

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATIONS

3-1 Project Effects

The expected effects of the Project are described as follows.

(1) Direct Effects

Current Situation and Problems	Remedial Measures under the Project (Requested Japanese Assistance)	Positive Effects and Degree of Improvement
Although Ghana is promoting the National Electrification Scheme (NES) and the Self Help Electrification Program (SHEP) as a rural electrification project, the electrification rate in rural areas (about 20%) still remains lower than that in urban areas (about 60%), thus creating a disparity in living standards.	33kV & 11kV distribution lines subject to West Akim District in the Eastern Region (31 communities, 76,000 residents) and Upper Denkyira District in the Central Region (16 communities, 36,000 residents) will be extended and pole mounted transformers will be installed. At the same time, low voltage trunk distribution lines will be procured.	Through electrification in 2 areas, the present household electrification rate of 15% in West Akim District in the Eastern Region (population of about 150,000) will increase to 35%. That of 22% in Upper Denkyira District in the Central Region (population of about 110,000) will increase to 44%.
Although kerosene lamps are utilized in un-electrified areas as for household lighting, smoke discharged by lamps becomes a cause for respiratory organs illness, which has a harmful effect on health.	Same as above	Incandescent lamps & fluorescent lamps can be utilized through the electrification, so it will be possible to reduce the harmful health effects of smoke discharged by kerosene lamps.

(2) Indirect Effects

Current Situation and Problems	Remedial Measures under the Project (Requested Japanese Assistance)	Positive Effects and Degree of Improvement
1. There are national hospitals & clinics at the Project sites that are utilized by resident. Although some medical institutions have installed sterilizers & medical treatment equipment, aside from national hospitals, most institutions have not been electrified, so there is a sanitation problem.	33kV & 11kV distribution lines subject to West Akim District in the Eastern Region (31 communities, 76,000 residents) and Upper Denkyira District in the Central Region (16 communities, 36,000 residents) will be extended and pole mounted transformers will be installed. At the same time, low voltage trunk distribution lines will be procured.	It will be possible to introduce medical equipment & refrigerators at pharmaceuticals with electricity. Improvement in public health & sanitation will be therefore promoted.
2. Women & girls are forced to draw and transport drinking water using hand pumps at the Project sites, which is a major burden for local residents.	Same as above	A stable supply of electricity will make it possible to utilize electric pumps. In particular, it will help alleviate the problem of women & girls having to draw water and reduce the severity of their labor.

Current Situation and Problems	Remedial Measures under the Project (Requested Japanese Assistance)	Positive Effects and Degree of Improvement
3. In non-electrified areas, expensive diesel fuel is utilized for corn mills to grind corn, which is a staple food, so this has become an economic burden for local residents.	Same as above	After electrification, electric corn mills can be utilized which will help to reduce milling costs and increase production volume. It will also alleviate the economic burden for local residents and vitalize local industries.
4. Although small-scale economic activities such as apparel manufacturers, commercial industries, restaurant business, barbers & beauty salons are present, business hours and productivity are restricted due to non-electrification.	Same as above	After electrification, business hours can be extended and productivity can be improved by utilizing electric appliances, which will improve the regional economy.

3-2 Recommendations

The Project is expected to have many wide-ranging benefits described earlier, while helping to improve the living standards of local residents. Accordingly, the Project can be implemented more smoothly and effectively if the implementing agency on the Ghanaian side accepts the following recommendations.

- (1) In line with work schedule for 33kV and 11kV distribution lines to be procured and installed by the Japanese side under the Project, the Ghanaian side should smoothly carry out installation work for low voltage trunk distribution lines to be procured by the Japanese side. Therefore, the Ghanaian side should promote construction efficiency by formulating a schedule plan, personnel plan, equipment and materials procurement plan.
- (2) Although the Project will help to ensure a stable electric power supply system at the Project sites, the Ghanaian side should operate the existing substations and distribution facilities in a proper manner to maintain the voltage of 33kV and 11kV distribution lines used to supply electric power at the Project sites within a suitable range.
- (3) In order to reduce transmission and distribution line accidents and to ensure a stable electricity supply system, the Ghanaian side should take preventive measures by carrying out periodical field patrols and maintenance, and tree clearing along transmission and distribution line routes.
- (4) The Ghanaian side should further promote on-going measures to reduce distribution loss and improve the balance of revenue and expenditure of electric power companies.

- (5) In order to ensure a sound and sustainable electric industry, a reasonable electricity tariff system should be established in accordance with the electricity tariff reform plan currently being promoted in Ghana.

APPENDICES

1. MEMBER LIST OF THE STUDY TEAM

1. Member List of the Study Team

(1) Basic Design Study

Name	Work Assignment	Position
Mr. Hiroshi MURAKAMI	Leader	Resident Representative, JICA Ghana Office
Mr. Shigehiko SUGITA	Project Coordinator	Transportation and Electric Power Team, Project Management Group I, Grant Aid Management Department, JICA
Mr. Hirohito SETO	Chief Consultant/ Power Supply Planner/ Power Distribution Planner I	Yachiyo Engineering Co., Ltd.
Mr. Mitsuhsa NISHIKAWA	Deputy Chief Consultant/ Power Distribution Planner II/ Operation and Maintenance Planner I	Yachiyo Engineering Co., Ltd.
Mr. Atsuhito URUNO	Power Distribution Equipment Planner I	Yachiyo Engineering Co. Ltd.
Mr. Kyoji FUJII	Power Distribution Equipment Planner II/ Operation and Maintenance Planner II/ Environmental and Social Consideration Analyst	Yachiyo Engineering Co., Ltd.
Mr. Tatsuya KOBAYASHI	Procurement Planner / Cost Estimator	Yachiyo Engineering Co. Ltd.

(2) Draft Basic Design Study

Name	Work Assignment	Position
Mr. Hiroshi MURAKAMI	Leader	Resident Representative, JICA Ghana Office
Mr. Hirohito SETO	Chief Consultant/ Power Supply Planner/ Power Distribution Planner I	Yachiyo Engineering Co., Ltd.
Mr. Kyoji FUJII	Power Distribution Equipment Planner II/ Operation and Maintenance Planner II/ Environmental and Social Consideration Analyst	Yachiyo Engineering Co., Ltd.

2. STUDY SCHEDULE

2. Study Schedule

(1) Basic Design Study

No	Date		Contents of the Study			Stay at
			Official Member	Consultant		
			JICA Mr. Hiroshi MURAKAMI Mr. Shigehiko SUGITA	Team A: Central Region, Upper Denkyira District (Hirohito SETO, Tatsuya KOBAYASHI)	Team B: Eastern Region, West Akim District (Mitsuhisa NISHIKAWA, Atsuhito URUNO, Kyoji FUJII)	
1	Jan. 28 th	Sat	• Trip { Tokyo 12:00 → London 15:45 by JL-401 } (Mr. Sugita)	• Trip { Tokyo 13:30 → Frankfurt 17:40 by JL-407 }		Official: London Consultant: Frankfurt
2	Jan. 29 th	Sun	• Trip { London 14:00 → Accra 20:55 by BA-081 } (Mr. Sugita)	• Trip { Frankfurt 11:10 → Accra 18:25 by LH-564 }		Accra
3	Jan. 30 th	Mon	• Courtesy call to Embassy of Japan in Ghana and JICA Ghana Office • Courtesy call and explanation of Inception report and field survey schedule, etc. to MOE and ECG			Accra
4	Jan. 31 st	Tue	• Trip [Accra → Nsawam → Asamankase by Car] • Field survey at West Akim district in Eastern Region • Trip [Asamankase → Shum → Kumasi by Car]			Kumasi
5	Feb. 1 st	Wed	• Field survey at Kumasi • Trip [Kumasi → Obuasi → Dunkwa by Car] • Field survey at Upper Denkyira district in Central Region			Obuasi Mr. Nishikawa; ; Frankfurt
			• Trip [Dunkwa → Accra] (Mr. Murakami)	• Trip [Dunkwa → Obuasi by Car] (Mr. Sugita and Consultant members) • Trip { Tokyo 13:30 → Frankfurt 17:40 by JL-407 } (Mr. Nishikawa)		
6	Feb. 2 nd	Thu	• Trip [Obuasi → Takoradi] (Mr. Sugita) • Site survey at Takoradi Port • Trip [Takoradi → Accra] (Mr. Sugita)	• Field survey at Upper Denkyira district in Central Region • Trip [Obuasi → Accra by Car] (Consultant members) • Trip { Frankfurt 11:10 → Accra 18:25 by LH-564 } (Mr. Nishikawa)		Accra
7	Feb. 3 rd	Fri	• Discussion on components, work demarcation, undertakings, etc. of the Project and explanation of Japan's Grant Aid Scheme with MOE and ECG • Discussion on necessary procedures of Preliminary Environmental Assessment with EPA • Trip { Tokyo 13:30 → Frankfurt 17:40 by JL-407 } (Mr. Uruno)			Accra Mr. Uruno: Frankfurt
8	Feb. 4 th	Sat	• Internal meeting and data analysis • Trip { Frankfurt 11:10 → Accra 18:25 by LH-564 } (Mr. Uruno)			Accra
9	Feb. 5 th	Sun	• Drafting Minutes of Discussions (M/D) • Internal meeting and data analysis			Accra
10	Feb. 6 th	Mon	• Explanation and discussion on M/D with MOE and ECG			Accra
11	Feb. 7 th	Tue	• Signing of M/D • Report to Embassy of Japan • Trip { Accra 23:30 → London 06:35+1 by BA-078 } (Mr. Sugita)	• Signing of M/D • Report to Embassy of Japan	• Signing of M/D • Field survey along 11kV distribution line routes in West Akim District, Eastern Region • Discussion on Power demand forecast	Official: In Flight Consultant: Accra
12	Feb. 8 th	Wed	• Trip { London 21:00 → Tokyo 17:55+1 by JL-404 } (Mr. Sugita)	• Trip [Accra → Kumasi by Car] • Visit ECG Kumasi office and discussion on field survey procedure, power demand forecast, etc.	• Field survey along 11kV distribution line routes in West Akim District, Eastern Region	Official: In Flight Team A: Kumasi Team B: Accra
13	Feb. 9 th	Thu	• Arrive at Tokyo [17:55 by JL-404] (Mr. Sugita)	• Field survey along 33kV distribution line routes in Upper Denkyira District, Central Region	• Field survey along 11kV distribution line routes in West Akim District, Eastern Region	Team A: Kumasi Team B: Accra
14	Feb. 10 th	Fri		• Field survey along 33kV distribution line routes in Upper Denkyira District, Central Region	• Field survey along 11kV distribution line routes in West Akim District, Eastern Region	Team A: Kumasi Team B: Accra
15	Feb. 11 th	Sat		• Field survey along 33kV distribution line routes in Upper Denkyira District, Central Region	• Field survey along 11kV distribution line routes in West Akim District, Eastern Region	Team A: Kumasi Team B: Accra
16	Feb. 12 th	Sun		• Trip [Kumasi → Accra by Car]	• Internal discussion and data sorting	Accra

No	Date		Contents of the Study		Stay at	
			Official Member	Consultant		
			JICA Mr. Hiroshi MURAKAMI Mr. Shigehiko SUGITA	Team A: Central Region, Upper Denkyira District (Hirohito SETO, Tatsuya KOBAYASHI)		Team B: Eastern Region, West Akim District (Mitsuhisa NISHIKAWA, Atsuhito URUNO, Kyoji FUJII)
17	Feb. 13 th	Mon		<ul style="list-style-type: none"> • Survey on progress status of National Electrification Scheme (NES) • Survey on progress status of Self Help Electrification Project (SHEP) • Market survey and visiting electric pole factory 	Accra	
18	Feb. 14 th	Tue		<ul style="list-style-type: none"> • Discussion and confirmation of undertakings by Ghana side • Survey on national finance in Ghana • Survey on organization, maintenance & operation scheme, power supply facilities (generation, transmission and distribution), electricity tariff of MOE and ECG • Market survey for cost estimation (construction firm, cable and insulator manufacturer, etc.) 	Accra	
19	Feb. 15 th	Wed		<ul style="list-style-type: none"> • Survey on organization, maintenance & operation scheme, power supply facilities (generation, transmission and distribution), electricity tariff of MOE and ECG • Market survey for cost estimation (construction firm, cable and insulator manufacturer, etc.) 	Accra	
20	Feb. 16 th	Thu		<ul style="list-style-type: none"> • Survey on design criteria, related regulations and materials for distribution facilities • Survey on assistance policy of other donors (WB, EU, UNDP, DANIDA, etc.) • Market survey for cost estimation (construction firm, cable and insulator manufacturer, etc.) 	Accra	
21	Feb. 17 th	Fri		<ul style="list-style-type: none"> • Survey on assistance policy of other donors (WB, EU, UNDP, DANIDA, etc.) • Survey on power sector reform • Market survey for cost estimation (construction firm, cable and insulator manufacturer, etc.) 	Accra	
22	Feb. 18 th	Sat		<ul style="list-style-type: none"> • Market survey for cost estimation (construction firm, cable and insulator manufacturer, etc.) • Internal discussion and data sorting 	Accra	
23	Feb. 19 th	Sun		<ul style="list-style-type: none"> • Preparation of field report • Field survey along 11kV distribution line routes in West Akim District, Eastern Region (by Chief consultant Mr. Seto) • Trip {Accra 20:05 → Frankfurt 05:35 +1 by LH-565}(Mr. Nishikawa) 	Accra Mr. Nishikawa: In Flight	
24	Feb. 20 th	Mon		<ul style="list-style-type: none"> • Preparation of field report • Collection of supplementary data/information • Trip {Frankfurt 20:20 → Tokyo 15:40+1 by JL-408}(Mr. Nishikawa) 	Accra Mr. Nishikawa: In Flight	
25	Feb. 21 st	Tue		<ul style="list-style-type: none"> • Submission and explanation of Field Report to MOE and ECG • Arrive at Tokyo [15:40 by JL-408] (Mr. Nishikawa) 	Accra	
26	Feb. 22 nd	Wed		<ul style="list-style-type: none"> • Discussion on Field Report with MOE and ECG 	Accra	
27	Feb. 23 rd	Thu		<ul style="list-style-type: none"> • Obtaining approval for Field Report from MOE and ECG • Collection of supplementary data/information 	Accra	
28	Feb. 24 th	Fri		<ul style="list-style-type: none"> • Report to Embassy of Japan and JICA Ghana office • Trip {Accra 20:05 → Frankfurt 05:35 +1 by LH-565}(Other members) 	In Flight	
29	Feb. 25 th	Sat		<ul style="list-style-type: none"> • Trip {Frankfurt 20:20 → Tokyo 15:40+1 by JL-408} 	In Flight	
30	Feb. 26 th	Sun		<ul style="list-style-type: none"> • Arrive at Tokyo [15:40 by JL-408] 		

