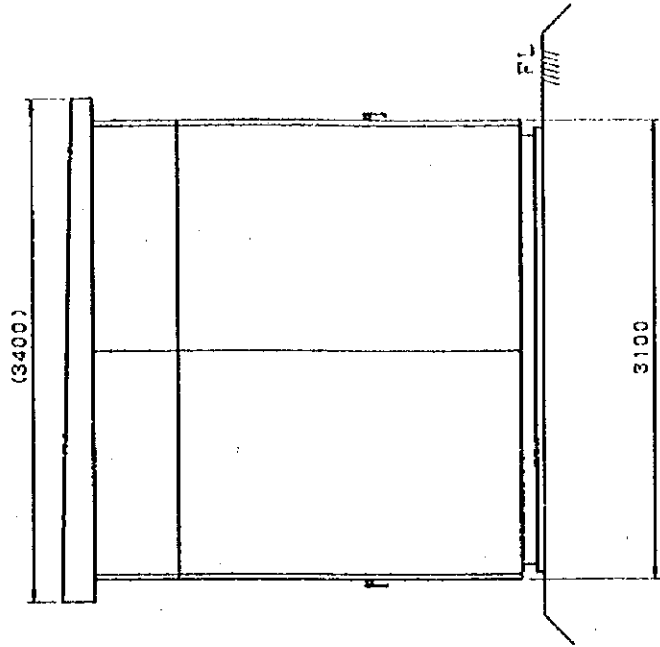


FRONT VIEW

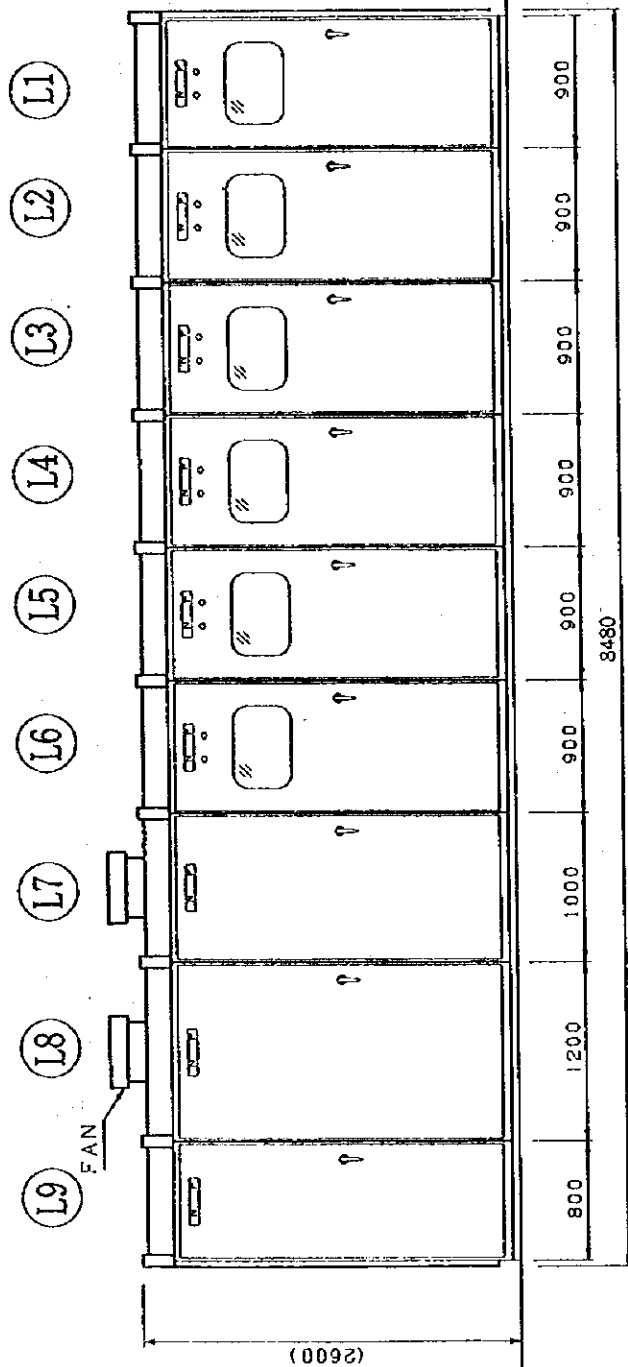


SIDE VIEW

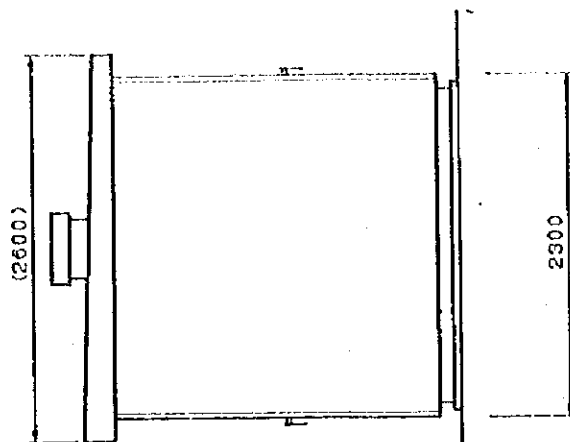
FOR REFERENCE ONLY

SYMBOL	COMPARTMENT NAME
(H1)	33KV TRANSMISSION FEEDER (1)
(H2)	MAIN TRANSFORMER FEEDER
(H3)	33KV TRANSMISSION FEEDER (2)

THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWINE AND SARACACCA				SCALE
				1 / 50
33KV屋外配電盤概略外形図 [ラバ変電所] OUTLINE OF 33KV OUTDOOR TYPE SWITCHGEAR PANEL [LA PAIX SUBSTATION]				DWG No. MS-03
DATE	DESIGNED	CHECKED	APPROVED	REVISION
24 July, 99	Urved M/c		ASW	
YEC				YACHIYO ENGINEERING CO., LTD TOKYO JAPAN



FRONT VIEW



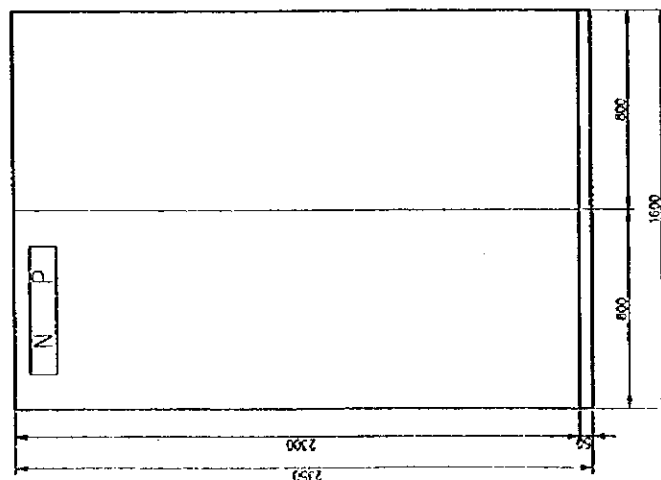
SIDE VIEW

FOR REFERENCE ONLY

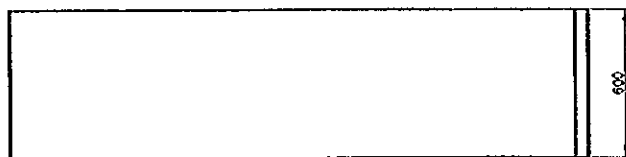
PANEL No.	DISCUSSION	PANEL No.	DISCUSSION
(1)	12.6kV DISTRIBUTION FEEDER (1)	(16)	12.6kV DISTRIBUTION FEEDER (5)
(2)	12.6kV DISTRIBUTION FEEDER (2)	(17)	STATION TRANSFORMER COMPARTMENT
(3)	12.6kV DISTRIBUTION FEEDER (3)	(18)	DC SUPPLY EQUIPMENT COMPARTMENT
(4)	MAIN TRANSFORMER FEEDER	(19)	SCADA INTERFACE CUBICLE
(5)	12.6kV DISTRIBUTION FEEDER (4)		

THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWLINE AND SARAMACCA		SCALE	1 / 50
12.6kV屋外配電盤概略外形図 [ラバ変電所]		DWG No.	MS-04
OUTLINE OF 12.6kV OUTDOOR TYPE SWITCHGEAR PANEL [LA PAIX SUBSTATION]			
DATE	DESIGNED	CHECKED	APPROVED

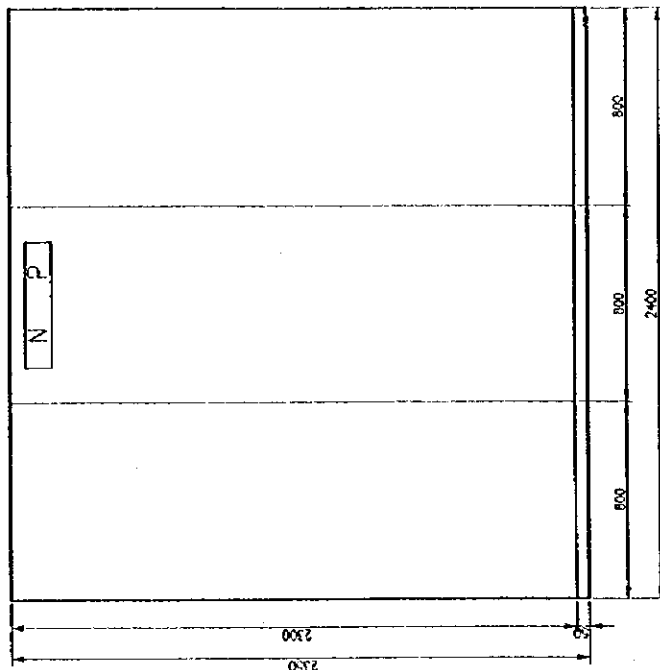
24 July, 99 *Urno* *m.f.* *ABON*
yec YACHIYO ENGINEERING CO., LTD
 TOKYO JAPAN



FRONT VIEW



SIDE VIEW



FRONT VIEW



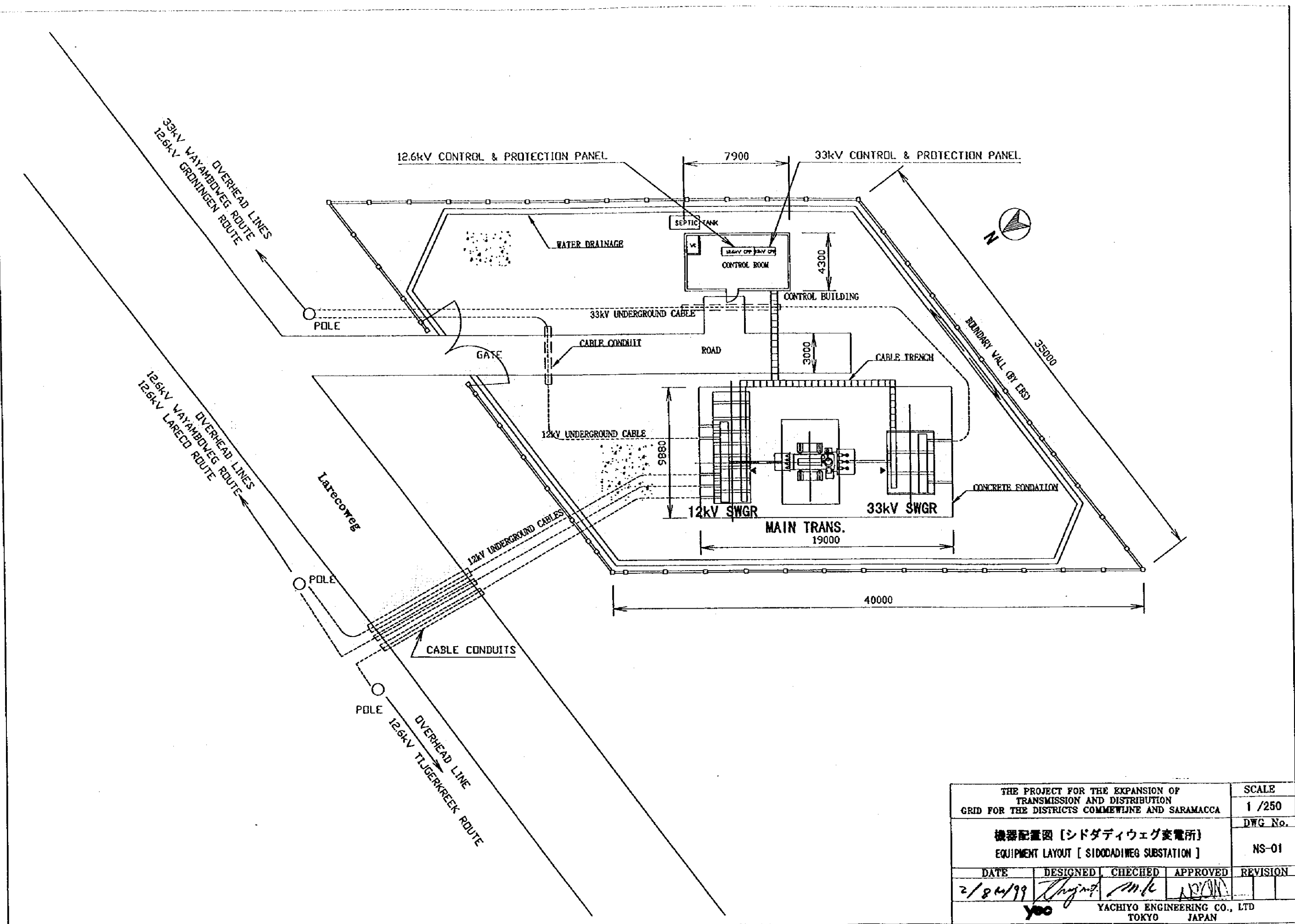
SIDE VIEW

33kV PROTECTION AND CONTROL PANEL

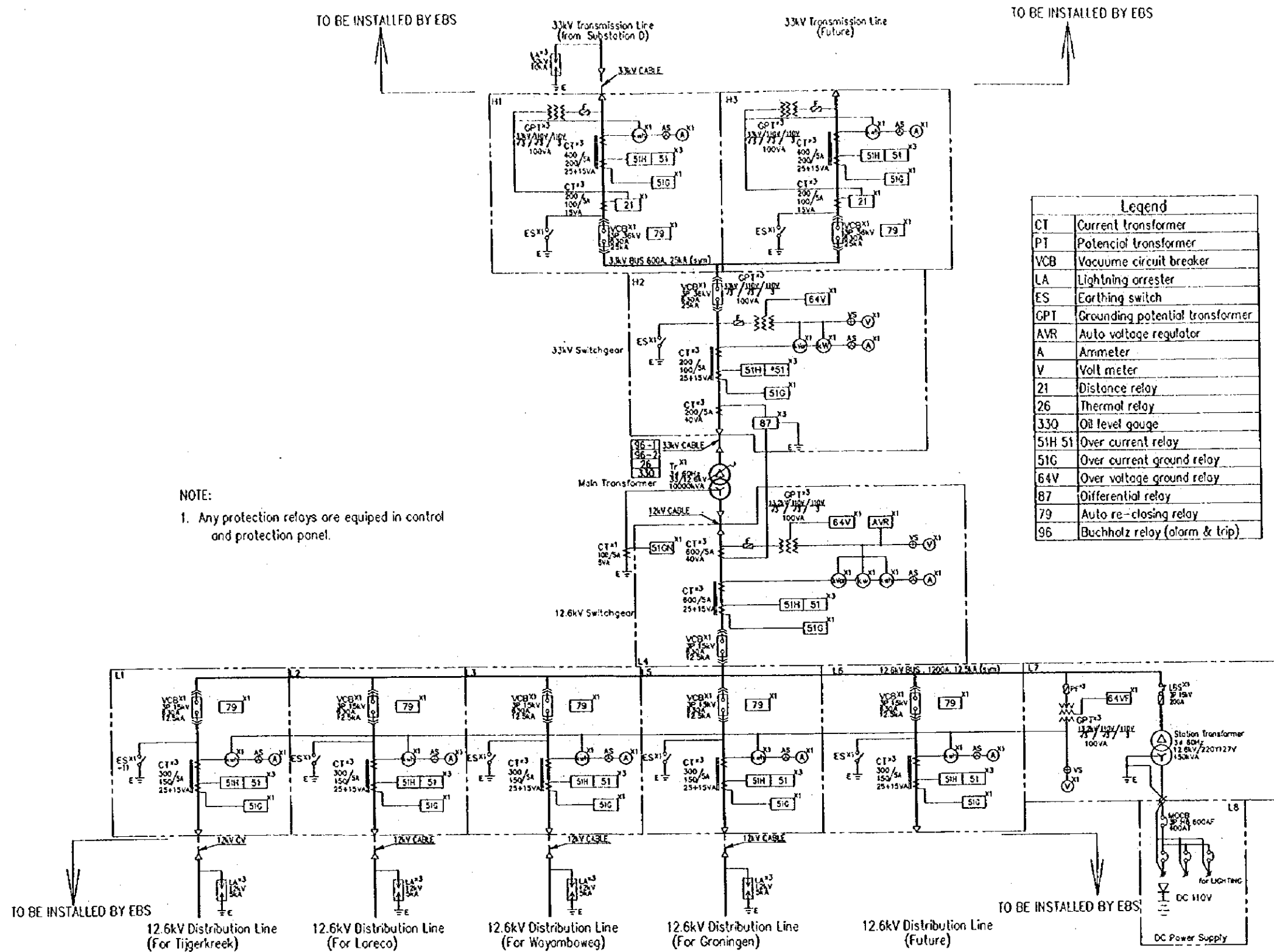
12.6kV CONTROL AND PROTECTION PANEL

FOR REFERENCE ONLY

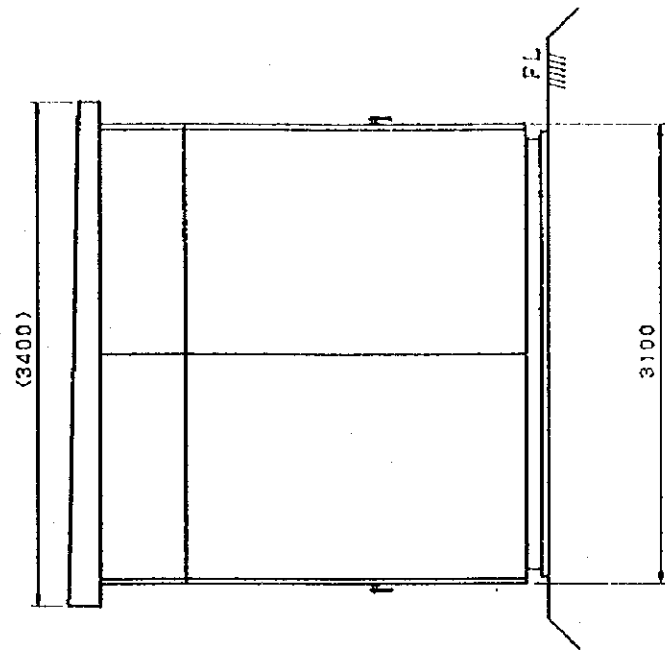
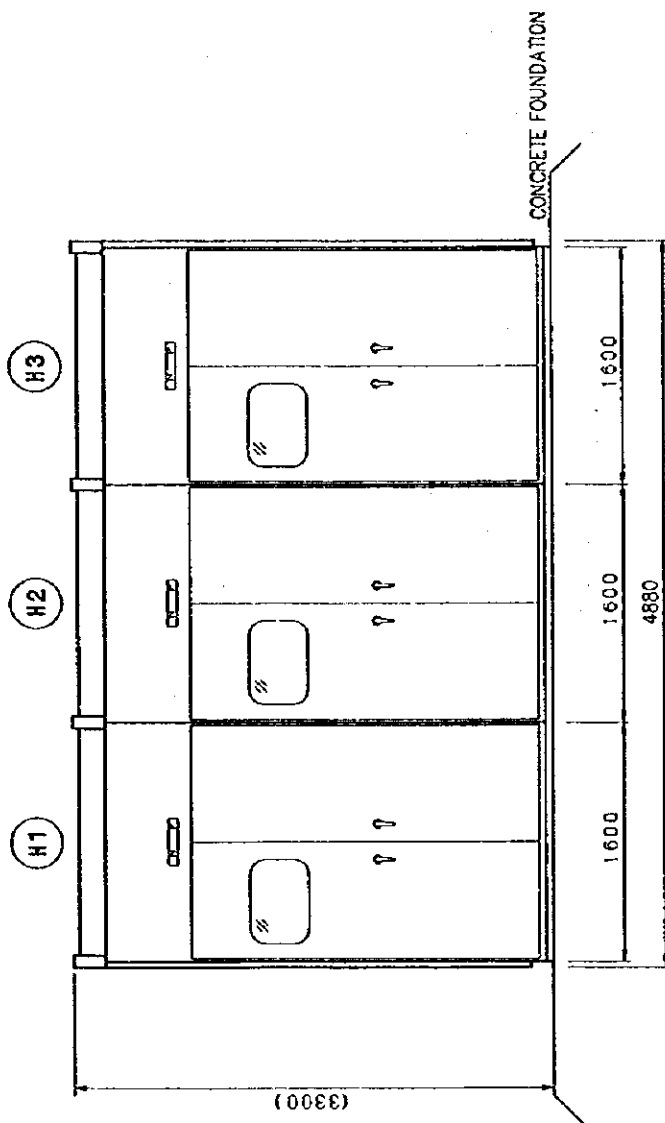
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWINE AND SARAWAKCA		SCALE	1 / 30
屋内型操作・保護リレー設備略外形図 [ラバ変電所]		DWG. No.	
OUTLINE OF INDOOR TYPE CONTROL AND PROTECTION PANEL [LA PAIX SUBSTATION]		MS-05	
DATE	DESIGNED	CHECKED	APPROVED
24 July, 99	Yoc	M. L.	K. O. M.
YACHIO ENGINEERING CO., LTD		TOKYO JAPAN	



THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWINE AND SARACCA					SCALE
					1 / 250
機器配置図 [シドダディウエグ変電所] EQUIPMENT LAYOUT [SIDDADINEG SUBSTATION]					DWG No.
					NS-01
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
2/8/99	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>		
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN					

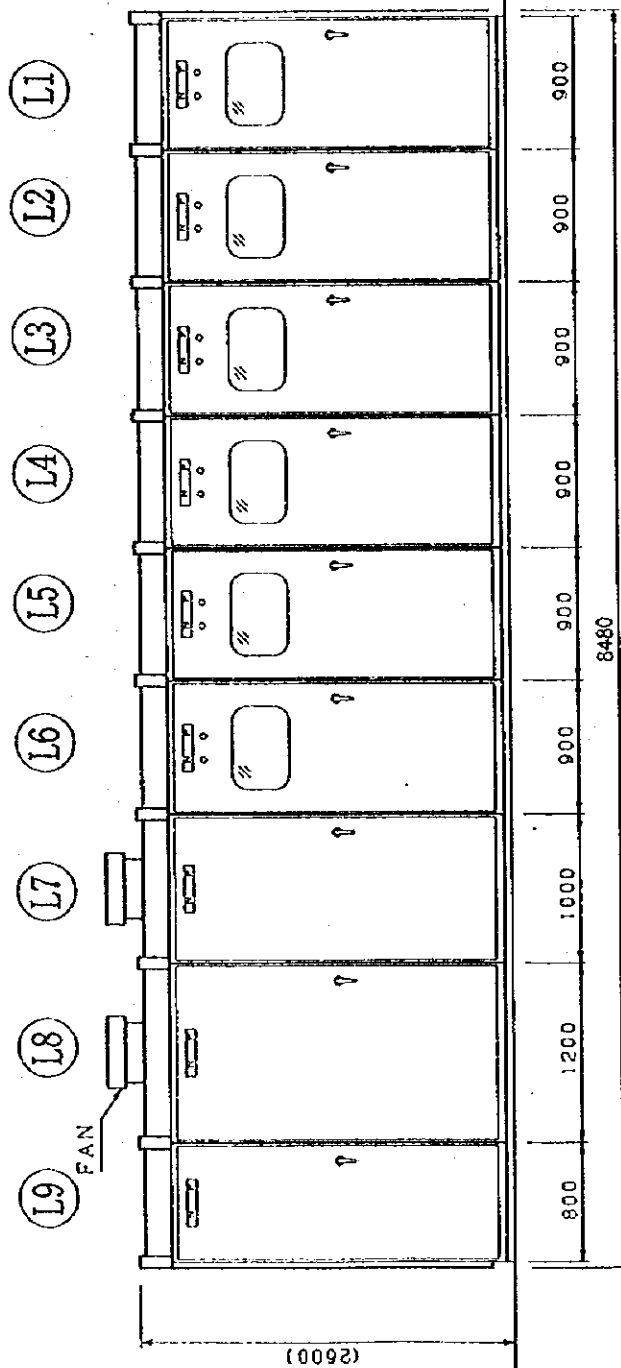


THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWINE AND SARAMACCA					SCALE
単線結線図 [シドダディウエグ変電所] SINGLE LINE DIAGRAM [SIDODADIWEG SUBSTATION]					DWG No. NS-02
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
10 Aug. '99	Dr. W. P.	M. K.	M. K.		
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN					



