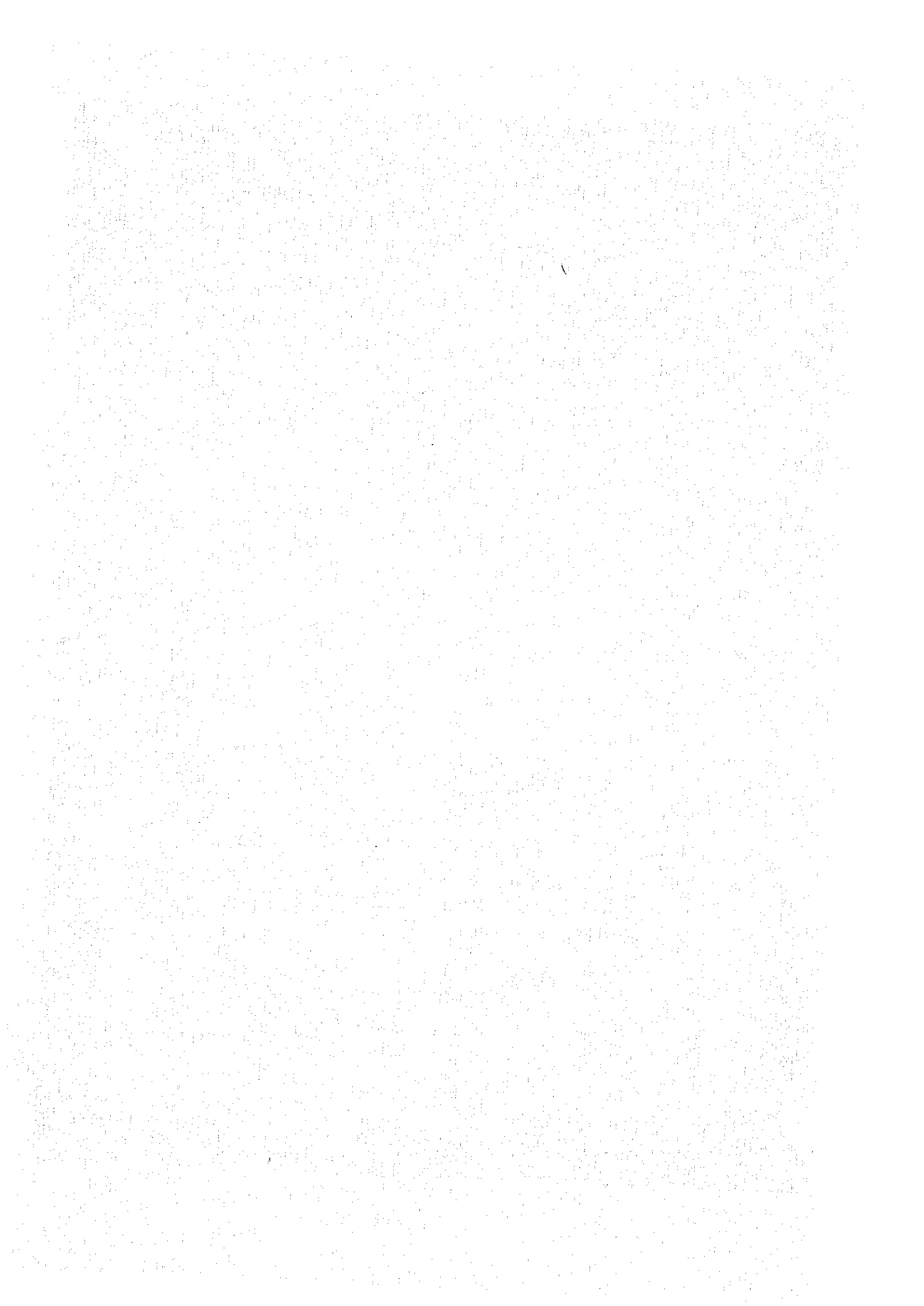


Table III.1 PW OF REVENUES AND COSTS
(Case III Discount Rate 10%)

Year in Order	Year	(1) Energy Supply to Local (GWh)	(2) Energy Supply to Medan (GWh)	(3) Total Energy Supply (GWh)	(4) Gross Revenues with Price Escalation (US\$10 ³)	(5) Energy Cost of the Project With Price Escalation	(6) Net Revenues: (4) - (5)	(7) PW of Net Revenues (US\$10 ³)	(8) Construction Cost and O & M Cost With Price Escalation (US\$10 ³)	(9) PW of Costs (US\$10 ³)
0	1979						36,395		36,151	
1	1980							2,610		
2	1981							16,063		
3	1982							18,521		
4	1983	37.31	61.94	99.25	3,532	1,610	1,922	3,825		
5	1984	87.34	60.46	147.80	5,576	2,560	3,016	468		
6	1985	109.06	76.32	185.38	7,413	3,437	3,976	496		
7	1986	134.69	76.77	211.46	8,964	4,180	4,784	526		
8	1987	168.54	42.92	211.46	9,502	4,431	5,071	558		
9	1988	211.46	-	211.46	10,072	4,697	5,375	591		
10	1989	211.46	-	211.46	10,676	4,979	5,697	627		
11	1990	211.46	-	211.46	11,317	5,278	6,039	664		
	- 2017									

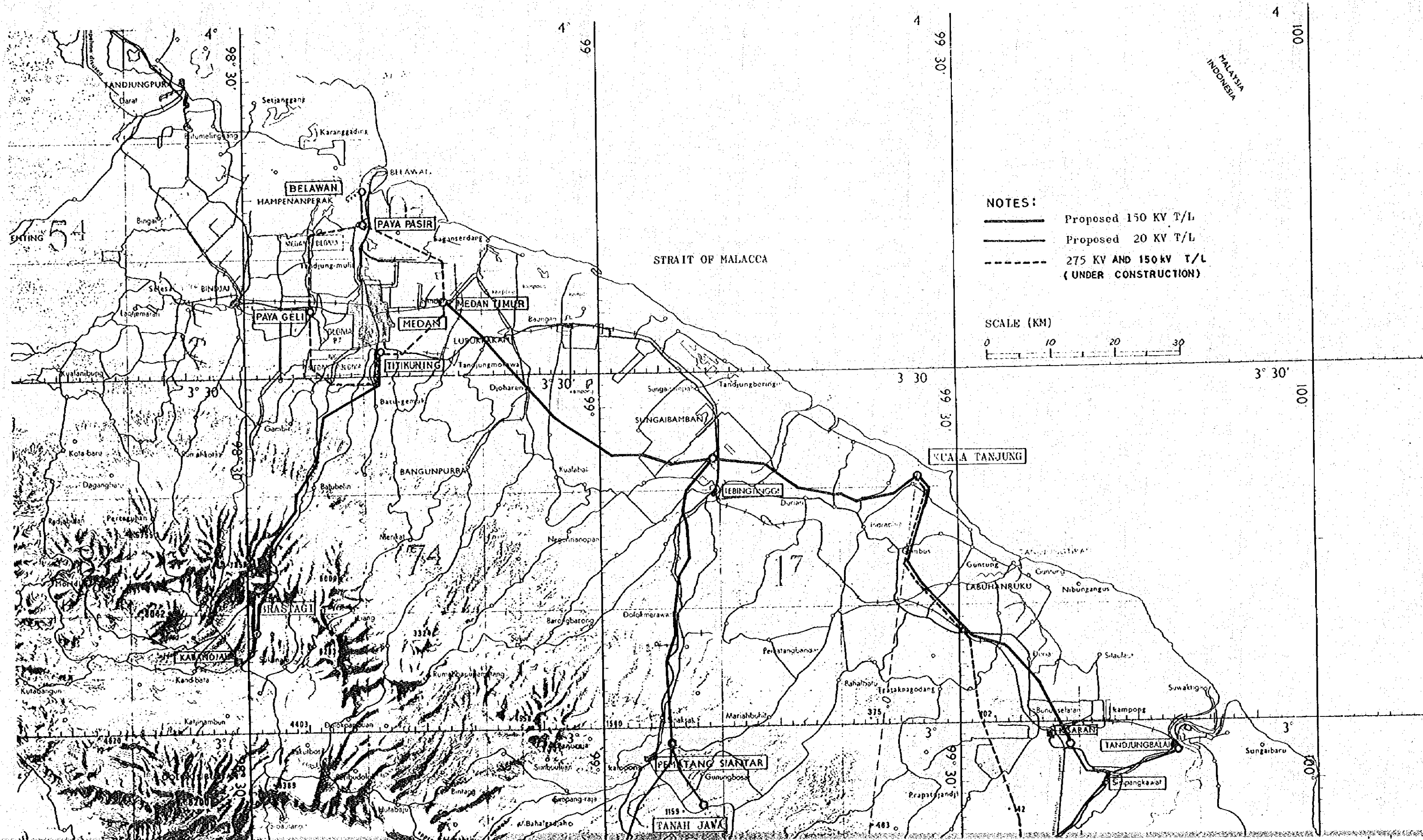
FIGURE III - ESTIMATION OF FIRR OF THE PROJECT



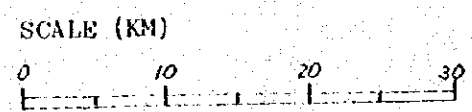


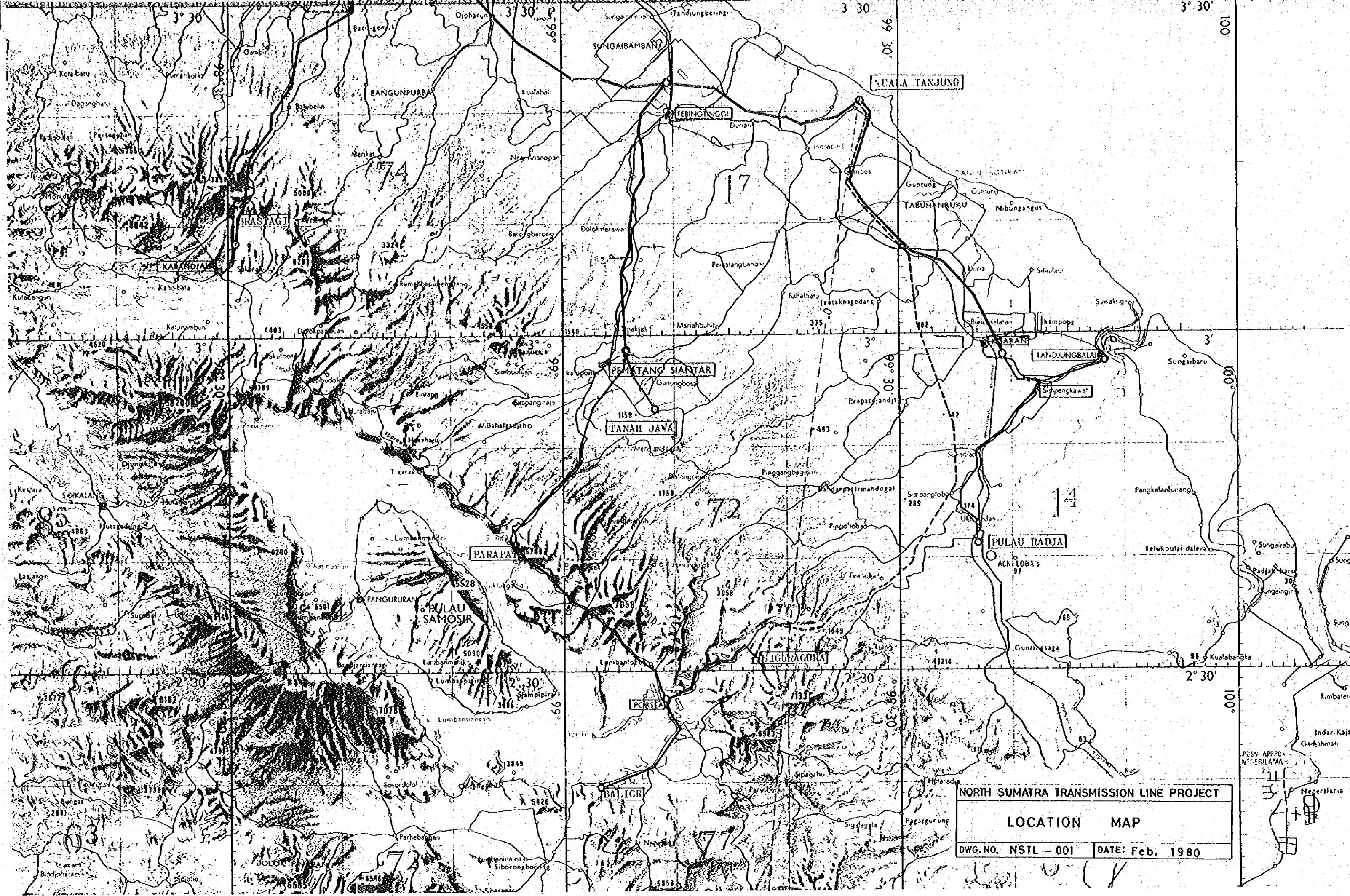
APPENDIX - IV DRAWINGS

MALAYSIA
INDONESIA



NOTES:
—— Proposed 150 KV T/L
—— Proposed 20 KV T/L
- - - - 275 KV AND 150 KV T/L
(UNDER CONSTRUCTION)