(2) Draft Basic Design Study

No	Date		Contents of the Study		Stay at
			Official Member	Consultant	
			JICA Mr. Hiroshi MURAKAMI	Hirohito SETO, Kyoji FUJII	
1	May 31 st	Wed		• Trip {Tokyo 13:00 → Frankfurt 18:00 by JL-407}	Frankfurt
2	Jun. 1 st	Thu		• Trip {Frankfurt 10:50 → Accra 17:00 by LH-564}	Accra
3	Jun. 2 nd	Fri		<ul style="list-style-type: none"> • Courtesy call to Embassy of Japan in Ghana and JICA Ghana Office • Courtesy call and submission, explanation and discussion of draft basic design study report to MOE and ECG • Confirmation of obtaining environmental permission for the Project (EPA, MOE) 	Accra
4	Jun. 3 rd	Sat		<ul style="list-style-type: none"> • Trip [Accra → Nsawam → Asamankase by Car] • Field survey at West Akim area in Eastern Region • Trip [Asamankase → Obuasi by Car] 	Obuasi
5	Jun. 4 th	Sun		<ul style="list-style-type: none"> • Trip [Obuasi → Dunkwa by Car] • Field survey at Upper Denkyira area in Central Region • Trip [Dunkwa → Accra by Car] 	Accra
6	Jun. 5 th	Mon		<ul style="list-style-type: none"> • Explanation and discussion on draft basic design study report with MOE and ECG • Explanation and discussion on draft technical specifications with MOE and ECG 	Accra
7	Jun. 6 th	Tue		• Explanation and discussion on draft basic design study report with MOE and ECG	Accra
8	Jun. 7 th	Wed		• Explanation and discussion on M/D with MOE and ECG	Accra
9	Jun. 8 th	Thu		<ul style="list-style-type: none"> • Explanation and discussion on M/D with MOE and ECG • Signing of M/D 	Accra
10	Jun. 9 th	Fri		• Report to Embassy of Japan and JICA Ghana office	Accra
				• Trip {Accra 19:00 → Frankfurt 05:30 +1 by LH-565}	In Flight
11	Jun. 10 th	Sat		• Trip {Frankfurt 21:05 → Tokyo 15:20+1 by JL-408}	In Flight
12	Jun. 11 th	Sun		• Arrive at Tokyo {15:20 by JL-408}	

[Abbreviations]

MOE : Ministry of Energy

ECG : Electricity Company of Ghana

EPA : Environmental Protection Agency

WB : World Bank

3. LIST OF PARTIES CONCERNED IN THE RECIPIENT COUNTRY

3. List of Parties Concerned in the Recipient Country

<u>Organization and Name</u>	<u>Position</u>
Ministry of Energy (MOE)	
Mr. Emmanuel Antwi-Darkwa	Director (Power)
Mr. Solomon Adjete	Programme Officer, Rural Electrification
Mr. Chris Anaglo - Nawunegblo	Associate Programme Officer
Mr. Aaron Asante-Addai	Environmental Consultant Environmental and Engineering Consultants (Consultant for MOE)
Ministry of Finance and Economic Planning (MOFEP)	
Mr. Ernest Osei Prempeh	Acting Director External Resource Mobilization (Bilateral) Division
Mr. Samuel Abu-Bonsrah	Head of Japan Desk
Ms. Patrice Alsan	Assistant Economy Officer
Mr. Stephen Yesoah Frimpong	Assistant Economy Officer
Environmental Protection Agency (EPA)	
Mr. Ebenezer Appah-Sampong	Head of Environmental Assessment and Audit
West Akim District Assembly in Eastern Region	
Hon. Kwabena Sintim Aboagye	Chief Executive
Mr. Bruce K. Awu	District Works Engineer
Upper Denkyira District in Central Region	
Mr. Richard Anane Adabor	Chief Executive
Electricity Company of Ghana (ECG) Head Office	
Mr. Stephen Akuoko	Managing Director
Mr. C. S. Tetteh	Director of Finance
Mr. Julius Kwame Kpekpena	Divisional Manager (Maintenance)
Ing. Sam Adjidjonu	Divisional Manager (Rural Projects)
Mr. Charles Yakah	Project Engineer (Rural Electrification)
Mr. Victor Ocran	Project Engineer (Rural Electrification)
Mr. Osei Yaw Adofo	Engineer of Design Section
ECG Ashanti West Regional Office	
Mr. Ing. Kofi Afewu	Regional Director
Mr. Agyemang Daniel Jackson	Regional Commercial Manager
Mr. Ing. Peter Opoku	Regional Engineer
Mr. Nii Okine-Gem	Regional Draughtsman

ECG Eastern Regional Office

Ing. Kofi Anane Kyeremeh	Regional Director
Dr. Kwabena Adomah	Regional Engineer
Mr. Godfred Awuku	Project Engineer

ECG West Akim District Office

Mr. Solomon Tsawe	West Akim District Manager
Mr. Obed Boniface Glover	West Akim District Engineer

ECG Nsawam District Office

Mr. Harry Obeng Baffoe	Nsawam District Engineer
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ECG Dunkwa District Office

Mr. Emmanuel Afari-Kwaku	Dunkwa District Manager
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ECG Wiawso District Office

Mr. Prince Buaku	Wiawso District Manager
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ECG Training Centre

Mr. Christian K. Lorho	Technical Instructor
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Ghana Highway Authority

Mr. S. Swanzy-Baffoe	Deputy Chief Executive (Development)
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Department of Feeder Road

Mr. E. Nii Klemesu Ashong	Deputy Director (Development)
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Volta River Authority (VRA)

Mr. O. Sackey	Sales Section
Mr. E. D. Osafo	Engineering Department Kpong Generating Station

The World Bank Ghana Office

Mr. Subramaniam V. Iyer	Lead Financial Analyst, Task Team Leader National Energy Development Project
Mr. Mats Karlsson	Country Director Ghana, Liberia and Sierra Leone

Embassy of Japan in Ghana

Mr. Yutaka Nakamura	Counselor, Deputy Head of Mission
Mr. Shinichi Tamamitsu	First Secretary
Mr. Takafumi Nakase	Special Assistant

JICA Ghana Office

Mr. Hiroshi Murakami	Resident Representative
Dr. Katsuya Kuge	Assistant Resident Representative
Ms. Rabi Ali-Abaari	Program Officer

4. MINUTES OF DISCUSSIONS

4. Minutes of Discussions

**Minutes of Discussions
of the Basic Design Study
on the Project for Rural Electrification
in the Republic of Ghana**

In response to the request from the Government of the Republic of Ghana (hereinafter referred to as "Ghana"), the Government of Japan decided to conduct a Basic Design Study on the Project for Rural Electrification (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Ghana the Basic Design Study Team (hereinafter referred to as "the Team"), headed by Mr. Hiroshi MURAKAMI, Resident Representative, JICA Ghana Office, and is scheduled to stay in the country from January 29 to February 24, 2006.

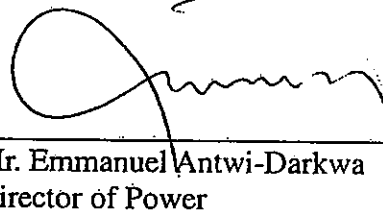
The Team held discussions with the concerned officials of the Government of Ghana and conduct field surveys at the study areas.

In the course of the discussions, both sides have confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the Draft Basic Design Report.

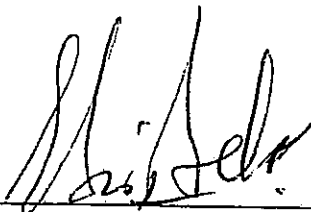
Accra, February 7, 2006

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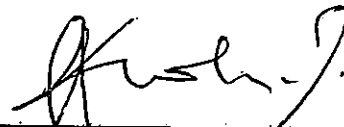
Mr. Hiroshi Murakami
Leader
Basic Design Study Team
Japan International Cooperation Agency



Mr. Emmanuel Antwi-Darkwa
Director of Power
Ministry of Energy
Republic of Ghana



Mr. Ernest Osei Prempeh
Acting Director
External Resource Mobilization (Bilateral) Division
Ministry of Finance and Economic Planning
Republic of Ghana



Mr. Stephen Akuoko
Managing Director
Electricity Company of Ghana
Republic of Ghana

ATTACHMENT

1. Objective

The objective of the Project is to realize rural electrification in and around West Akim District in Eastern Region and in and around Upper Denkyira District in Central Region by supplying and installing distribution network.

2. Project Site

The study areas are shown in Annex-1.

The study communities are listed in Annex-2.

The Project sites (project communities) will be confirmed within the study areas after the site survey.

3. Responsible and Implementing Organizations

(1) The Responsible and the Implementing organization is the Ministry of Energy (MOE).

(2) The Agency in charge of operation and maintenance of the distribution network to be provided under the Project is the Electricity Company of Ghana (ECG).

The organization charts of MOE and ECG are shown in Annex-3.

4. Components Requested by the Government of Ghana

After discussions with the Team, the following components were finally requested by the Ghanaian side;

(1) Supply and Installation of Distribution Lines in and around West Akim District in Eastern Region

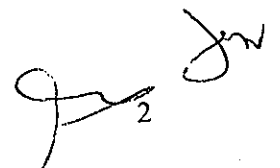
- Supply and Installation of 33/11kV Distribution Lines including 33kV/LV and 11kV/LV Substations
- Supply of LV Trunk Distribution Line Materials except service drop wires and credit meters

(2) Supply and Installation of Distribution Lines in and around Upper Denkyira District in Central Region

- Supply and Installation of 33/11kV Distribution Lines including 33kV/LV and 11kV/LV Substations
- Supply of LV Trunk Distribution Line Materials except service drop wires and credit meters

The outline of the Project Component is shown in Annex-4.

JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.



5. Japan's Grant Aid Scheme

- (1) The Ghanaian side understands the Japan's Grant Aid scheme and the necessary measures to be taken by the Government of Ghana explained by the Team as described in Annex-5 and Annex-6.
- (2) The Ghanaian side promised to take necessary measures as described in Annex-7, for smooth implementation of the Project as a condition for the Japan's Grant Aid to be implemented.

6. Schedule of the Study

- (1) The Team will proceed to further studies in Ghana until February 24, 2006.
- (2) JICA will prepare the Draft Basic Design Report in English and dispatch a team to Ghana in order to explain its contents around the beginning of June 2006.
- (3) When the contents of the Draft Basic Design Report are accepted in principle by the Government of Ghana, JICA will complete the final report in English around the end of July 2006 and send it to the Government of Ghana.

7. The JICA Guidelines for Environmental and Social Considerations

- (1) The Team explained the outline of the JICA Guidelines for Environmental and Social Considerations (hereinafter referred to as "the JICA Guidelines").
- (2) The Ghanaian side took the JICA Guidelines into consideration, and agreed to complete the necessary procedures, when deemed necessary.
- (3) The both sides confirmed that there is no need of involuntary resettlement for the implementation of the Project.
- (4) The Ghanaian side explained that they already obtained a basic agreement for implementation of the Project from the Environmental Protection Agency (hereinafter referred as "EPA") and had confirmed the concrete procedure in accordance with due process stipulated in the Environmental Assessment Regulations, 1999, Legislative Instrument 1652.
- (5) MOE shall obtain the Environmental Permit for the Project from EPA by the end of March 2006.