SYMBOL	COMPARTMENT NAME
(H1)	33kV TRANSMISSION FEEDER (1)
(H2)	MAIN TRANSFORMER FEEDER
(H3)	33kV TRANSMISSION FEEDER (2)

THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMOWLINE AND SARACCA		SCALE
33kV屋外配電盤概略外形図 [シドタイプウエグ変電所] OUTLINE OF 33kV OUTDOOR TYPE SWITCHGEAR PANEL [SIDODATWEG SUBSTATION]		1 / 50
DATE		DWG No.
28 July 99	DESIGNED	NS-03
YEC	CHECKED	REVISION
YACHIYO ENGINEERING CO., LTD.		
TOKYO JAPAN		

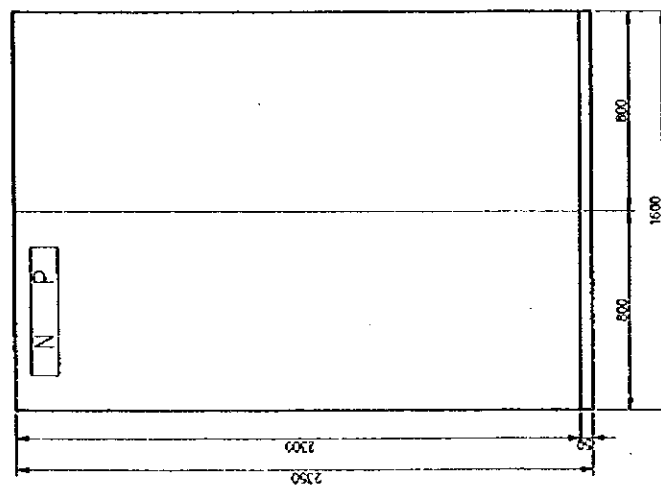


FRONT VIEW

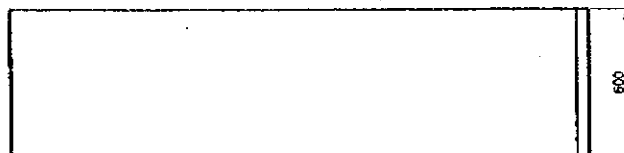
SIDE VIEW

PANEL No.	DESCRIPTION	PANEL No.	DESCRIPTION
(1)	12kV DISTRIBUTION FEEDER (1)	(16)	12kV DISTRIBUTION FEEDER (5)
(2)	12kV DISTRIBUTION FEEDER (2)	(17)	STATION TRANSFORMER COMPARTMENT
(3)	12kV DISTRIBUTION FEEDER (3)	(18)	DC SUPPLY EQUIPMENT COMPARTMENT
(4)	MAIN TRANSFORMER FEEDER	(19)	SCADA INTERFACE CIRCUIT
(5)	12kV DISTRIBUTION FEEDER (4)		

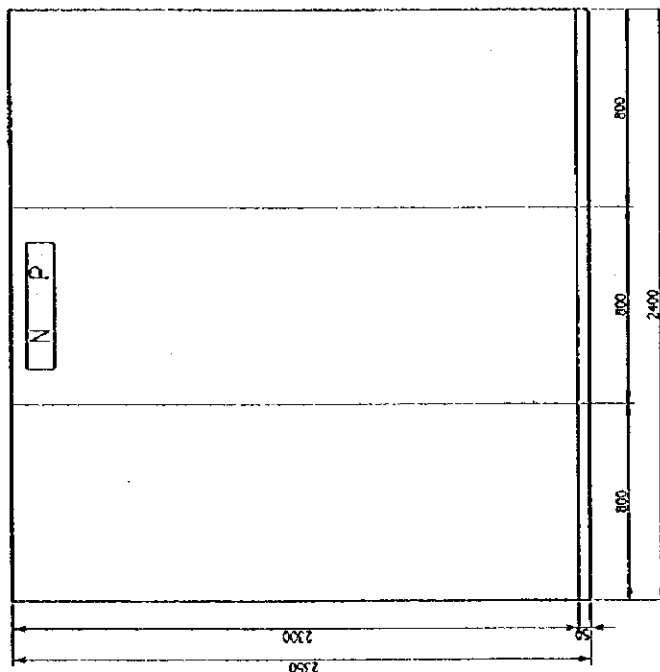
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMUTELINE AND SARAMACCA				SCALE
				1 / 50
12. 6KV屋外配電盤概略外形図 [シールドタイプエグゼクティブ] OUTLINE OF 12. 6KV OUTDOOR TYPE SWITCHGEAR PANEL [SHIELD TYPE SUBSTATION]				DWG No. NS-04
DATE	DESIGNED	CHECKED	APPROVED	REVISION
24 July, 99	Yoc	Yoc	Yoc	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				



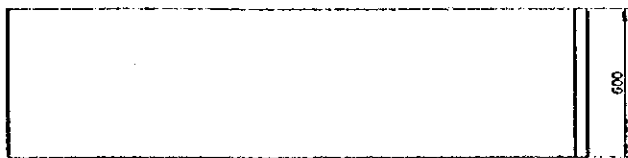
FRONT VIEW



SIDE VIEW



FRONT VIEW

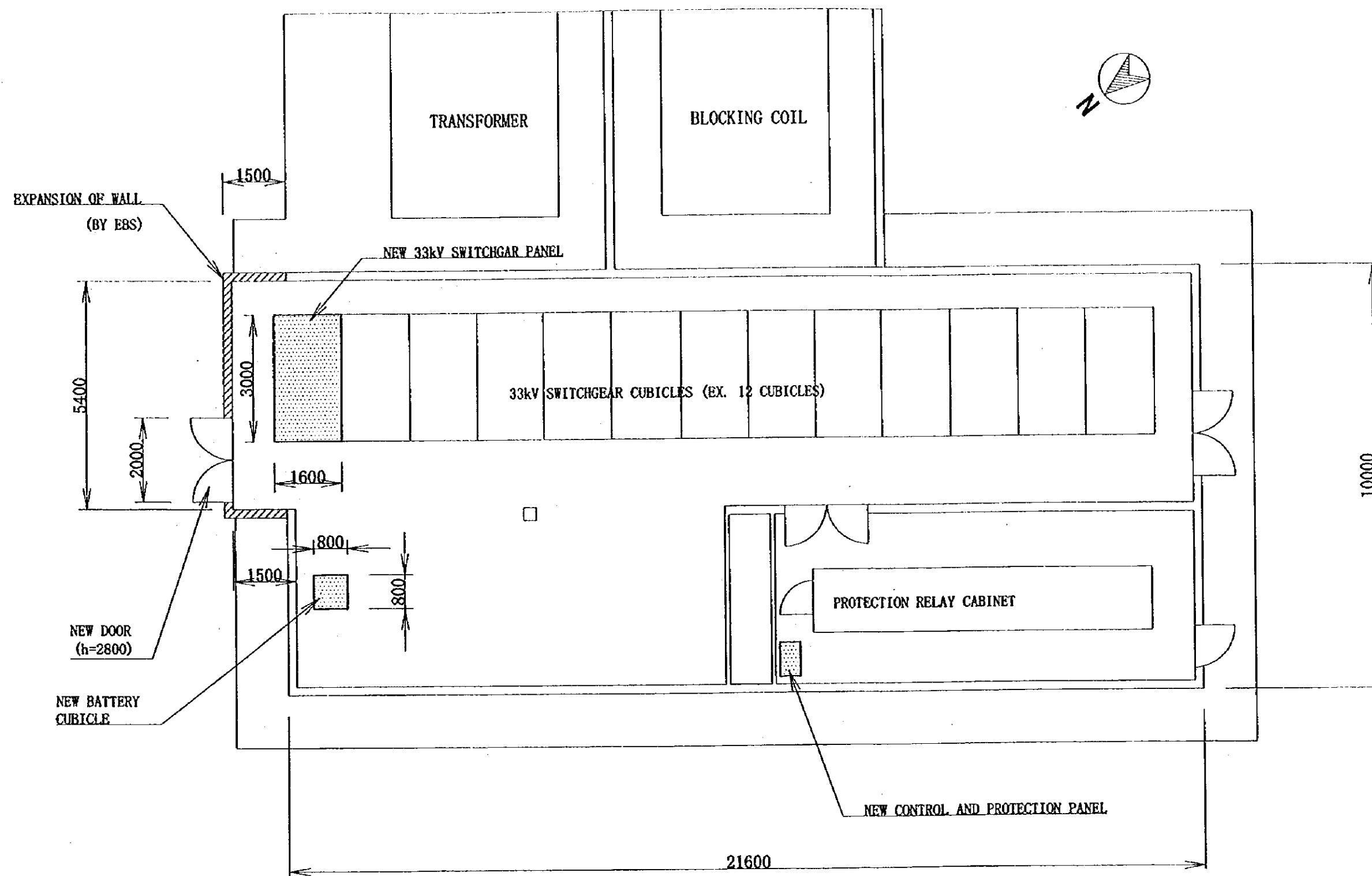


SIDE VIEW

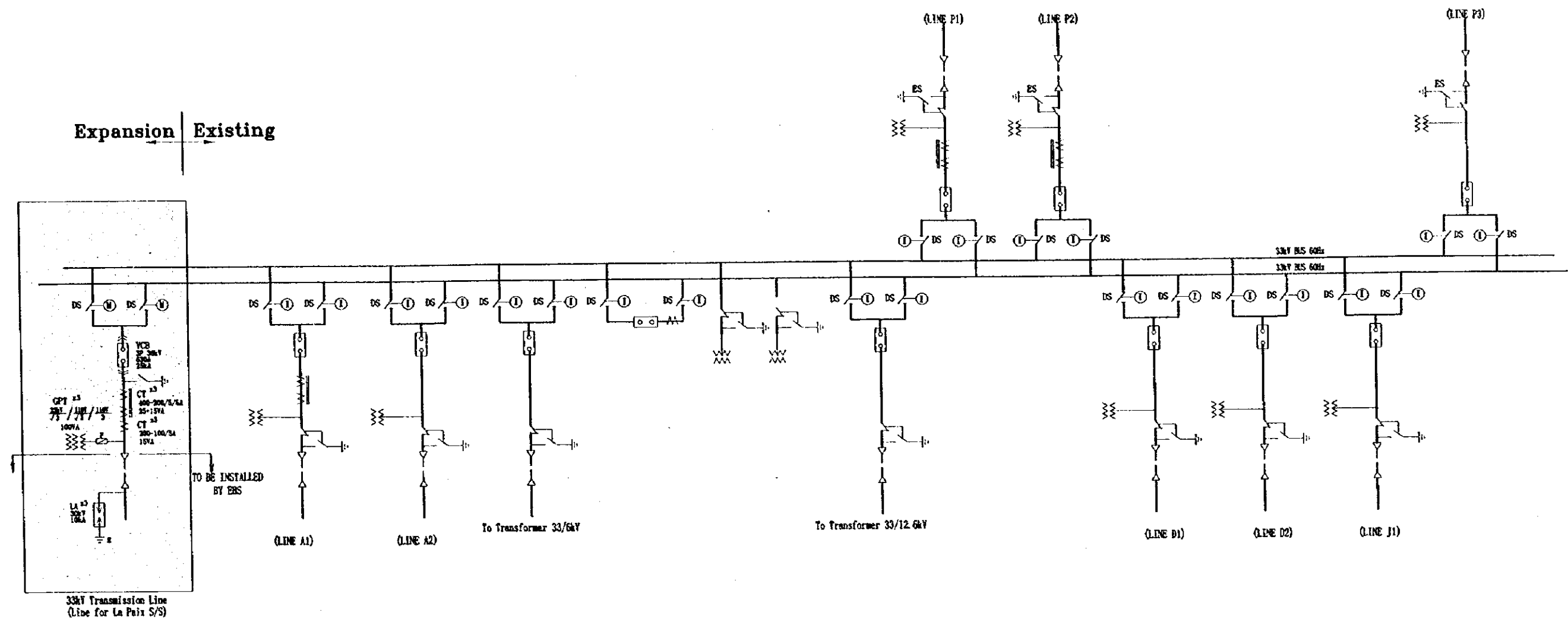
33kV PROTECTION AND CONTROL PANEL

12.6kV CONTROL AND PROTECTION PANEL

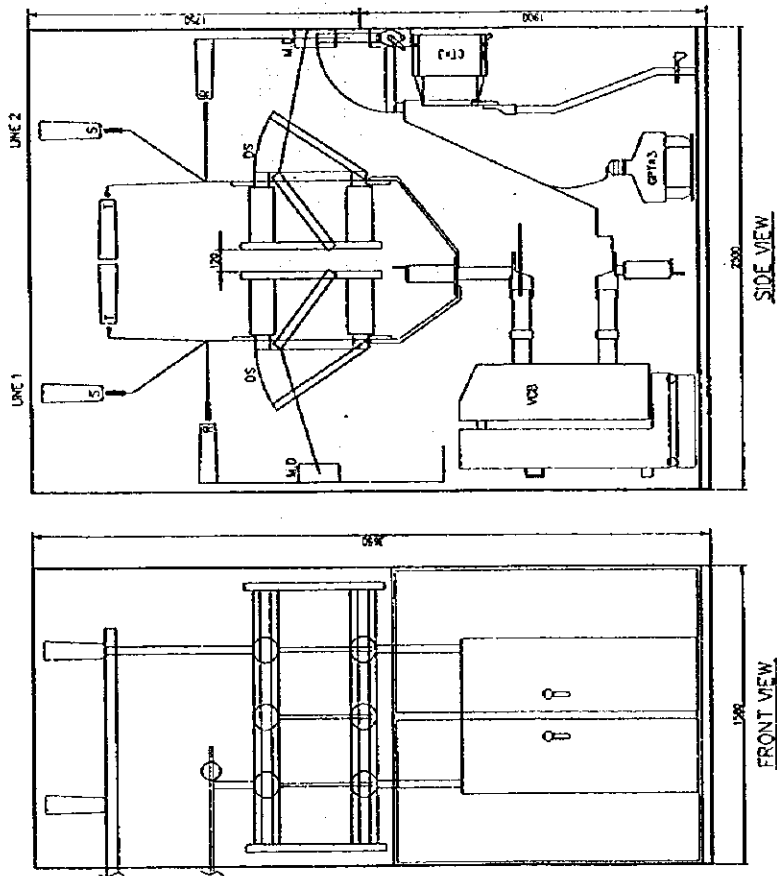
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWINE AND SARAWAK		SCALE
屋内型操作・保護リレー盤概略外形図 [シドダディウエグ変電所] OUTLINE OF INDOOR TYPE CONTROL AND PROTECTION PANEL [SIDODADINES SUBSTATION]		1 / 30
DATE		DWG No.
DESIGNED		NS-05
CHECKED		REVISION
APPROVED		
20 July 99		
YPC		
YACHYO ENGINEERING CO., LTD		
TOKYO JAPAN		



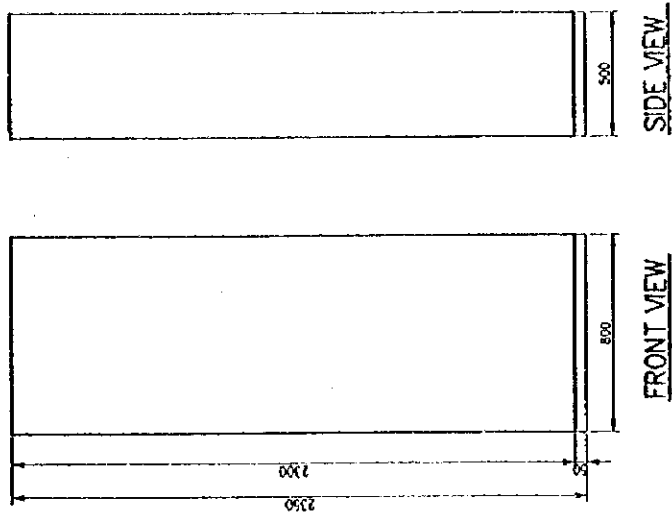
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARAMACCA					SCALE
配電盤室内機器配置図〔既設8変電所〕					1 / 100
EQUIPMENT LAYOUT IN THE EXISTING SWITCHGEAR BUILDING [EXISTING SUBSTATION 8]					DWG No.
					BS-01
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
24 July, 99	Uring	m/c	JSKND		
yec					YACHIYO ENGINEERING CO., LTD
					TOKYO JAPAN



THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMENIJINE AND SARAMACCA				SCALE
33kV配電盤単線結線図[既設8変電所]				DWG No.
SINGLE LINE DIAGRAM OF 33kV SWITCHGEAR PANEL [EXISTING SUBSTATION 8]				BS-02
DATE	DESIGNED	CHECKED	APPROVED	REVISION
10 Aug. '97	Oruno	M.K.	ABON	1
yec				YACHIYO ENGINEERING CO., LTD TOKYO JAPAN

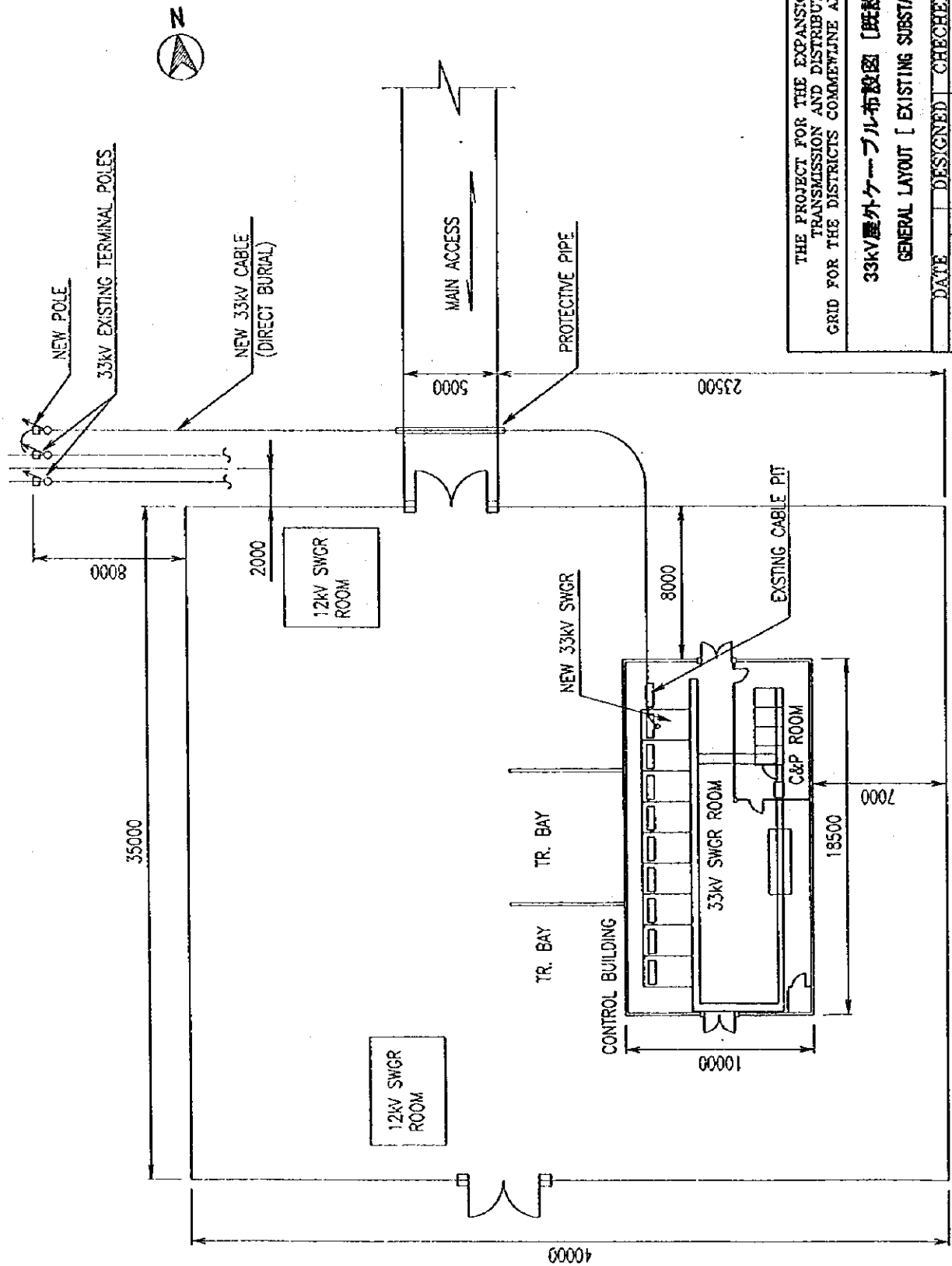


33kV SWITCHGEAR PANEL
(SCALE 1:40)

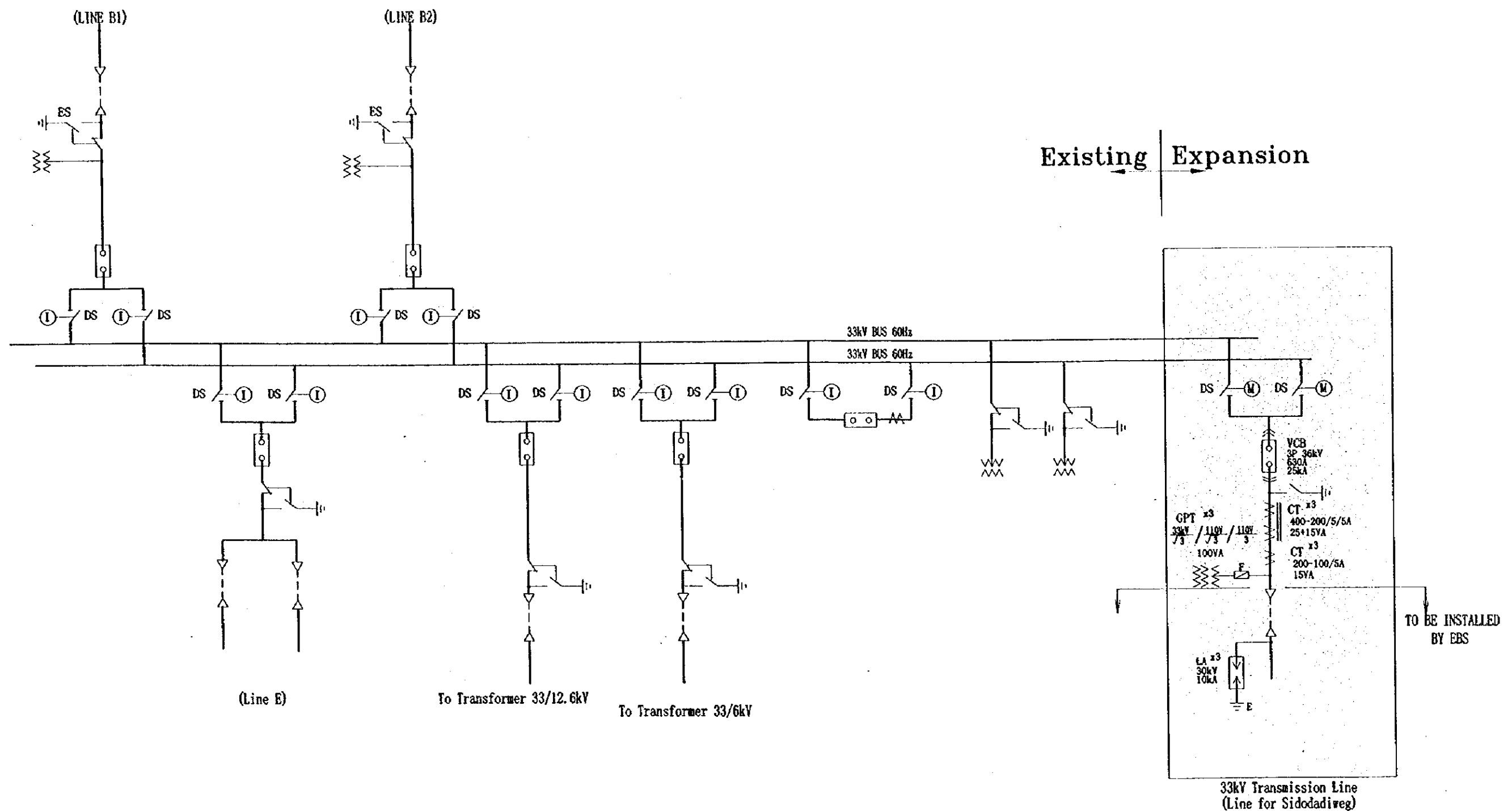


33kV CONTROL AND PROTECTION PANEL
(SCALE 1:30)