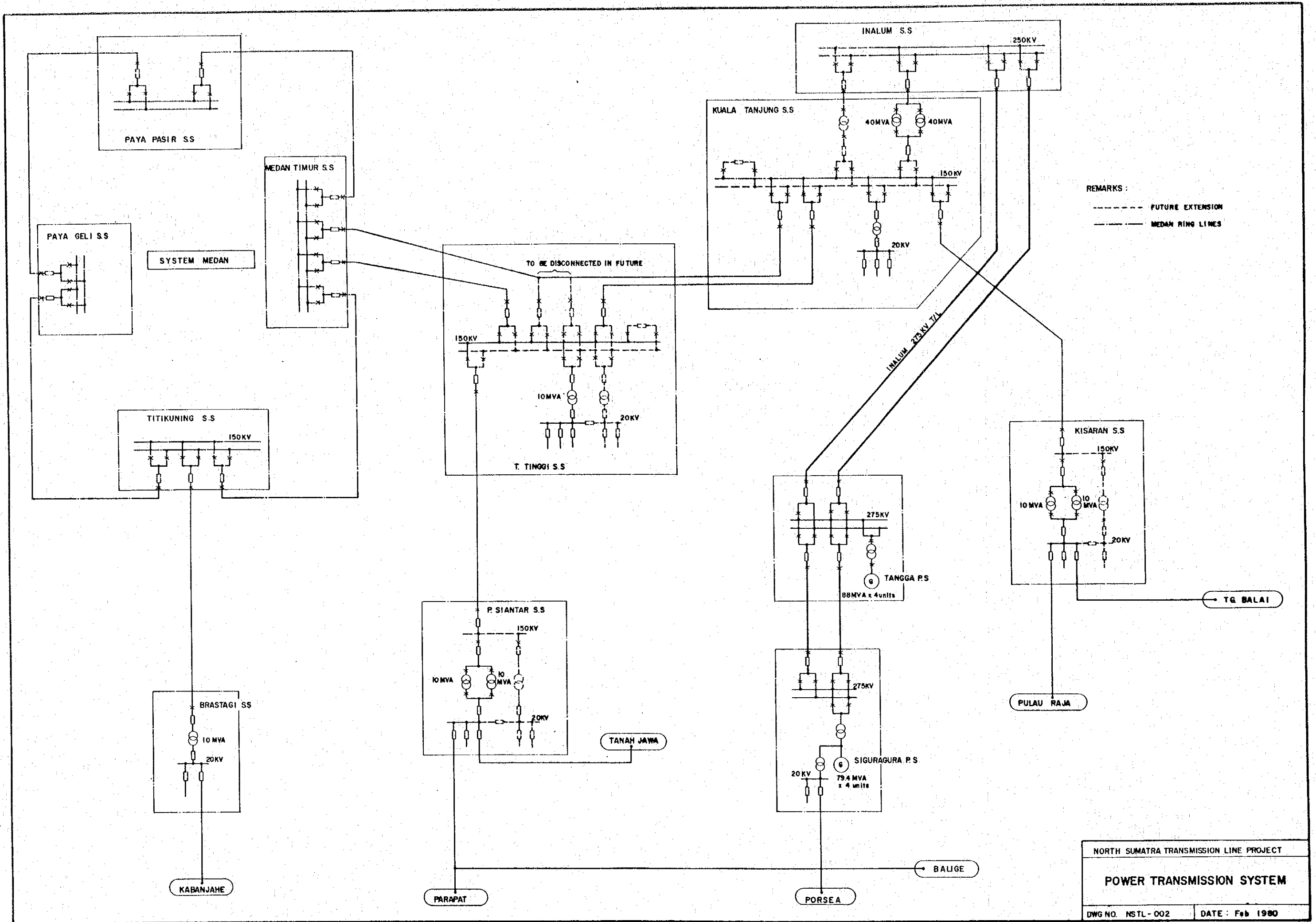




NORTH SUMATRA TRANSMISSION LINE PROJECT

LOCATION MAP

DWG. NO. NSTL - 001 DATE: Feb. 1980



REMARKS :
 - - - - - FUTURE EXTENSION
 ———— MEDAN RING LINES

NORTH SUMATRA TRANSMISSION LINE PROJECT
POWER TRANSMISSION SYSTEM
 DWG NO. NSTL-002 DATE : Feb 1980

150KV T/L (MAIN LINE)

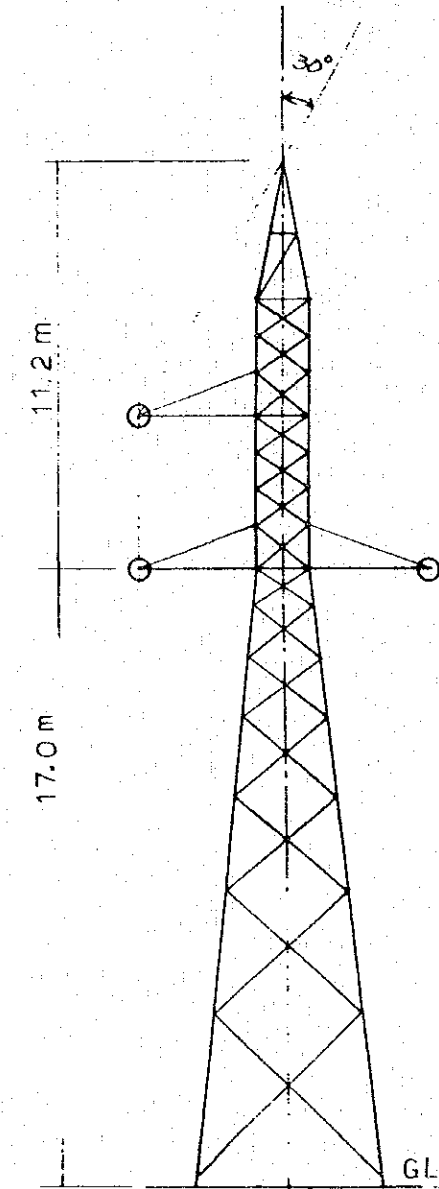
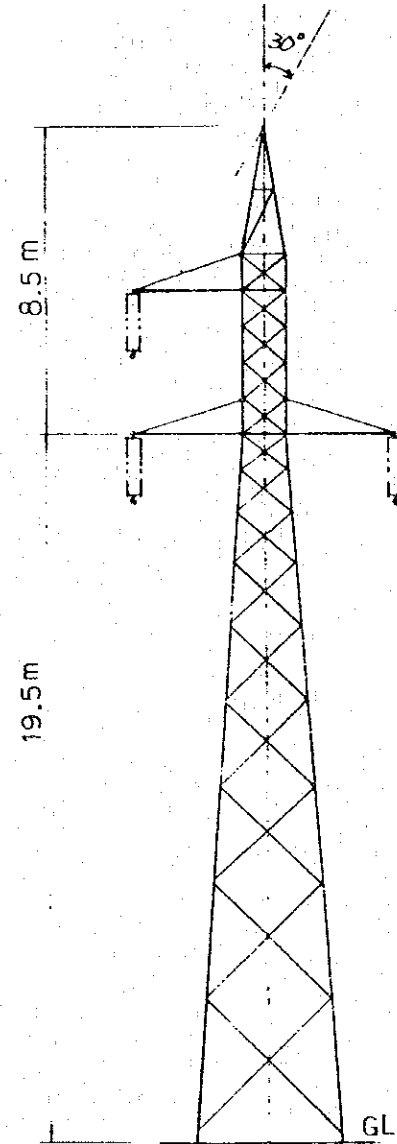
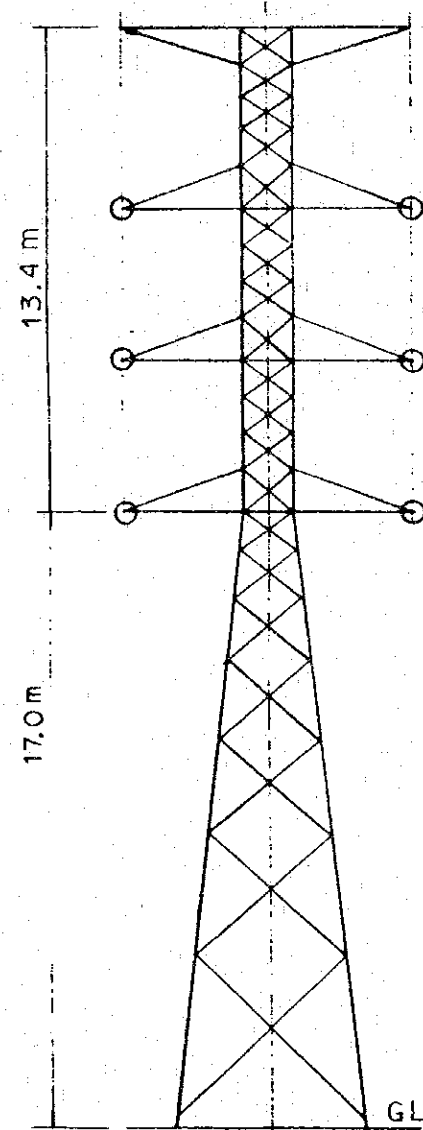
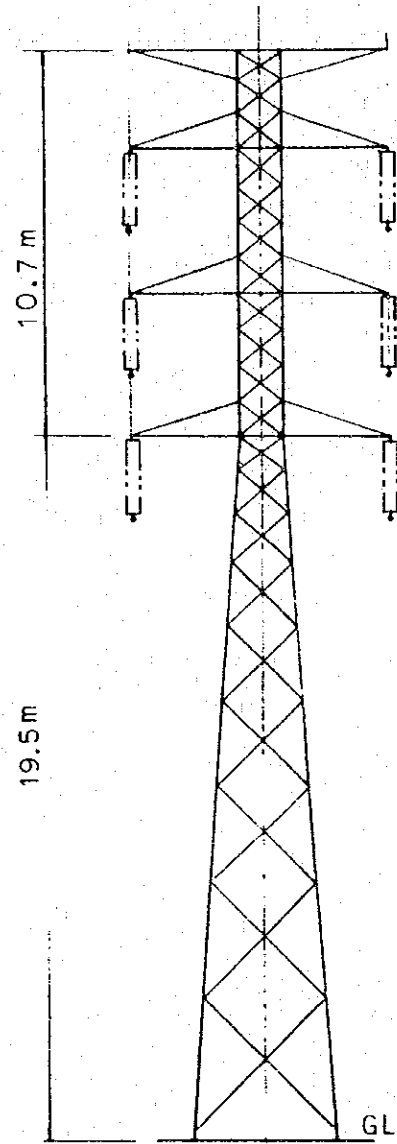
150KV T/L (BRANCH LINE)

SUSPENSION TOWER

TENSION TOWER

SUSPENSION TOWER

TENSION TOWER



NORTH SUMATRA TRANSMISSION LINE PROJECT

PRELIMINARY DESIGN OF TOWER
FOR 150KV T/L

DWG. NO. NSTL-003

DATE: Feb. 1980

20KV D/L (TOWER SECTION)