8. Other Relevant Issues

- (1) The Ghanaian side should submit answers in English to the Questionnaire, which the Team handed to the Ghanaian side, by February 10, 2006.
- (2) The Ghanaian side should provide necessary number(s) of counterpart personnel to the Team during the field survey.

- (3) The Ghanaian side shall make arrangements to allow the Team to bring back to Japan any necessary data, maps and materials related to the study, subject to approval by the relevant ministry, in order to prepare the reports.
- (4) The Ghanaian side should arrange the budget allocation for undertakings shown in Annex-7, and others described in this Minutes of Discussion, including procurement of materials such as service drop wires, watt-hour meters, etc. in conformity with the Project construction schedule. MOE shall supply and install all materials needed for service drops as in Annex-4.
- (5) The Ghanaian side explained to the Team that they secured the land necessary for construction of distribution network in the proposed project areas.
- (6) The Ghanaian side requested the Team to carry out the counterpart training to the MOE / ECG staff in Japan on operation and maintenance techniques as technical cooperation by JICA. The Ghanaian side agreed to submit the official request regarding training with concrete contents of training through the Embassy of Japan by the end of June 2006.
- (7) The Ghanaian side explained the status of the organizations concerned and the ownership of the property provided under the Project as follows;
 - MOE shall own the assets provided under the Project.
 - ECG shall be in charge of operation and maintenance of the distribution network provided under the Project.
 - The ownership of the properties provided under the Project belongs to MOE and shall not be transferred to private sector.
- (8) Both sides agreed that the information obtained through a series of discussions and field survey are confidential and should not be disclosed to any outside party in order to secure the fair and competitive tender in case the Project will be implemented.

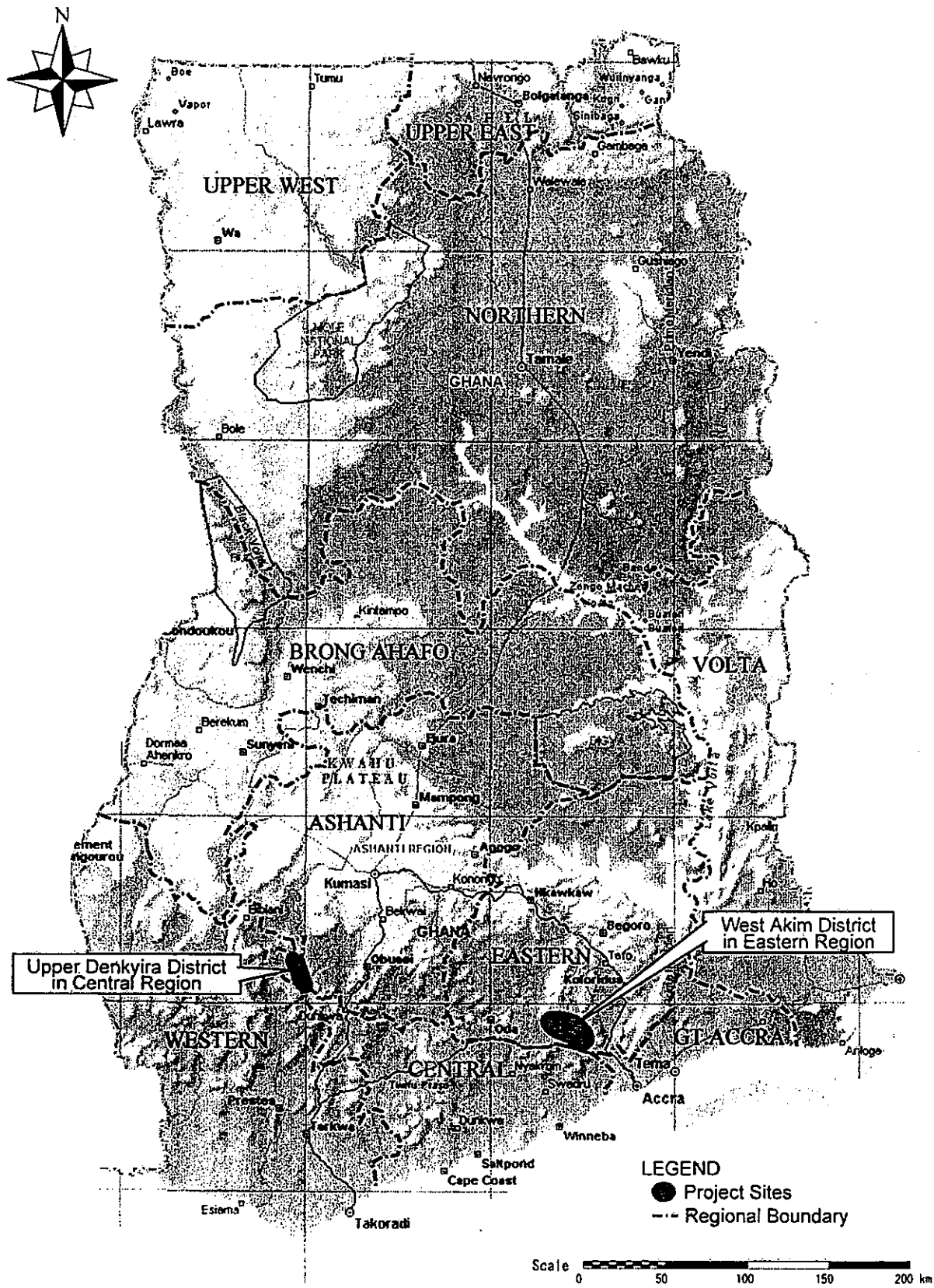
- Annex-1: Project Site Map
- Annex-2: Proposed Project Communities List
- Annex-3: (1) Organization Chart of MOE
(2) Organization Chart of ECG
- Annex-4: Outline of the Project Component
- Annex-5: Japan's Grant Aid Scheme
- Annex-6: Flow Chart of Japan's Grant Aid Procedures
- Annex-7: Major Undertakings to be taken by Each Government

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Project Site Map

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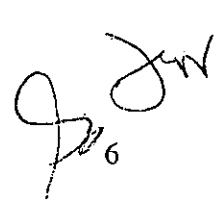
Proposed Project Communities List

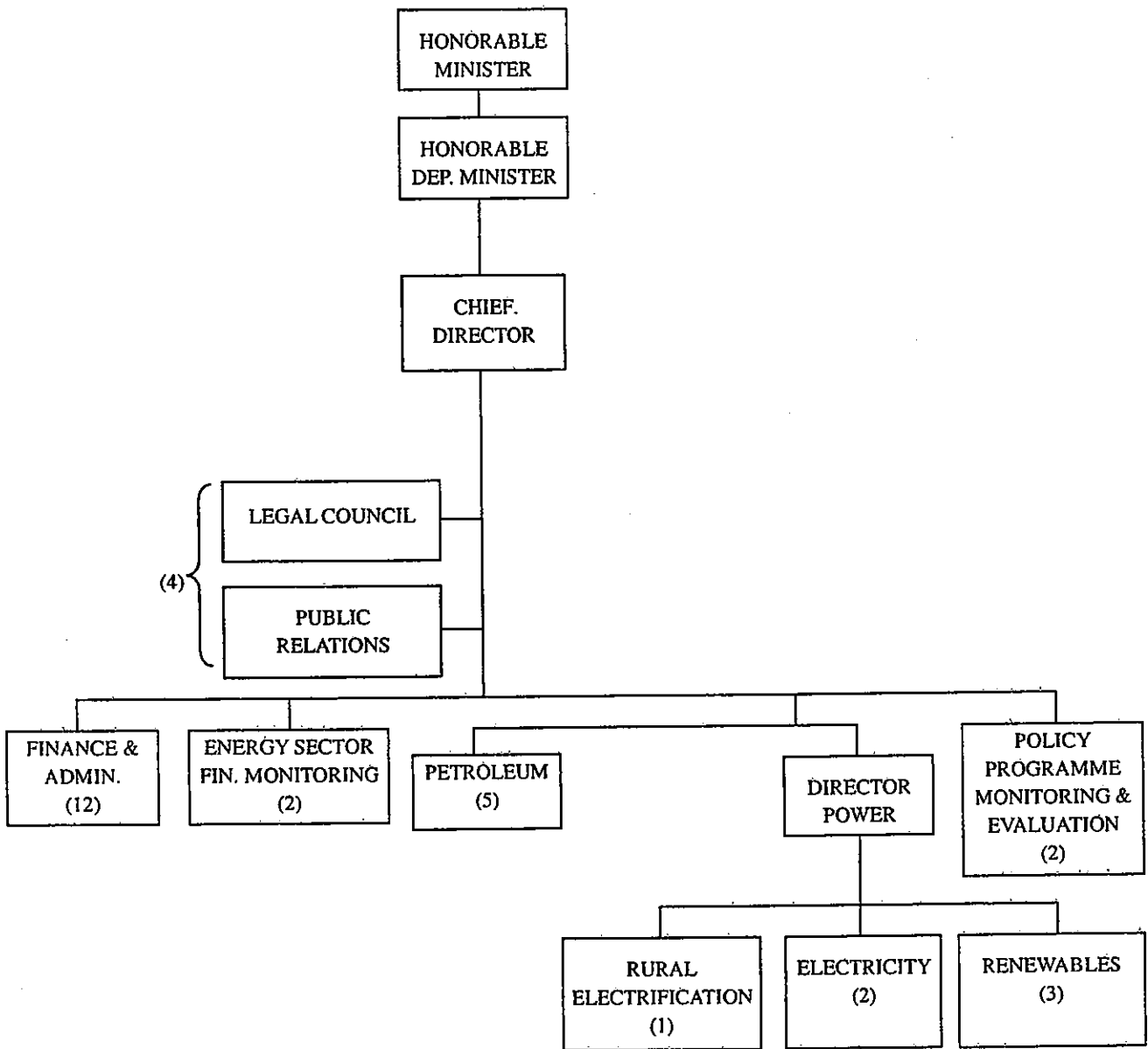
West Akim District in Eastern Region

1. Krodua
2. Akim Breman
3. Kwabaa
4. Nyanoa
5. Obinyimda
6. Abankrom
7. Kumikrom
8. Esaaso
9. Danso
10. Nkurankan
11. Nyakoma
12. Anomakojo
13. Asuofori
14. Akanteng
15. Krobiso
16. Afranse
17. Ammarko
18. Brekumaso
19. Owuram
20. Pobi
21. Anum Apapam
22. Mfranor
23. Kuano
24. Sowatey
25. Sukutu
26. Bunsu
27. Abuchenso
28. Krofokrom
29. Odjade
30. Akwadum
31. Takorase
32. Atokrom
33. Kofikyere

Upper Denkyira District in Central Region

1. Dominase
2. Nyinawusu/Anhwiaso
3. Subin
4. Afiefiso
5. Ameyaw
6. Akwaboso
7. Asaaman
8. Esienkyen
9. Dawusaso
10. Brofoyedru
11. Bremang
12. Nkröful
13. Ampabame/Beseasi
14. Anurawra
15. Abrua