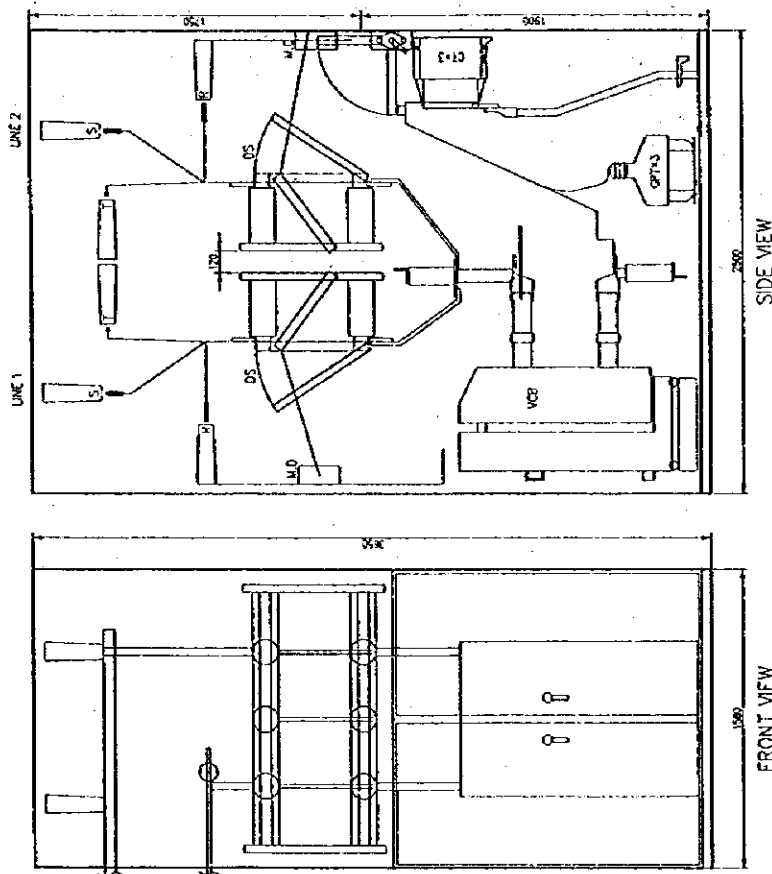
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWINE AND SARAMACCA	SCALE	1/30, 1/40
	DWG No.	SS-03
33kV屋内配電盤及び操作・保護リレー盤概略外形図 [既設変電所]		
OUTLINE OF 33kV INDOOR TYPE SWITCHGEAR AND CONTROL AND PROTECTION PANEL [EXISTING SUBSTATION B]		
DATE	DESIGNED	CHECKED
2024.09.09	Yec	m.d
	APPROVED	REVISION
	ASICW	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN		



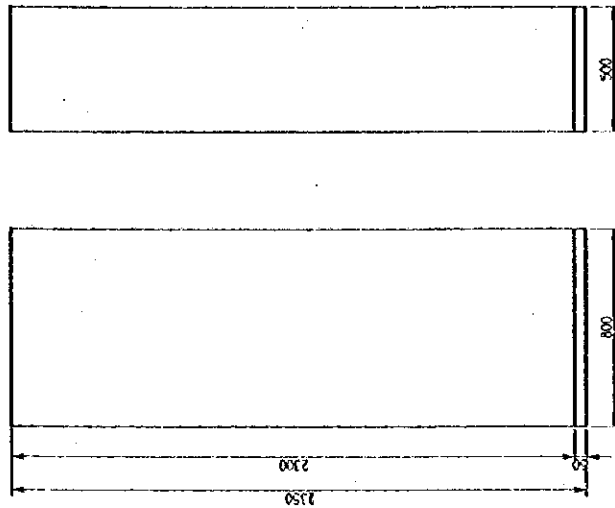
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMEWLINE AND SARAMACCA		SCALE	1 / 300
33KV屋外ケーブル布設図 [既設D変電所]		DWG No.	DS-01
GENERAL LAYOUT [EXISTING SUBSTATION D]			
DATE	DESIGNED	CHECKED	APPROVED
28 July 99	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN		REVISION	



THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMENTINE AND SARAMACCA				SCALE
33kV配電盤単線結線図 [既設D変電所]				DWG No.
SINGLE LINE DIAGRAM OF 33kV SWITCHGEAR PANEL [EXISTING SUBSTATION D]				DS-03
DATE	DESIGNED	CHECKED	APPROVED	REVISION
10 Aug. '99	Ormo	MAK	MSUNO	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				



33kV SWITCHGEAR PANEL
(SCALE 1/40)

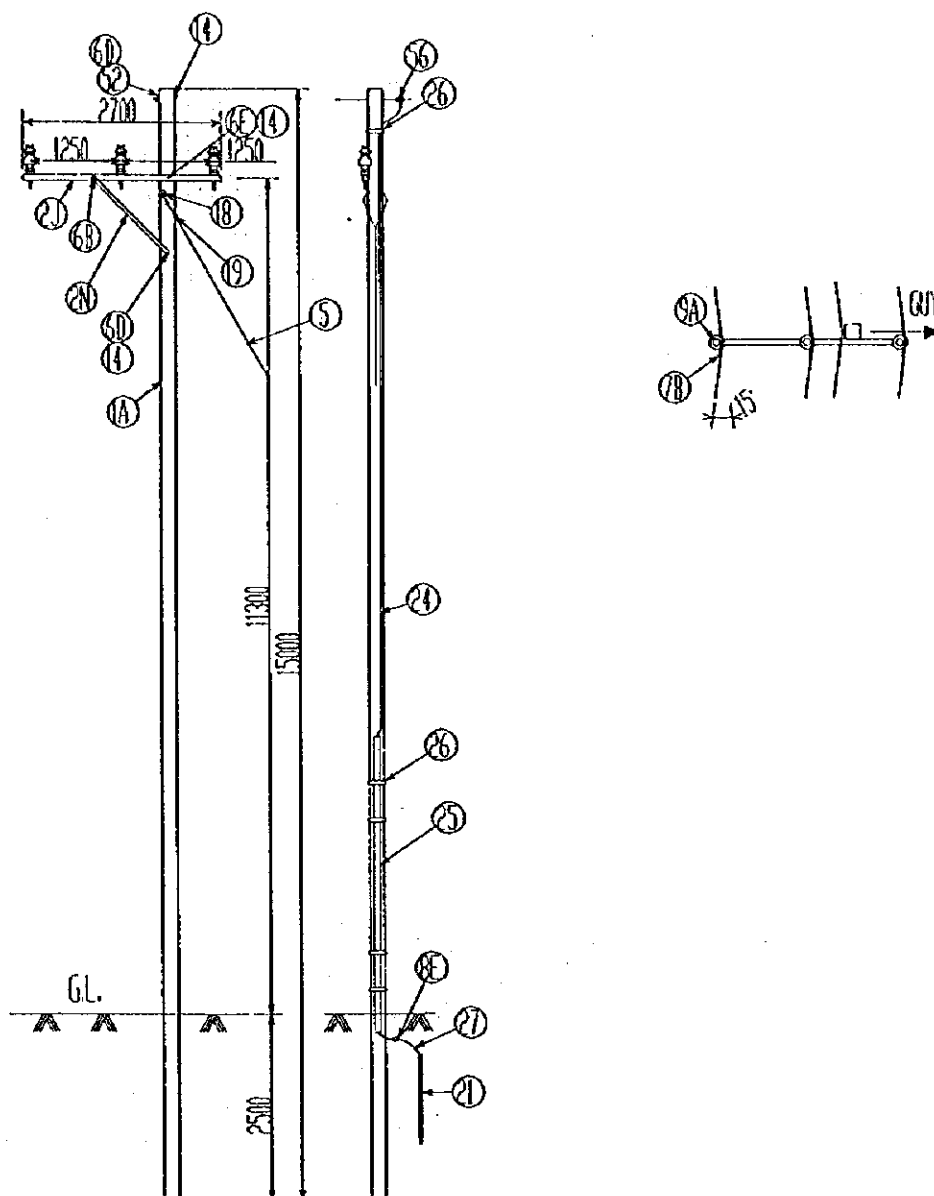


CONTROL AND PROTECTION PANEL
(SCALE 1/30)

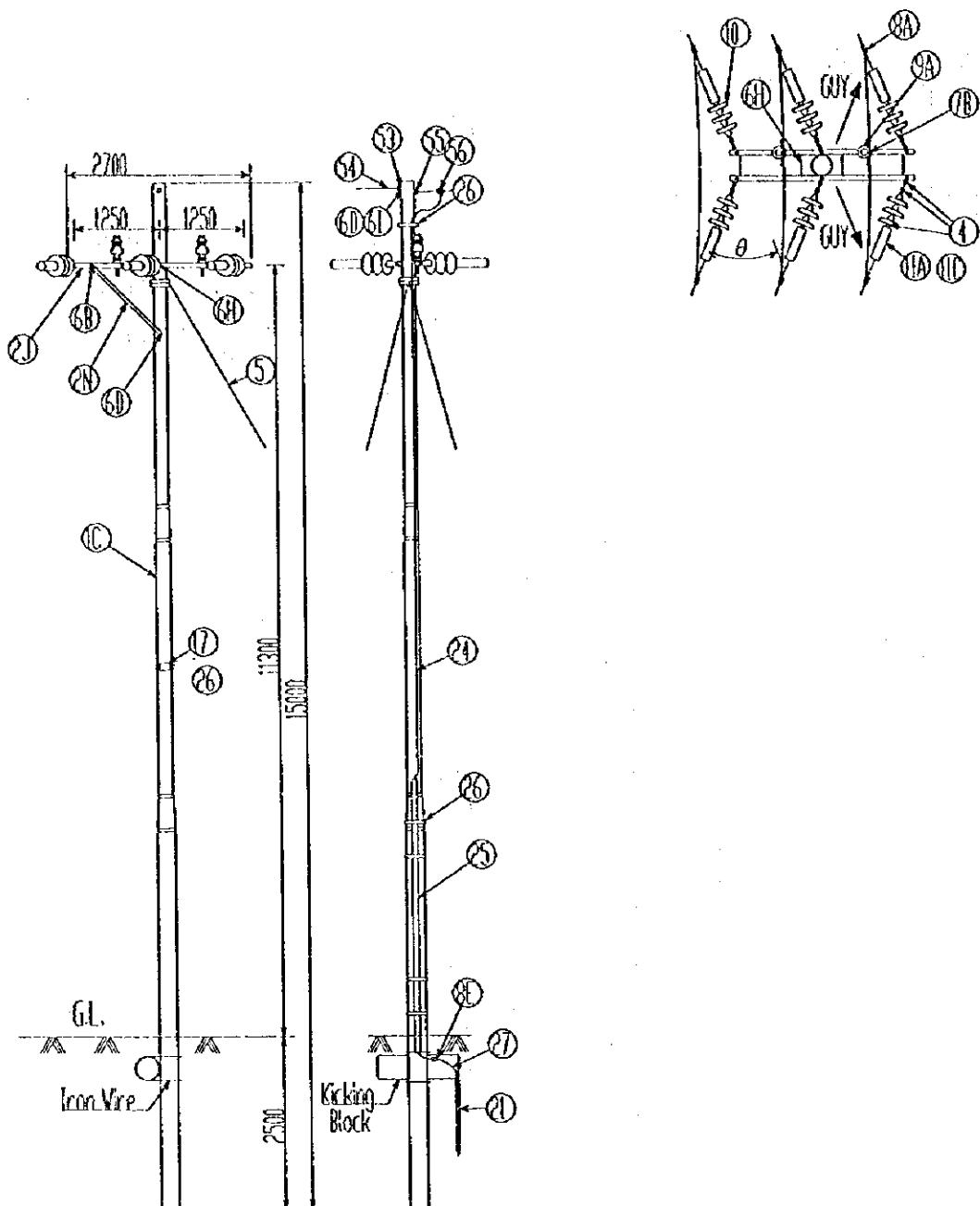
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMEMLINE AND SARAMACCA		SCALE
33kV屋内配電盤及び操作・保護リレー盤概略外形図 [既設変電所]		1/30, 1/40
OUTLINE OF 33kV INDOOR TYPE SWITCHGEAR AND CONTROL AND PROTECTION PANEL [EXISTING SUBSTATION D]		DWG No. DS-04
DATE	DESIGNED	CHECKED
28 July 89	Y. M. S.	A. S. M.
		APPROVED
		REVISION
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN		

PL-2: Material List for 33kV and 12.6kV Combination Line (33kV 共架柱装柱資材リスト)

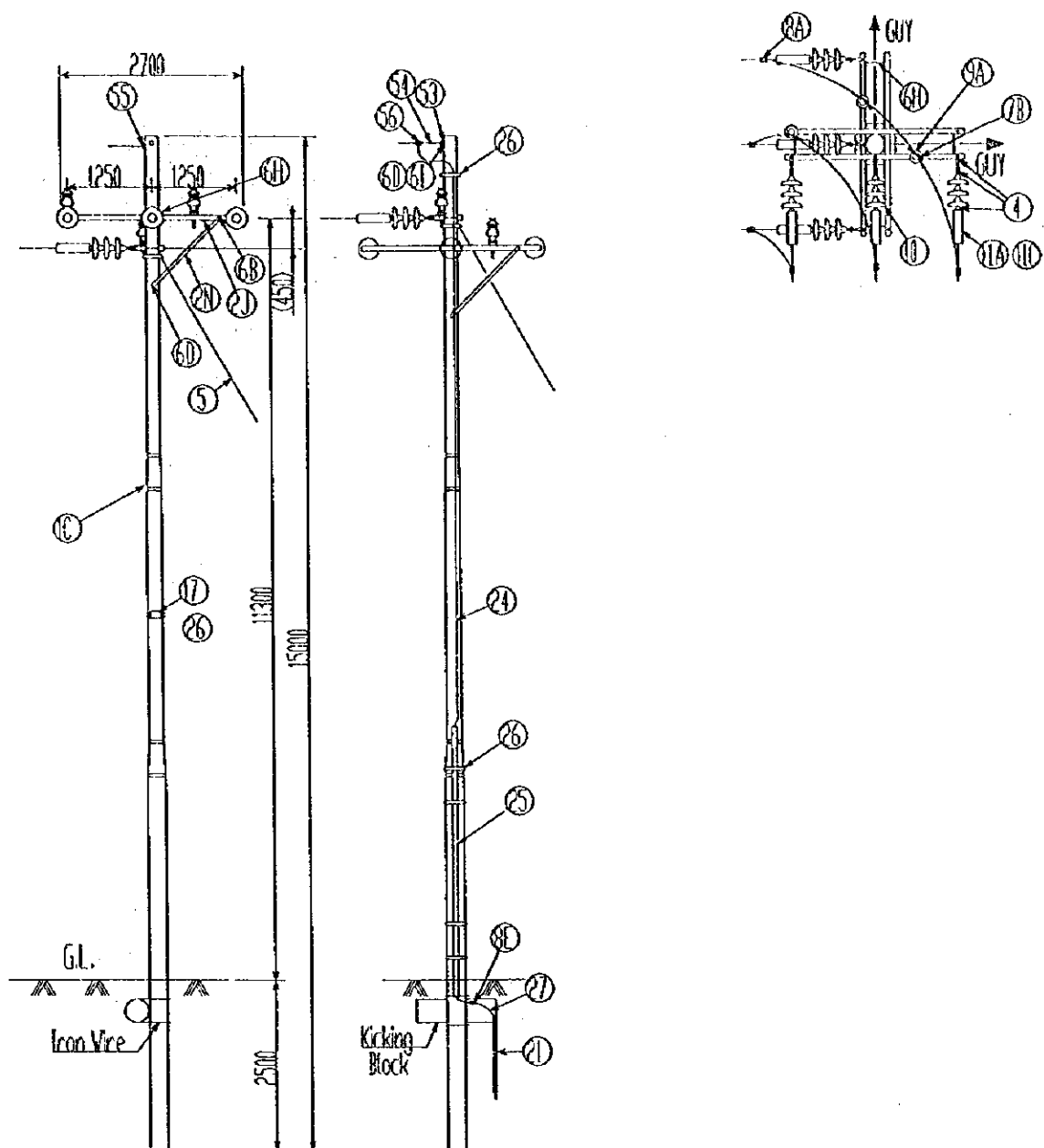
Part No. (資材番号)	Part Name (資材名)	Specification (仕様)	Remark (備考)	Unit (単位)	Pole Type				
					DMG	SMC	HMC	BMC	OMC
1A	Wooden pole	15m	EBS supply	no	1				
1B	Wooden pole	11m	EBS supply	no					
1C	Steel Pole	15m		no		1	1	1	1
2J	Crossarm	75x75x3 2x2700		pc	1	2	4	2	2
2K	Crossarm for Pin support	75x75x3 2x2700		pc					
2L	Crossarm	75x75x3 2x2100		pc	1	2	4	2	2
2M	Crossarm for Pin support	75x75x3 2x2100		pc					
2N	Crossarm Brace	L=1455		pc	2	4	8	4	4
3P	Crossarm Brace	L=945		pc					
3A	Tr.Support(A)	75x75x3 2x3000		pc					
3B	Tr.Support(B)	75x75x3.2x1500		pc					
4	(1) Anchor Shackle			set		12	12	12	6
	(2) Ball Clevis			set		12	12	12	6
	(3) Socket eye			set		12	12	12	6
	(4) Twist Strap set			set		12	12	12	6
5	(1) Strain Plate			pc	4				
	(2) Dead End Grip for Pole			pc	2				
	(3) Dead End Grip for Thimble			pc	2	8	8	8	4
	(4) Dead End Grip for Insulator			pc	4	8	8	8	4
	(5) Stay Wire	45mm2		m	30	60	60	60	30
	(6) Stay Insulator 33kV			pc	2	4	4	4	2
	(7) Stay Anchor	Driving Type		pc	2	4	4	4	2
	(8) Turnbuckle			pc	2	4	4	4	2
	(9) Stay Band			pc		4	4	4	2
6A	Bolt & Nut	M16x50, Galv.		set					
6B	Bolt & Nut	M16x120, Galv.		set	2	4	8	4	4
6C	Bolt & Nut	M16x200, Galv.		set					
6D	Bolt & Nut	M16x250, Galv.		set	2	2	4	2	2
6E	Bolt & Nut	M16x320, Galv.		set	2				
6F	Bolt & Nut	M16x360, Galv.		set					
6G	Bolt & Nut	M16x240, Galv.		set	1	2	2	2	1
6H	Bolt & Nut	M16x400, Galv.		set		10	20	10	10
6I	Bolt & Nut	M16x60, Galv.		set		2	2	2	1
7A	Preformed Side Tie	for ACSR 4/0		set	3	2	3	3	
7B	Preformed Side Tie	for ACSR 1/0		set	3	2	3	3	
8A	Compression Connector	Al125/Al125		pc		6	6	6	
8B	Compression Connector	Al125/Cu22		pc					
8C	Compression Connector	Cu14.22/Cu14		pc	1	1	1	1	1
8D	Compression Connector	Cu38/Cu38		pc					
8E	Compression Connector	Cu38/Cu22		pc					
8F	Compression Connector	Al65/Al65		pc		6	6	6	
8G	Compression Connector	Al65/Cu22		pc					
9A	Pin Insulator	for 33kV		pc	3	2	3	3	3
9B	Pin Insulator	for 12.6kV		pc	3	2	3	3	
10	Suspension Insulator			pc		24	24	24	12
11A	Dead End Clamp	for 33kV		pc		6	6	6	3
11B	Dead End Clamp	for 12kV		pc		6	6	6	3
11C	Dead End Clamp adapter			pc		12	12	12	6
14	Square Washer			pc	4			4	
16	Copper Binding Wire			m					
17	Number Plate		EBS supply	pc	1	1	1	1	1
18	Nail			pc	16				
19	Staple			pc	8				
21	Ground Rod with lead wire	14mm x 1.5m		pc	1	1	1	1	1
22	IBT Band			pc					
23	Drop Wire	PDC22mm2		m					
24	Grounding Wire	IV 14 mm2		m	15	15	15	15	15
25	RGSC Pipe	L=4m		no	1	1	1	1	1
26	Stainless Band	L=1200mm		pc	4	4	4	4	4
27	IV Cable	38mm2		pc					
28	Kicking Block		EBS supply	pc		1	1	1	1
29	Iron Wire	4mm	EBS supply	m		8	8	8	8
36	Cable Protection Pipe	L=2.75m		no					
37	Cable Bracket Support			pc					
40A	Lightning Arrester	for 33kV		pc					3
40B	Lightning Arrester	for 12kV		pc					3
51	Open Fuse Cutout			pc					
52	GSW Support			pc	1				
53	GSW Dead End Support			pc		2	2	2	1
54	GSW Dead End Grip			pc		2	2	2	1
55	Thimble			pc		2	2	2	1
56	Connector	Bolt type		pc	1	1	1	1	1



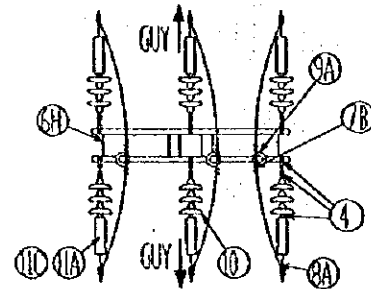
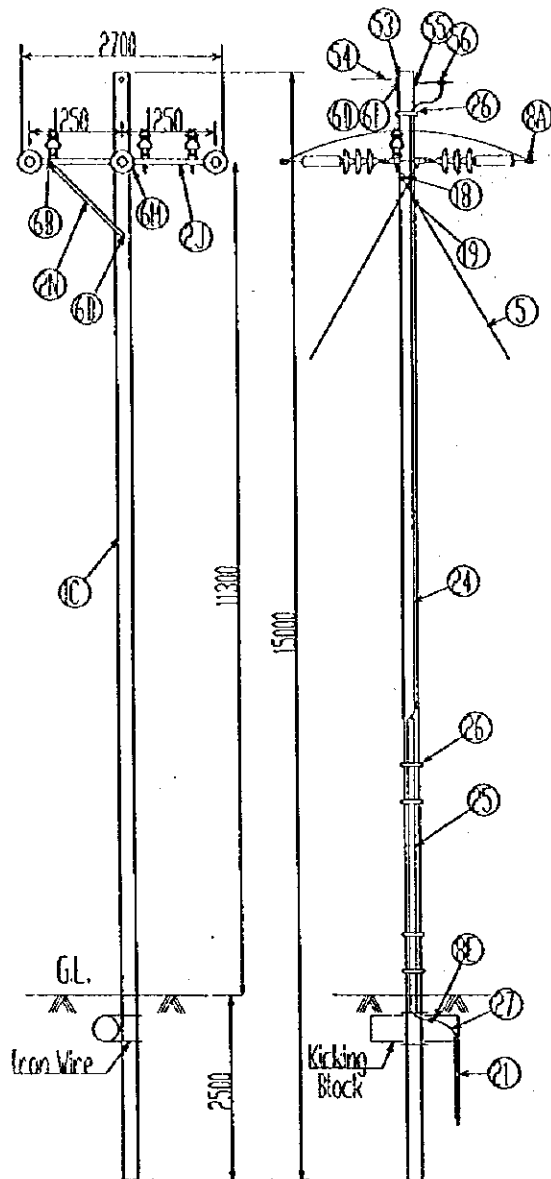
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARACACCA				SCALE
				—
33kV中間柱				DWG No.
33kV INETRMEIATE POLE				DN3
DATE	DESIGNED	CHECKED	APPROVED	REVISION
24 July '77	Urno	m.l	NS(ON)	
YACIYO ENGINEERING CO., LTD TOKYO JAPAN				