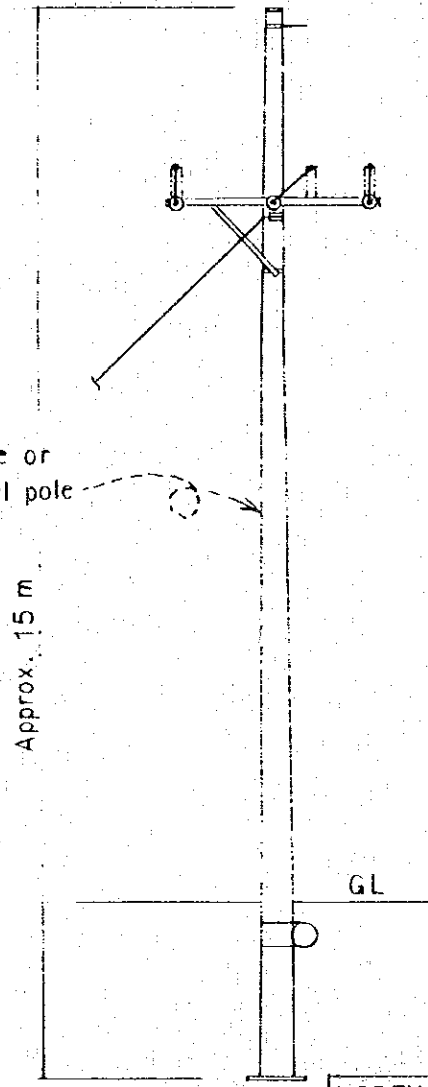
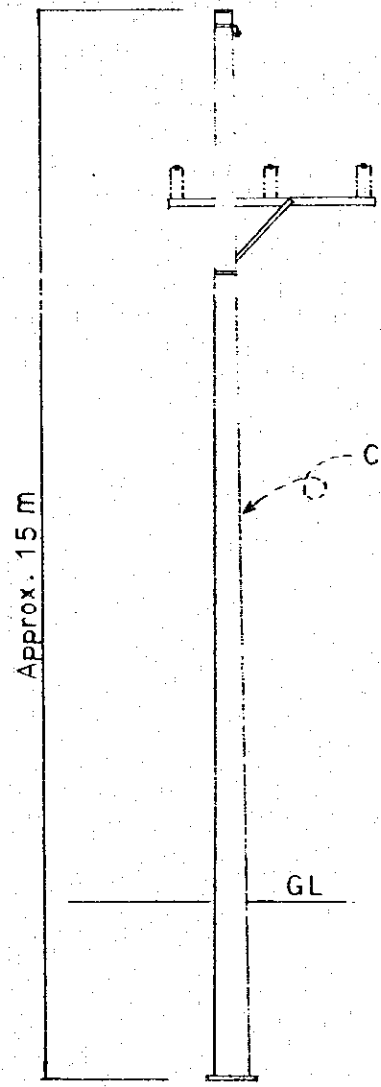
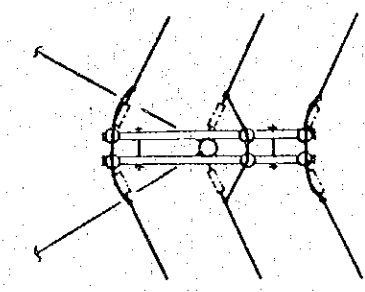
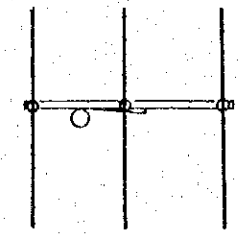
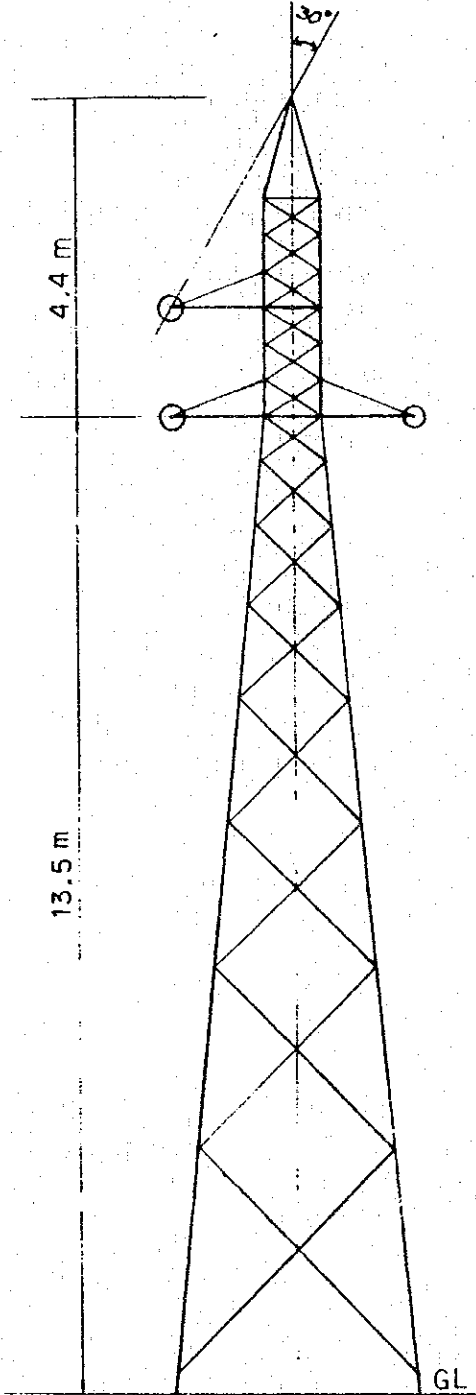
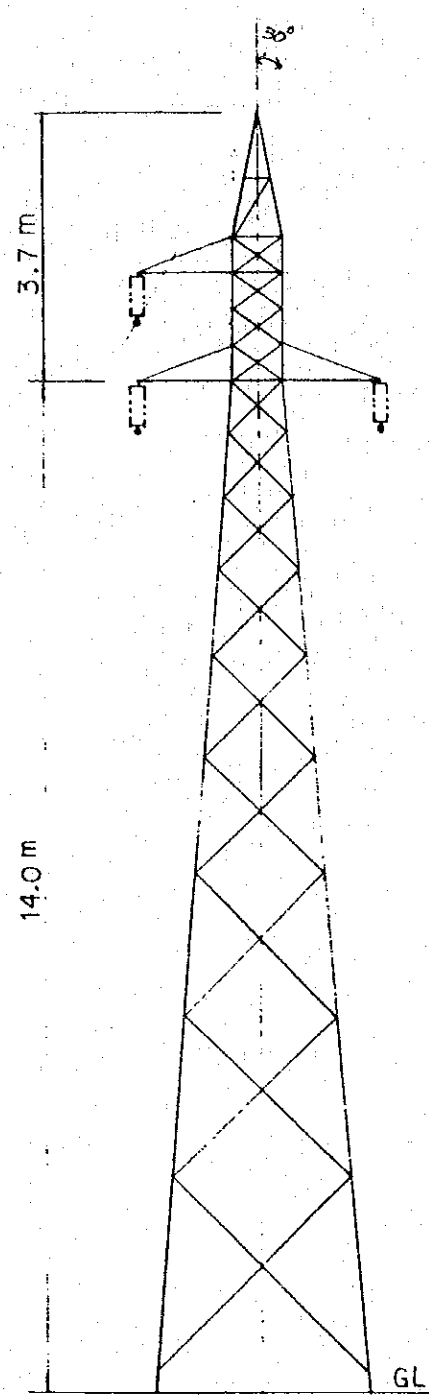
20KV D/L (POLE SECTION)

SUSPENSION TOWER

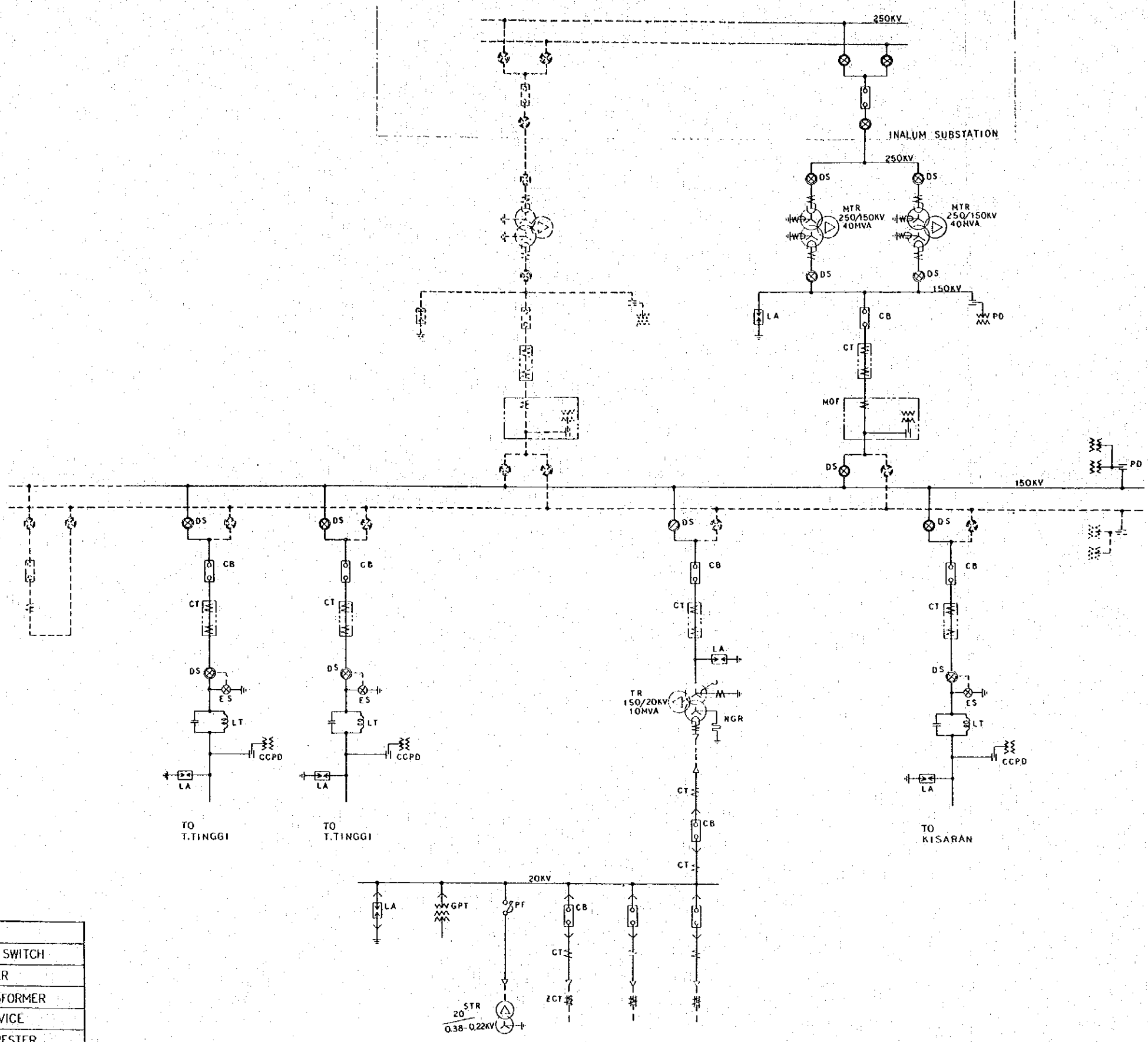
TENSION TOWER

SUSPENSION TYPE

TENSION TYPE



NORTH SUMATRA TRANSMISSION LINE PROJECT
PRELIMINARY DESIGN OF SUPPRT
FOR 20kv D/L
DWG.NO. NSTL-004 | DATE: Feb. 1980

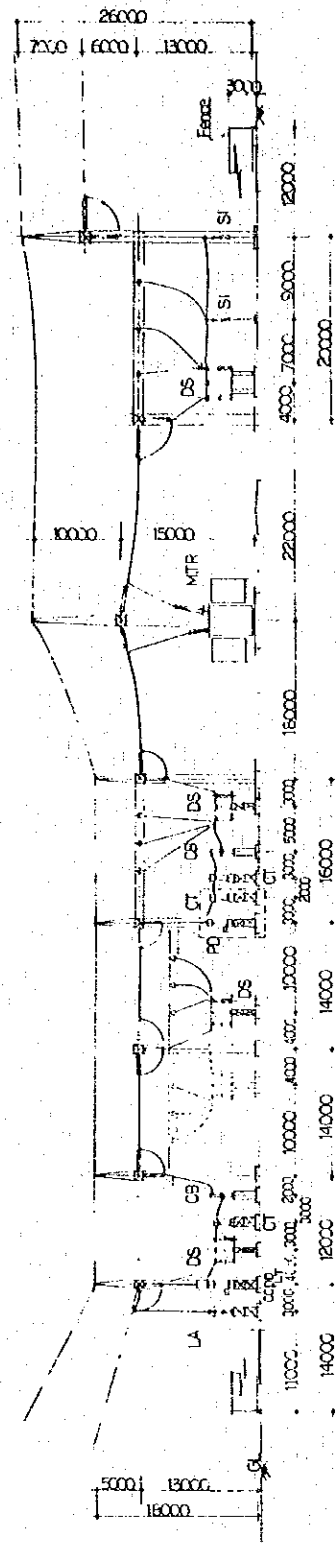


LEGEND	
DS	DISCONNECTING SWITCH
CB	CIRCI BREAKER
CT	CURRENT TRANSFORMER
PD	POTENTIAL DEVICE
LA	LIGHTNING ARRESTER
LT	LINE TRAP