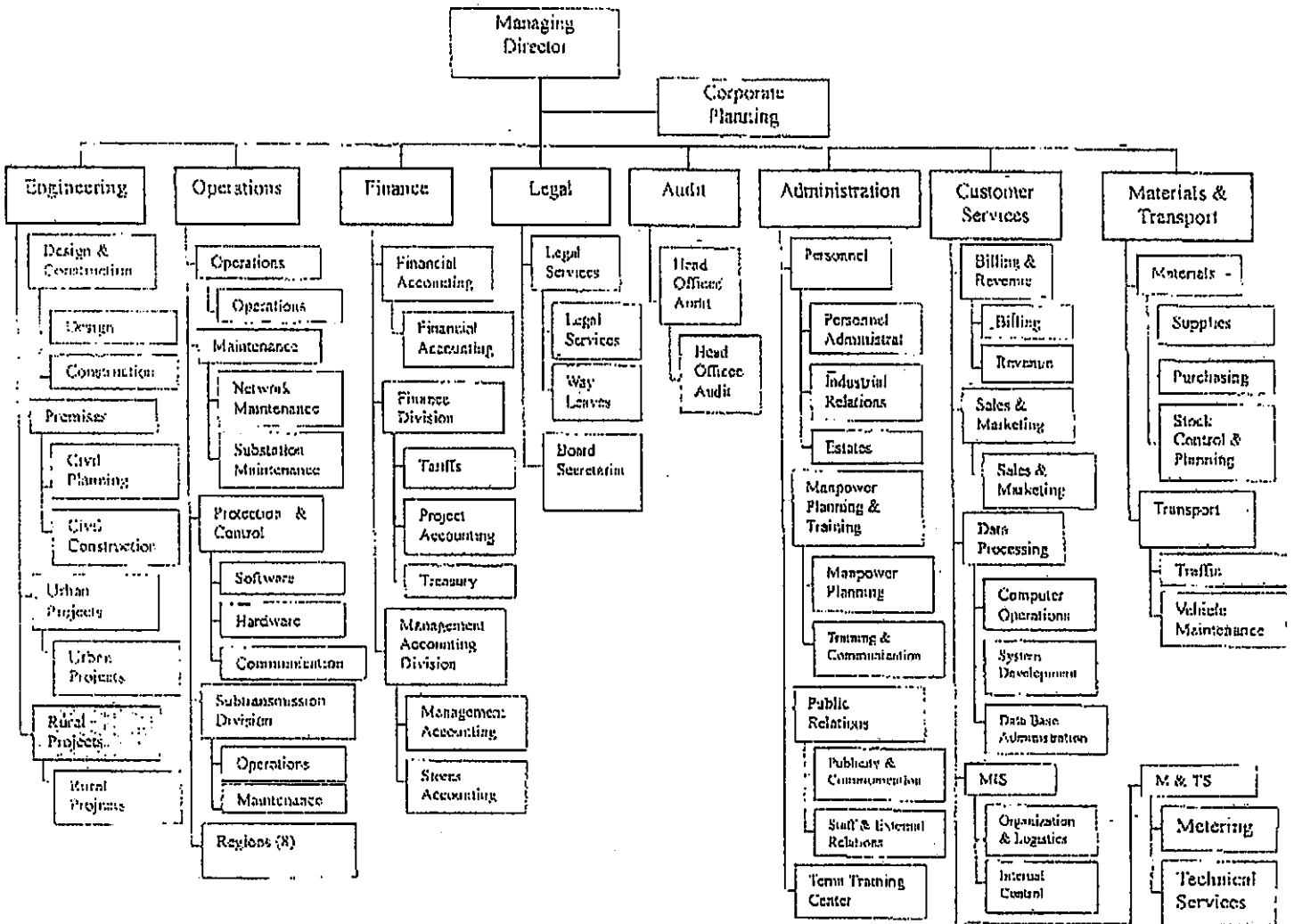


Organization Chart of MOE

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Organization Chart of ECG

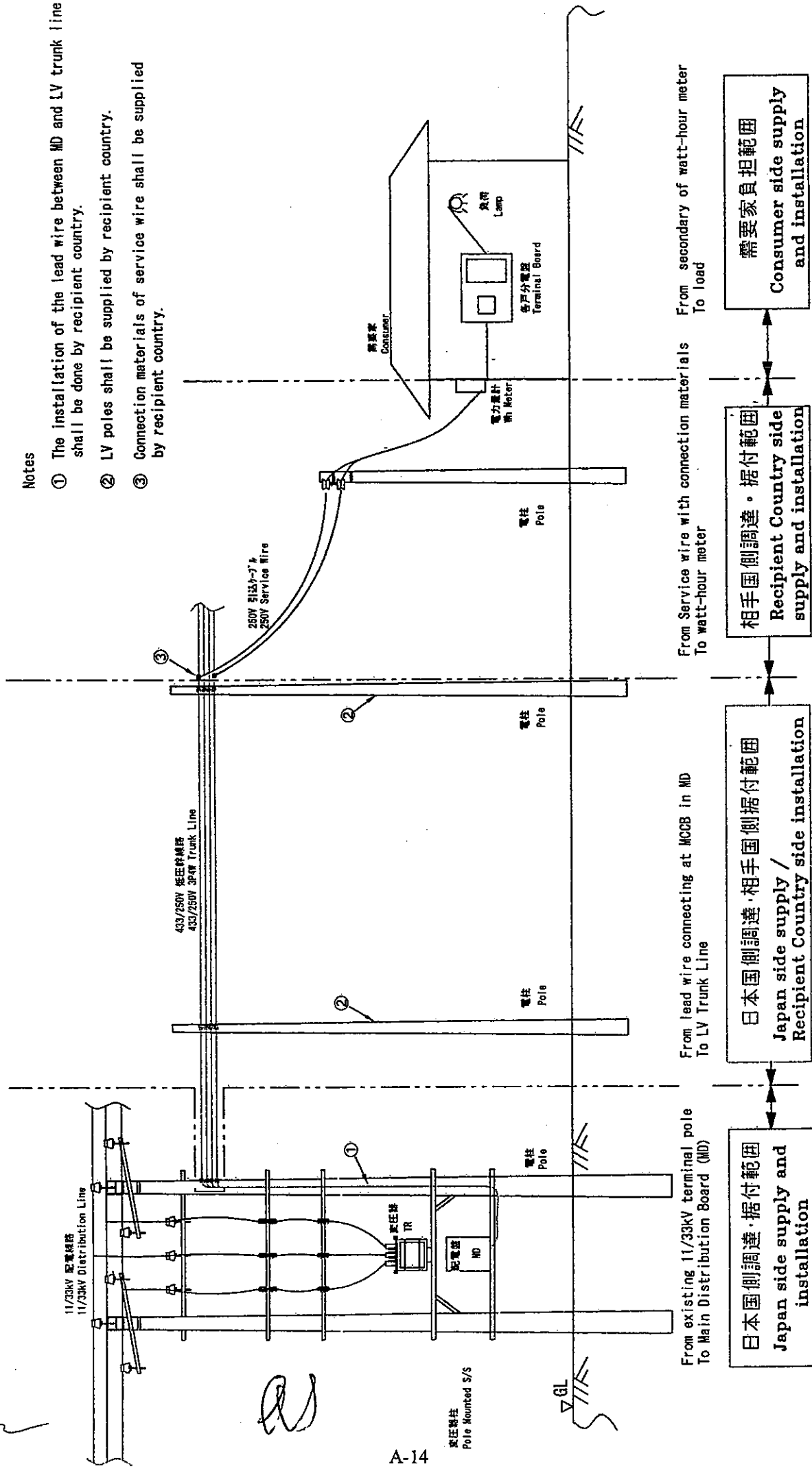
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Notes

- ① The installation of the lead wire between MD and LV trunk line shall be done by recipient country.
- ② LV poles shall be supplied by recipient country.
- ③ Connection materials of service wire shall be supplied by recipient country.



変圧器柱
Pole Mounted S/S

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JAPAN'S GRANT AID SCHEME

The Grant Aid Scheme provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

Japan's Grant Aid Scheme is executed through the following procedures.

Application	(Request made by the recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by the Cabinet)
Determination of	(The Note exchanged between the Governments of Japan and
Implementation	recipient country)

Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study) using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Scheme, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes (E/N) signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

(1) Contents of the study

The aim of the Basic Design Study (hereafter referred to as "the Study") conducted by JICA on a requested project (hereafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.

- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of a basic design of the Project.
- Estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA. The consultant firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency.

3. Japan's Grant Aid Scheme

(1) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

(2) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed. However, in case of delays in delivery, installation or construction due to unforeseen factors such as national disaster, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

(3) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, consulting, constructing and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(4) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(5) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as the following:

- a) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction,
- b) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,
- c) To secure buildings prior to the procurement in case the installation of the equipment,
- d) To ensure all the expenses and prompt excursion for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid,
- e) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts,
- f) To accord Japanese nationals, whose services may be required in connection with the supply of the products and services under the Verified contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(6) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(7) "Re-export"

The products purchased under the Grant Aid should not be re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

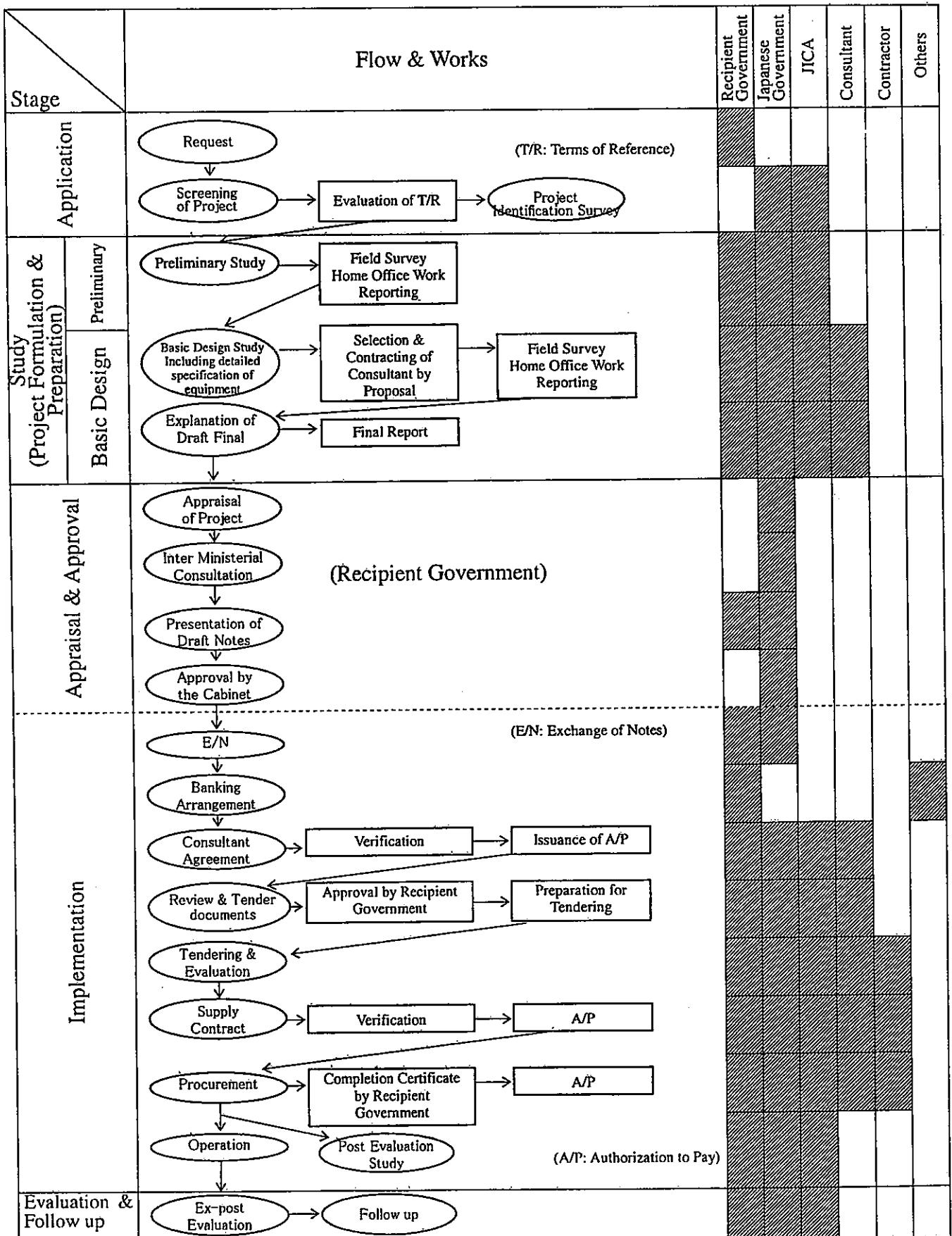
b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

 (End)

Flow Chart of Japan's Grant Aid Procedures



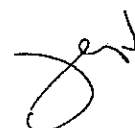
Note: This chart shows the procedures in case of the Basic Design Study will include preparation of detailed specification of equipment

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To bear the following commissions to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
4	To ensure smooth unloading and customs clearance at the port of disembarkation in the recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and customs clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project sites		●
5	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.		●
6	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts		●
7	To maintain and use properly and effectively the facilities constructed and the equipment provided under the Grant Aid		●
8	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the installation of the facilities as well as the transportation of the equipment		●

(B/A: Banking Arrangement, A/P: Authorization to Pay)





**Minutes of Discussions
of the Basic Design Study
on the Project for Rural Electrification
in the Republic of Ghana
(Explanation on the Draft Report)**

In January to February, 2006, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study Team on the Project for Rural Electrification (hereinafter referred to as "the Project") to the Republic of Ghana (hereinafter referred to as "Ghana"). JICA prepared a draft report of the study based on the discussion, field survey and technical examination in Japan.

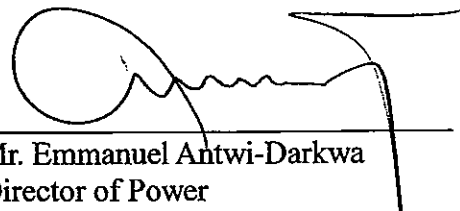
In order to explain and consult the Government of Ghana on the components of the draft report, JICA sent to Ghana the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is dispatched by the Grant Aid Management Department, JICA headquarters and is scheduled to stay in the country from June 2 to 9, 2006.

As a result of discussions between the Team and the Government of Ghana, both sides have confirmed the main items described in the attached sheets.

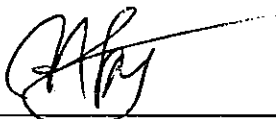
Accra, June 8, 2006

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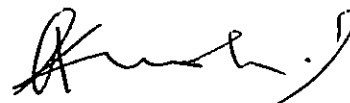
Mr. Hiroshi Murakami
Leader
Basic Design Study Team
Japan International Cooperation Agency



Mr. Emmanuel Antwi-Darkwa
Director of Power
Ministry of Energy
Republic of Ghana

for 

Mr. Ernest Osei Prempeh
Acting Director
External Resource Mobilization (Bilateral) Division
Ministry of Finance and Economic Planning
Republic of Ghana



Mr. Stephen Akuoko
Managing Director
Electricity Company of Ghana
Republic of Ghana

ATTACHMENT

1. Components of the Draft Report

The Ghanaian side agreed and accepted in principle the components of the Draft Report explained by the Team.