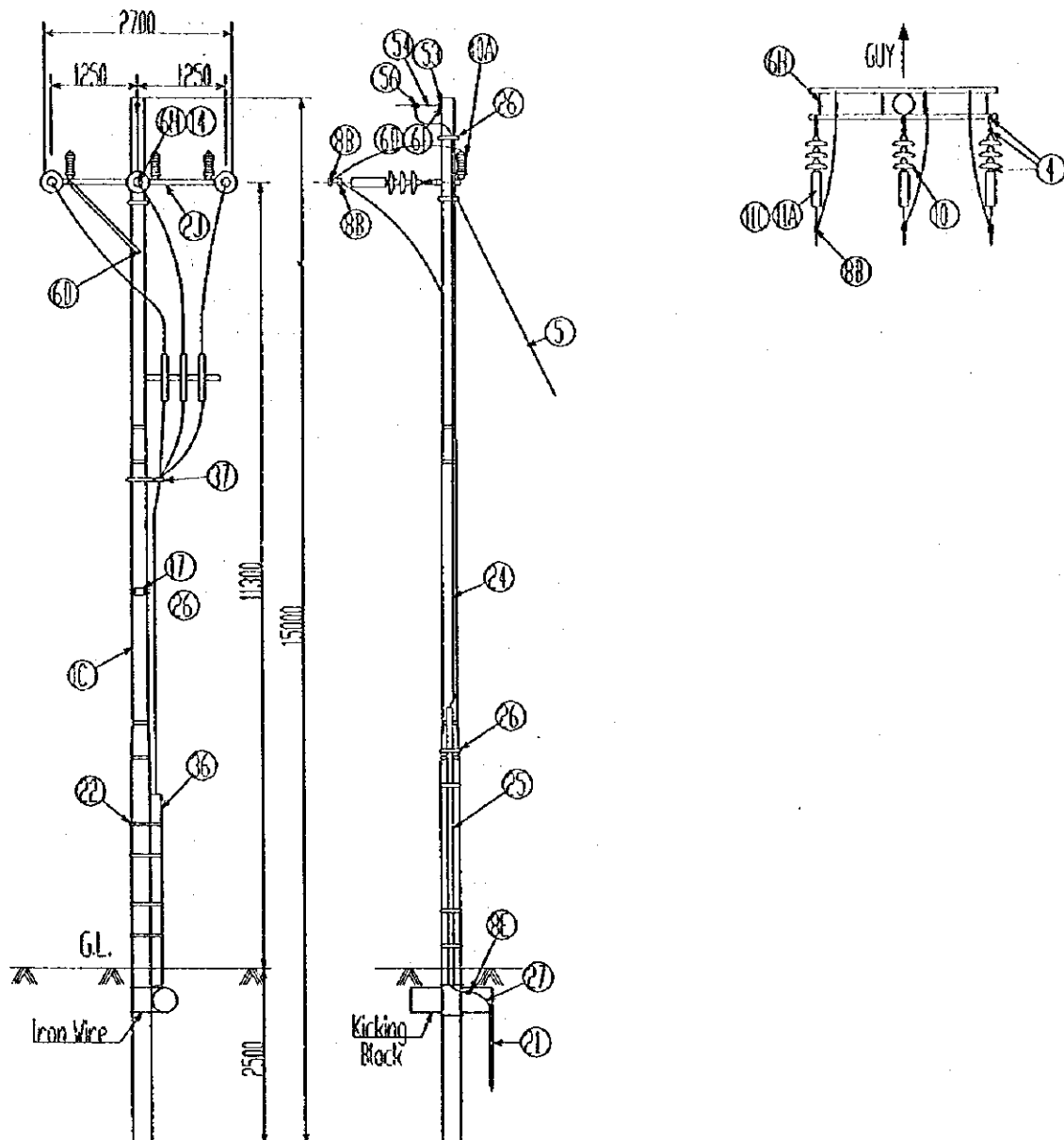
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARACCA				SCALE
33kV角度柱 (15~45度)				—
33kV LIGHT ANGLE POLE (15~45°)				DWG No.
				SW3
DATE	DESIGNED	CHECKED	APPROVED	REVISION
24 July, '99	Uruni	m.k	ALSON	
YEC				
YACHIYO ENGINEERING CO., LTD				
TOKYO JAPAN				



THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMENJINE AND SARAMACCA				SCALE
33kV角度柱 (45~90度)				—
33kV HEAVY ANGLE POLE (45~90°)				DWG No.
				HM3
DATE	DESIGNED	CHECKED	APPROVED	REVISION
24 July '99	Uruu	MB	MB	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				



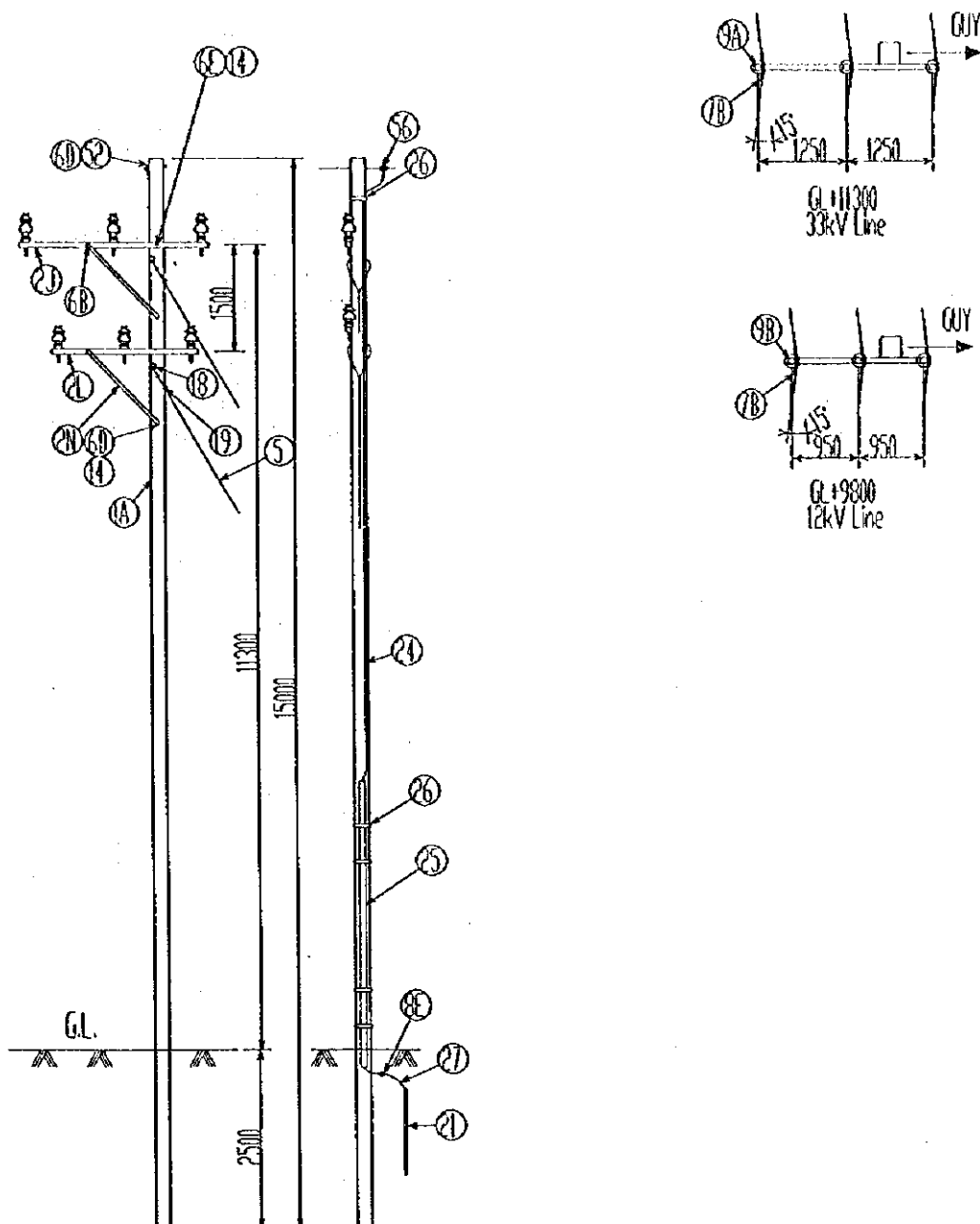
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARAMACCA				SCALE
33kV中間接続柱				—
33kV SECTION POLE				DWG No.
				BM3
DATE	DESIGNED	CHECKED	APPROVED	REVISION
24 July, '99	Ume	m.k	ASAW	
YEC				
YACHIYO ENGINEERING CO., LTD				
TOKYO JAPAN				



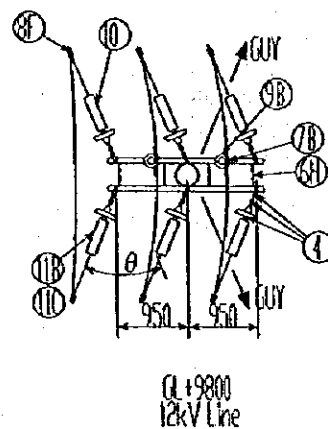
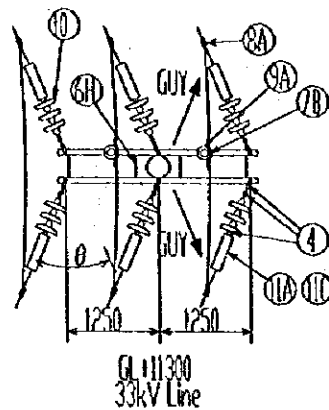
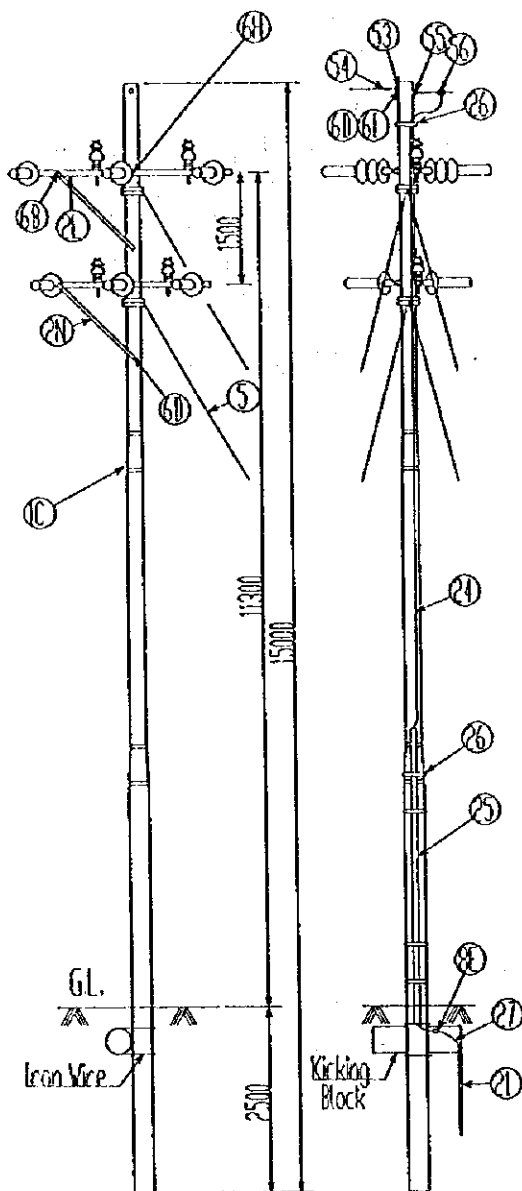
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWDINE AND SARAMACCA				SCALE
				—
33kV 终端柱 (引留柱) 33kV TERMINAL POLE				DWG No.
				OM3
DATE	DESIGNED	CHECKED	APPROVED	REVISION
24 July, '98	Uruu	mik	NSKAW	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				

PL-2: Material List for 33kV 12.6kV Combination Line (33kV 共架柱装柱資材リスト)

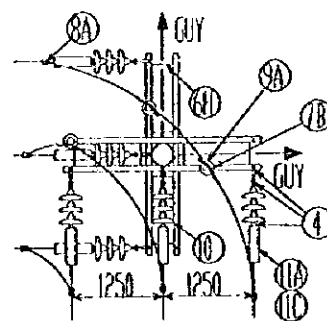
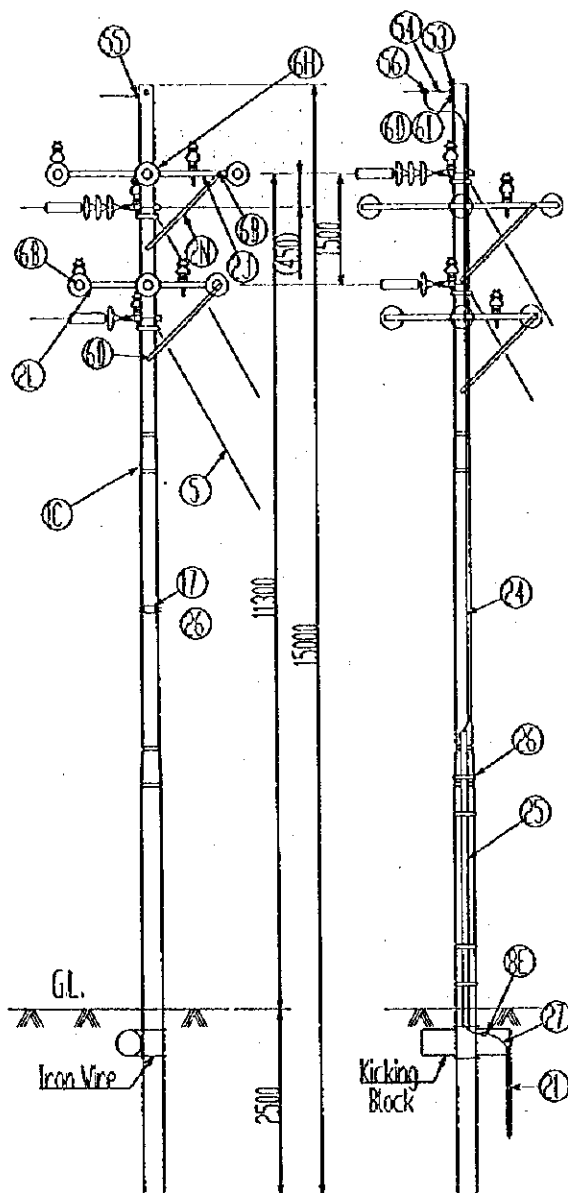
Part No. (資材番号)	Part Name (資材名)	Specification (仕様)	Remark (備考)	Unit (単位)	Pole Type				
					DMG	SMC	HMC	BMG	OMG
1A	Wooden pole	15m	EBS supply	no	1				
1B	Wooden pole	11m	EBS supply	no					
1C	Steel Pole	15m		no		1	1	1	1
2J	Crossarm	75x75x3.2x2100		pc	1	2	4	2	2
2K	Crossarm for Pin support	75x75x3.2x2100		pc					
2L	Crossarm	75x75x3.2x2100		pc	1	2	4	2	2
2M	Crossarm for Pin support	75x75x3.2x2100		pc					
2N	Crossarm Brace	L=1455		pc	2	4	8	4	4
3P	Crossarm Brace	L=945		pc					
3A	Tr.Support(A)	75x75x3.2x3000		pc					
3B	Tr.Support(B)	75x75x3.2x1500		pc					
4	(1) Anchor Shackle			set		12	12	12	6
	(2) Ball Clevis			set		12	12	12	6
	(3) Socket eye			set		12	12	12	6
	(4) Twist Strap set			set		12	12	12	6
5	(1) Strain Plate			pc	4				
	(2) Dead End Grip for Pole			pc	2				
	(3) Dead End Grip for Thimble			pc	2	8	8	8	4
	(4) Dead End Grip for Insulator			pc	4	8	8	8	4
	(5) Stay Wire	45mm ²		m	30	60	60	60	30
	(6) Stay Insulator 33kV			pc	2	4	4	4	2
	(7) Stay Anchor	Driving Type		pc	2	4	4	4	2
	(8) Turnbuckle			pc	2	4	4	4	2
	(9) Stay Band			pc		4	4	4	2
6A	Bolt & Nut	M16x50, Galv.		set					
6B	Bolt & Nut	M16x120, Galv.		set	2	4	8	4	4
6C	Bolt & Nut	M16x200, Galv.		set					
6D	Bolt & Nut	M16x250, Galv.		set	2	2	4	2	2
6E	Bolt & Nut	M16x320, Galv.		set	2				
6F	Bolt & Nut	M16x360, Galv.		set					
6G	Bolt & Nut	M16x240, Galv.		set	1	2	2	2	1
6H	Bolt & Nut	M16x400, Galv.		set		10	20	10	10
6I	Bolt & Nut	M16x60, Galv.		set		2	2	2	1
7A	Preformed Side Tie	for ACSR 4/0		set	3	2	3	3	
7B	Preformed Side Tie	for ACSR 1/0		set	3	2	3	3	
8A	Compression Connector	Al125/Al125		pc		6	6	6	
8B	Compression Connector	Al125/Cu22		pc					
8C	Compression Connector	Cu14.22/Cu14		pc	1	1	1	1	1
8D	Compression Connector	Cu38/Cu38		pc					
8E	Compression Connector	Cu38/Cu22		pc					
8F	Compression Connector	Al65/Al65		pc		6	6	6	
8G	Compression Connector	Al65/Cu22		pc					
9A	Pin Insulator	for 33kV		pc	3	2	3	3	3
9B	Pin Insulator	for 12.6kV		pc	3	2	3	3	
10	Suspension Insulator			pc		24	24	24	12
11A	Dead End Clamp	for 33kV		pc		6	6	6	3
11B	Dead End Clamp	for 12kV		pc		6	6	6	3
11C	Dead End Clamp adapter			pc		12	12	12	6
14	Square Washer			pc	4			4	
16	Copper Binding Wire			m					
17	Number Plate		EBS supply	pc	1	1	1	1	1
18	Nail			pc	16				
19	Staple			pc	8				
21	Ground Rod with lead wire	14mm x 1.5m		pc	1	1	1	1	1
22	IBT Band			pc					
23	Drop Wire	PDC22mm ²		m					
24	Grounding Wire	IV 14 mm ²		m	15	15	15	15	15
25	RGSC Pipe	L=4m		no	1	1	1	1	1
26	Stainless Band	L=1200mm		pc	4	4	4	4	4
27	IV Cable	38mm ²		pc					
28	Kicking Block		EBS supply	pc		1	1	1	1
29	Iron Wire	4mm	EBS supply	m		8	8	8	8
36	Cable Protection Pipe	L=2.75m		no					
37	Cable Bracket Support			pc					
40A	Lightning Arrester	for 33kV		pc					3
40B	Lightning Arrester	for 12kV		pc					3
51	Open Fuse Cutout			pc					
52	GSW Support			pc	1				
53	GSW Dead End Support			pc		2	2	2	1
54	GSW Dead End Grip			pc		2	2	2	1
55	Thimble			pc		2	2	2	1
56	Connector	Bolt type		pc	1	1	1	1	1



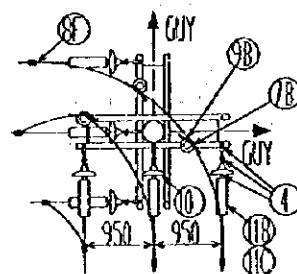
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARAMACCA					SCALE
33kV & 12.6kV 共架中間柱 33kV & 12.6kV COMBINATION INTERMEDIATE POLE					—
					DWG No.
					DMC
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
24 July, 97	Uruo	mik	ASDA		
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN					



THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARAMACCA					SCALE
33kV & 12.6kV 共架角度柱 (15~45度)					DWG No.
33kV & 12.6kV COMBINATION LIGHT ANGLE POLE (15~45°)					SMC
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
24 July, 99	Urma	m.k	ASOM		
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN					

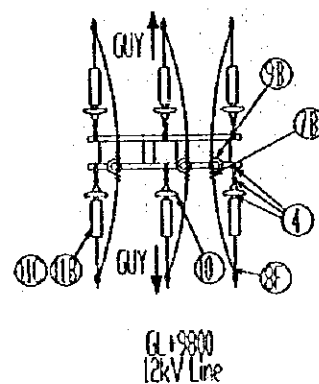
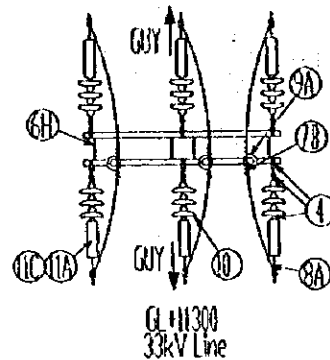
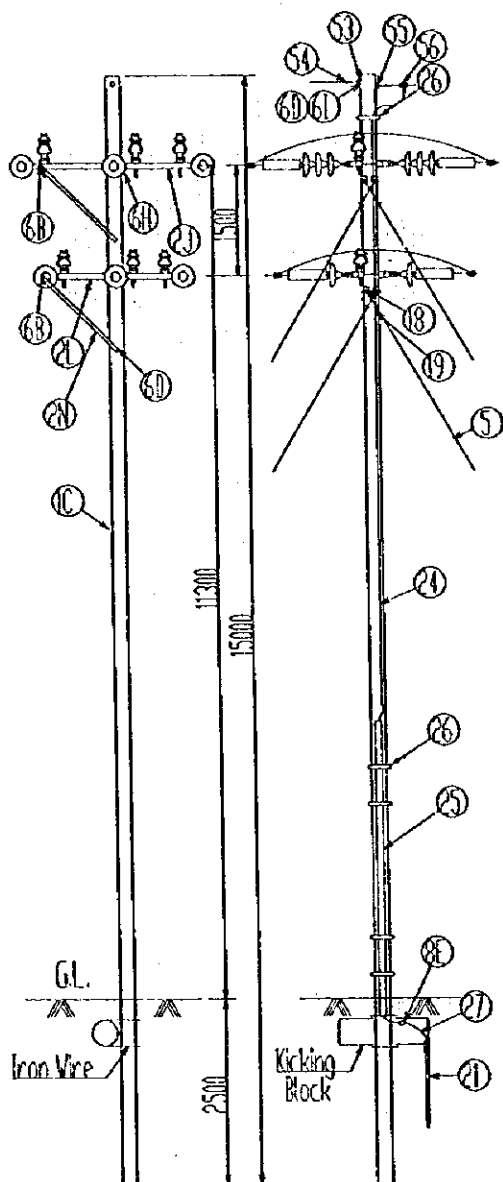


GL+11300
33kV Line

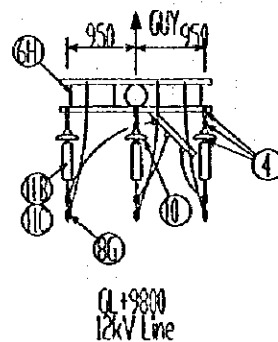
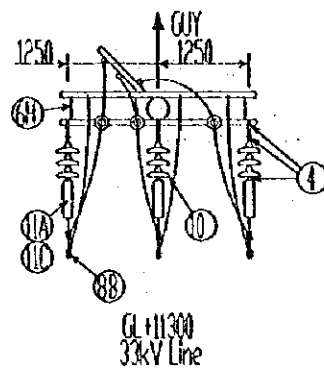
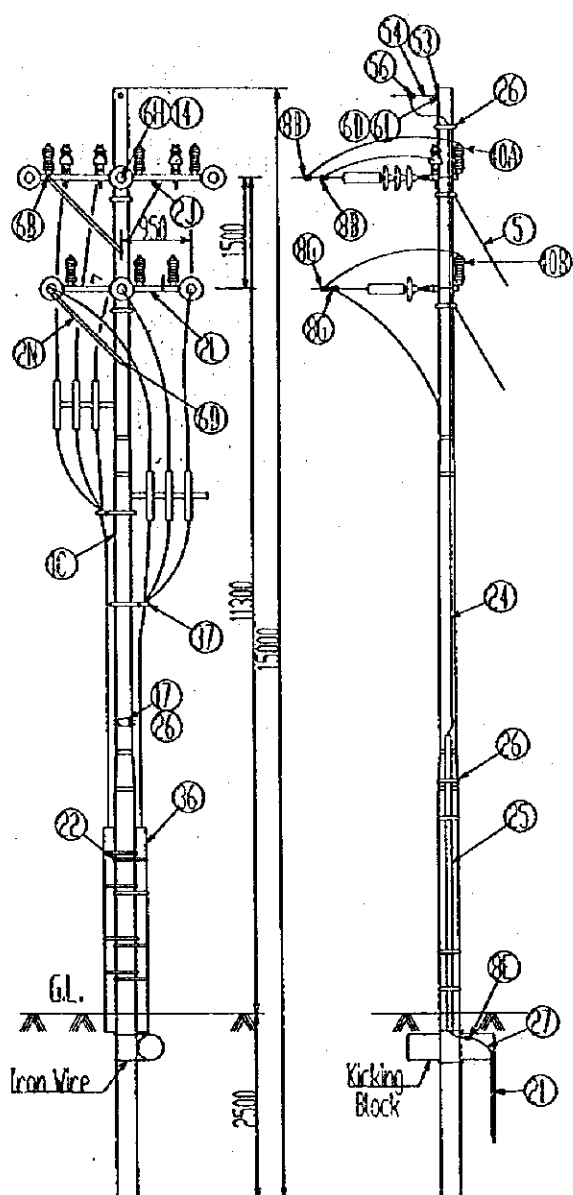