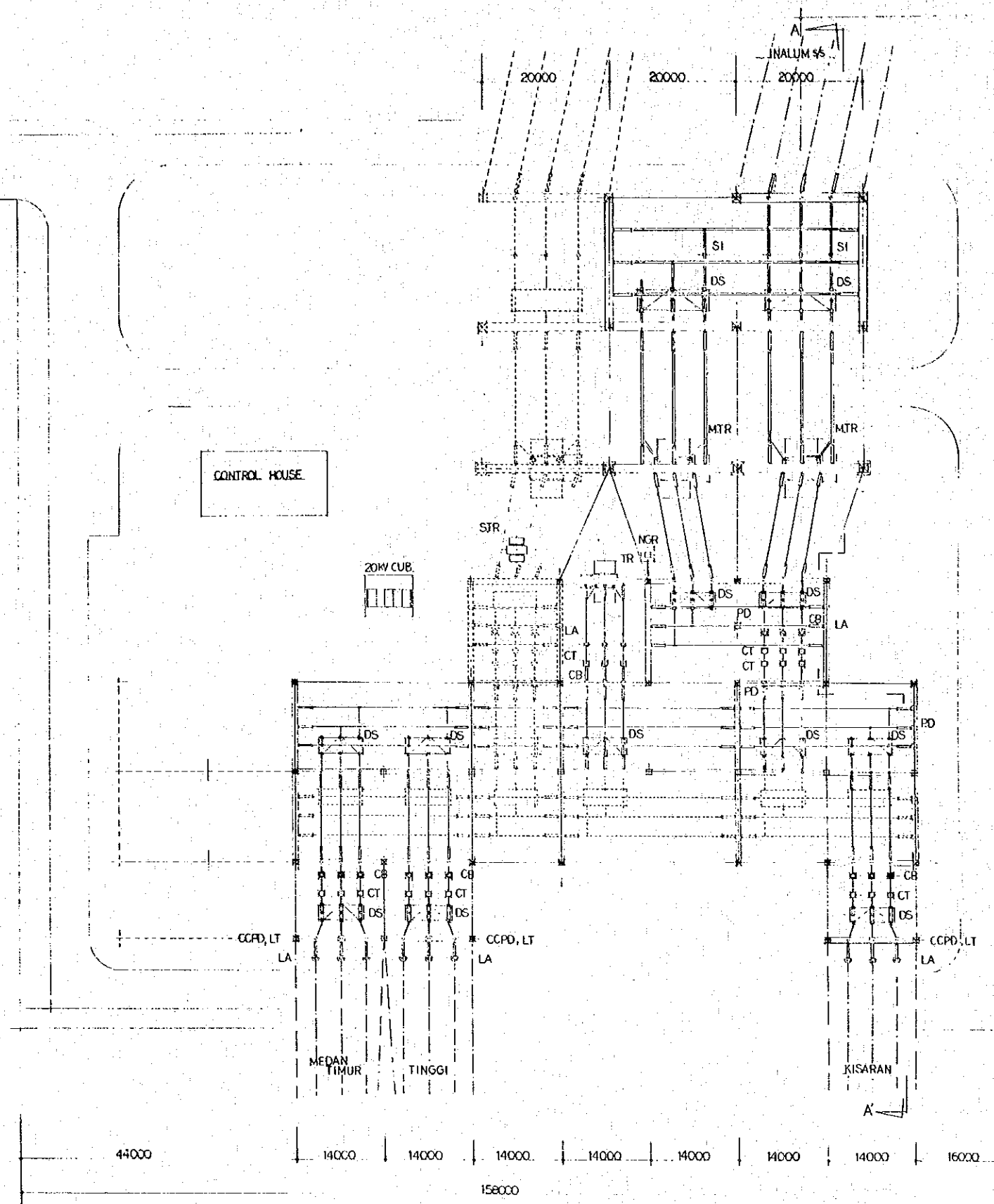
REMARK :
 ----- FUTURE EXTENSION

NORTH SUMATRA TRANSMISSION LINE PROJECT	
SINGLE LINE CONNECTION DIAGRAM	
KUALA TANJUNG 9/5	
DWG.NO. NSTL-005	DATE: Feb. 1980

150KV 275KV



A-A SECTION



LEGEND	
D S	DISCONNECTING SWITCH
C B	CIRCUIT BREAKER
C T	CURRENT TRANSFORMER
P D	POTENTIAL DEVICE
L A	LIGHTNING ARRESTER
L T	LINE TRAP

REMARK:
 ----- FUTURE EXTENSION

75000

12000
20000
22000
13000
15000
14000
14000
12000
14000

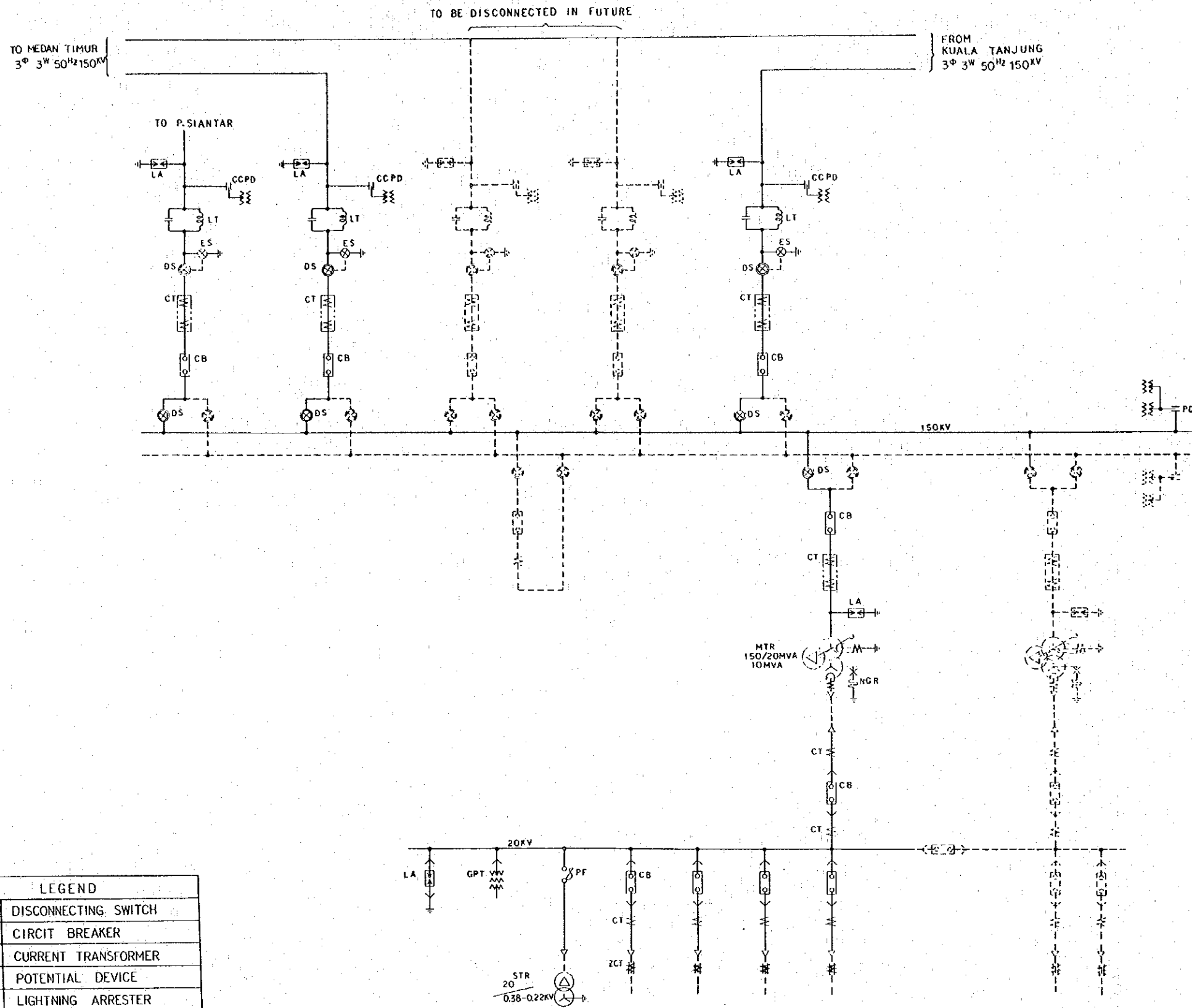
142000

NORTH SUMATRA TRANSMISSION LINE PROJECT

ARRANGEMENT OF OUTDOOR EQUIPMENT

KL'ALA TANJUNG 5/6

DWG. NO. NSTL-006 DATE: Feb. 1980



LEGEND	
DS	DISCONNECTING SWITCH
CB	CIRCUIT BREAKER
CT	CURRENT TRANSFORMER
PD	POTENTIAL DEVICE
LA	LIGHTNING ARRESTER
LT	LINE TRAP

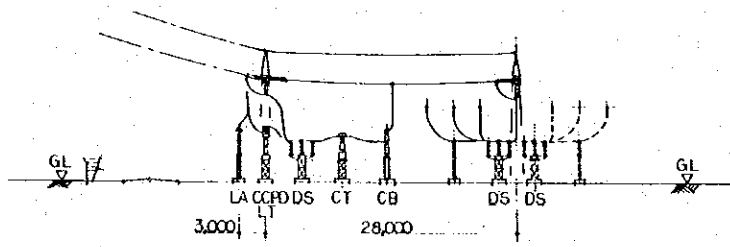
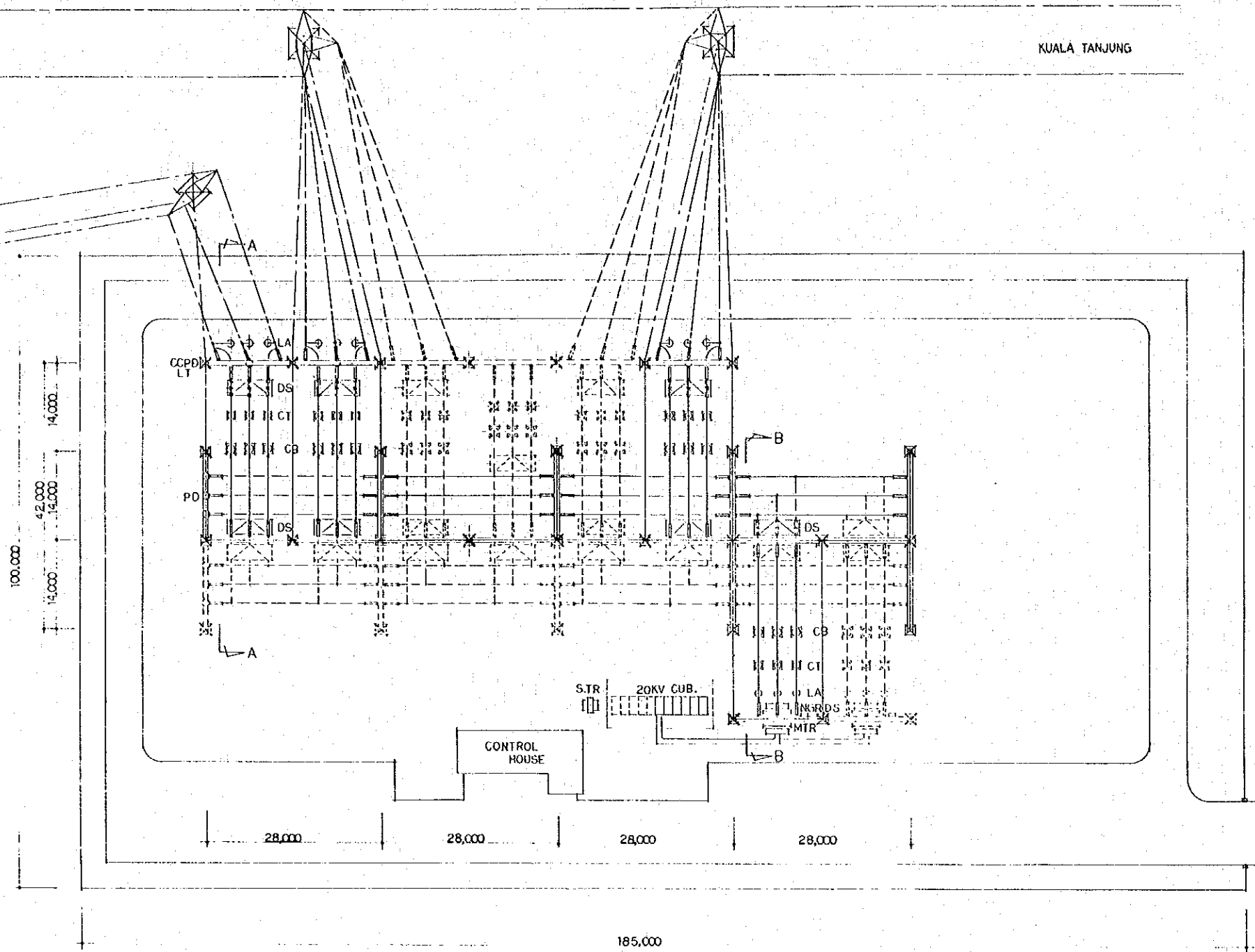
REMARK :
 ----- FUTURE EXTENSION