2. Japan's Grant Aid Scheme

The Ghanaian side reconfirmed the framework of the Japan's Grant Aid scheme and the implementation of necessary measures to be taken by the Ghanaian side as explained by the Team in February 2006 and described in the Annex-5 of the Minutes of Discussions signed by both sides on February 7, 2006.

3. Schedule of the Study

JICA will complete the Final Report by the end of July 2006 and send it to the Ghanaian side around August 2006.

4. Other Relevant Issues

(1) Both sides confirmed that the Ministry of Energy of Ghana already obtained the Environmental Permit for the Project from the Environmental Protection Agency, as shown in ANNEX-1, and that the content of the permission was acceptable.

(2) Both sides confirmed that the three villages (Abucheno, Anhwiaso, and Nyinawusu) have had their LV distribution plan prepared by Electricity Company of Ghana, and these villages should be included in the Project. Sukuntu should be excluded from the Project because the electrification there will not be sustainable due to its small population.

(3) Both sides re-confirmed that the Ghanaian side shall allocate necessary budget for the fiscal years of 2007 and 2008 for undertakings to be done in a timely manner, based on the provisional amount shown in page 39 and 40 of the Draft Report.

(4) Both sides confirmed that the Ghanaian side shall ensure the tax exemption including VAT according to the procurement schedule presented by the Team.

(5) Both sides confirmed major undertakings listed below are to be done by the Ghanaian side for the smooth implementation of the Project;

1) to clear bush, trees and obstacles along the 11/33kV distribution lines and LV distribution lines.

2) to install the LV trunk line equipment and materials supplied under the Grant Aid.

3) to procure and install wooden poles for LV distribution lines.

4) to procure and install service wiring to the consumers including energy meter.

5) to energize the 11 kV line between Mepom and Kwao-Baah by March 2007.

6) to energize the existing Nkwantanum switching station within year 2007.

(6) The Team explained that the Project would be divided into two phases as shown in the Draft Report. Both sides confirmed that the electrification in and around the West Akim District in Eastern Region would be done in the first phase, and the Upper Denkyira District in the Central Region in the second phase.

(7) Both sides agreed that this Draft Report handed to the Ghanaian side from the Team is confidential and should not be disclosed to any other parties in order to ensure the fair and competitive tender for the Project.

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662465 / 667524

Fax: 233 (021) 662690

Email: support@epaghana.org



Environmental Protection Agency

P.O. Box M 326
Ministries Post Office
Accra, Ghana

Permit No: CE0013950106

ENVIRONMENTAL PROTECTION AGENCY


ENVIRONMENTAL PERMIT
(ENVIRONMENTAL IMPACT ASSESSMENT)

This is to certify that

Authorisation has been given to **MINISTRY OF ENERGY**

to commence and pursue operations as per attached schedule

Date Issued: JUNE 2, 2006


.....
J. A. ALLOTEY
EXECUTIVE DIRECTOR

**NB: This permit is only valid with the Seal of the
Environmental Protection Agency.**







SCHEDULE TO THE ENVIRONMENTAL PERMIT

- 1.0 CONTACT : THE DIRECTOR (POWER)
- 2.0 PROPONENT : MINISTRY OF ENERGY
P. O. BOX T 40
STADIUM POST OFFICE
ACCRA
- 3.0 REGISTRATION NO. : CE1395/01/06
- 4.0 PERMIT NO. : CE0013950106

5.1 PEA OF RURAL ELECTRIFICATION PROJECT FOR WEST AKIM DISTRICT

In pursuance of the Environmental Protection Agency Act 1994, (Act 490) {Sections 2(i) and 12(1)} and the Environmental Assessment Regulations, LI 1652 of 1999 and, on the basis of the published project Preliminary Environmental Report (March 2006), this Environmental Permit is issued authorizing **Ministry of Energy** to commence work on the proposed Rural Electrification Project for the West Akim District in the Eastern Region of Ghana.

6.0 CONDITIONS OF PERMIT

6.1 Commitment to Project Specification

Comply with all project specifications, mitigation, monitoring and other environmental management provisions as indicated in the project Preliminary Environmental Report (PER) The project involves the:

- The supply and installation of 11kV sub-transmission and distribution lines spanning a length of 102km and covering thirty-two (32) beneficiary communities.
- The supply of Low Voltage materials including service drop wires and credit meters.

6.2 Location

- The project area has been categorised into five (5) sections namely:
 - Adeiso-Danso section
 - Mepom-Esaaso section
 - Asuokaw-Kofi Kyere section
 - Odjade-Asamankese-Sowatey section
 - Anomakojo-Osenase-Kobriso section

6.3 Acquisition and Protection of Right of Way

- A detailed survey of all Project Affected Persons (PAPS) and properties should be compiled and valued and the appropriate compensation paid by the West Akim District Assembly for their losses.
- Buildings, land and crops should be duly compensated for in accordance with the provisions of the law at the appropriate values in line with Land Valuation Board procedures.

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6.4 Traffic and Public Safety

- Trucks and machinery being sent to the sites should display appropriate road safety signals (red flags and flashing amber lights).
- Deliveries should be made during daylight hours and speeds limited to prescribed safe levels (10-20km/h) especially within towns and settlements.
- Speed limits should be imposed on the sensitive sections of roads through settlements as well as the use of speed ramps at those locations.
- Where stringing is expected to cross power lines, telephone lines, public roads etc. due notification should be given to the appropriate authorities.

6.5 Compliance with Factories, Offices and Shops Act.

- Comply with the requirements of the Factories, Offices and Shops Act, 1970, Act 328) consult with the Factories Inspectorate Department in order to satisfy the requirements of the Act and the Department.

6.6 Occupational Health and Public Safety Measures

Occupational health and safety measures should include among others:

- Environmental awareness training programmes to sensitise workers on the need to follow laid down procedures and the handling of equipment/machinery etc.
- Provision of appropriate personal protective clothing/gear such as helmets, climbing belts, wellington boots, hand gloves etc. to workers.
- Provision of a well-stocked first aid kit with all items prescribed by the Factories, Shops & Offices Act 328 for minor injuries that might occur in the course of construction.
- All potentially hazardous machinery should undergo statutory examination by a certified engineer.

6.7 Archaeology and Cultural Heritage

- Project construction should be made in such a way as to avoid, as much as possible the destruction of any cultural properties.
- Where cultural properties (e.g. cemeteries) are affected by the project construction, the necessary performance of pacification rites should be undertaken under an agreement with the local communities.
- Procedures for managing chance finds from archaeological discoveries should be in line with procedures of the National Museum Degree 1969 (NLCD 387).

6.8 Commencement and Completion Notice

- Notify EPA on the completion of the construction project (i.e before the electrification project commences operations).

6.9 Notification of Changes

- Notify EPA of any major changes in the planned development of the project contrary to the information provided in the PER.

6.10 Annual Environmental Report

- Submit Annual Environmental Report of the project's operations in accordance with Regulation 25 of LI 1652. The first report should be submitted by June 2, 2007.

6.11 Environmental Monitoring

- The following parameters should be monitored:

- Water quality of rivers and streams, where construction activities are carried out close to streams and rivers every month. During maintenance phase, monitoring should be carried out twice yearly. Parameters to be monitored include BOD, pH, Turbidity, TSS, Conductivity, Total Coliform.
- Transportation effects
- Occupational health & safety issues

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- Transmission lines
- Accidents
- Waste management
- Compensation payment and persons affected by the project
- Cultural/archaeological finds
- Submission of maintenance reports every month during the construction phase and yearly during operations

6.12 Environmental Management Plan

- Submit within eighteen (18) months on commencement of operations, an Environmental Management Plan on the project in accordance with Regulation 24 of LI 1652.

6.13 Environmental Certificate

- An Environmental Certificate must be obtained within 24 months (before June 2, 2008) of satisfactory performance and compliance with relevant permit conditions, in accordance with Regulation 22 of LI 1652.

6.14 Other Permits

- Notwithstanding this permit, the project is further subject to other relevant regulations and permits pertaining to the sector and must be observed.

6.15 Validity Period

- The permit shall be valid for a period of 18 months effective from the date of issue of this permit
- Failure to commence operations within the 18 months shall render the permit invalid after the period

Failure to comply with or observe all the permit conditions above would render the Environmental Permit invalid.

EXECUTIVE DIRECTOR.

.....
J. A. ALLOTEY

June 2, 2006
DATE ISSUED

NOTIFICATION

The Hon. Minister, Ministry of Local Government, Rural Development & Environment, Accra
The Hon. Minister, Ministry of Energy, Accra
The Executive Secretary, Energy Commission, Accra
The District Chief Executive, West Akim District Assembly, Asamankese
The Director, EPA Eastern Region, Koforidua

Mydoc: Greater Accra

Tel: (021) 664697 / 664698,
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Fax: 233 (021) 662690

Email: support@epaghana.org



Environmental Protection Agency

P.O. Box M 326
Ministries Post Office
Accra, Ghana

Permit No: CE0013940106

ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL PERMIT

(ENVIRONMENTAL IMPACT ASSESSMENT)

This is to certify that

Authorisation has been given to **MINISTRY OF ENERGY**

to commence and pursue operations as per attached schedule

Date Issued: JUNE 2, 2006


.....
J. A. ALLOTAY
EXECUTIVE DIRECTOR

**NB: This permit is only valid with the Seal of the
Environmental Protection Agency.**

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Tel: (021) 664697 / 664698,
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Fax: 233 (021) 662690



Environmental Protection Agency

P.O. Box M 326
Ministries Post Office
Accra, Ghana

Email: support@epaghana.org

SCHEDULE TO THE ENVIRONMENTAL PERMIT

- 1.0 CONTACT : THE DIRECTOR (POWER)
- 2.0 PROPONENT : MINISTRY OF ENERGY
P. O. BOX T 40
STADIUM POST OFFICE
ACCRA
- 3.0 REGISTRATION NO. : CE1394/01/06
- 4.0 PERMIT NO. : CE0013940106
- 5.0 PEA OF RURAL ELECTRIFICATION PROJECT FOR UPPER DENKYIRA DISTRICT

In pursuance of the Environmental Protection Agency Act 1994, (Act 490) (Sections 2(i) and 12(1)) and the Environmental Assessment Regulations, LI 1652 of 1999 and, on the basis of the published project Preliminary Environmental Report (March 2006), this Environmental Permit is issued authorizing **Ministry of Energy** to commence work on the proposed Rural Electrification Project for the Upper Denkyira District in the Central Region of Ghana.

6.0 CONDITIONS OF PERMIT

6.1 Commitment to Project Specification

Comply with all project specifications, mitigation, monitoring and other environmental management provisions as indicated in the project Preliminary Environmental Report (PER) The project involves the:

- Design, delivery to site of equipment, erection, testing and commissioning of 33kV transmission and 11kV distribution lines spanning a length of 65km and covering sixteen (16) beneficiary communities.

6.2 Location

- The project area spans across sixteen (16) communities namely; Brofoyedru, Bremang, Dominase, Abora, Awiawa, Besease, Nkroful, Treposo, Esienkyem, Asaaman, Akwaboso, Afiefiso, Ameyaw, Subin, Anhwiaso and Nyinawusu in the Upper Denkyira District of the Central Region.

6.3 Acquisition and Protection of Right of Way

- A detailed survey of all Project Affected Persons (PAPS) and properties should be compiled and valued and the appropriate compensation paid by the Upper Denkyira District Assembly for their losses.
- Buildings, land and crops should be duly compensated for in accordance with the provisions of the law at the appropriate values in line with Land Valuation Board procedures.

6.4 Traffic and Public Safety

- Trucks and machinery being sent to the sites should display appropriate road safety signals (red flags and flashing amber lights).

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- Deliveries should be made during daylight hours and speeds limited to prescribed safe levels (10-20km/h) especially within towns and settlements.
- Speed limits should be imposed on the sensitive sections of roads through settlements as well as the use of speed ramps at those locations.
- Where stringing is expected to cross power lines, telephone lines, public roads etc. due notification should be given to the appropriate authorities.

6.5 Compliance with Factories, Offices and Shops Act.

- Comply with the requirements of the Factories, Offices and Shops Act, 1970, Act 328) consult with the Factories Inspectorate Department in order to satisfy the requirements of the Act and the Department.

6.6 Occupational Health and Public Safety Measures

Occupational health and safety measures should include among others:

- Environmental awareness training programmes to sensitise workers on the need to follow laid down procedures and the handling of equipment/machinery etc.
- Provision of appropriate personal protective clothing/gear such as helmets, climbing belts, wellington boots, hand gloves etc. to workers.
- Provision of a well-stocked first aid kit with all items prescribed by the Factories, Shops & Offices Act 328 for minor injuries that might occur in the course of construction.
- All potentially hazardous machinery should undergo statutory examination by a certified engineer.

6.7 Archaeology and Cultural Heritage

- Project construction should be made in such a way as to avoid, as much as possible the destruction of any cultural properties.
- Where cultural properties (e.g. cemeteries) are affected by the project construction, the necessary performance of pacification rites should be undertaken under an agreement with the local communities.
- Procedures for managing chance finds from archaeological discoveries should be in line with procedures of the National Museum Degree 1969 (NLCD 387).