GL+9800
12kV Line

THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWINE AND SARAWAK				SCALE
				—
33kV & 12.6kV 共架角度柱 (45~90度)				DWG No.
33kV & 12.6kV COMBINATION HEAVY ANGLE POLE (45~90°)				HMC
DATE	DESIGNED	CHECKED	APPROVED	REVISION
24 July 99	Urm	m.k	NORIN	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				



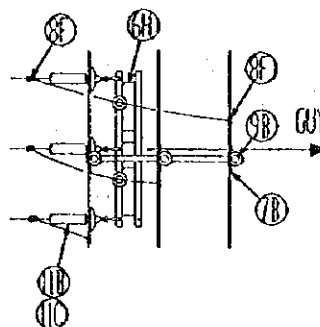
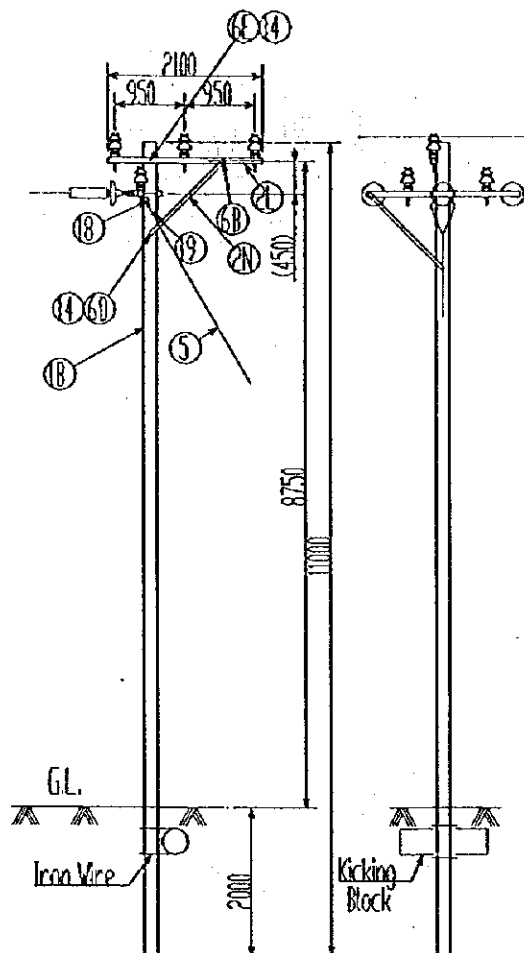
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARAMACCA					SCALE
33kV & 12.6kV 共架中間接続柱 33kV & 12.6kV COMBINATION SECTION POLE					—
					DWG No.
					BMC
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
24 July '99	<i>Yachiyo</i>	<i>Yachiyo</i>	<i>Yachiyo</i>		
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN					



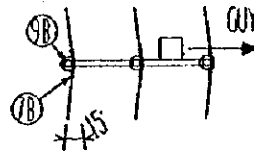
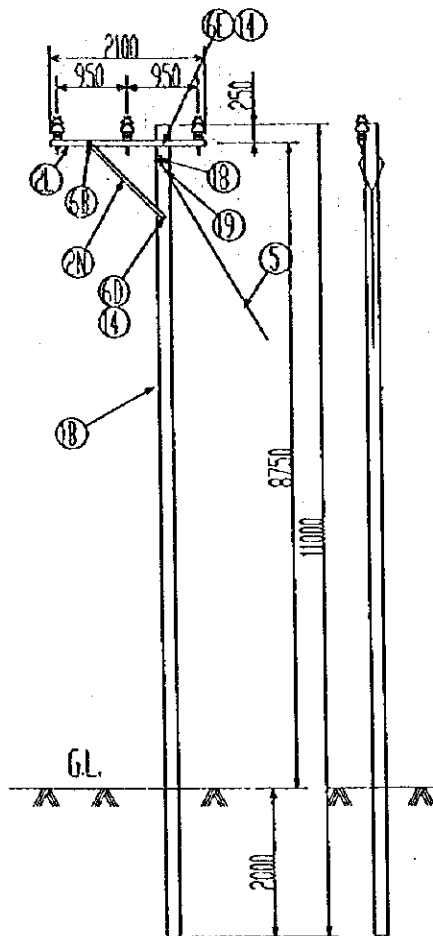
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARAMACCA				SCALE
				—
33kV & 12.6kV 共架終端柱 (引留柱)				DWG No.
33kV & 12.6kV COMBINATION TERMINAL POLE				OMC
DATE	DESIGNED	CHECKED	APPROVED	REVISION
24 July, 99	Yec	M. K.	NSD	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				

PL-3: Material List for 12.6kV Single Distribution Line (12.6kV 配電柱装仕資材リスト)

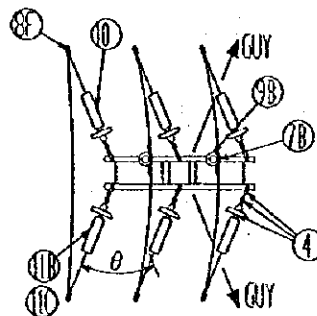
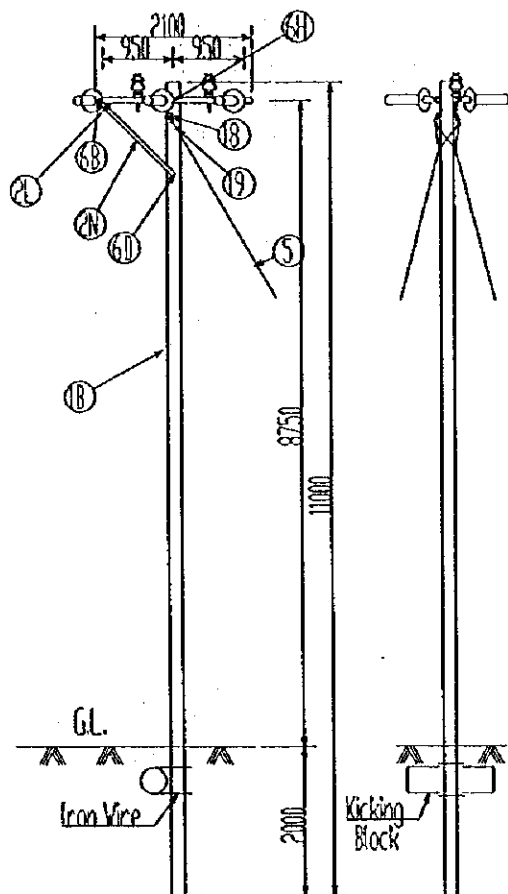
Part No. (資材番号)	Part Name (資材名)	Specification (仕様)	Remark (備考)	Unit (単位)	Pole Type								
					YMI	DMI	SMI	HMI	BMI	OMI	LMI	TMI	
1A	Wooden pole	15m	EBS supply	no									
1B	Wooden pole	11m	EBS supply	no	1	1	1	1	1	1	1	1	2
1C	Steel Pole	15m		no									
2J	Crossarm	75x75x3 2x2700		pc									2
2K	Crossarm for Pin support	75x75x3 2x2700		pc									2
2L	Crossarm	75x75x3 2x2100		pc	3	1	2	4	2	2	2		
2M	Crossarm for Pin support	75x75x3 2x2100		pc									
2N	Crossarm Brace	L=1455		pc	3	1	2	4	2	2	2		
3P	Crossarm Brace	L=945		pc									12
3A	Tr.Support(A)	75x75x3 2x3000		pc									2
3B	Tr.Support(B)	75x75x3 2x1500		pc									4
4	(1) Anchor Shackle			set	3		6	6	6	3	6	6	
	(2) Ball Clevis			set	3		6	6	6	3	6	6	
	(3) Socket eye			set	3		6	6	6	3	6	6	
	(4) Twist Strap set			set	3		6	6	6	3	6	6	
5	(1) Strain Plate			pc	2	2	4	4	4	2	4	8	
	(2) Dead End Grip for Pole			pc	1	1	2	2	2	1	2	4	
	(3) Dead End Grip for Thimble			pc	1	1	2	2	2	1	2	4	
	(4) Dead End Grip for Insulator			pc	2	2	4	4	4	2	4	8	
	(5) Stay Wire	45mm2		m	15	15	30	30	30	15	30	60	
	(6) Stay Insulator 33kV			pc	1	1	2	2	2	1	2	4	
	(7) Stay Anchor	Driving Type		pc	1	1	2	2	2	1	2	4	
	(8) Turnbuckle			pc	1	1	2	2	2	1	2	4	
	(9) Stay Band			pc									
6A	Bolt & Nut	M16x50, Galv.		set									
6B	Bolt & Nut	M16x120, Galv.		set	3	1	2	4	2	2	2	16	
6C	Bolt & Nut	M16x200, Galv.		set								8	
6D	Bolt & Nut	M16x250, Galv.		set	2	1	1	2	1	1	1	8	
6E	Bolt & Nut	M16x320, Galv.		set	1	1							
6F	Bolt & Nut	M16x360, Galv.		set	10		5	10	5	5	5	14	
6G	Bolt & Nut	M16x240, Galv.		set									
6H	Bolt & Nut	M16x400, Galv.		set									
6I	Bolt & Nut	M16x60, Galv.		set									
7A	Preformed Side Tie	for ACSR 4/0		set									
7B	Preformed Side Tie	for ACSR 1/0		set	3	3	2	3	3		6	3	
8A	Compression Connector	Al125/Al125		pc									
8B	Compression Connector	Al125/Cu22		pc									
8C	Compression Connector	Cu14.22/Cu14		pc						1	1	4	
8D	Compression Connector	Cu38/Cu38		pc								1	
8E	Compression Connector	Cu38/Cu22		pc								1	
8F	Compression Connector	Al65/Al65		pc	6		6	6	6			6	
8G	Compression Connector	Al65/Cu22		pc						3		3	
9A	Pin Insulator	for 33kV		pc									
9B	Pin Insulator	for 12.6kV		pc	3	3	2	3	3			6	
10	Suspension Insulator			pc	3		6	6	6	3	6	6	
11A	Dead End Clamp	for 33kV		pc									
11B	Dead End Clamp	for 12kV		pc	3		6	6	6	3	6	6	
11C	Dead End Clamp adapter			pc	3		6	6	6	3	6	6	
14	Square Washer			pc	2	2					4	30	
16	Copper Binding Wire			m								24	
17	Number Plate		EBS supply	pc	1	1	1	1	1	1	1	1	
18	Nail			pc	8	8	16	16	16	8	16	32	
19	Staple			pc	4	4	8	8	8	4	8	16	
21	Ground Rod with lead wire	14mm x 1.5m		pc						1	1	2	
22	IBT Band			pc									
23	Drop Wire	PDC22mm2		m								36	
24	Grounding Wire	IV 14 mm2		m						15	15	30	
25	RGSC Pipe	L=4m		no						1	1	2	
26	Stainless Band	L=1200mm		pc						4	4	12	
27	IV Cable	38mm2		pc								10	
28	Kicking Block		EBS supply	pc	1		1	1	1	1	1	1	
29	Iron Wire	4mm	EBS supply	m	8		8	8	8	8	8	8	
36	Cable Protection Pipe	L=2.75m		no									
37	Cable Bracket Support			pc									
40A	Lightning Arrester	for 33kV		pc									
40B	Lightning Arrester	for 12kV		pc						3		3	
51	Open Fuse Cutout			pc							3	3	
52	GSW Support			pc									
53	GSW Dead End Support			pc									
54	GSW Dead End Grip			pc									
55	Thimble			pc									
56	Connector	Bolt type		pc									



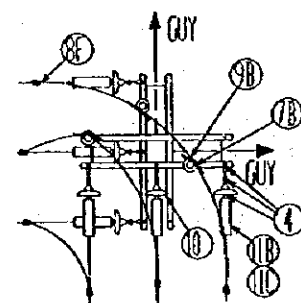
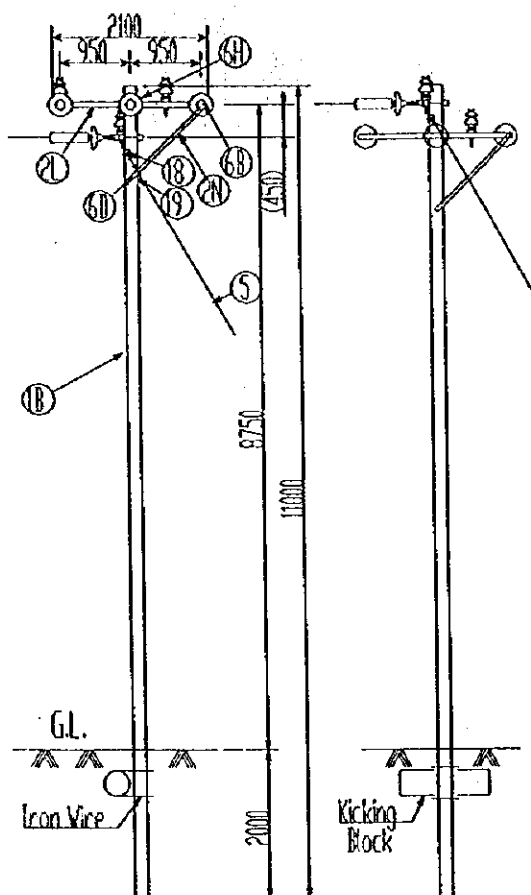
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMENJINE AND SARACCA				SCALE
12. 6kV分岐回路柱 12. 6kV T-OFF POLE				---
				DWG. No. YM1
DATE	DESIGNED	CHECKED	APPROVED	REVISION
28 July, '98	Yoo	Yoo	Yoo	
YACHIO ENGINEERING CO., LTD TOKYO JAPAN				



THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARACCA				SCALE
				—
12. 6kV中間柱 12. 6kV INTERMEDIATE POLE				DWG No.
				DM1
DATE	DESIGNED	CHECHED	APPROVED	REVISION
24 July '99	Urui	m k	ASIAN	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				

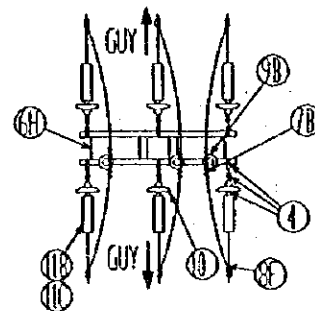
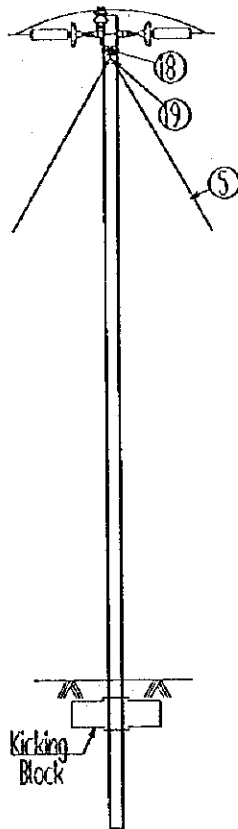
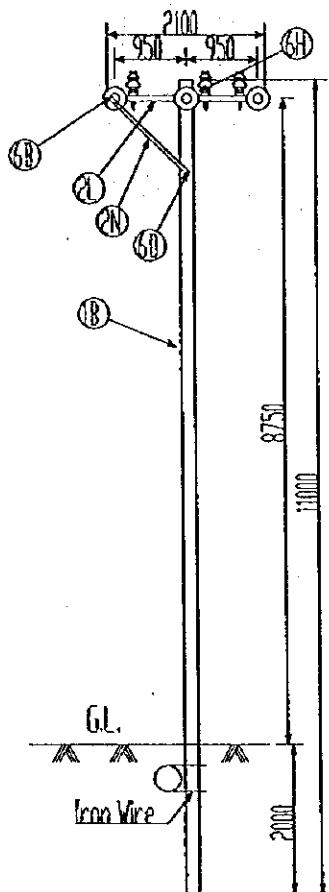


THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARACCA				SCALE
12.6KV角度柱 (15~45度) 12.6KV LIGHT ANGLE POLE (15~45°)				---
				DWG No.
				SM1
DATE	DESIGNED	CHECKED	APPROVED	REVISION
28 July '99	Urno	m.l.	AKEN	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				

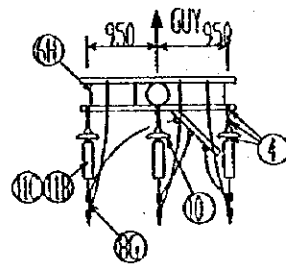
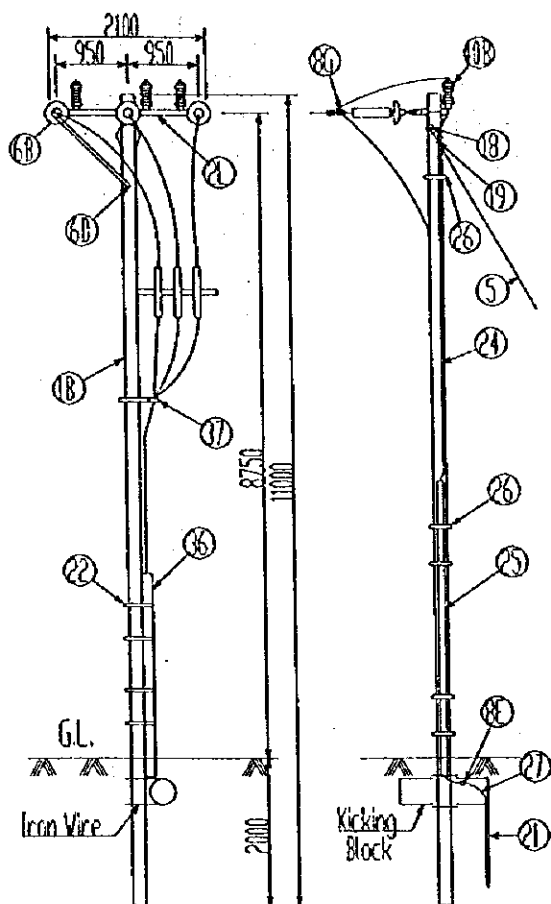


THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARAMACCA				SCALE

12. 6kV角度柱 (45~90度) 12. 6kV HEAVY ANGLE POLE (45~90°)				DWG No.
				HM1
DATE	DESIGNED	CHECHED	APPROVED	REVISION
28 July, 99	Urund m. k	MSION		
YEC YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				

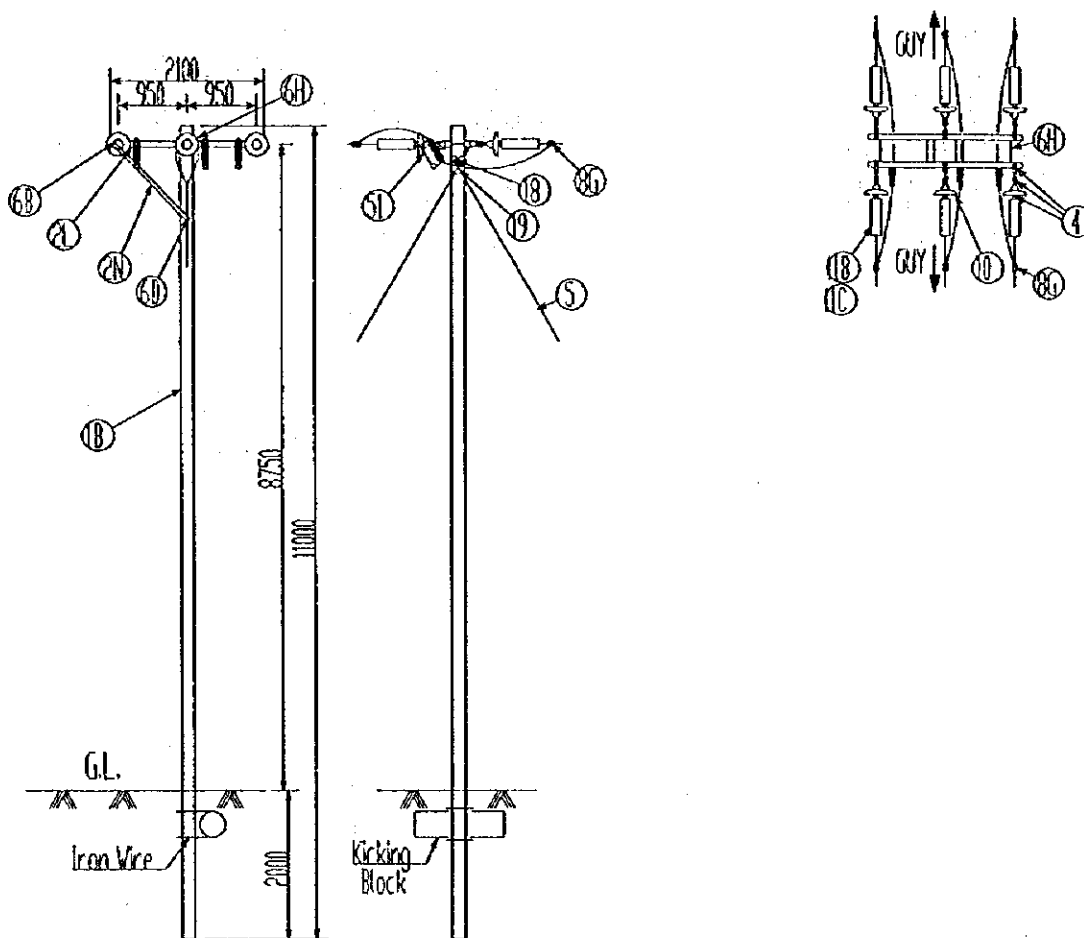


THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARACACCA				SCALE
12.6kV中間接続柱 12.6kV SECTION POLE				—
				DWG No.
				BM1
DATE	DESIGNED	CHECKED	APPROVED	REVISION
28 July '99	Uruu	mik	ASICHS	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				

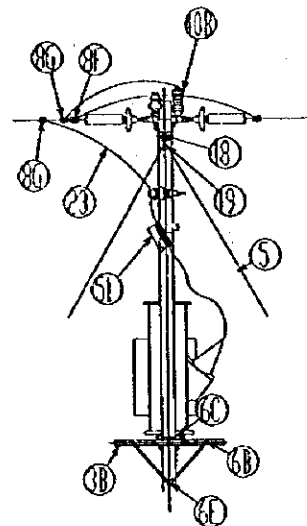
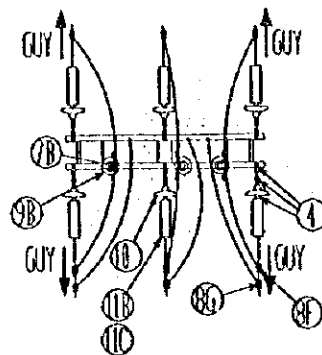
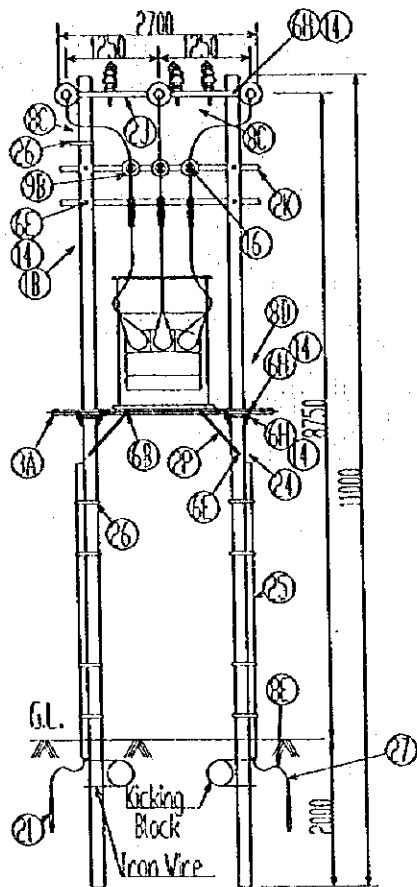


THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWINE AND SARACACCA					SCALE

12.6kV 終端柱 (引留柱)					DWG No.
12.6kV TERMINAL POLE					OM1
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
24 July, '89	Urned	m.k	MSOM		
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN					