NORTH SUMATRA TRANSMISSION LINE PROJECT	
SINGLE LINE CONNECTION DIAGRAM	
TEBING TINGGI 5/5	
DWG. NO. NSTL-007	DATE: Feb. 1980

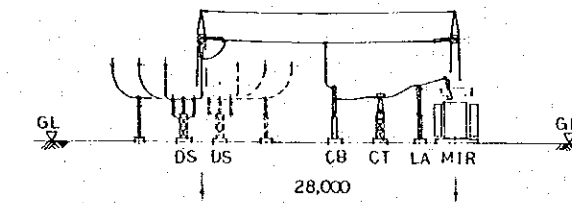
MEDAN TIMUR

KUALA TANJUNG

P. SIANTAR



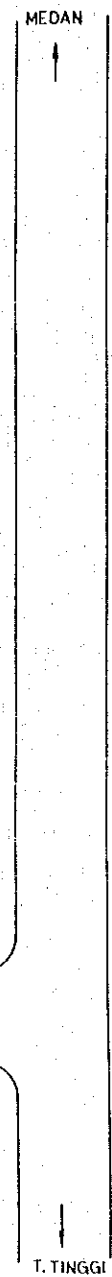
SECTION A - A



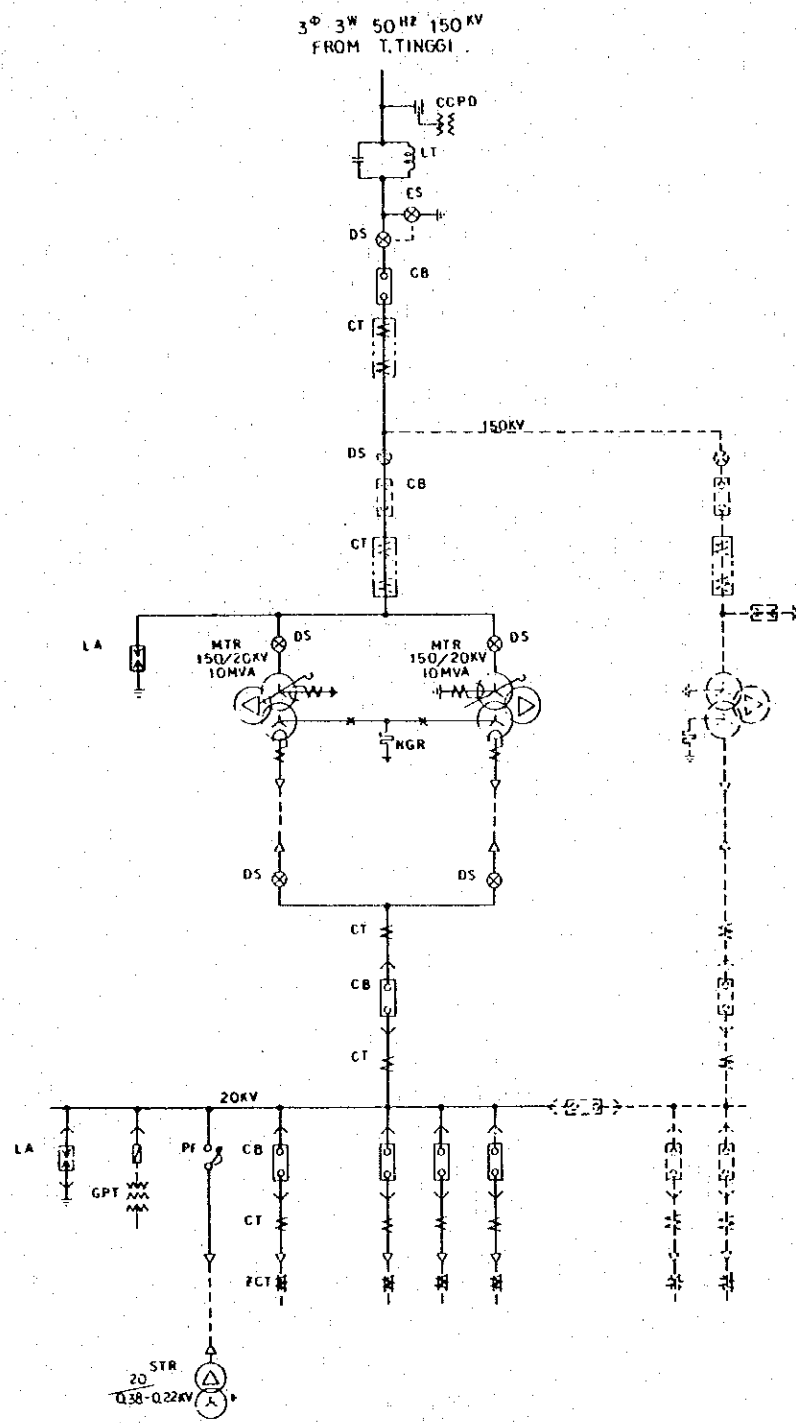
SECTION B - B

LEGEND	
DS	DISCONNECTING SWITCH
CB	CIRCUIT BREAKER
CT	CURRENT TRANSFORMER
PD	POTENTIAL DEVICE
LA	LIGHTNING ARRESTER
LT	LINE TRAP

REMARK:
 ----- FUTURE EXTENSION

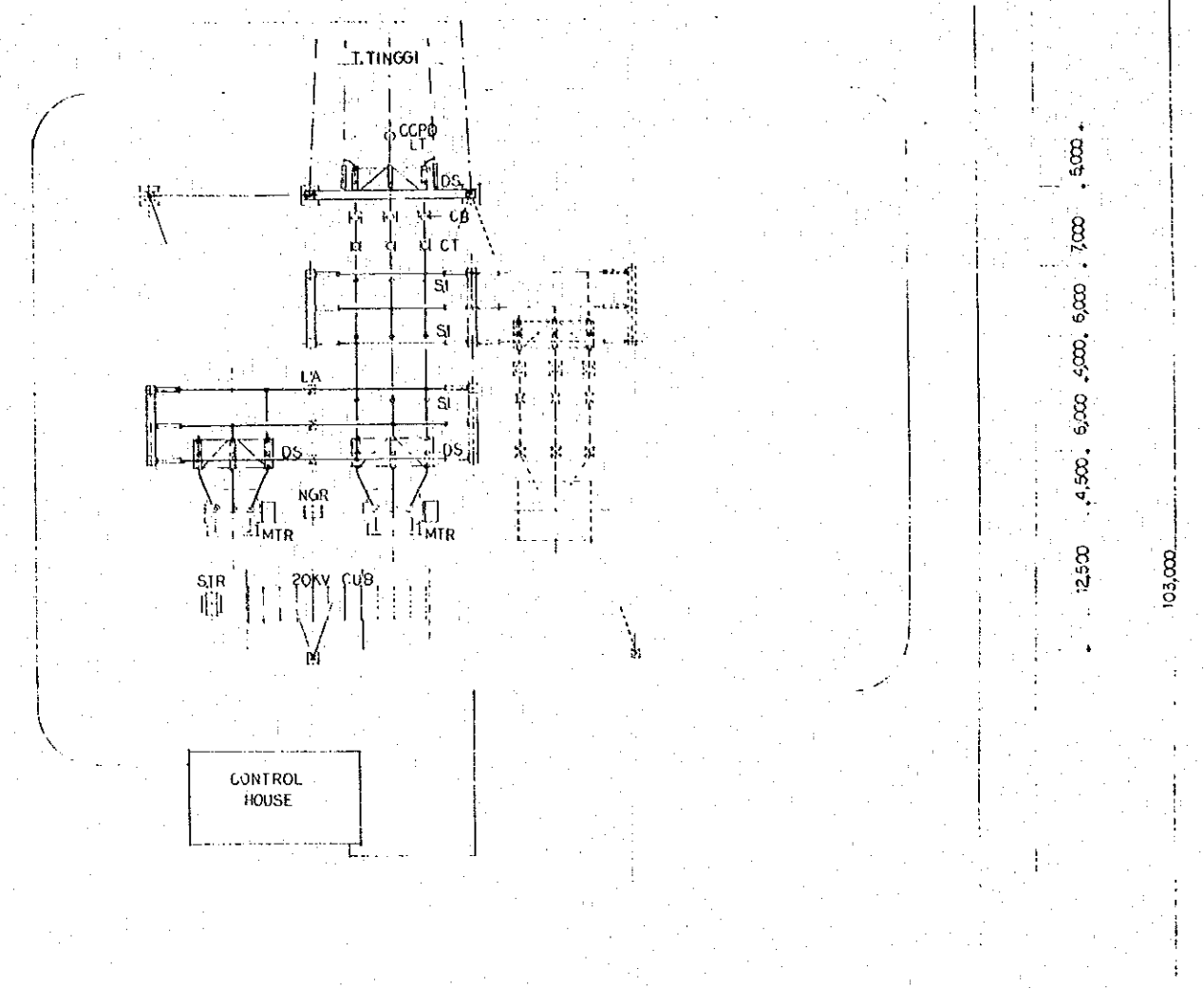


NGRTH SUMATRA TRANSMISSION LINE PROJECT	
ARRANGEMENT OF OUTDOOR EQUIPMENT	
TEBING TINGGI $\frac{S}{S}$	
DWG. NO. NSTL-008	DATE: Feb. 1980