6.8 Commencement and Completion Notice

- Notify EPA on the completion of the construction project (i.e before the electrification project commences operations).

6.9 Notification of Changes

- Notify EPA of any major changes in the planned development of the project contrary to the information provided in the PER.

6.10 Annual Environmental Report

- Submit Annual Environmental Report of the project's operations in accordance with Regulation 25 of LI 1652. The first report should be submitted by June 2, 2007.

6.11 Environmental Monitoring

- A monitoring programme should be put in place to deal with the following:
 - Water quality of rivers and streams (where construction activities are carried out close to streams and rivers) every month. Parameters to be monitored include BOD, pH, Turbidity, TSS, Conductivity, Total Coliform.
 - Transportation effects
 - Occupational health & safety issues
 - Transmission lines
 - Accidents
 - Waste management
 - Compensation payment and persons affected by the project
 - Cultural/archaeological finds

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- Submission of maintenance reports every month during the construction phase and yearly during operations

6.12 Environmental Management Plan

- Submit within eighteen (18) months on commencement of operations, an Environmental Management Plan on the project in accordance with Regulation 24 of LI 1652.

6.13 Environmental Certificate

- An Environmental Certificate must be obtained within 24 months (before June 2, 2008) of satisfactory performance and compliance with relevant permit conditions, in accordance with Regulation 22 of LI 1652.

6.14 Other Permits

- Notwithstanding this permit, the project is further subject to other relevant regulations and permits pertaining to the sector and must be observed.

6.15 Validity Period

- The permit shall be valid for a period of 18 months effective from the date of issue of this permit.
- Failure to commence operations within the 18 months shall render the permit invalid after the period.

Failure to comply with or observe all the permit conditions above would render the Environmental Permit invalid.

EXECUTIVE DIRECTOR

.....
J. A. ALLOTEY

June 2, 2006
DATE ISSUED

NOTIFICATION

The Hon. Minister, Ministry of Local Government, Rural Development & Environment, Accra
The Hon. Minister, Ministry of Energy, Accra
The Executive Secretary, Energy Commission, Accra
The District Chief Executive, Upper Denkyira District Assembly, Dunkwa-On-Offin
The Ag. Director, EPA Central Region, Cape Coast
The Deputy Director, Built Environment Department, EPA, Accra

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5. BASIC DESIGN DRAWINGS

List of Basic Design Drawing

DWG No.	Title
---------	-------

1. Overall Drawings

(1) West Akim Area

- 1) DL-WA01 Route Map (West Akim of Eastern) [Front Page]
- 2) DL-WA02 11 kV Distribution System (West Akim of Eastern)

(2) Upper Denkyira Area

- 1) DL-UD01 Route Map (Upper Denkyira of Central) [Front Page]
- 2) DL-UD02 33 and 11 kV Distribution System (Upper Denkyira of Central)

(3) Others

- 1) G-02 Outline of the Project Component
- 2) SLD-1 Single Line Diagram for Distribution Transformer
- 3) SLD-2 Single Line Diagram for Auto Recloser

2. Typical Pole Arrangement for 11/33kV Distribution Lines

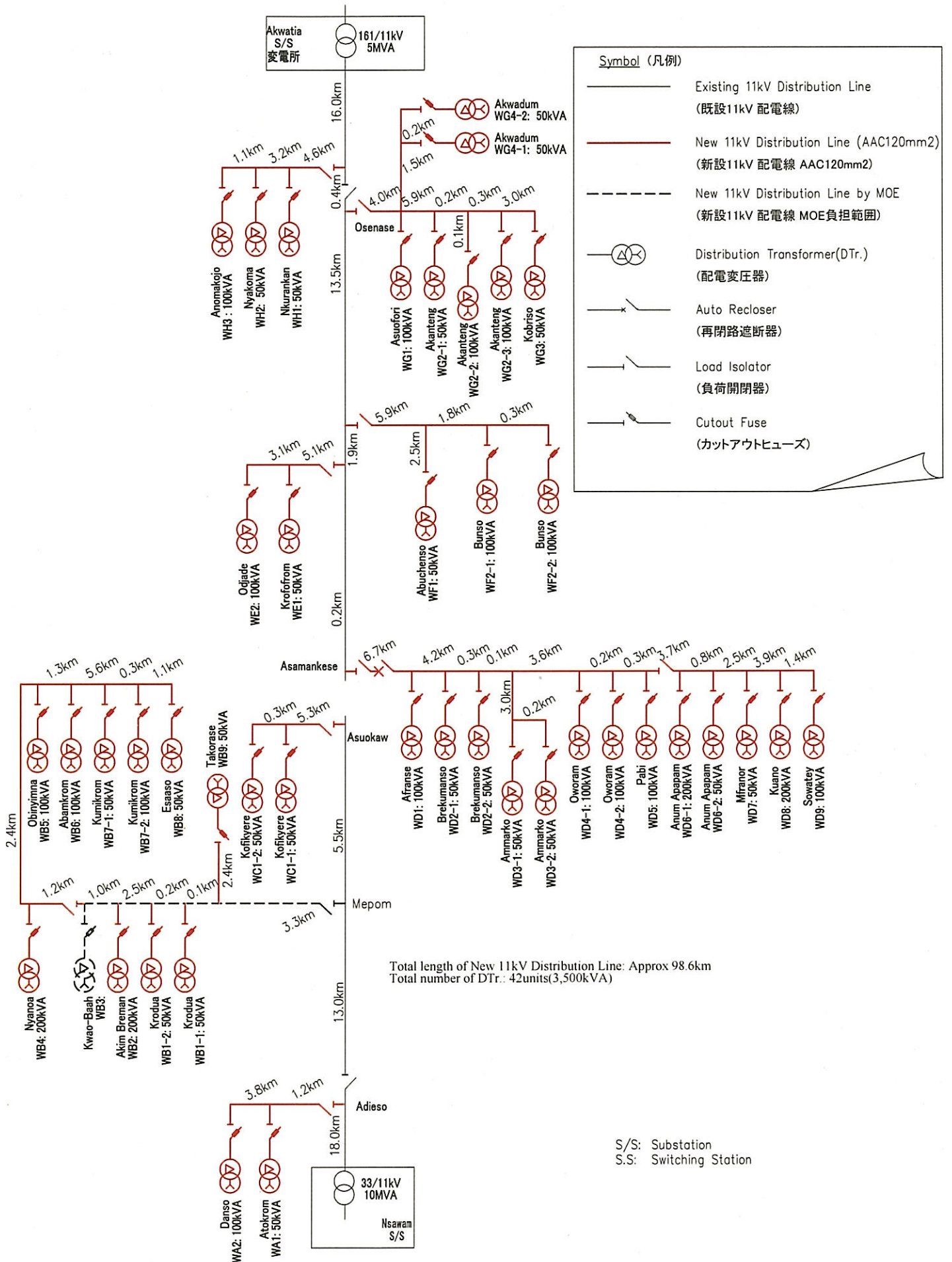
- (1) TPA-A: 11/33kV Intermediate Pole (Line Angle 0-5deg.) [Type 1A/3A]
- (2) TPA-B: 11/33kV Light Angle Pole (Line Angle 5-20deg.) [Type 1B/3B]
- (3) TPA-C: 11/33kV Medium Angle Pole (Line Angle 20-60deg.) [Type 1C/3C]
- (4) TPA-D: 11/33kV Heavy Angle Pole (Line Angle 60-90deg.) [Type 1D/3D]
- (5) TPA-E: 11/33kV Cross Pole (Line Angle 90deg.) [Type 1E/3E]
- (6) TPA-F: 11/33kV Section Pole [Type 1F/3F]
- (7) TPA-G: 11/33kV T-off Pole [Type 1G/3G]
- (8) TPA-H: 11/33kV Terminal Pole [Type 1H/3H]
- (9) TPA-J: 11/33kV Load Isolator Pole [Type 1J/3J]
- (10) TPA-K: 11/33kV Intermediate Transformer Pole [Type 1K/3K]
- (11) TPA-M: 11/33kV Dead End Transformer Pole [Type 1M/3M]
- (12) TPA-N: 11/33kV Auto Recloser Pole [Type 1N/3N]
- (13) TPA-Z: Material Composition of Assembly Parts

3. Typical Pole Arrangement for LV Distribution Line

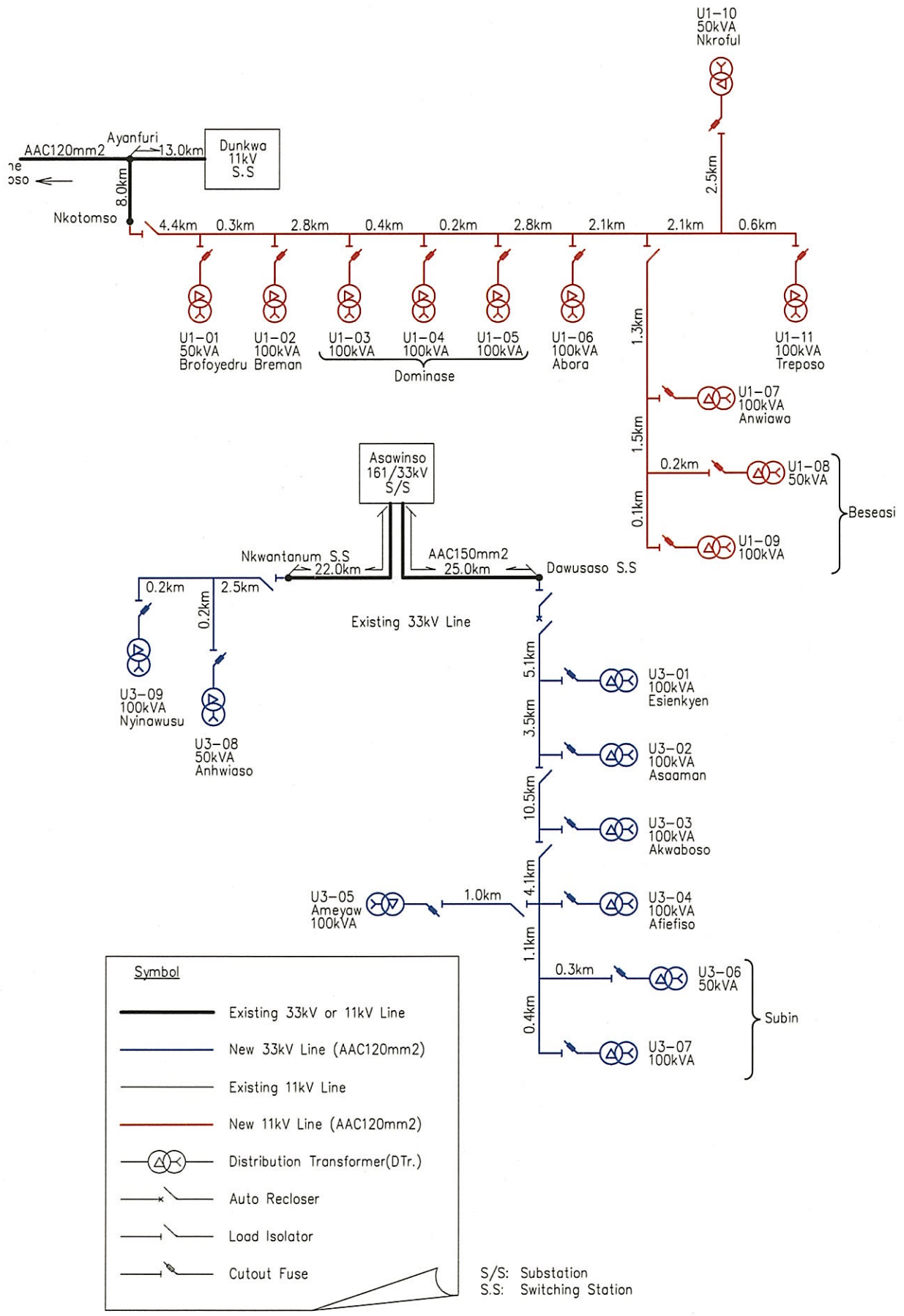
- (1) TPA-LA: LV Intermediate Pole
- (2) TPA-LB: LV Section Pole
- (3) TPA-LC: LV T-off Pole
- (4) TPA-LD: LV Right Angle Pole
- (5) TPA-LE: LV Cross Pole
- (6) TPA-LF: LV Terminal Pole

4. Connection Point Diagram

- (1) TPA-X Typical Connection Plan to the Existing Line (Cross Type)
- (2) TPA-Y Typical Connection Plan to the Existing Line (Extension Type)
- (3) UD-1: 33kV Connection Plan at Dawusaso Switching Station
- (4) UD-2: 33kV Connection Plan at Nkwantanum Switching Station