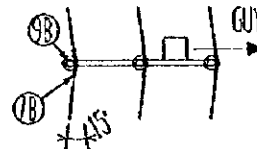
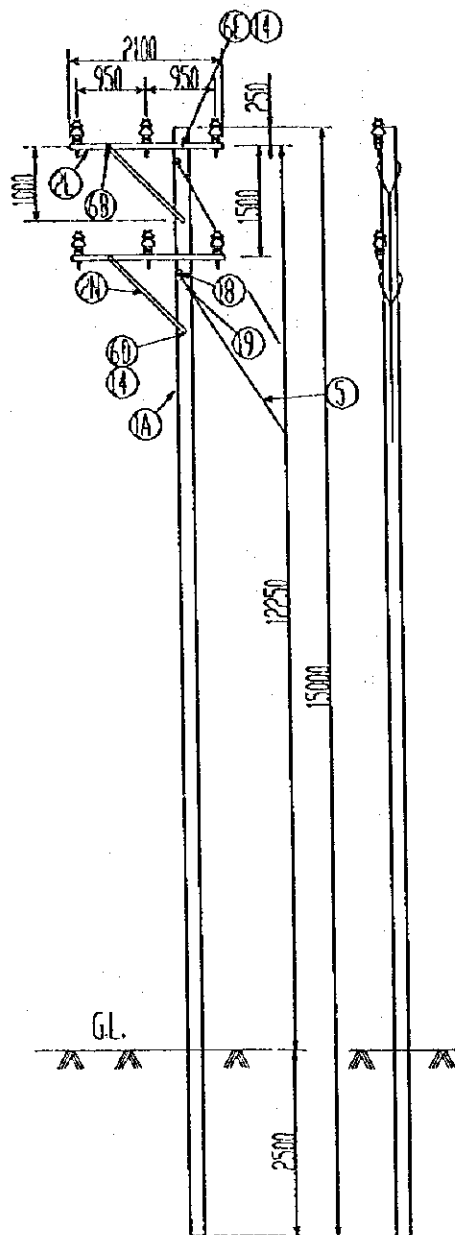
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARACCA				SCALE
12. 6kVフューズ付カットアウト設置柱 12. 6kV OPEN FUSE CUTOUT POLE				DWG No.
				LN1
DATE	DESIGNED	CHECKED	APPROVED	REVISION
24 July '99	Urno	mle	NSOK	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				



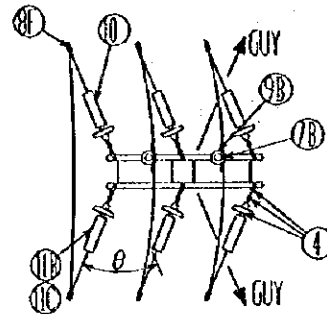
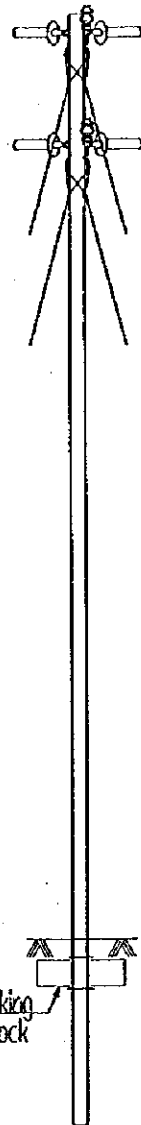
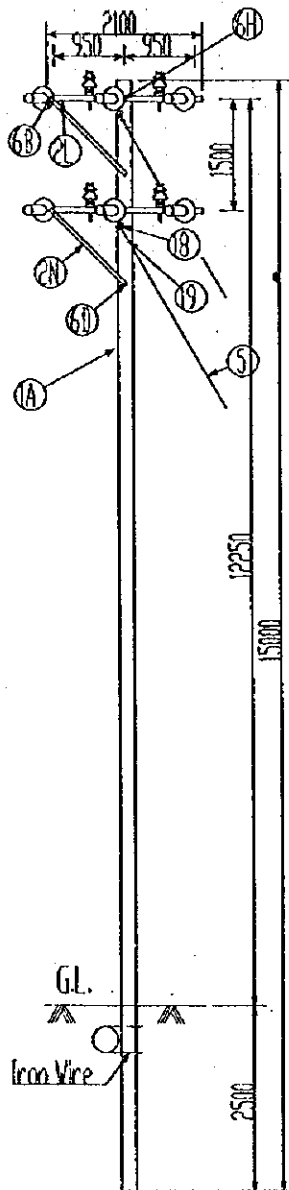
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARACACCA				SCALE
12.6kV柱上変圧器設置柱				—
12.6kV LINE DISTRIBUTION TRANSFORMER POLE				DWG No.
				TM1
DATE	DESIGNED	CHECKED	APPROVED	REVISION
24 July, '99	Y. Yachiyo	M. K.	Y. Yachiyo	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				

PL-4: Material List for 12.6kV Dual Distribution Line (12.6kV 二回線用配電仕装仕材リスト)

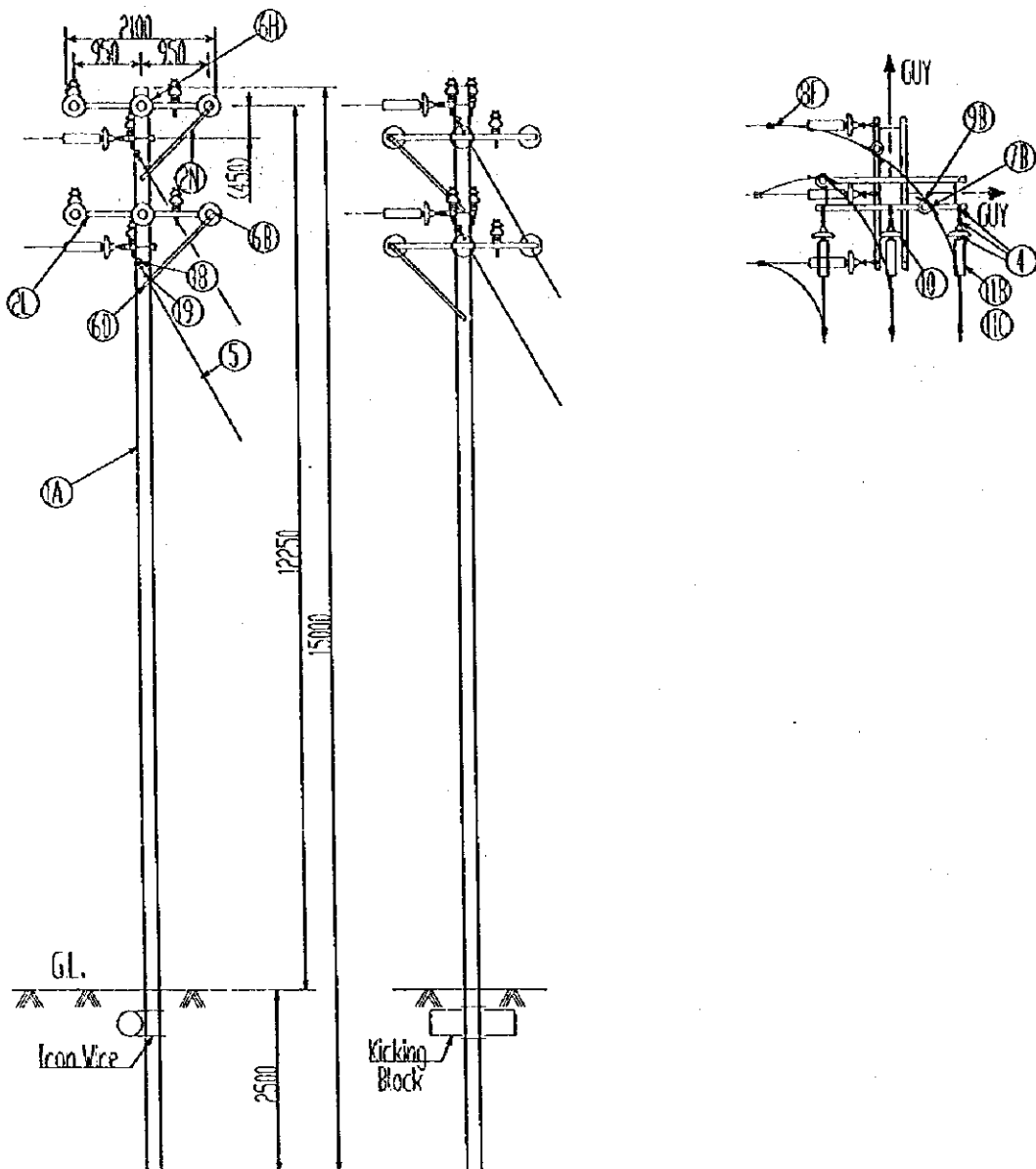
Part No. (資材番号)	Part Name (資材名)	Specification (仕様)	Remark (備考)	Unit (単位)	Pole Type			
					DMID	SMID	HMID	OMID
1A	Wooden pole	15m	EBS supply	no	1	1	1	1
1B	Wooden pole	11m	EBS supply	no				
1C	Steel Pole	15m		no				
2J	Crossarm	75x75x3.2x2700		pc				
2K	Crossarm for Pin support	75x75x3.2x2700		pc				
2L	Crossarm	75x75x3.2x2100		pc	2	4	8	4
2M	Crossarm for Pin support	75x75x3.2x2100		pc				
2N	Crossarm Brace	L=1455		pc	2	4	8	4
3P	Crossarm Brace	L=945		pc				
3A	Tr.Support(A)	75x75x3.2x3000		pc				
3B	Tr.Support(B)	75x75x3.2x1500		pc				
4	(1) Anchor Shackle			set		12	12	6
	(2) Ball Clevis			set		12	12	6
	(3) Socket eye			set		12	12	6
	(4) Twist Strap set			set		12	12	6
5	(1) Strain Plate			pc	4	8	8	4
	(2) Dead End Grip for Pole			pc	2	4	4	2
	(3) Dead End Grip for Thimble			pc	2	4	4	2
	(4) Dead End Grip for Insulator			pc	4	8	8	4
	(5) Stay Wire	45mm ²		m	30	60	60	30
	(6) Stay Insulator 33kV			pc	2	4	4	2
	(7) Stay Anchor	Driving Type		pc	2	4	4	2
	(8) Turnbuckle			pc	2	4	4	2
	(9) Stay Band			pc				
6A	Bolt & Nut	M16x50, Galv.		set				
6B	Bolt & Nut	M16x120, Galv.		set	2	4	8	4
6C	Bolt & Nut	M16x200, Galv.		set				
6D	Bolt & Nut	M16x250, Galv.		set	2	2	4	2
6E	Bolt & Nut	M16x320, Galv.		set	2			
6F	Bolt & Nut	M16x360, Galv.		set				
6G	Bolt & Nut	M16x240, Galv.		set				
6H	Bolt & Nut	M16x400, Galv.		set		10	20	12
6I	Bolt & Nut	M16x60, Galv.		set				
7A	Preformed Side Tie	for ACSR 4/0		set				
7B	Preformed Side Tie	for ACSR 1/0		set	6	4	6	
8A	Compression Connector	Al125/Al125		pc				
8B	Compression Connector	Al125/Cu22		pc				
8C	Compression Connector	Cu14,22/Cu14		pc				
8D	Compression Connector	Cu38/Cu38		pc				
8E	Compression Connector	Cu38/Cu22		pc				
8F	Compression Connector	Al65/Al65		pc		12	12	
8G	Compression Connector	Al65/Cu22		pc				6
9A	Pin Insulator	for 33kV		pc				
9B	Pin Insulator	for 12.6kV		pc	6	4	6	
10	Suspension Insulator			pc		12	12	6
11A	Dead End Clamp	for 33kV		pc				
11B	Dead End Clamp	for 12kV		pc		12	12	6
11C	Dead End Clamp adapter			pc		12	12	6
14	Square Washer			pc	4			
16	Copper Binding Wire			m				
17	Number Plate		EBS supply	pc	1	1	1	1
18	Nail			pc	16	32	32	16
19	Staple			pc	8	16	16	8
21	Ground Rod with lead wire	14mm x 1.5m		pc				
22	IBT Band			pc				
23	Drop Wire	PDC22mm ²		m				
24	Grounding Wire	IV 14 mm ²		m				
25	RGSC Pipe	L=4m		no				
26	Stainless Band	L=1200mm		pc				
27	IV Cable	38mm ²		pc				
28	Kicking Block		EBS supply	pc		1	1	1
29	Iron Wire	4mm	EBS supply	m		8	8	8
36	Cable Protection Pipe	L=2.75m		no				
37	Cable Bracket Support			pc				
40A	Lightning Arrester	for 33kV		pc				
40B	Lightning Arrester	for 12kV		pc				6
51	Open Fuse Cutout			pc				
52	GSW Support			pc				
53	GSW Dead End Support			pc				
54	GSW Dead End Grip			pc				
55	Thimble			pc				
56	Connetor	Bolt type		pc				



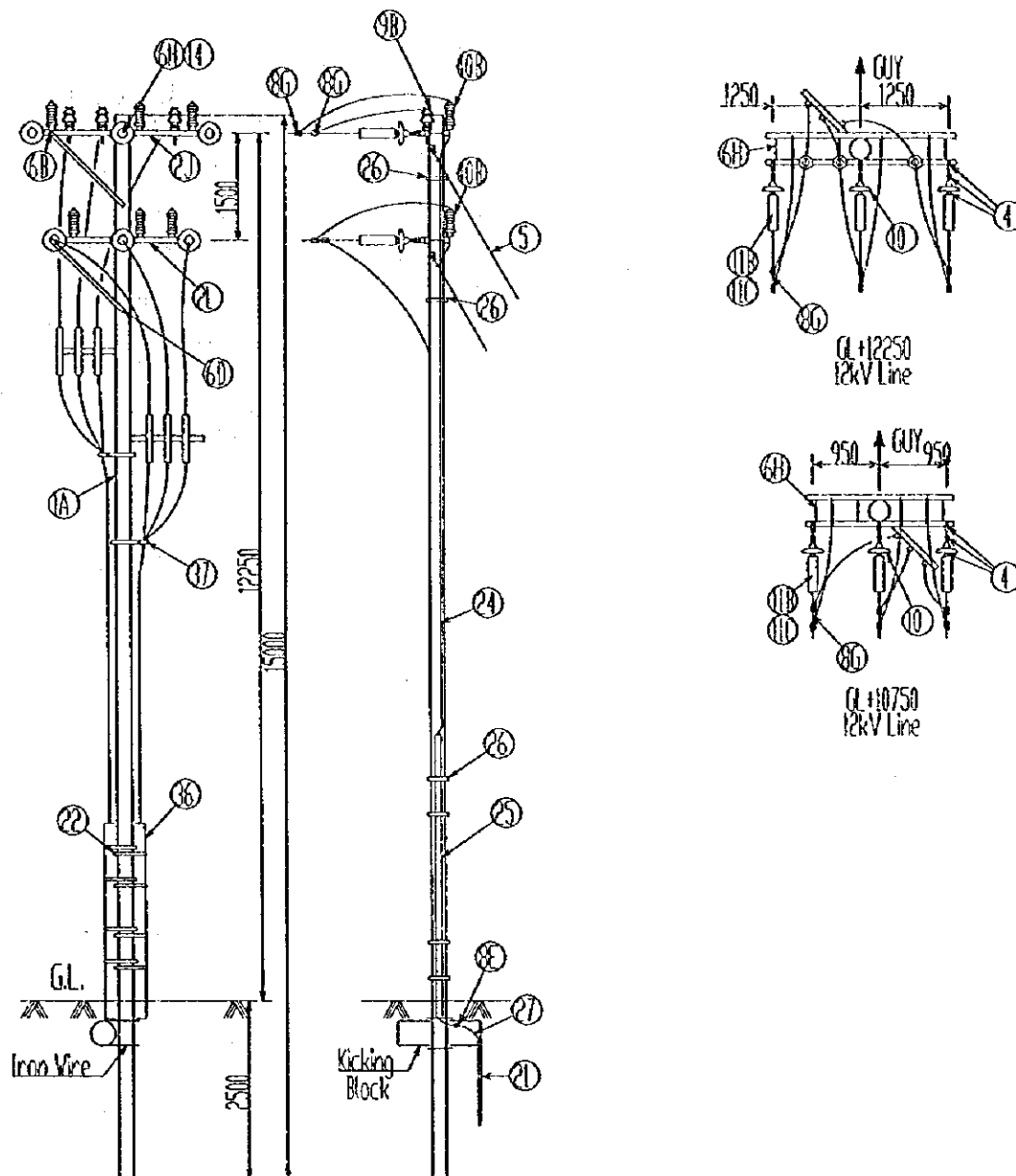
THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIINE AND SARACACCA				SCALE
12.6KV二回線用中間柱 12.6KV DUAL INTERMEDIATE POLE				—
				DWG No.
				DN1D
DATE	DESIGNED	CHECKED	APPROVED	REVISION
24 July '99	Uruu	ma	ASD	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				



THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWINE AND SARAMACCA				SCALE
12. 6kV二回線用角度柱 (15~45度)				---
12. 6kV DUAL LIGHT ANGLE POLE (15~45°)				DWG No.
				SM1D
DATE	DESIGNED	CHECHED	APPROVED	REVISION
24 July, '99	Unna	m. h	AKOON	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				

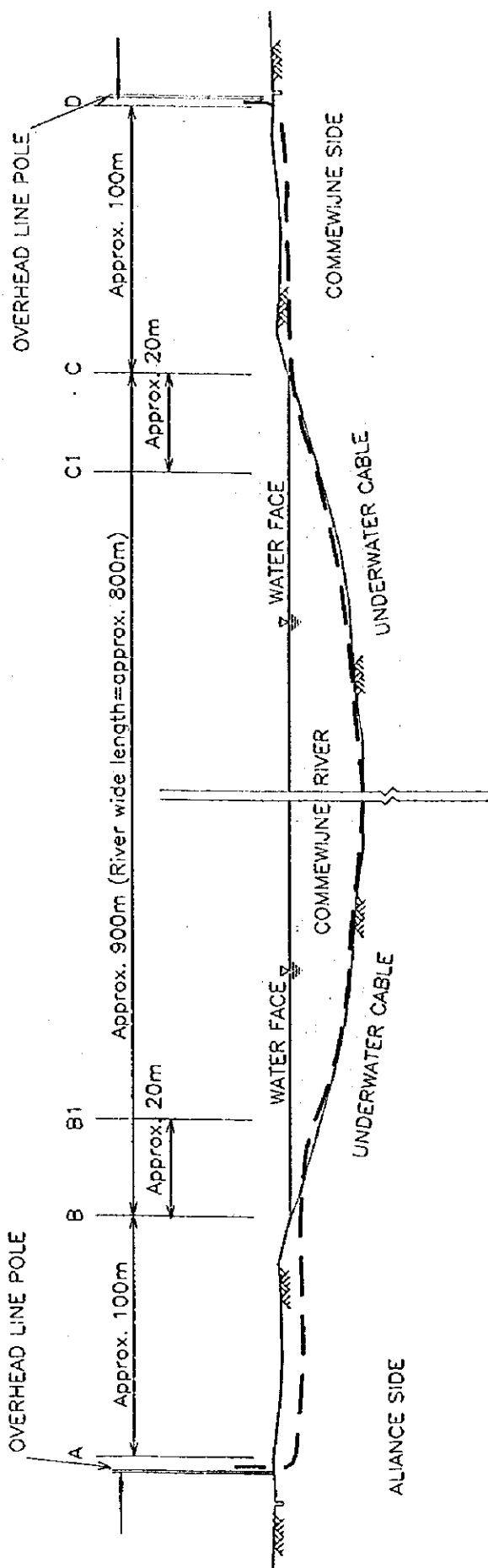


THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARAMACCA				SCALE
				—
12. 6kV二回線用角度柱 (45~90度) 12. 6kV DUAL HEAVY ANGLE POLE (45~90°)				DWG No.
				HM1D
DATE	DESIGNED	CHECHED	APPROVED	REVISION
28 July '99	Umeo	M. K.	Yachiyo	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				

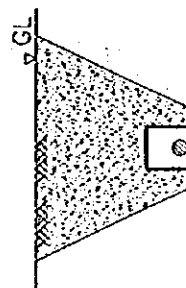


THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARACCA				SCALE

12. 6kV二回線用終端柱 (引留柱) 12. 6kV DUAL TERMINAL POLE				DWG No.
				OM1D
DATE	DESIGNED	CHECKED	APPROVED	REVISION
24 July '99	Ummi	m.k	YEC	
YACHIYO ENGINEERING CO., LTD TOKYO JAPAN				



A~B, C~D
DIRECT BARRIED



B~B1, C1~C
SPRIT PIPE PROTECTION

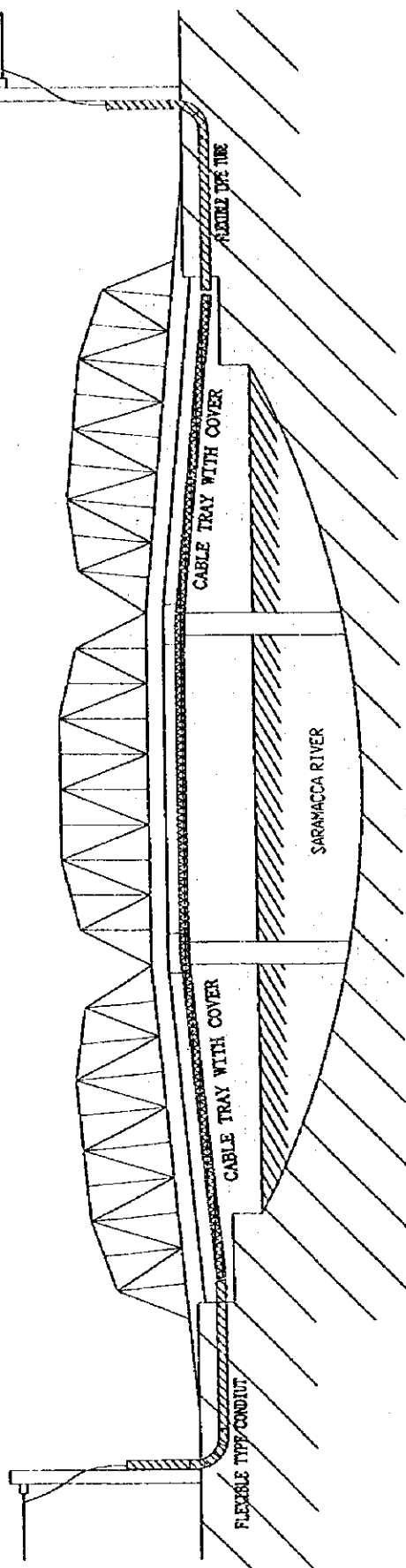


B1~C1

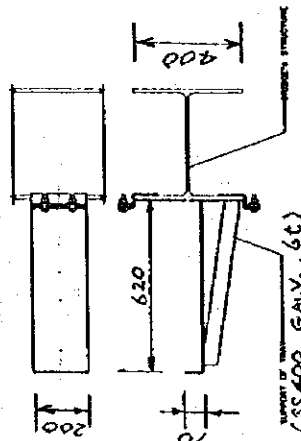


THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMMEWIJNE AND SARAWACCA		SCALE
12. 6kV水底ケーブルコモウェイナ川横断面図 12. 6kV UNDERWATER CABLE PLAN IN COMMEWIJNE RIVER		DWG No. CD1-52
DATE	DESIGNED	CHECKED
28 July 99	Yoo	ASD
YACHIO ENGINEERING CO., LTD TOKYO JAPAN		APPROVED
		REVISION

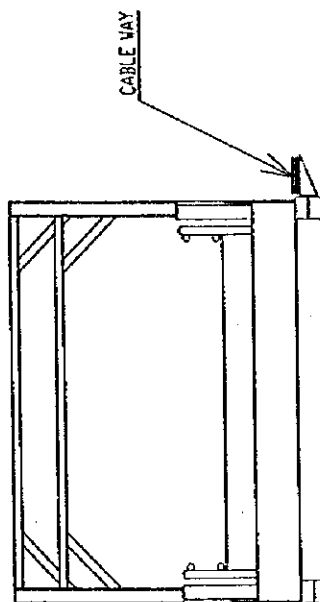
TERMINAL TYPE POLE



SECTION OF SARAMACCA BRIDGE



TYPICAL OF CABLE TRAY SUPPORT



SECTION OF SARAMACCA BRIDGE (BACK TO PARAMARIBO)

THE PROJECT FOR THE EXPANSION OF TRANSMISSION AND DISTRIBUTION GRID FOR THE DISTRICTS COMEWEINE AND SARAMACCA		SCALE
サラムツカ橋ケーブル布設図		—
CABLING PLAN ON SARAMACCA BRIDGE		DWG No. SD3-60
DATE	DESIGNED	CHECKED
27 July 89	Y. Yano	ASAD
YACHIO ENGINEERING CO., LTD		REVISION
YOO		
TOKYO JAPAN		

CHAPTER 3

IMPLEMENTATION PLAN

CHAPTER 3

IMPLEMENTATION PLAN

3.1 Implementation Plan

3.1.1 Implementation Concept

The Project will be implemented within the framework of Japan's grant aid cooperation scheme and, therefore, its implementation will only take place after approval of the Project by the Government of Japan and the exchange of notes between the Government of Japan and the Government of Suriname. The basic issues and points to note in the process of implementing the Project are described below.