P. SIANTAR ← → KISARAN

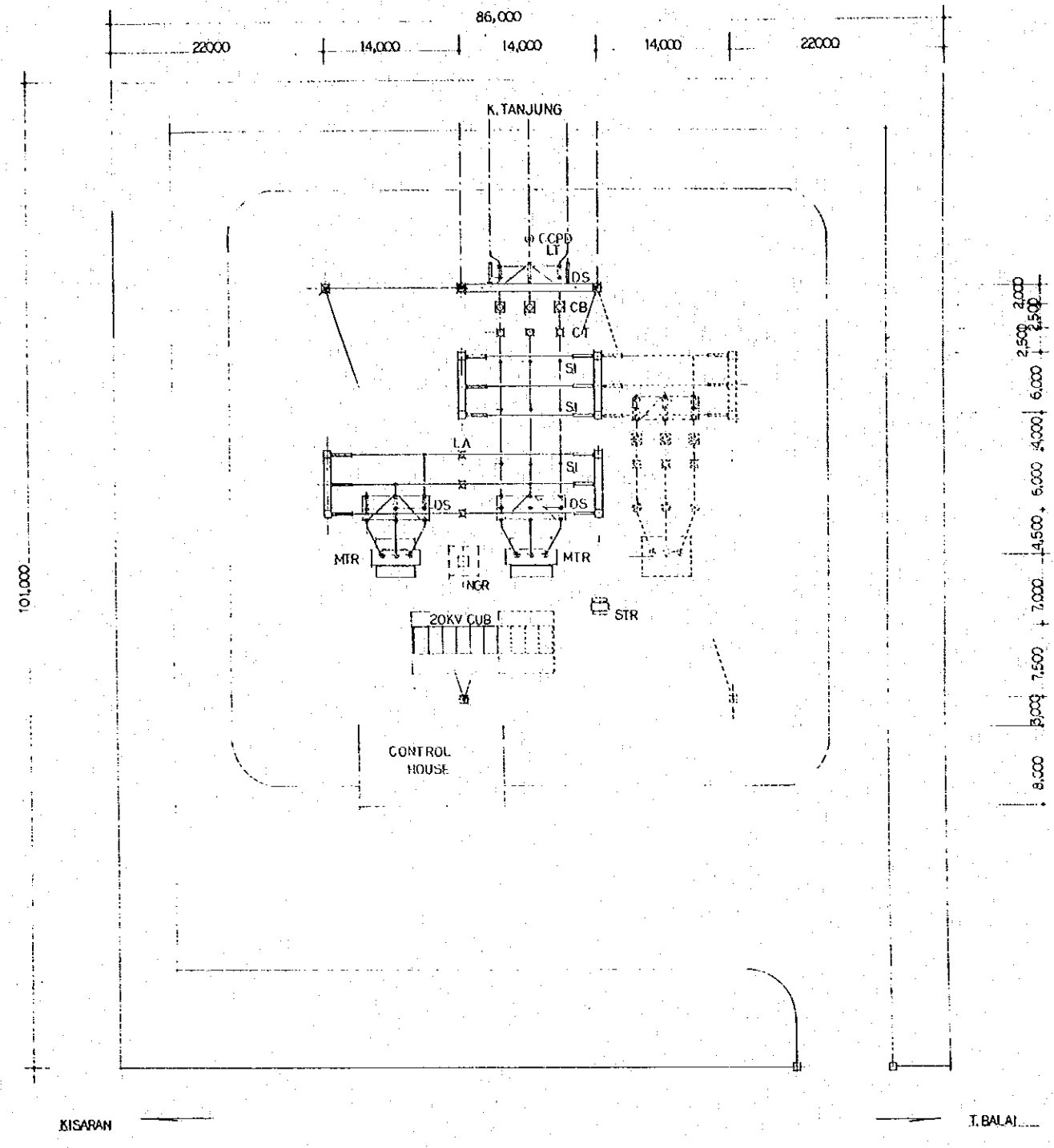
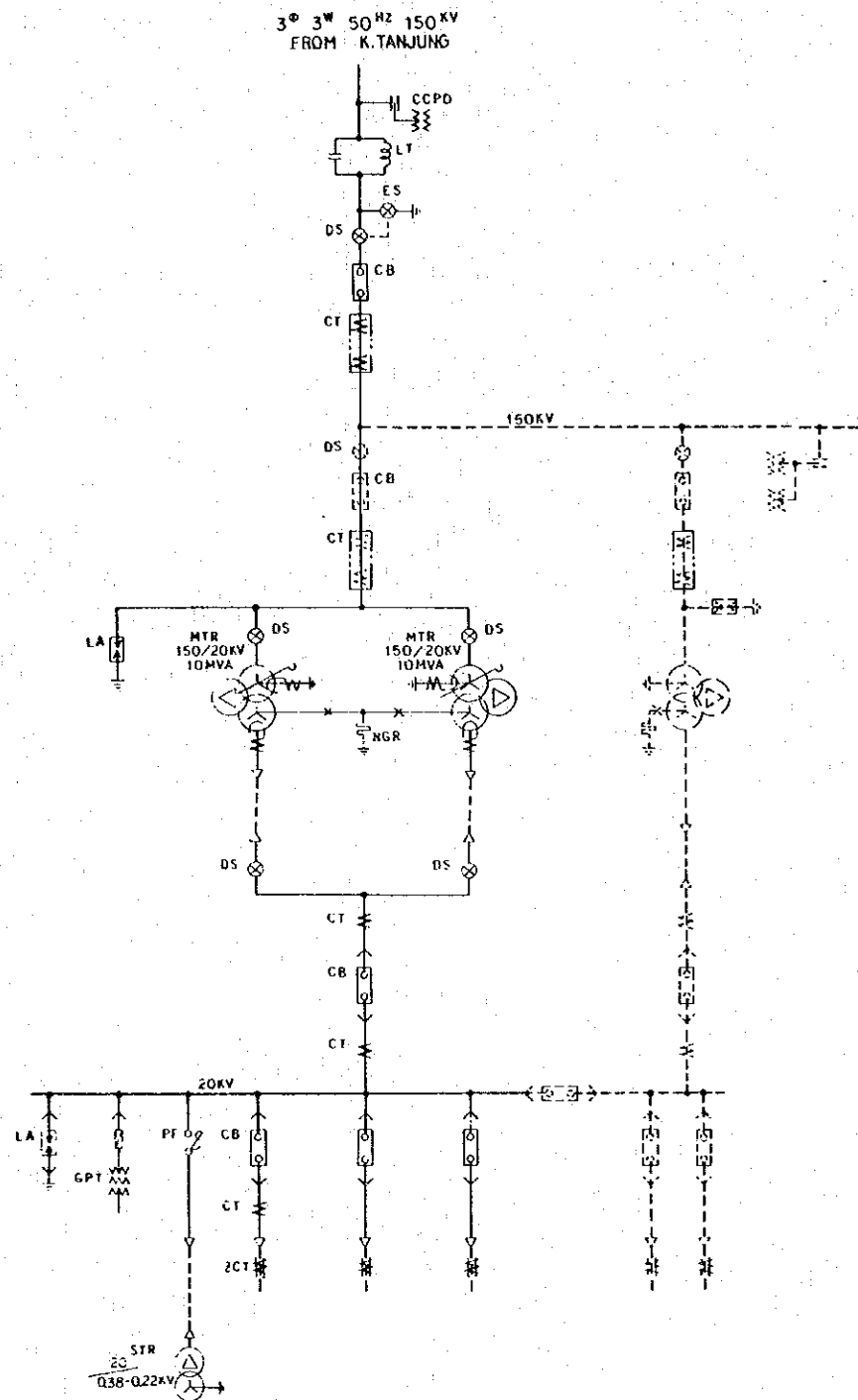
26000 14,000 14,000 14,000 35000



LEGEND	
DS	DISCONNECTING SWITCH
C.B	CIRCUIT BREAKER
CT	CURRENT TRANSFORMER
PD	POTENTIAL DEVICE
LA	LIGHTNING ARRESTER
LT	LINE TRAP

REMARK:
----- FUTURE EXTENSION

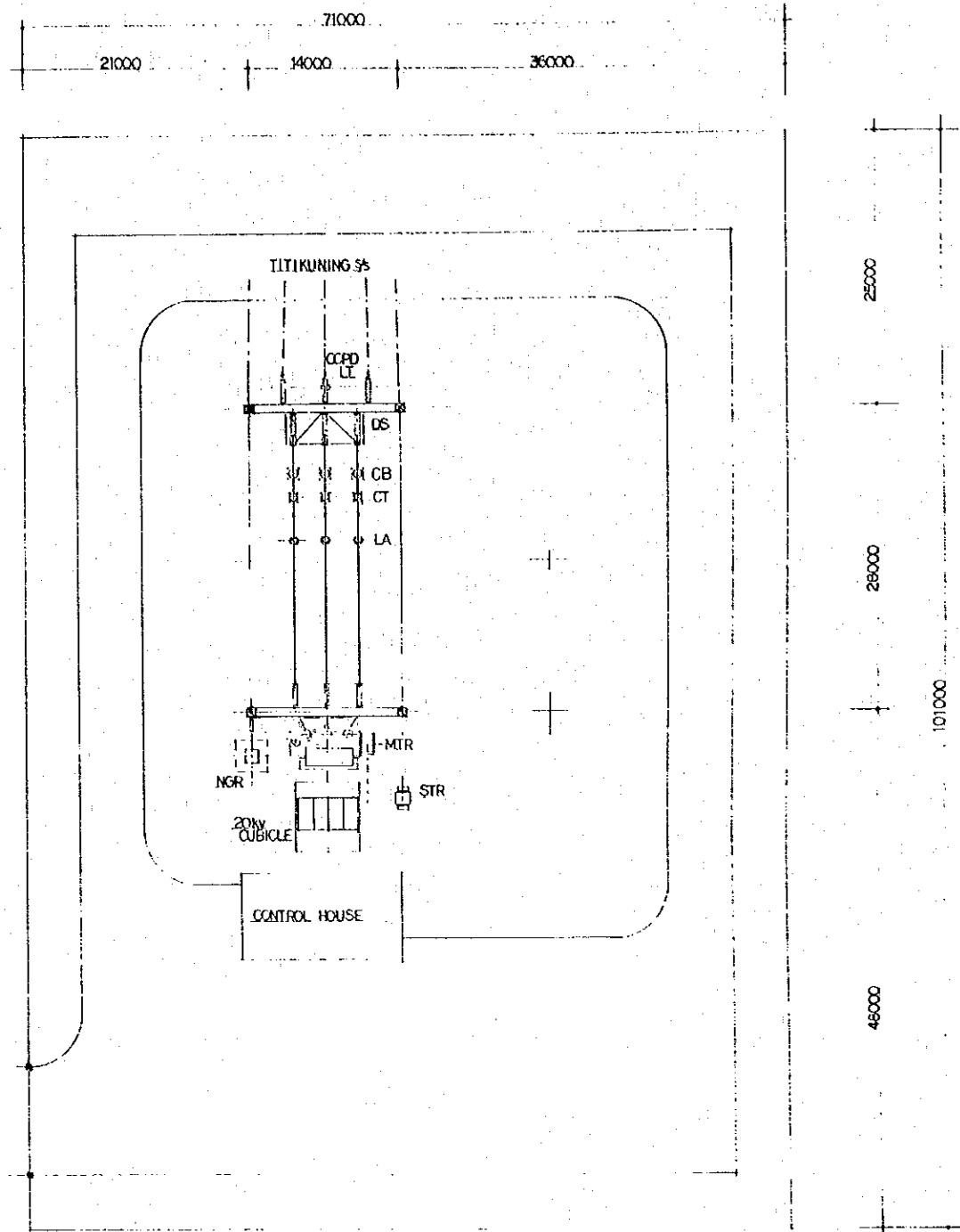
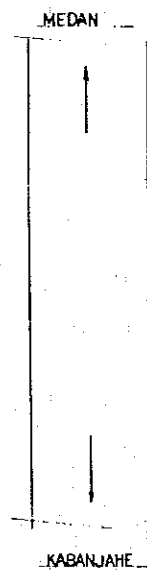
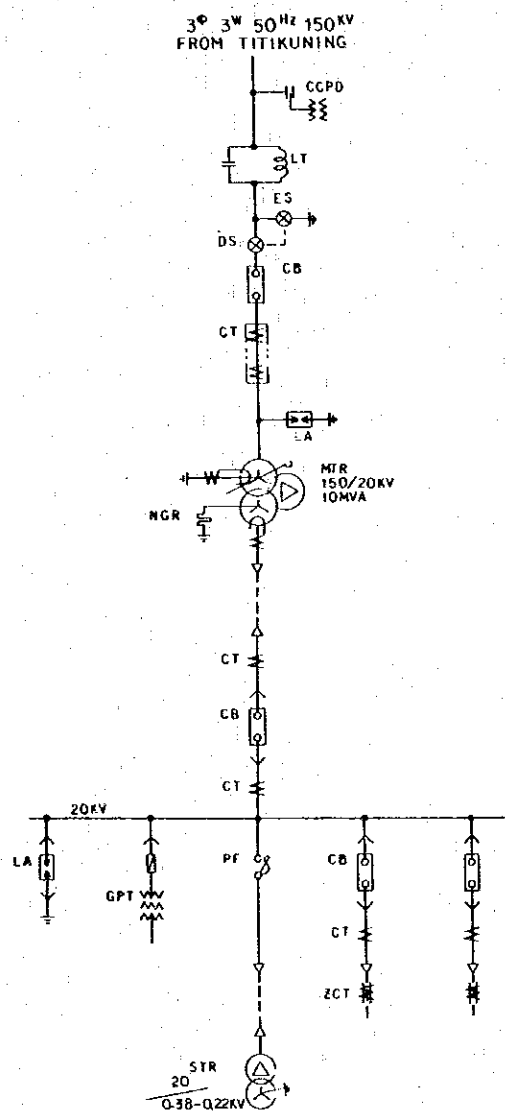
NORTH SUMATRA TRANSMISSION LINE PROJECT
SINGLE LINE CONNECTION DIAGRAM AND
ARRANGEMENT OF OUTDOOR EQUIPMENT
PEMATANG SIANTAR 5/5
DWG. NO. NSTL-009 DATE: Feb. 1980