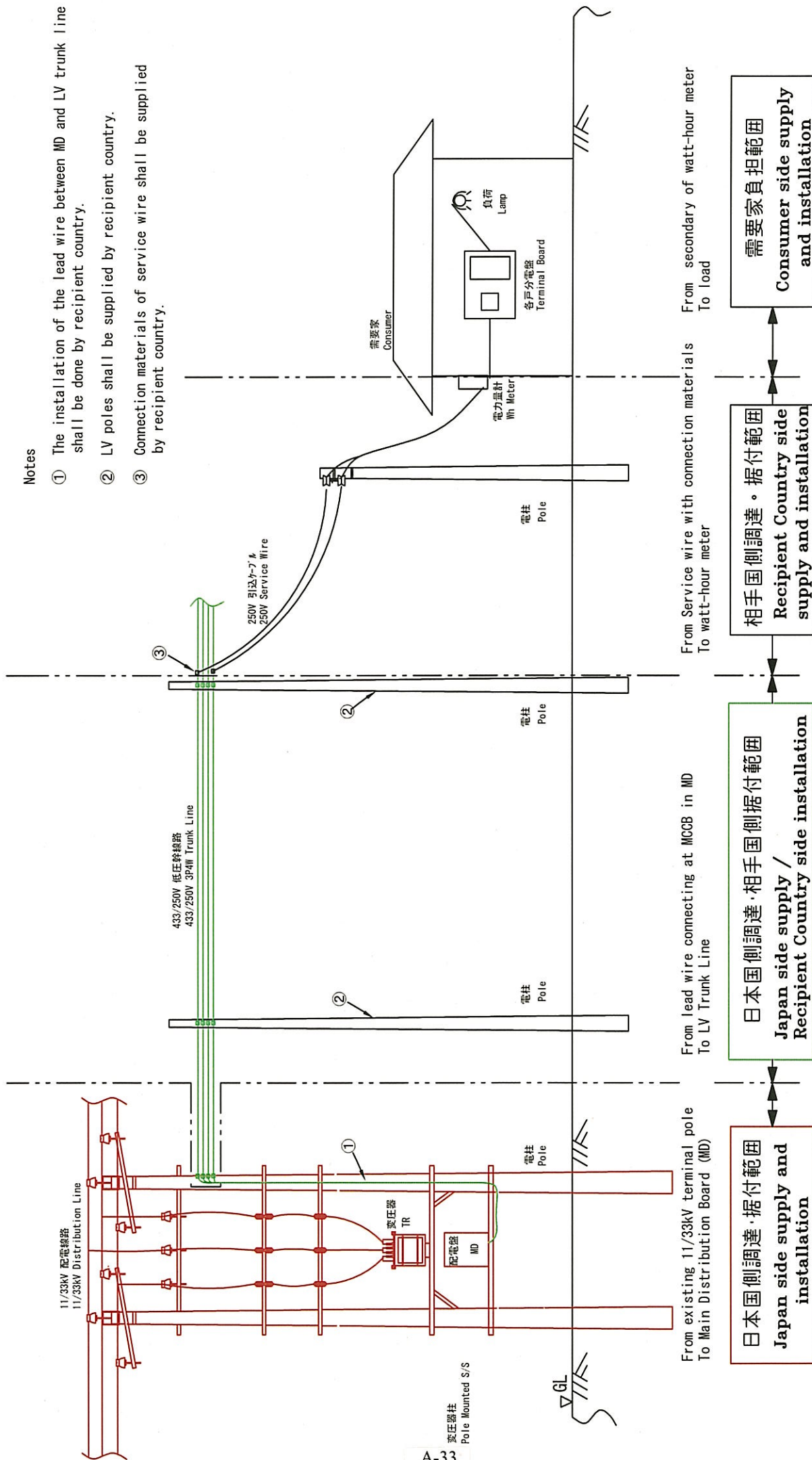
DL-WA02: 11kV Distribution System [West Akim Area]
 11kV 配電系統図 [西アキム地区]

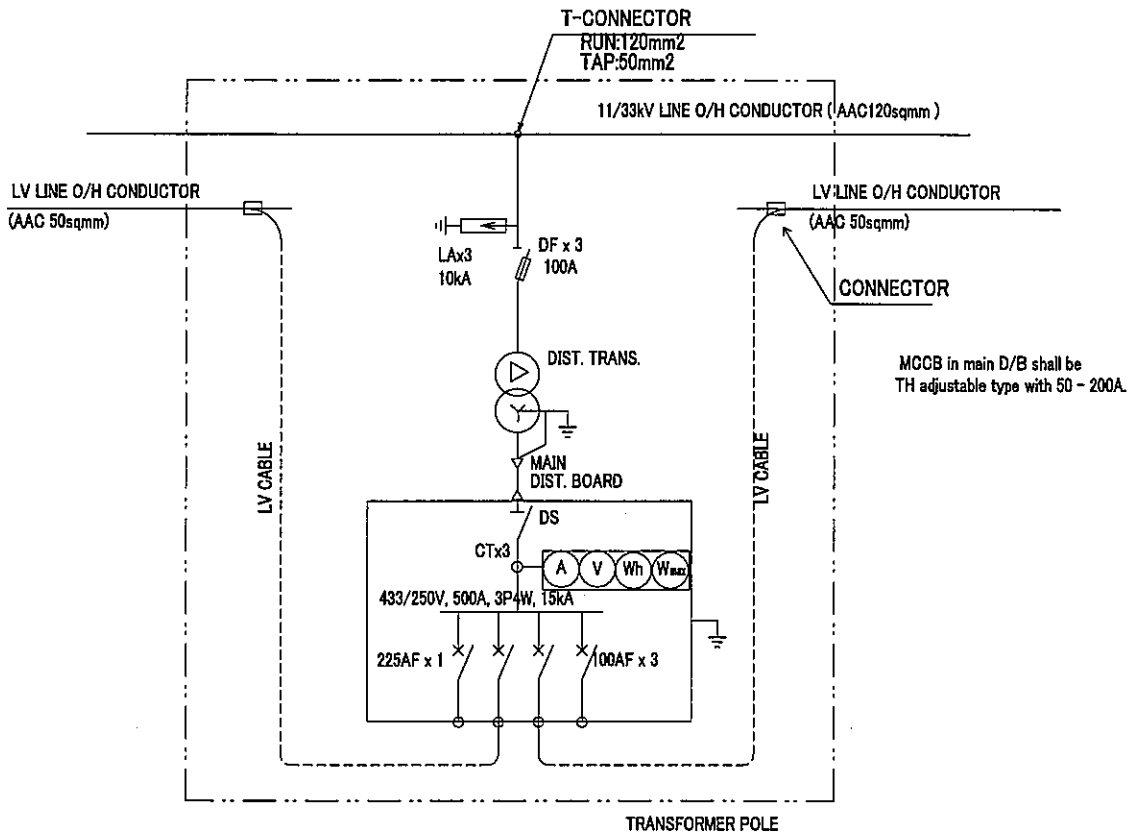


DL-UD02: 33kV and 11kV Distribution System [Upper Denkyira Area]
 33kV 及び 11kV 配電系統図 [アッパーデンチラ地区]

Notes

- ① The installation of the lead wire between MD and LV trunk line shall be done by recipient country.
- ② LV poles shall be supplied by recipient country.
- ③ Connection materials of service wire shall be supplied by recipient country.

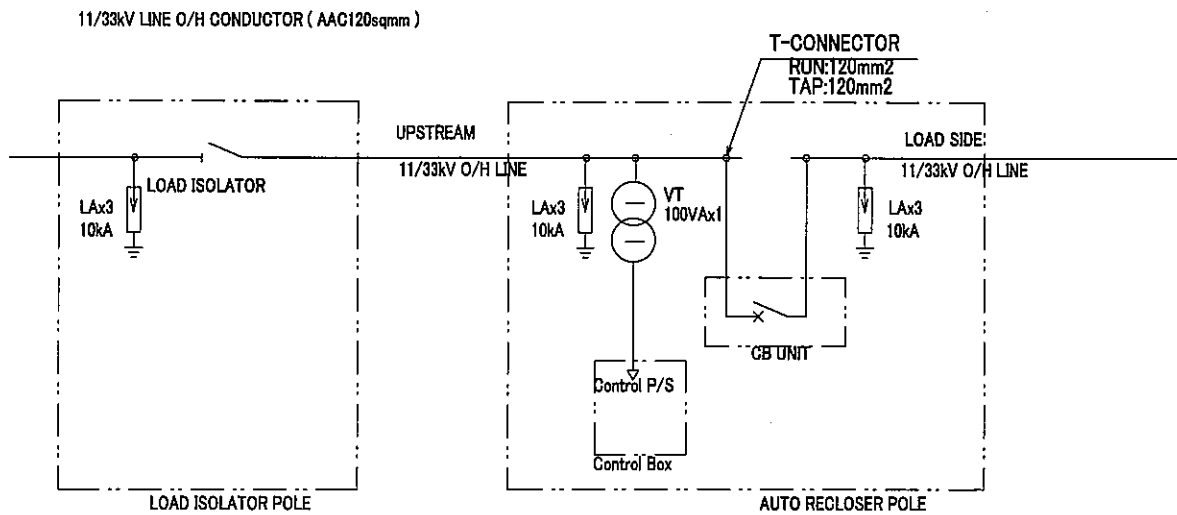




Dwg.No.SLD-1

配電変圧器柱単線図

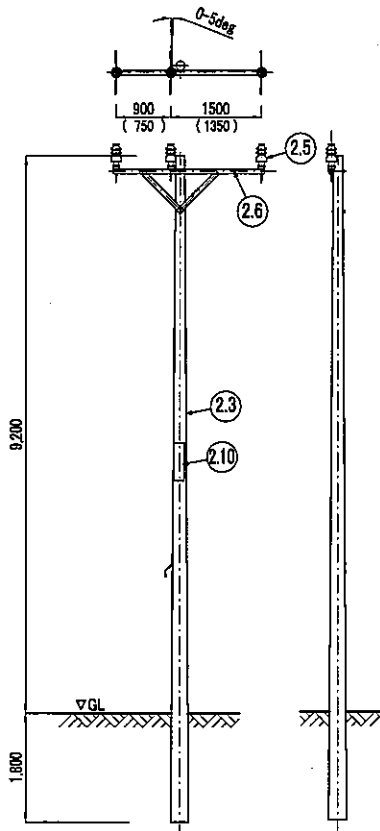
Single Line Diagram for Distribution Transformer System



Dwg.No.SLD-2

自動再閉路装置単線図

Single Line Diagram for Auto Recloser System

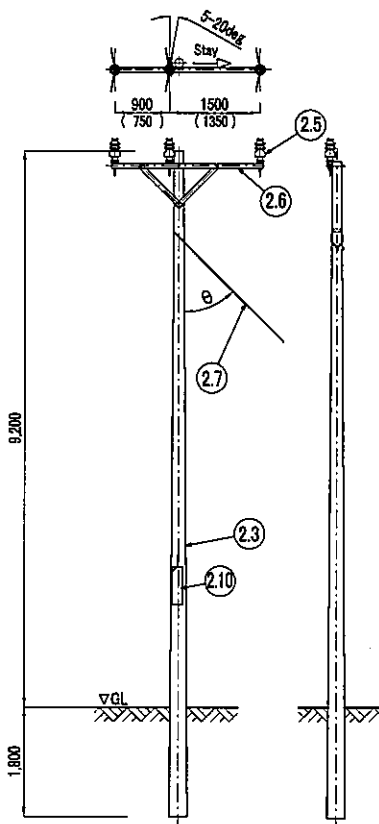


P/NO.	DESCRIPTION		Q'TY
1.1	Distribution Transformer (DTr)	配電用変圧器	0
1.2	Auto Recloser	自動再閉路装置	0
1.3	Load Isolator	負荷開閉器	0
1.4	Cutout Switch with Fuse	ヒューズ付きカットアウトスイッチ	0
1.5	Lightning Arrester	避雷器	0
1.6	Main Distribution Board(MDB)	主分電盤	0
2.1	Conductor (m)	電線 (m)	0
2.2	Connector	コネクター	0
2.3	Steel Pole (11m)	鋼管柱 (11m)	1
2.4	Strain Insulator Set	耐張碍子セット	0
2.5	Pin Insulator set	ピン碍子セット	3
2.6	Crossarm set	腕金セット	1
2.7	Stay Wire Set	支線セット	0
2.8	Earth Wire Set	接地線セット	0
2.9	LV Cabling Materials	低圧ケーブル材料	0
2.10	Plate set	プレートセット	1

Remarks : Pole Type "1A" is for 11kV and then type 3A is for 33kV.