(1) Project Implementation Agency

The organization responsible for the implementation of the Project on the Suriname side is the EBS and the Electricity Division of the EBS will be directly responsible for the Project. It will, therefore, be necessary for the Manager of the EBS's Electricity Division to maintain close contact and to consult with the Japanese consultant and the equipment supplier and to select a person to be responsible for the Project to ensure the smooth progress of the Project.

The EBS staff member selected to be responsible for the Project will be required to fully explain the contents of the Project to other staff members as well as to local people living near the project sites of those substations and transmission and distribution grids which are subject to expansion/new construction under the Project in order to facilitate their understanding of the Project and to encourage their cooperation for the implementation of the Project.

(2) Consultant

A Japanese consultant will conclude the consulting services agreement with the EBS and will conduct the detailed design and work supervision for the Project to materialise the planned procurement and installation of equipment and the construction of facilities under the Project. The consultant will also prepare the tender documents and will conduct the tender on behalf of the EBS, the project implementation agency.

(3) Equipment Supplier

In accordance with the mechanism of Japan's grant aid cooperation scheme, a Japanese equipment supplier selected by the Suriname side through an open tender will conduct the procurement and installation of equipment and the construction of facilities. As it is deemed necessary for the equipment supplier to provide after-services, including the supply of spare parts and an appropriate response to breakdowns, the equipment supplier must pay proper attention to the establishment of an adequate communication channel with the Suriname side after the handing over of the equipment and facilities to the EBS.

(4) Necessity for Dispatch of Japanese Engineers

In order to complete the planned substation construction as well as expansion work in a short period of time, the careful coordination of all types of work will be essential given their complexity, ranging from earth work and foundation work to the installation of such substation equipment as transformers and switchgear panels. As most of the different work will be simultaneously conducted, it is essential that a site manager who is capable of controlling and guiding all the work in an integral manner be dispatched from Japan to ensure work progress, quality and safety.

As most installation work for substation and transmission and distribution lines in Suriname has long been conducted only by the EBS as described later in 3.1.2-(1), private construction companies in Suriname have few skilled workers who are also conversant with the installation, testing and adjustment of substation equipment. Even in the case of the staff of the EBS, it may be possible that they do not fully understand the latest technologies while having mastered more conventional technologies. It will, therefore, be necessary for the manufacturers of the substation equipment to dispatch experts to Suriname to supervise the installation, testing and adjustment of the said equipment and to transfer operation and maintenance techniques.

3.1.2 Implementation Conditions

(1) State of Construction Industry in Suriname and Technology Transfer

No large construction work, such as office building construction work, is being conducted in Suriname, even in its capital of Paramaribo, except for the Suriname River Bridge construction work, reflecting the sluggish state of the national economy in recent years. As a result, each of the several general construction companies based in the capital region only employs some 200 workers, including approximately 10 engineers.

The number of construction works is even smaller in the Commewijne and Saramacca Districts, i.e. the Project Area, and infrastructure development has been long delayed. Consequently, no local construction company exists, making reliance on a construction company in Paramaribo necessary to conduct the civil and building work for the Project. Accordingly, it will be necessary for the implementation plan to take the transportation method of the construction equipment and materials from the capital and the introduction of the necessary facilities for the site offices into careful consideration.

Installation work for substation equipment has so far been directly conducted by the EBS in many cases. As a result, there is no private company with the high technical capability and specialist expertise required for the installation, test operation and adjustment of substation equipment. The dispatch of Japanese engineers is, therefore, desirable to supervise the substation equipment installation work under the Project. During the equipment installation period, technology transfer to Surinamese engineers/technicians will be made by means of OJT, using the presence of the Japanese engineers on site.

(2) Use of Local Equipment and Materials

In planning the construction work plan, emphasis will be placed on the maximum use of locally available equipment and materials. As it is possible to procure aggregate, cement, reinforcing bars, etc., for civil and building work in Suriname, these will be procured for the building, exterior and foundation work under the Project. In comparison, in regard to equipment and materials for substation and transmission and distribution lines, not only such main equipment as switchgear panels and transformers but also such auxiliary equipment as structural steel, cables and insulators are not manufactured domestically, making their import from Japan and/or a third country necessary.

3.1.3 Scope of Work

There is a division of work to be conducted by the Japanese side and Suriname side under the Project. The Japanese side will be responsible for procurement, installation, testing, adjustment and the necessary civil and building work for the new substations to be constructed by the Japanese side.

In the case of existing Substations B and D where an additional switchgear panel, etc. will be installed, the Japanese side will conduct the installation work, including the procurement, testing and adjustment of equipment, while the Suriname side will be responsible for the expansion of buildings, change of fittings and fixtures, etc.

For the 33 kV transmission line and 12.6 kV distribution line construction work, the Japanese side will procure the main equipment and materials while the Suriname side will conduct the installation work, including the procurement of electric poles (wooden poles). In the case of low voltage distribution lines, the Suriname side will be entirely responsible for the procurement of the necessary wires and cables, cable accessories, arresters, poles, insulators, watt-hour meters, etc. and for their installation.

Table 3-1-1 shows the detailed division of work between the Japanese and Suriname sides.

Table 3-1-1 Division of Work Between Japanese and Suriname Sides

(1/3)

Work Item	Procurement		Installation		Remarks
	Japan	Suriname	Japan	Suriname	
1. Construction of New La Paix Substation					
(1) 33/12.6 kV transformer (10 MVA)	○		○		Including SCADA interface cubicle
(2) 33 kV switchgear panel	○		○		
(3) 12.6 kV switchgear panel	○		○		
(4) DC supply system	○		○		
(5) Remote control and protection panel	○		○		
(6) Equipment and materials required for connection of (1) through (5) above	○		○		
(7) Civil engineering, foundation and exterior work required for (1) through (5) above	○		○		Premises only, including outdoor lighting
(8) Control building		○		○	Existing building
(9) Building services for (8) above (lighting, air-conditioning, plumbing, etc.)	○		○		Including water supply, drainage, septic tanks, etc.
(10) 33 kV underground transmission cable	○			○	Upto connection point with overhead line
(11) 12.6 kV underground distribution cable	○			○	Upto connection point with overhead line
(12) Spare parts, testing equipment and installation/maintenance manuals	○			○	Spare parts: one year's supply
(13) On-site testing before handing over	○		○		
(14) OJT	○		○		
(15) Construction of perimeter fence, gate and access road		○	○	○	
2. Construction of New Sidodadiweg Substation					
(1) 33/12.6 kV transformer (10 MVA)	○		○		
(2) 33 kV switchgear panel	○		○		
(3) 12.6 kV switchgear panel	○		○		
(4) DC supply system	○		○		
(5) Remote control and protection panel	○		○		
(6) Equipment and materials required for connection of (1) through (5) above	○		○		
(7) Civil engineering, foundation and exterior work required for (1) through (5) above	○		○		Premises only, including outdoor lighting
(8) Control building	○		○		Including water supply, drainage, septic tanks, etc.
(9) Building services for (8) above (lighting, air-conditioning, plumbing, etc.)	○		○		
(10) 33 kV underground transmission cable	○			○	Upto connection point with overhead line
(11) 12.6 kV underground distribution cable	○			○	Upto connection point with overhead line
(12) Spare parts, testing equipment and installation/maintenance manuals	○			○	Spare parts: one year's supply
(13) On-site testing before handing over	○		○		
(14) OJT	○		○		
(15) Construction of perimeter fence, gate, access road		○	○	○	

Work Item	Procurement		Installation		Remarks
	Japan	Suriname	Japan	Suriname	
3. Expansion of Substation B					
(1) 33 kV switchgear panel	<input type="radio"/>		<input type="radio"/>		
(2) DC supply system	<input type="radio"/>		<input type="radio"/>		
(3) Remote control and protection panel	<input type="radio"/>		<input type="radio"/>		
(4) Equipment and materials required for (1) through (3) and for connection with existing switchgear panel	<input type="radio"/>		<input type="radio"/>		
(5) 33 kV underground transmission cable	<input type="radio"/>			<input type="radio"/>	Upto connection point with 33 kV overhead transmission line
(6) Remodelling of existing building (including equipment foundations, cables trenches and fixtures)		<input type="radio"/>		<input type="radio"/>	Including replacement of equipment delivery door
(7) Spare parts, testing equipment and installation/maintenance manuals	<input type="radio"/>			<input type="radio"/> (to keep)	Spare parts: one year's supply
(8) One-site testing before handing over	<input type="radio"/>		<input type="radio"/> (to conduct)		
4. Expansion of Substation D					
(1) 33 kV switchgear panel	<input type="radio"/>		<input type="radio"/>		
(2) DC supply system	<input type="radio"/>		<input type="radio"/>		
(3) Remote control and protection panel	<input type="radio"/>		<input type="radio"/>		
(4) Equipment and materials required for (1) through (3) and for connection with existing switchgear panel	<input type="radio"/>		<input type="radio"/>		
(5) 33 kV underground transmission cable	<input type="radio"/>			<input type="radio"/>	Upto connection point with 33 kV overhead transmission line
(6) Remodelling of existing building (replacement of equipment delivery door)		<input type="radio"/>		<input type="radio"/>	
(7) Spare parts, testing equipment and installation/maintenance manuals	<input type="radio"/>			<input type="radio"/> (to keep)	Spare parts: one year's supply
(8) One-site testing before handing over	<input type="radio"/>		<input type="radio"/> (to conduct)		
5. Construction of 33 kV Transmission Line					
(1) ACSR, grounding cable, arresters, insulators, metal arms, fixing metal-ware and accessories	<input type="radio"/>			<input type="radio"/>	Angle poles, section poles and dead end poles only
(2) Electric poles (wooden)		<input type="radio"/>		<input type="radio"/>	
(3) Electric poles (steel)	<input type="radio"/>			<input type="radio"/>	
(4) Cables for Suriname River Bridge	<input type="radio"/>			<input type="radio"/>	
(5) Cable Hanger for Suriname River Bridge		<input type="radio"/>		<input type="radio"/>	
(6) Underground cable (including protective tubing, terminal treatment materials, etc.)	<input type="radio"/>			<input type="radio"/>	
(7) Civil engineering work (foundation, excavation, refilling work, etc.)		<input type="radio"/>		<input type="radio"/>	
(8) Installation/maintenance manuals	<input type="radio"/>			<input type="radio"/> (to learn)	
(9) Testing and adjustment equipment and tools	<input type="radio"/>			<input type="radio"/> (to conduct)	

Work Item	Procurement		Installation		Remarks
	Japan	Suriname	Japan	Suriname	
6. Construction of 12.6 kV Distribution Line					
(1) ACSR, pole-mounted transformers, arresters, insulators, fused cutout switches, metal arms, fixing metal-ware and accessories	○	○		○	Some of the pole-mounted transformers will be procured by Suriname side.
(2) Electric poles (wooden)		○		○	
(3) Underwater cable (including protective tubing and terminal treatment materials)	○			○	* Barge, crane, winch, etc.
(4) Equipment and materials for underwater cabling work	○	○*		○	
(5) Underground cable (including protective tubing, terminal treatment materials, etc.)	○			○	
(6) Civil engineering work (foundation, excavation, refilling work, etc.)		○		○	
(7) Installation/maintenance manuals	○			○ (to learn)	
(8) Testing and adjustment equipment and tools	○			○ (to conduct)	
7. Construction of Low Voltage Distribution Line					
(1) Cables, distribution panels, cable accessories, insulators, WHIMs and metal-ware		○		○	
(2) Procurement of wooden poles		○		○	
(3) Installation of members and equipment and wiring work		○		○	
(4) Procurement of spare parts		○		○	

Note: ○ indicates the responsible side for the work/procurement concerned.

3.1.4 Work Supervision by the Consultant

The consultant will organize a consistent project team to conduct the detailed design and work supervision to ensure the smooth implementation of the Project, taking the objectives of the basic design into consideration, based on Japan's grant aid scheme. Given the dispersion of the four substation sites over a wide area and the planned parallel implementation of civil and building works and substation equipment installation work by the Japanese side, the consultant will appoint one full-time civil engineer and one building engineer during the civil and building works period and two electrical engineers during the substation equipment installation work period to conduct schedule control, quality control and safety control. In addition, the consultant will dispatch other engineers in line with the progress of the equipment installation, test operation and adjustment and completion testing, etc. to supervise the relevant work conducted by the equipment supplier.

Furthermore, the consultant will assign Japanese experts to witness the factory testing and pre-shipment testing of equipment to be manufactured in Japan so that any equipment problems after the arrival of the equipment in Suriname can be prevented in advance.

(1) Basic Principles for Work Supervision

The basic principles for the consultant to execute its assigned work are supervision of the work progress to ensure completion within the set schedule, to ensure the quality specified in the contract and to supervise the equipment supplier so that the site work is safely conducted. Important points to note for the work supervision are described below.

1) Schedule Control

The implementation schedule planned at the time of concluding the equipment supply contract and the actual state of progress will be compared every month or every week to ensure that the equipment supplier complies with the date of handing over specified in the contract. If any delay of the work is anticipated, the consultant will issue a warning to the contractor and will request that the contractor implement measures to improve the situation so that the work is completed within the contracted period. The above comparison will mainly be conducted for the following items.

- ① Quantity of work completed (quantity of equipment manufacture completed at the factory and quantity of completed civil and building works on site)
- ② Quantity of equipment and materials delivered (substation, transmission and distribution equipment, and civil and building equipment)
- ③ State of temporary work and preparation of construction machinery
- ④ Actual number of engineers, skilled workers and labourers and their ratios compared to the original plan

2) Quality and Specification Control

The consultant will carry out the items listed below to ensure that the equipment and materials manufactured, delivery and installed and that the facilities constructed meet the quality and specifications demanded by the contract. If there is any doubt in regard to their satisfactory quality or specifications, the consultant will immediately request the equipment supplier to rectify, alter or improve the situation.

- ① Checking of shop drawings and specifications of equipment and materials

- ② Witnessing of factory inspection of equipment and materials or checking of factory inspection results
- ③ Checking of equipment installation drawings and instructions
- ④ Checking of manuals on test operation, adjustment, testing and inspection of equipment
- ⑤ Supervision of equipment installation work and witnessing of test operation, adjustment, testing and inspection
- ⑥ Checking of civil and building construction drawings and product fabrication drawings; and checking of completed civil and buildings and products against original drawings

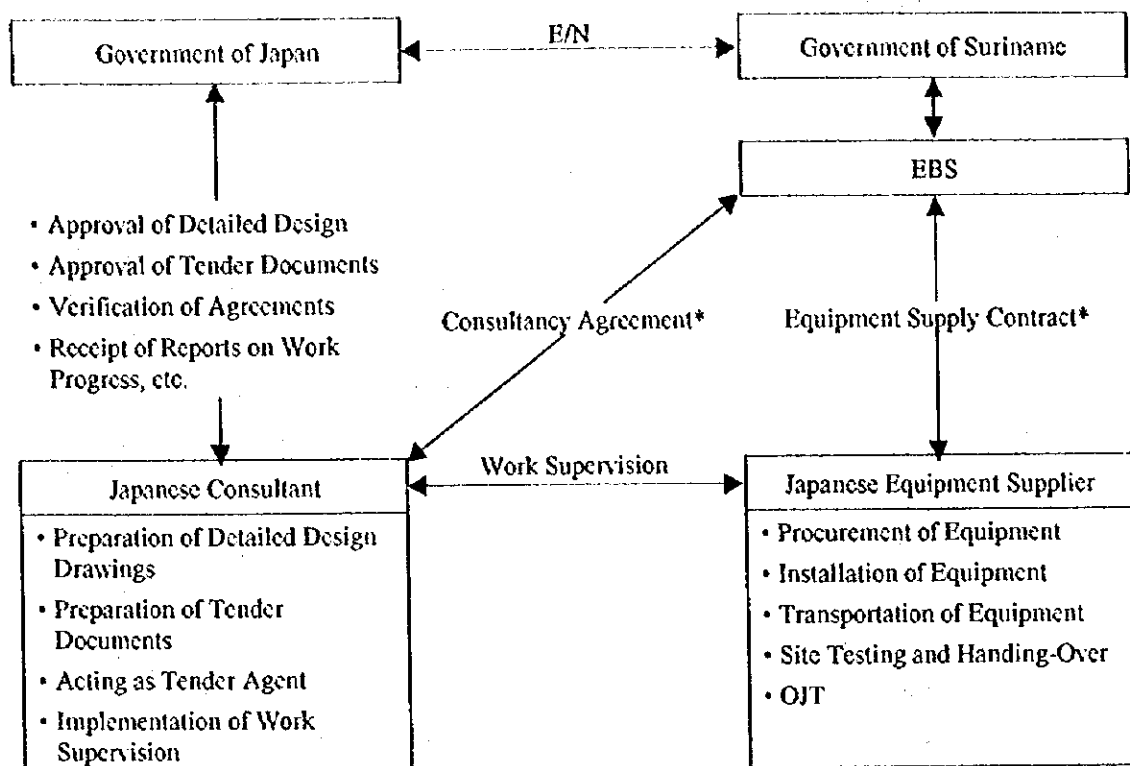
3) Safety Control

The consultant will conduct work supervision to prevent site accidents involving site workers and/or third persons during the construction period in consultation and cooperation with the site representative(s) of the equipment supplier. The following points should be carefully noted regarding safety control on site.

- ① Enforcement of safety control rules and appointment of a safety control manager
- ② Prevention of accidents by means of regular inspection of construction equipment and machinery
- ③ Clear instruction of travelling routes for work-related vehicles and construction machinery and strict enforcement of slow driving on site
- ④ Enforcement of welfare measures and days-off for workers

(2) Project Implementation System

The relationship between those involved in the implementation of the Project, including the work supervision stage, is shown in Fig. 3-1-1.



Note: The consultancy agreement and the equipment supply contract must be certified by the Government of Japan.

Fig. 3-1-1 Project Implementation System

(3) Supervisory Engineers Dispatched by the Equipment Supplier

In conducting the equipment installation work as well as the necessary civil and building work at the new La Paix and Sidodadiweg Substations and existing Substations B and D, the equipment supplier will procure and deliver the transmission equipment and materials and will use a local construction company as a subcontractor. As it will be necessary for the subcontractor to fully understand the contents of the subcontracting agreement regarding the work schedule, work quality and compliance with the specifications and safety measures, the equipment supplier will dispatch Japanese engineers with experience of overseas work similar to that under the Project to guide/educate the subcontractor.

Given the scale and contents of the planned substation construction work under the Project, it is desirable that the equipment supplier dispatch at least those engineers listed in Table 3-1-2 for full-time assignment on site.

Table 3-1-2 Engineers Dispatched by the Equipment Supplier

Type of Engineer	No.	Assigned Work	Assignment Period
Site Manager	1	Overall work management; consultation and coordination with related organizations, obtaining of necessary permits, etc.; OJT supervision; equipment procurement and control; customs clearance; personnel control; accounting	Entire construction period
Electrical Engineer (A)	1	Installation supervision of transformers	Relevant equipment installation period
Electrical Engineer (B)	2	Installation supervision of switchgear panels, cabling, etc.	Relevant equipment installation period
Civil and/or building Engineers	2	Supervision of civil engineering and building work, including foundation work for transforming equipment	Relevant civil and building work period
Testing and Adjustment Engineers	2	Testing and adjustment	Relevant work period

3.1.5 Equipment and Materials Procurement Plan

The substation, transmission and distribution equipment to be procured and installed under the Project is not manufactured in Suriname and transformers, switchgear panels, conductors, insulators, etc., are all imported from such European countries as the Netherlands, Belgium and Italy as well as from other countries because of the funding background of various projects. Few manufacturers, however, have agents in Suriname to provide after-services in connection with breakdown repair and spare parts supply, making it necessary for Suriname operators to directly place orders to overseas equipment manufacturers.

As far as the materials for civil and building work are concerned, locally produced aggregate, cement and timber and imported reinforcing bars and paint are readily available in the domestic market and can, therefore, be procured in Suriname. In contrast, it will be necessary to newly import structural steel, finishing materials, etc., as in the case of the substation and distribution equipment.

As 50 ton class cranes and trailers can be leased locally, no problems are anticipated in regard to equipment installation and transportation in connection with the planned construction/expansion of substations and overhead transmission and distribution lines under the Project.

Given the above situation, the required equipment and materials for the Project will be procured in the following manner.

(1) Equipment and Materials for Local Procurement

Wooden poles, cement; sand, concrete aggregate, concrete blocks, bricks, reinforcing bars, paint, timber, petrol, diesel oil, small vehicles, crane; trailer, other equipment and materials for temporary work

(2) Equipment and Materials to be Procured from Japan

1) Substation Equipment and Materials

Transformers, 33 kV and 12.6 kV switchgear panels, remote control and protection panels, DC supply systems, testing/inspection equipment, etc.

2) Transmission and Distribution Equipment and Materials (Japanese Portion)

Conductors, Cables, underwater cables with accessories, underground cables, steel poles, pole-mounted transformers, insulators; arresters, etc.

For the transportation of the products procured from Japan, an adequate packaging method will be employed to ensure safe transportation during the long maritime voyage, landing at the port, land transportation to the project sites and storage at the project sites. Port Paramaribo appears to be the most appropriate port of landing as its major loading/unloading facilities are suitable for the landing of the equipment to be procured under the Project. The road for inland transportation of some 40 km in length between Port Paramaribo and the Sidodadiweg Substation site which is the furthest project site is currently used as a trunk road. Even though the paving conditions of some sections are not very satisfactory, large trailers can use this road with cautious driving. It usually takes up to one month for imported goods to undergo the customs clearance process at Port Paramaribo and, therefore, the equipment supplier should prepare the necessary documentation in advance in order to minimise the length of this process to comply with the planned project implementation schedule with the cooperation of the EBS.

The road transportation of the underwater cable may prove difficult because of the total weights involved, i.e. some 30 tons of 12.6 kV cable with cable drums. Port Paramaribo will, therefore, be designated as the handing over point and the underwater cable will be unloaded at Port Paramaribo using a crane on board the transportation vessel from Japan. The Suriname side will then load the underwater cable in question onto a barge (to be arranged by the Suriname side) using the crane at Port Paramaribo.

3.1.6 Implementation Schedule

The project implementation schedule shown in Fig. 3-1-2 is suggested based on Japan's grant aid cooperation scheme.

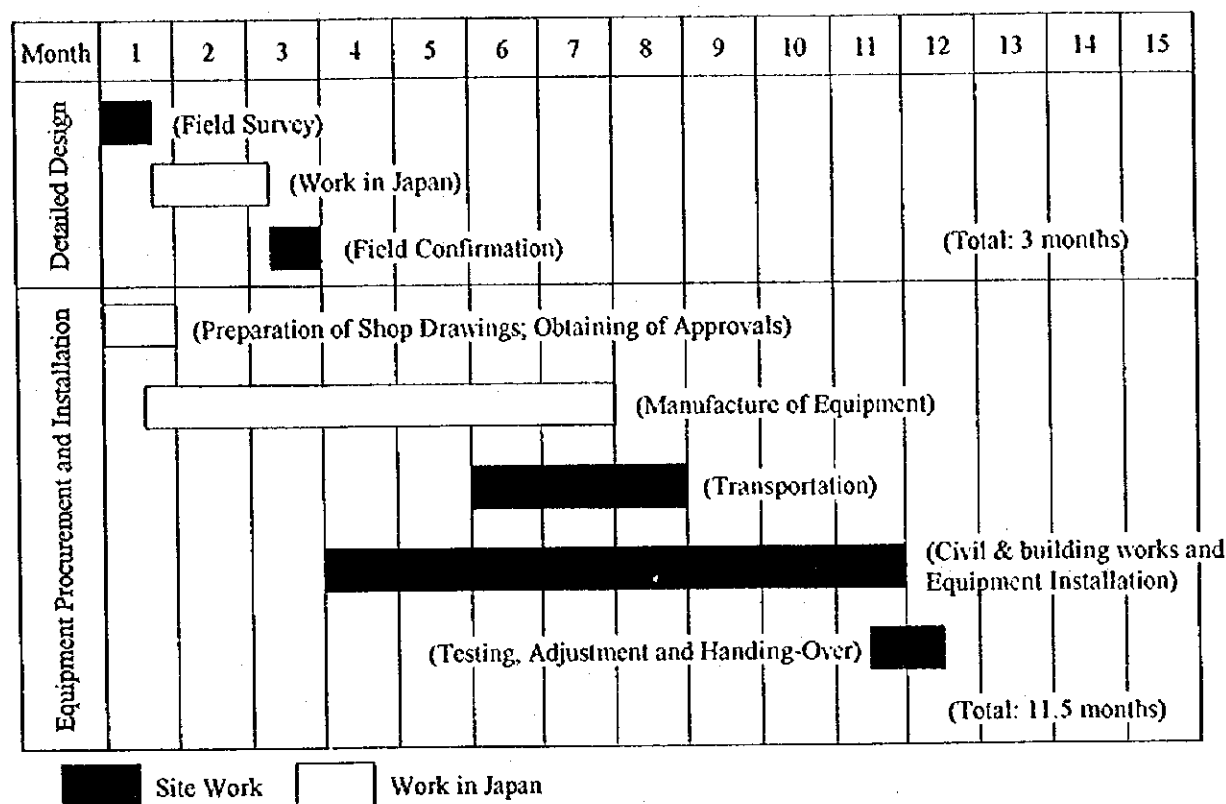


Fig. 3-1-2 Project Implementation Schedule

3.1.7 Obligations of Recipient Country

In the course of the implementation of the Project, the Government of Suriname will be responsible for conducting the following work or providing the following items in addition to the scope of work for the Suriname side described in 3.1.3.