LEGEND	
DS	DISCONNECTING SWITCH
CB	CIRCUIT BREAKER
CT	CURRENT TRANSFORMER
PD	POTENTIAL DEVICE
LA	LIGHTNING ARRESTER
LT	LINE TRAP

REMARK:
----- FUTURE EXTENSION

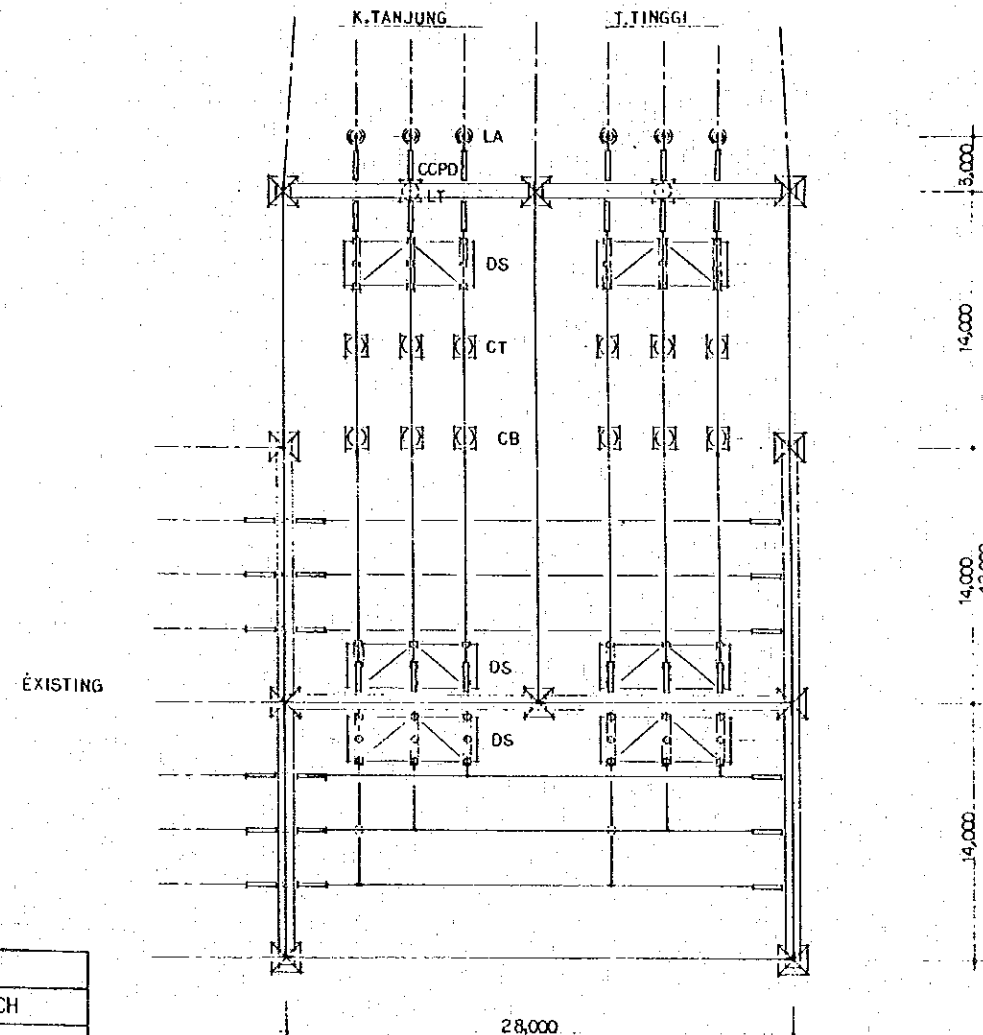
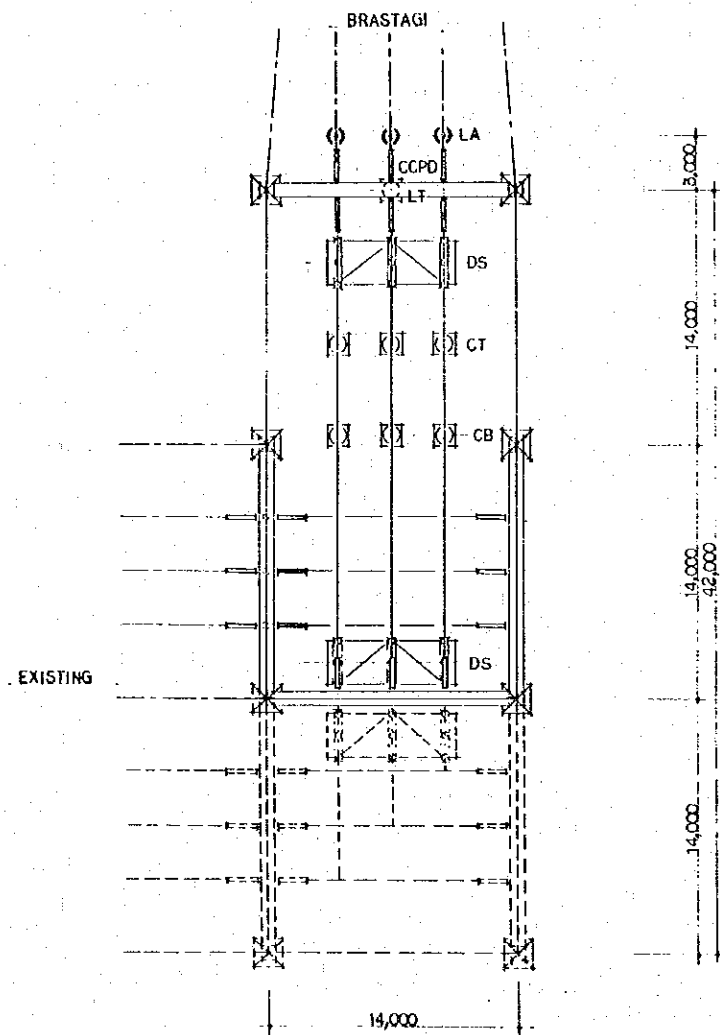
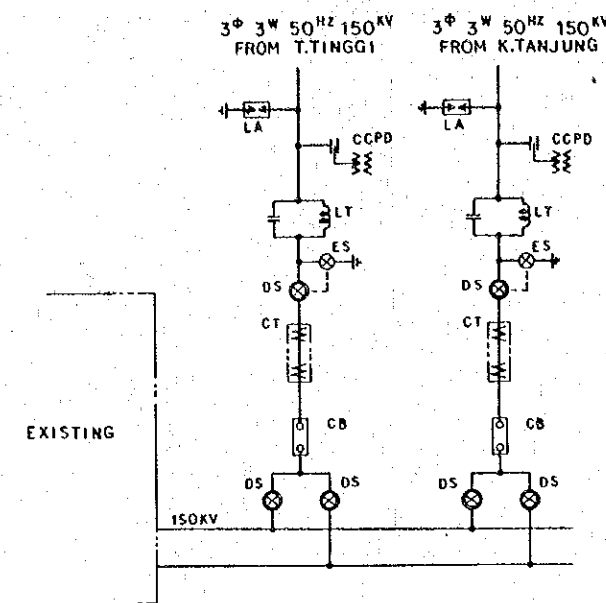
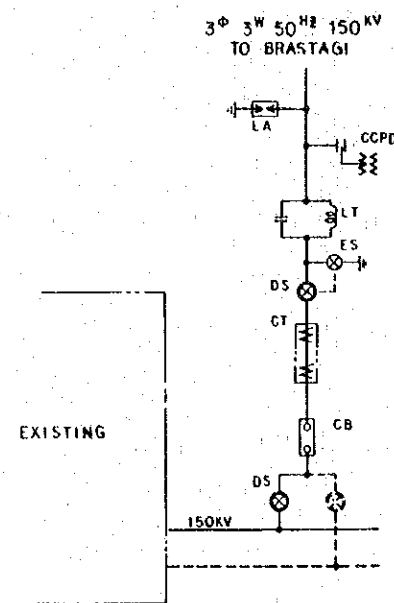
NORTH SUMATRA TRANSMISSION LINE PROJECT	
SINGLE LINE CONNECTION DIAGRAM AND ARRANGEMENT OF OUTDOOR EQUIPMENT KISARAN S/S	
DWG. NO. NSTL-010	DATE: Feb. 1980



LEGEND	
DS	DISCONNECTING SWITCH
CB	CIRCI BREAKER
CT	CURRENT TRANSFORMER
PD	POTENTIAL DEVICE
LA	LIGHTNING ARRESTER
LT	LINE TRAP

REMARK:
----- FUTURE EXTENSION

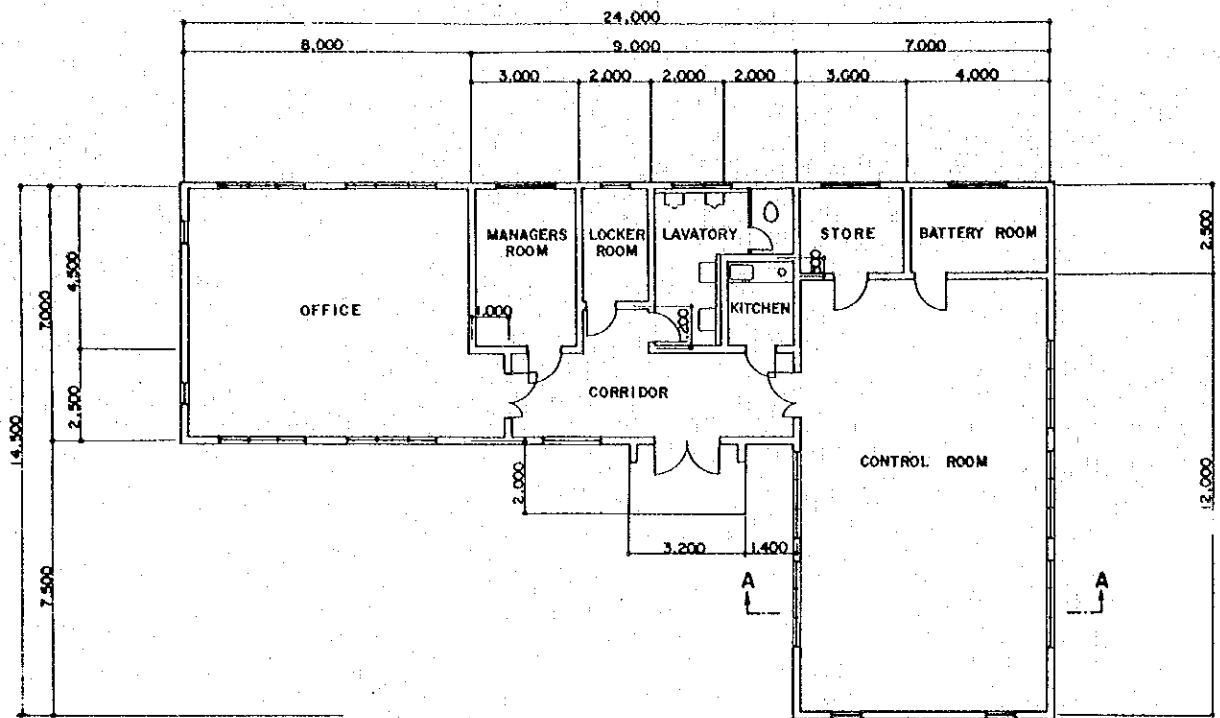
NORTH SUMATRA TRANSMISSION LINE PROJECT	
SINGLE LINE CONNECTION DIAGRAM AND ARRANGEMENT OF OUTDOOR EQUIPMENT BRASTAGI SS	
DWG.NO. NSTL-011	DATE: Feb. 1980