- (1) To provide necessary data and information for the Project.
- (2) To secure and provide cleared embanked and levelled land as well as access roads for the new substations prior to the commencement of the construction work under the Project.

- (3) To ensure speedy unloading, customs clearance and tax exemption of the goods for the Project at the port and/or airport of disembarkation and internal transportation in the Republic of Suriname.
- (4) To accord Japanese nationals whose services may be required in connection with the supply of products and services under the verified contracts such facilities as may be necessary for their entry into the Republic of Suriname and stay therein for the performance of their work.
- (5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the Republic of Suriname with respect to the supply of the products and services under the verified contracts.
- (6) To bear commissions to a Japanese bank for banking services based on the banking arrangements.
- (7) To bear all expenses other than those to be borne by the Grant Aid necessary for the execution of the Project.
- (8) To provide proper arrangements for the construction/installation work, such as water supply, electricity and drainage, etc., if necessary.
- (9) To assign exclusive counterpart engineers and technicians for the Project in order to transfer operation and maintenance techniques under the Project and to witness and confirm the construction/installation work and quality of equipment and materials when inspection is conducted.
- (10) To take necessary measures and responsibility for the stoppage of electricity during the construction/installation period if necessary.
- (11) To construct and to connect the cables supplied by Japanese grant aid for the incoming and outgoing feeders for the substations to be constructed under the Project.
- (12) To use and maintain properly and effectively all equipment and materials provided under the Japan's Grant Aid.
- (13) To construct incidental outdoor facilities, boundary fence and entrance gate at the new substations by the completion of the Project.

- (14) To install the equipment and materials for the transmission and distribution networks supplied under the Project in accordance with the proper implementation schedule to meet the requirement of Japan's Grant Aid scheme.
- (15) To provide proper disposal places for excavated soil, waste water and oil discharged during the implementation period.

3.2 Operation and Maintenance Plan

(1) Basic Concept

The proper operation and maintenance (O & M) of the substation, transmission and distribution equipment and the preservation of a proper working environment are essential to achieve the improved reliability of the electricity supply system to provide stable electricity supply services for consumers in the Project Area. Therefore, in order to do, appropriate preventive maintenance aimed at reducing the accident rate and improving the reliability, safety and efficiency of the substation, transmission and distribution equipment is highly desirable to ensure a stable electricity supply for consumers in the Project Area. Fig. 3-2-1 shows the basic concept of maintenance.

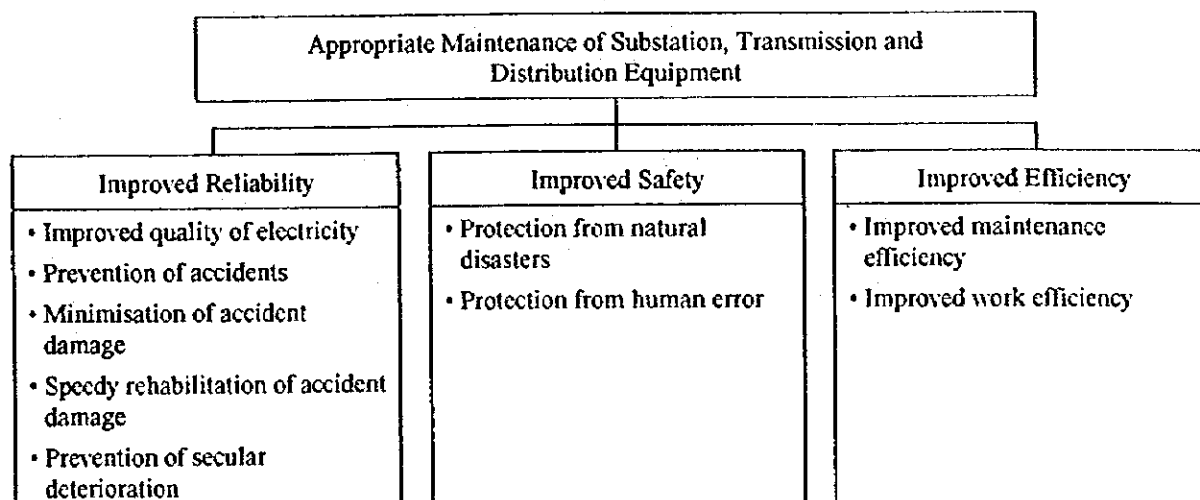


Fig. 3-2-1 Basic Concept of Substation, Transmission and Distribution Equipment Maintenance

Based on the basic maintenance concept described above, the maintenance emphasis for the procured and installed equipment and constructed facilities under the Project should be placed on preventive maintenance which should then be conducted without fail.

The implementation of OJT on the operation and maintenance of the substation equipment is planned by engineers to be dispatched by the Japanese equipment supplier during the installation work and testing and adjustment work periods. The EBS is, therefore, expected to conduct maintenance work after the commencement of actual operation using the operation and maintenance skills acquired through OJT, bearing the basic issues described above in mind.

(2) Regular Inspection Items

1) Regular Inspection of Substation Equipment

The standard regular inspection items for the substation equipment to be procured and installed under the Project are shown in Table 3-2-1. As the table shows, inspection of the substation equipment is classified as ① “patrolling inspection” which is conducted daily using human senses to check any abnormal heating and sound, etc. of the equipment, ② “standard inspection” to check items beyond the daily patrolling inspection, including the fastening conditions of bolts, etc. of the equipment and the cleanliness of or damage to such loaded sections as the surface of insulated items, etc. and ③ “detailed inspection” to check the proper functioning of the interlocking mechanism between equipment and other mechanisms.

Standard inspections are conducted every one or two years while detailed inspections are conducted approximately every four years.

The regular replacement of certain parts at the time of either standard inspection or detailed inspection based on the characteristics as well as frequency of use of such parts is desirable. These include the fuses, measuring instruments and relays, etc. installed inside the switchgear panels and others which are liable to performance deterioration, including the insulation performance, abrasion of the contact points and changes of the characteristics.

Table 3-2-1 Regular Inspection Items for Standard Substation, Transmission and Distribution Equipment and Materials

Subject	Inspection Item (Method)	Patrolling Inspection	Standard Inspection	Detailed Inspection
Equipment Outlook	Switchgear Indicator and indication light	○	○	
	Abnormal sound or odour	○	○	
	Thermal discolouration of terminals	○	○	
	Cracks, damage or staining of bushing and insulator	○	○	
	Rust on casings and frames	○	○	
	Abnormal temperature (thermometer)	○	○	
	Fastening of bushing terminals (mechanical check)	○	○	
Operating Apparatus and Control Panel	Pressure gauge indication	○	○	○
	Counter indication		○	○
	Condensation and damage inside console and panels		○	○
	State of oil supply and cleaning		○	○
	Fastening of cable terminals	○	○	○
	State of switchgear indication		○	○
	Air leakage and oil leakage		○	○
	Pressure before and after operation (air pressure, etc.)		○	○
	Working of instruments		○	○
	Rust, deformation and/or damage to springs	○	○	○
	Abnormality of fastening pins		○	○
	Auxiliary switchgear and relays		○	○
Measurement/ Testing	Measurement of insulation resistance		○	○
	Measurement of contact resistance			○
	Breaking of heater cable		○	○
	Testing of relay function		○	○

2) Regular Inspection of Transmission/Distribution Lines

One of the most important consumer services is the maintenance of transmission/distribution lines by means detecting breakdowns and damage through regular patrolling and immediate repair. In addition, if short-circuiting or any other accident is envisaged due to the contact of a tree, etc. with a transmission/distribution line, it is essential to take preventive measures, including the felling of the tree. The major check items for patrolling inspection are listed below.

- ① Breakdown of conductors
- ② Damage to insulators
- ③ Contact between conductors and trees
- ④ Damage to poles

- ⑤ Straightness of poles
- ⑥ Conditions of pole-mounted transformers
- ⑦ Abnormal temperature increase of pole-mounted transformers
- ⑧ Operational status of circuit switches

(3) Maintenance Cost

The Electrical Operations Department, Electricity division of the EBS will be responsible for the operation and maintenance of the La Paix Substation, Sidodadiweg Substation, 33 kV transmission line and 12.6 kV distribution line for which equipment and materials will be newly installed under the Project following the commencement of their operation. As this division has already enough operation and maintenance staff, it will be unnecessary to recruit new staff following the implementation of the Project.

The substation equipment to be installed is basically maintenance-free and no regular replacement will be required except for some items (for example, silica gel for the transformer, etc.) However, the spare parts described in (4) below will be required in preparation for unexpected breakdowns. Consequently, it will be necessary for the Suriname side to make the necessary budgetary appropriation, approximately 1.5 million yen a year, for the smooth implementation of the operation and maintenance of the equipment in question.

(4) Spare Parts Procurement Plan

The spare parts for the substation, transmission and distribution equipment are classified as standard accessories requiring regular replacement depending on the state of deterioration and renewal parts required for such emergencies as accidents and breakdowns. It will be necessary for the Suriname side to purchase these spare parts in line with the regular inspection cycle described in (2) above. One year's supply of spare parts and maintenance tools will be procured under the Project as listed in Table 3-2-2. By the end of the first year after the completion of the Project, it will be necessary for the EBS to secure the necessary budget for the purchase of additional spare parts from the second year onwards.

Table 3-2-2 Spare Parts and Maintenance Tools to be Procured Under the Project
Spare Parts for Substation

No.	Part item	Description	Q'ty	Unit
1.	For Main transformer	(33/12.6kV, 10MVA)		
(1)	33kV bushing		2	Nos.
(2)	12.6kV bushing		2	Nos.
(3)	Silica gel for breather	200g	2	sets
(4)	Buchholz relay		2	pcs
(5)	Dial type thermometer		2	pcs
(6)	Dial type oil level gauge		2	pcs
(7)	Gasket for normal maintenance		2	sets
2.	For Metal-enclosed type switchgear	(33kV & 12.6kV)		
(1)	Closing coil of VCB	For 33kV switchgear	4	pcs
(2)	Trip coil of VCB	For 33kV switchgear	4	pcs
(3)	Closing coil of VCB	For 12.6kV switchgear	2	pcs
(4)	Trip coil of VCB	For 12.6kV switchgear	2	pcs
(5)	Earth switch	Only 1 phase, 33kV switchgear	2	pcs
(6)	Earth switch	Only 1 phase, 12.6kV switchgear	2	pcs
(7)	Disconnecting switch	For dual bus bars of 33kV switchgear	1	pc
3.	For Control and Protection Panel (CPP)	(33kV & 12.6kV)		
(1)	Ammeter (scale 0 to 200/100A)	With demand pointer, for 33kV CPP	2	pcs
(2)	Ammeter (scale 0 to 400/200A)	With demand pointer, for 33kV CPP	2	pcs
(3)	Ammeter (scale 0 to 600A)	With demand pointer, for 12.6kV CPP	2	pcs
(4)	Ammeter (scale 0 to 300/150A)	With demand pointer, for 12.6kV CPP	2	pcs
(5)	Wathour meter	For 33kV CPP	2	pcs
(6)	Wathour meter	For 12.6kV CPP	2	pcs
(7)	Active power meter	For 33kV CPP	2	pcs
(8)	Active power meter	For 12.6kV CPP	2	pcs
(9)	Reactive power meter	For 33kV CPP	2	pcs
(10)	Reactive power meter	For 12.6kV CPP	2	pcs
(11)	Voltmeter (scale 0 to 45kV)	For 33kV CPP	2	pcs
(12)	Voltmeter (scale 0 to 15kV)	For 12.6kV CPP	2	pcs
(13)	Overcurrent relay (51&51H)	Unit only, common use	2	pcs
(14)	Overcurrent ground relay (51G)	Unit only, common use	2	pcs
(15)	Distance relay (21)	For 33kV CPP	2	pcs
(16)	Reclosing relay (79)	Common use	2	pcs
(17)	Differential relay (87)	Unit only, for 33kV CPP	2	pcs
(18)	Voltage relay (64V)	Unit only, common use	2	pcs
(19)	Automatic voltage regulating relay (AVR)	Unit only, for 12.6kV CPP	2	pcs
(20)	Auxiliary relay (various)	Common use	2	sets
(21)	Change-over switch (various)	Common use	4	sets
(22)	Control switch (various)	Common use	4	sets
(23)	Indication lamp (various)	Common use	4	sets
(24)	Power & Protection Fuse Link (various)	Common use	2	sets
(25)	Chart paper of recorder	For 1 year operation	4	sets
(26)	Ink of recorder	For 1 year operation	4	sets
(27)	Fluorescent Lamp for Panel	Common use	2	pcs

Maintenance Tool List

No.	Descriptions	Specifications	Q'ty	Unit
	<For Main Transformers>			
1	Vacuum oil purifier with vacuum pump	Outdoor use, self container type, 4000liters/hour	1	set
2	Oil storage tank	Outdoor use, steel tank, 1500liters (for main trans. Insulation oil)	1	set
3	Oil tester	Portable type, 0~60kV, 0.5kVA (for main trans. Insulation oil)	1	set
4	AC dielectric tester set	Equipment composition as follow	1	set
	(1) Testing transformer	Outdoor use, pri.: 220-440V, sec.: 50kV		
	(2) Inductive voltage regulator(IVR)	Outdoor use, pri.: 220V, sec.: 440V, Line capacity: 20kVA		
	(3) Control board for IVR	Outdoor use, self standing type		
5	Oil jack	Manual operation, 30tons	4	pcs
6	Oil jack	Manual operation, 10tons	4	pcs
7	Winch	Handy type, Capacity: 3ton with wire rope	1	set
8	Wire rope	Dia.14mm x 2.5m	4	pcs
	<For Protection Relays>			
9	Slide transformer	3phase, 60Hz 220V, output: 0~440V 10A	1	set
10	Single phase relay test set (for Protection relays)	Portable type, Adjustable amp: 0~50A Adjustable voltage: 0~300V	1	set
11	Three phase relay test set (for protection relay 87)	Portable type, Adjustable voltage: 0~260V Adjustable angle: 0~360deg	1	set
12	AC V-A meter	Portable type, range: 0~750V, 0~50mV, 0~30A,	1	pc
13	DC V-A meter	Portable type, range: 0~100V, 0~300mA	1	pc
	<For HV/LV Cables>			
*14	DC dielectric tester set	For 33kV cable Outdoor use, output voltage: min. 100kV,	1	set
*15	Hydraulic compression terminal machine	Hand-operate type, 30tons with dice, for HV cables	1	set
*16	Hydraulic termination tools	14~100mm ² , with dice, for LV cables	1	set
*17	Cable cutter	Hand operation type, cable size: diameter 50mm, for LV cables	1	set
	<For Substations>			
18	Universal circuit tester	Analogue type DCV: max. 1000V, DCA: max. 30mA ACV: max. 1000V, OHM: min. 1Ω	1	pc
19	Phase rotation meter	Portable type, voltage: 100~480V	1	pc
*20	Voltage detector	Portable type with lamp and sound, AC 3~36kV	1	Pc
21	Insulation tester 500V	Portable type, 500VDC/100MΩ	1	pc
22	Insulation tester 1000V	Portable type, 1000VDC/2000MΩ	1	pc
23	Earth resistance tester	Portable type, DC battery use	1	pc
24	Digital multi-meter	LED indicator, handy type DC(V): 0~1000V, DC(A): 0~10mA AC(V): 0~1000V, AC(A): 0~10A OHM 0~20MΩ	1	pc
25	Clip-on meter	Handy type, AC(A): 0~1500A	1	Pc
*26	Electrician hand tool set	General set with case	5	sets
27	Guard fence	Pipe frame, 1.8 x 1.8m	10	pcs
28	Danger Plate	Aluminum, 100 x 300 x 15mm	5	pcs

Note: Items marked with * shall be used for both substation and transmission/distribution lines.

CHAPTER 4

PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 4

PROJECT EVALUATION AND RECOMMENDATIONS

4.1 Project Effects

Suriname has a population of approximately 430,000 (1997 statistics), most of which live on the fertile plains in the north. Some 228,000 people, half of the total population, living in the capital, Paramaribo. While there is still continuous migration to the capital region, the slow progress of social infrastructure development due to the budgetary shortfall of the Government of Suriname has prevented improvement of the local standard of living and industrial development.

The electricity sector in Suriname is run by the EBS. While the EBS supplies electricity to residential areas in the capital region as well as to local areas, there is no national transmission grid.

In regard to the transmission and distribution grid in and around Paramaribo, the development of trunk 33 kV transmission lines to meet the demand in the ever expanding distribution area caused by the population increase in the capital region has been much delayed. At present, while suburban Paramaribo areas in the Saramacca District and Commewijne District (Project Area) receive power via 12.6 kV distribution lines crossing Saramacca River and Suriname River respectively, the long distribution distance causes a serious voltage drop. In addition, the inadequate distribution capacity means unstable as well as uneconomical power supply to these areas. Some parts of these districts are not even electrified. Under these circumstances, the EBS hopes to construct new 33 kV transmission lines to these districts to create a consistent power grid together with the existing 12.6 kV distribution lines with a view to establishing an efficient power supply system and ensuring a stable power supply to meet the demand.

The implementation of the Project will constitute part of the development of social infrastructure which is essential for improvement of the living standard, stable operation of social and public facilities and industrial development by means of promoting "the development of agriculture and fisheries and the improvement of social infrastructure" which is a key policy under the Multi-Annual Development Programme of the Government of Suriname. The principal aims of the Project are the construction of 33 kV transmission and 12.6 kV distribution lines to meet the power demand upto the year 2006 in order to promote local electrification in liaison with the existing transmission and distribution grid with a view to establishing an efficient power supply system. The number of people who will directly benefit

from the Project is estimated to be some 24,000 in the Commewijne District and some 15,000 in the Saramacca District, totalling 39,000.

The operation and maintenance of the new facilities and equipment after completion of the Project will be conducted by the EBS which is the sole power provider in Suriname and which is responsible for nationwide power transmission, distribution and transforming activities. Judging from the transmission, distribution and substation equipment owned by the EBS and the operation and maintenance conditions of the related facilities, staff members of the EBS have sufficient technical capability in regard to the operation and maintenance of the new 33 kV transmission and 12.6 kV distribution lines as well as the new substations, etc. and also sufficient capability in regard to conducting the necessary equipment installation work, posing no problems for the implementation of the Project. Moreover, no new staff recruitment will be necessary as existing EBS staff members will conduct the operation and maintenance of the new substations and transmission/distribution lines to be constructed under the Project.

Among the equipment to be procured under the Project, the transformers have the strongest implications vis-a-vis the environment. However, their impacts on neighbouring communities will be minimised by environmental measures to deal with waste oil, noise, etc. which will be implemented under the Project.

Based on the above evaluation results, the Project is deemed suitable for implementation with grant aid provided by the Government of Japan because of its significant effects.

Current State and Problems	Remedial Measures Under the Project	Degree of Positive Effects/Improvement
<p>1. Despite the proximity to Paramaribo (the capital), only suburban areas of Paramaribo in the northern parts of the Saramacca District and Commewijne District (Project Area) receive power via the 12.6 kV distribution lines crossing Saramacca River and Suriname River respectively. Because of the long distribution distance, the voltage drop is as large as 15% and the inadequate distribution capacity means unstable and uneconomical power supply.</p>	<p>Extension of the 33 kV transmission line from existing substations in Paramaribo to Sidodadiweg in the Saramacca District and La Paix in the Commewijne District, construction of new substations (33/12.6 kV, 10 MVA) to meet the power demand in 2006, the target year of the Project, and connection to the existing 12.6 kV distribution grid.</p>	<p>Improvement of the transmission and distribution grid in the Project Area will reduce the voltage drop to less than 10%, providing a stable supply of power.</p>
<p>2. Despite their proximity to the capital region, both the Saramacca and Commewijne Districts have areas without the 12.6 kV distribution grid and many consumers (approximately 1,700 households) are awaiting connection to the grid to stabilise their daily lives.</p>	<p>New 12.6 kV distribution lines will be extended from La Paix Substation and Sidodadiweg Substation to be newly constructed under the Project to unelectrified areas and the existing distribution grid will be expanded to facilitate local electrification.</p>	<p>Unelectrified areas in the Project Area will be electrified with the implementation of the Project.</p>
<p>3. There are some 1,100 waiting consumers (including commercial premises) in areas already served by the existing 12.6 kV distribution grid in the Project Area because of the large voltage drop (more than 15%) and inadequate distribution capacity.</p>	<p>Distribution transformers will be procured to serve ordinary consumers (excepting commercial premises) in areas where waiting consumers are concentrated which are already served by the existing distribution grid in the Project Area.</p>	<p>Some 470 waiting households other than commercial premises in areas served by the existing distribution grid will receive power supply.</p>
<p>4. The generation inefficiency of such independent power plants as Alliance, Canawapibo and Lareco in the Commewijne and Saramacca Districts due to the deterioration of equipment and an increased fuel consumption by 50 - 100% above the normal level has worsened the business performance of the EBS.</p>	<p>With the construction of the Sidodadiweg Substation and La Paix Substations, these independent power plants can be decommissioned and the existing distribution grid will be connected to the grid by the new substations.</p>	<p>The decommissioning of three independent power plants will result in a saving of some 43,000 dollars of the fuel cost alone per year in addition to providing a stable supply of power.</p>

4.2 Recommendations

As the Project is expected to achieve the significant effects described in 4.1 above as well as to positive contribute to the BHN of local people living in the Project Area, the appropriateness of implementing the Project with Japan's grant aid is positively confirmed. Moreover, the Suriname side is deemed to have sufficient manpower and funding capability to operate and maintain the equipment and facilities provided under the Project. However, it is judged that the Project can be more smoothly and effectively implemented with the improvement of the following points.

- (1) The Surinamese side should form construction teams and prepare the installation plan, personnel plan and equipment and materials procurement plan (including the purchase of wooden poles) to ensure the smooth progress of its own work to install the equipment and materials for the 33 kV transmission lines in line with the work schedule of the Japanese side for the procurement and installation of the substation equipment under the Project.
- (2) Under the Project, pole-mounted distribution transformers will be installed along the new distribution lines as well as parts of the existing distribution lines in the Project Area to meet the power demand upto the year 2006. The Suriname side must periodically review the power demand in regard to not only inadequate power supply in areas served by the existing distribution grid but also the likely demand increase after 2006, formulate a plan for the installation of additional pole-mounted transformers after the completion of the Project and appropriate the necessary budget for the procurement of new equipment.
- (3) Although an electricity supply system for consumers in the Project Area will be established under the Project, it will be necessary for the Suriname side to review the transmission and distribution grid in view of the expansion of areas requiring power supply in the future in order to improve the local standard of living and to narrow the gap in living infrastructure between different areas.
- (4) It will be necessary for the Suriname side to promote a plan to expand the generating facilities, including the purchase of power from SURALCO, by means of preparing an appropriate power demand forecast from time to time to prevent a power supply shortage, taking the increase trend of new power demand as well as the existing load following extension of the transmission network into careful consideration.

- (5) It will be necessary for the Suriname side to conduct regular patrols to implement preventive maintenance, including the felling of trees along the transmission and distribution routes, in order to reduce the number of accidents involving transmission and distribution lines to secure a stable power supply system.
- (6) It will be necessary for the Suriname side to install a watthour meter at all consumer premises and to strictly conduct meter readings and billing in order to establish a fair electricity charge collection system. In addition, it is also necessary for the Suriname side (EBS) to constantly review the need to maintain the electricity tariff at a reasonable level to achieve financial independence, taking all operation cost including equipment replacement cost, maintenance cost, etc. into consideration.