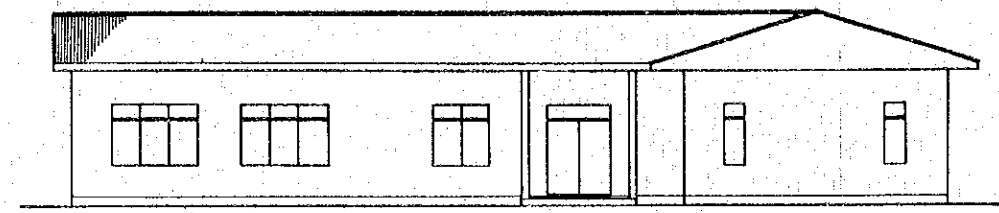
LEGEND	
D S	DISCONNECTING SWITCH
C B	CIRCUIT BREAKER
C T	CURRENT TRANSFORMER
P D	POTENTIAL DEVICE
L A	LIGHTNING ARRESTER
L T	LINE TRAP

REMARK:
----- FUTURE EXTENSION

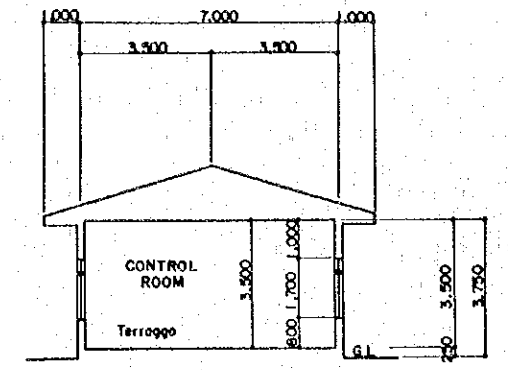
NORTH SUMATRA TRANSMISSION LINE PROJECT
SINGLE LINE CONNECTION DIAGRAM AND
ARRANGEMENT OF OUTDOOR EQUIPMENT
MEDAN TIMUR S/S & TITI KUNING S/S
DWG. NO. NSTL - 012 | DATE: Feb. 1980



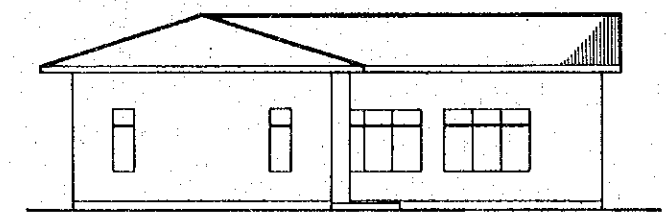
CONTROL BUILDING PLAN



FRONT ELEVATION



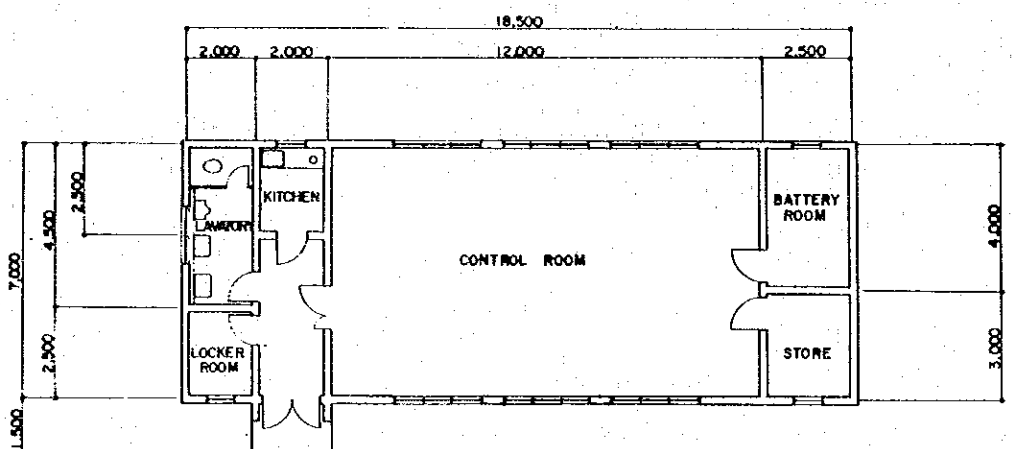
SECTION A - A



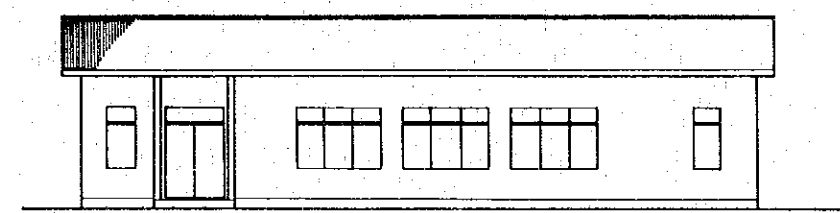
SIDE ELEVATION

- FINISH SCHEDULE**
- Roof : Wooden truss
 - : Corrugated asbestos cement sheet
 - Floor : Terrazzo
 - Wall : Brick
 - : Interior - Vinyl paint on cement mortar fini
 - : Exterior - Colored cement splay fini

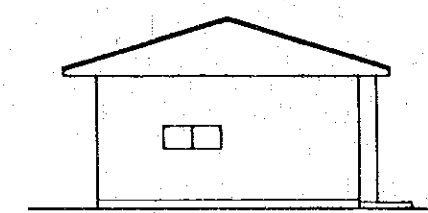
TEBING TINGGI S/S



CONTROL BUILDING PLAN

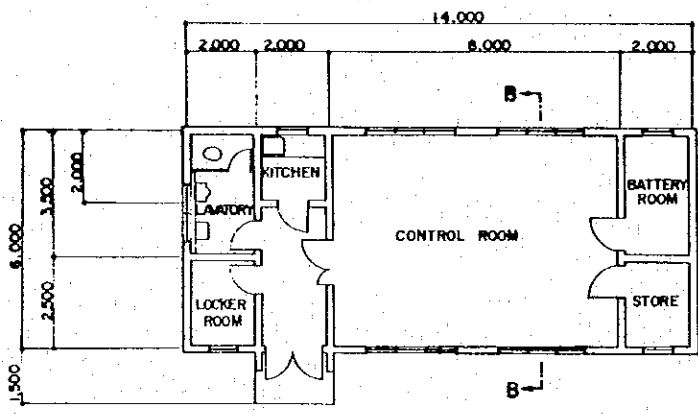


FRONT ELEVATION

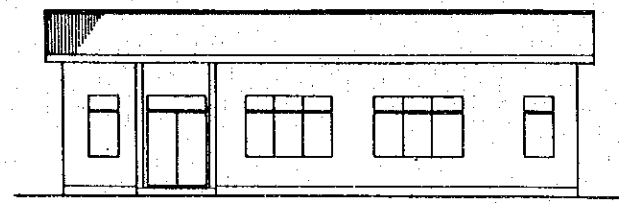


SIDE ELEVATION

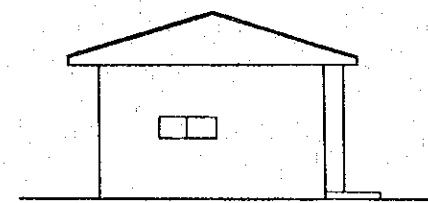
KUALA TANJUNG S/S



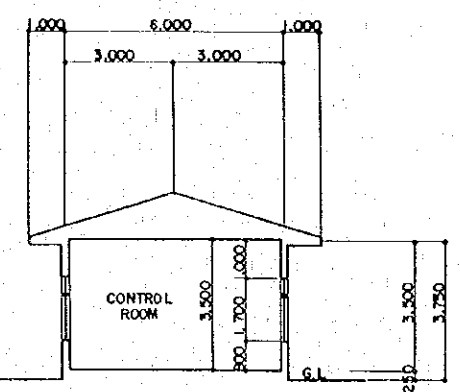
CONTROL BUILDING PLAN



FRONT ELEVATION



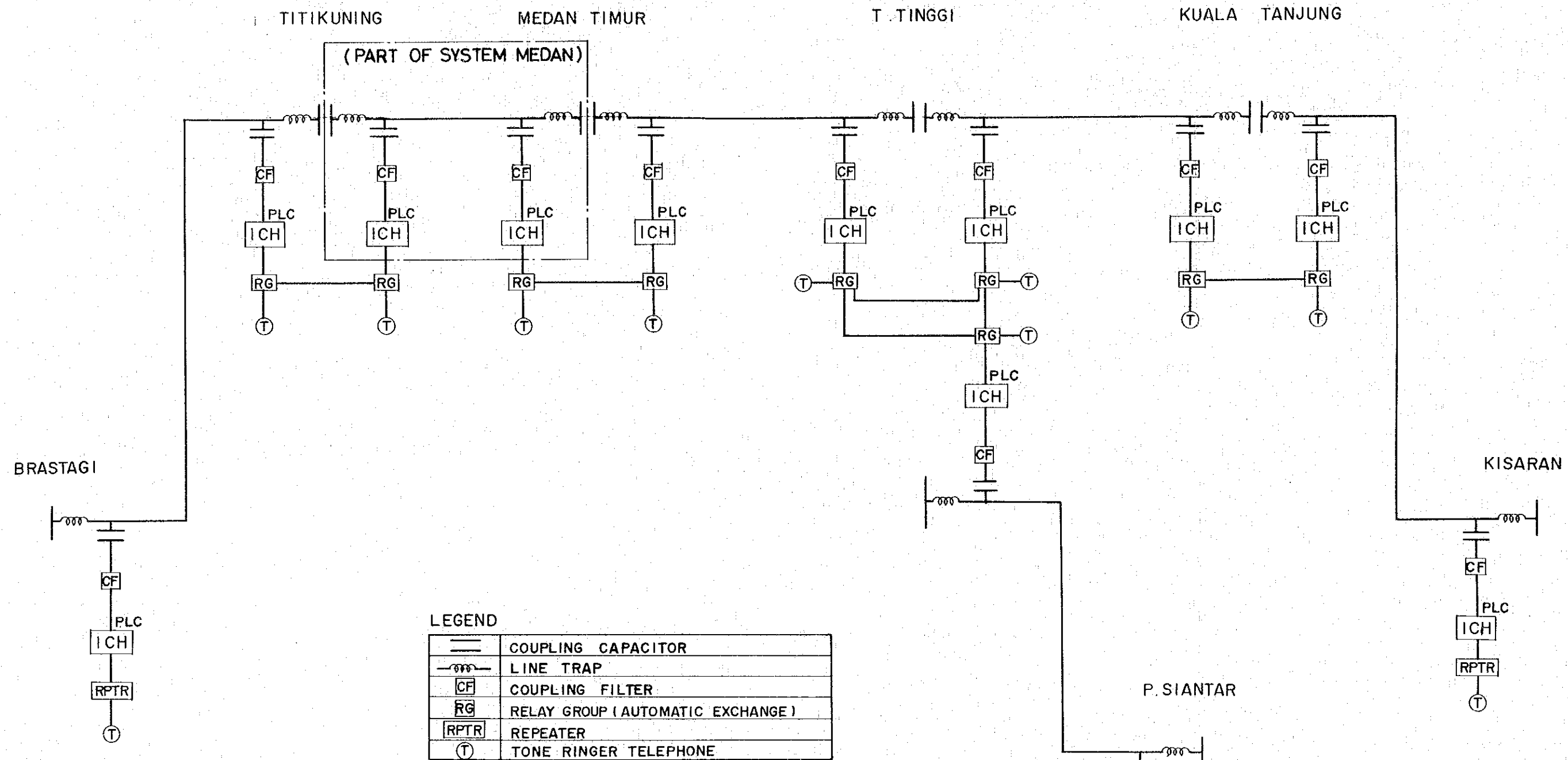
SIDE ELEVATION



SECTION B - B

P. SIANTAR S/S , KISARAN S/S & BRASTAGI S/S

NORTH SUMATRA TRANSMISSION LINE PROJECT	
CONTROL BUILDINGS OF SUBSTATIONS	
DWG. NO. NSTL-013	DATE: Feb. 1980



LEGEND

	COUPLING CAPACITOR
	LINE TRAP
	COUPLING FILTER
	RELAY GROUP (AUTOMATIC EXCHANGE)
	REPEATER
	TONE RINGER TELEPHONE

NORTH SUMATRA TRANSMISSION LINE PROJECT
 POWER LINE CARRIER
 TELEPHONE SYSTEM
 DWG. NO. NSTL - 014 DATE : Feb. 1980

JICA