Dwg.No.TPA-A

11/33kV 引通し柱(0度~5度)[型番1A/3A]
11/33kV Intermediate Pole (Line Angle 0-5deg.) [Type 1A/3A]

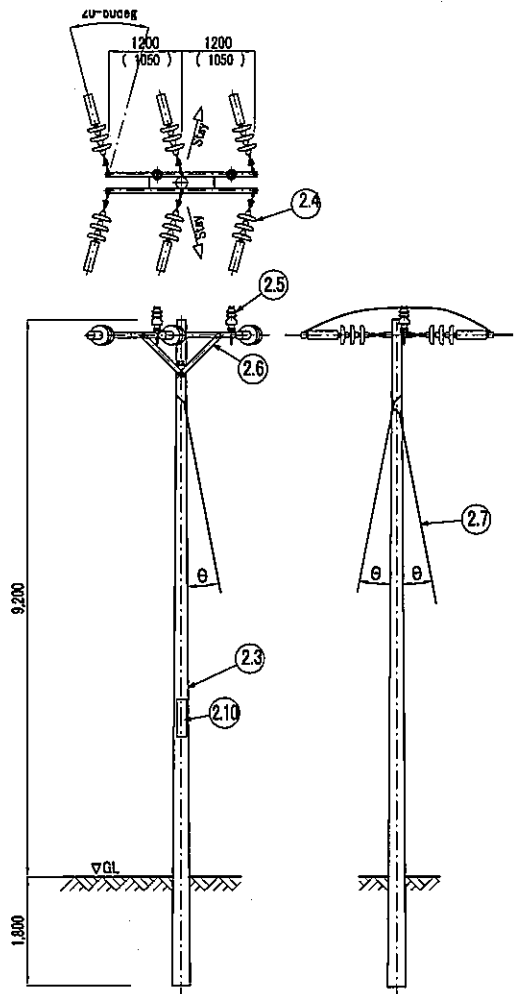


P/NO.	DESCRIPTION		Q'TY
1.1	Distribution Transformer (DTr)	配電用変圧器	0
1.2	Auto Recloser	自動再閉路装置	0
1.3	Load Isolator	負荷開閉器	0
1.4	Cutout Switch with Fuse	ヒューズ付きカットアウトスイッチ	0
1.5	Lightning Arrester	避雷器	0
1.6	Main Distribution Board(MDB)	主分電盤	0
2.1	Conductor (m)	電線 (m)	0
2.2	Connector	コネクター	0
2.3	Steel Pole (11m)	鋼管柱 (11m)	1
2.4	Strain Insulator Set	耐張碍子セット	0
2.5	Pin Insulator set	ピン碍子セット	3
2.6	Crossarm set	腕金セット	1
2.7	Stay Wire Set	支線セット	1
2.8	Earth Wire Set	接地線セット	0
2.9	LV Cabling Materials	低圧ケーブル材料	0
2.10	Plate set	プレートセット	1

Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$

Dwg.No.TPA-B

11/33kV 軽角度柱(5度~20度)[型番1B/3B]
11/33kV Light Angle Pole (Line Angle 5-20deg.) [Type 1B/3B]
A-35

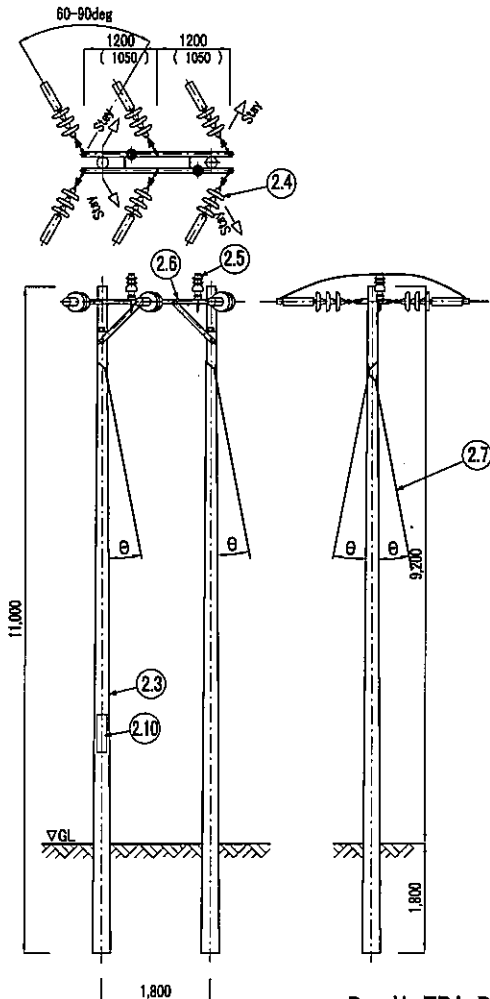


Dwg.No.TPA-C

P/NO.	DESCRIPTION	Q'TY
1.1	Distribution Transformer (DTr) 配電用変圧器	0
1.2	Auto Recloser 自動再閉路装置	0
1.3	Load Isolator 負荷開閉器	0
1.4	Cutout Switch with Fuse ヒューズ付きカットアウトスイッチ	0
1.5	Lightning Arrester 避雷器	0
1.6	Main Distribution Board(MDB) 主分電盤	0
2.1	Conductor (m) 電線 (m)	0
2.2	Connector コネクター	0
2.3	Steel Pole (11m) 鋼管柱 (11m)	1
2.4	Strain Insulator Set 耐張罫子セット	6
2.5	Pin Insulator set ピン罫子セット	2
2.6	Crossarm set 腕金セット	2
2.7	Stay Wire Set 支線セット	2
2.8	Earth Wire Set 接地線セット	0
2.9	LV Cabling Materials 低圧ケーブル材料	0
2.10	Plate set プレートセット	1

Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$

11/33kV 中角度柱(20度~60度)[型番 1C/3C]
11/33kV Medium Angle Pole (Line Angle 20-60deg.)(Type 1C/3C)

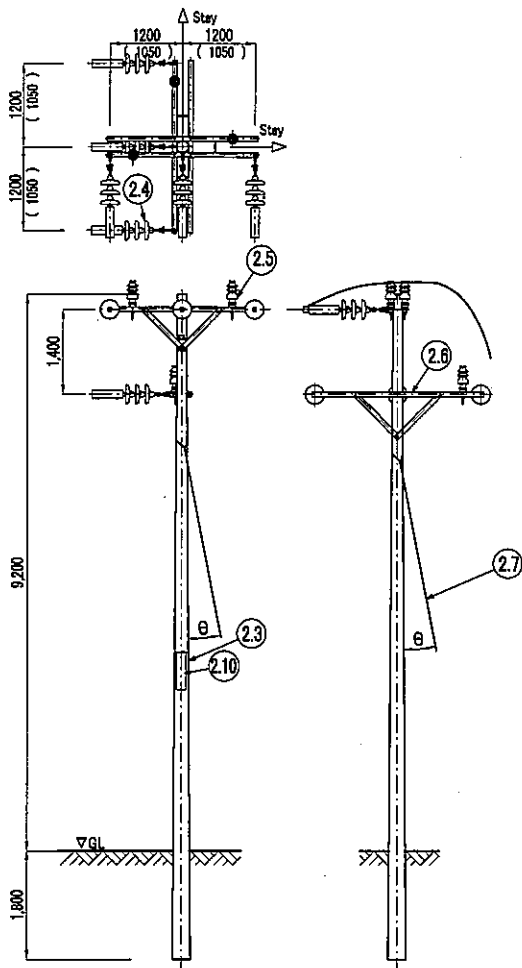


Dwg.No.TPA-D

P/NO.	DESCRIPTION	Q'TY
1.1	Distribution Transformer (DTr) 配電用変圧器	0
1.2	Auto Recloser 自動再閉路装置	0
1.3	Load Isolator 負荷開閉器	0
1.4	Cutout Switch with Fuse ヒューズ付きカットアウトスイッチ	0
1.5	Lightning Arrester 避雷器	0
1.6	Main Distribution Board(MDB) 主分電盤	0
2.1	Conductor (m) 電線 (m)	0
2.2	Connector コネクター	0
2.3	Steel Pole (11m) 鋼管柱 (11m)	2
2.4	Strain Insulator Set 耐張罫子セット	6
2.5	Pin Insulator set ピン罫子セット	2
2.6	Crossarm set 腕金セット	2
2.7	Stay Wire Set 支線セット	4
2.8	Earth Wire Set 接地線セット	0
2.9	LV Cabling Materials 低圧ケーブル材料	0
2.10	Plate set プレートセット	1

Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$

11/33kV 強角度柱(60度~90度未満)[型番 1D/3D]
11/33kV Heavy Angle Pole (Line Angle 60-90deg.)(Type 1D/3D)

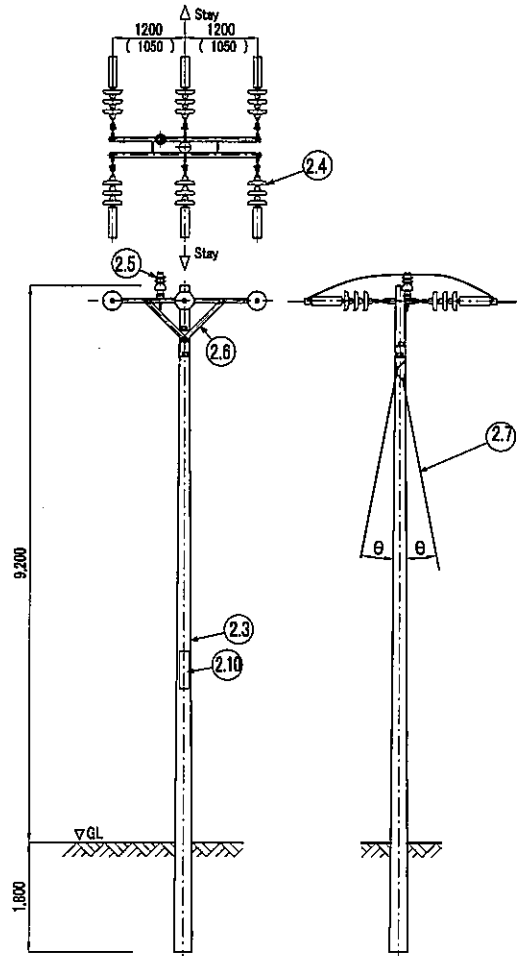


Dwg.No.TPA-E

P/NO.	DESCRIPTION	Q'TY	
1.1	Distribution Transformer (DTr)	配電用変圧器	0
1.2	Auto Recloser	自動再閉路装置	0
1.3	Load Isolator	負荷開閉器	0
1.4	Cutout Switch with Fuse	ヒューズ付きカットアウトスイッチ	0
1.5	Lightning Arrester	避雷器	0
1.6	Main Distribution Board(MDB)	主分電盤	0
2.1	Conductor (m)	電線 (m)	0
2.2	Connector	コネクター	0
2.3	Steel Pole (11m)	鋼管柱 (11m)	1
2.4	Strain Insulator Set	耐張罫子セット	6
2.5	Pin Insulator set	ピン罫子セット	3
2.6	Crossarm set	腕金セット	4
2.7	Stay Wire Set	支線セット	2
2.8	Earth Wire Set	接地線セット	0
2.9	LV Cabling Materials	低圧ケーブル材料	0
2.10	Plate set	プレートセット	1

Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$

11/33kV 直交柱(90度)[型番 1E/3E]
11/33kV Cross Pole (Line Angle 90deg.)(Type 1E/3E)

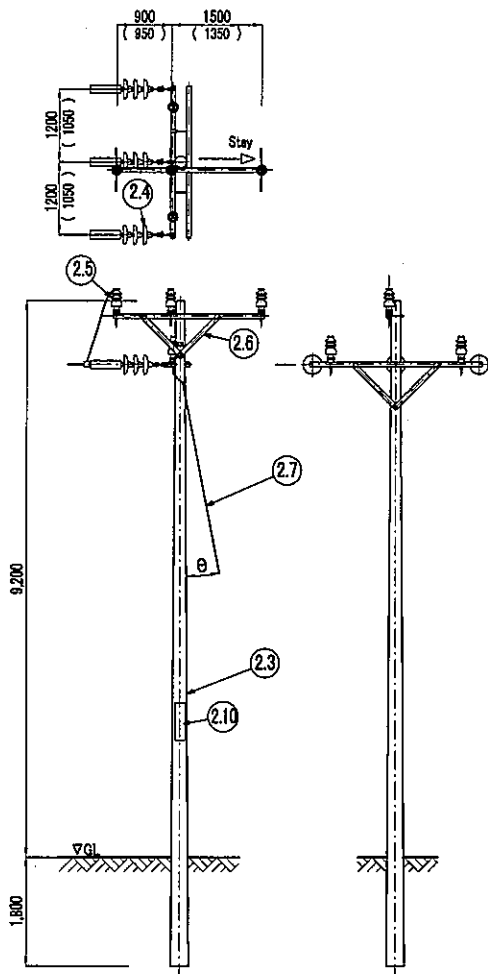


Dwg.No.TPA-F

P/NO.	DESCRIPTION	Q'TY	
1.1	Distribution Transformer (DTr)	配電用変圧器	0
1.2	Auto Recloser	自動再閉路装置	0
1.3	Load Isolator	負荷開閉器	0
1.4	Cutout Switch with Fuse	ヒューズ付きカットアウトスイッチ	0
1.5	Lightning Arrester	避雷器	0
1.6	Main Distribution Board(MDB)	主分電盤	0
2.1	Conductor (m)	電線 (m)	0
2.2	Connector	コネクター	0
2.3	Steel Pole (11m)	鋼管柱 (11m)	1
2.4	Strain Insulator Set	耐張罫子セット	6
2.5	Pin Insulator set	ピン罫子セット	1
2.6	Crossarm set	腕金セット	2
2.7	Stay Wire Set	支線セット	2
2.8	Earth Wire Set	接地線セット	0
2.9	LV Cabling Materials	低圧ケーブル材料	0
2.10	Plate set	プレートセット	1

Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$

11/33kV 両引留め柱[型番 1F/3F]
11/33kV Section Pole[Type 1F/3F]

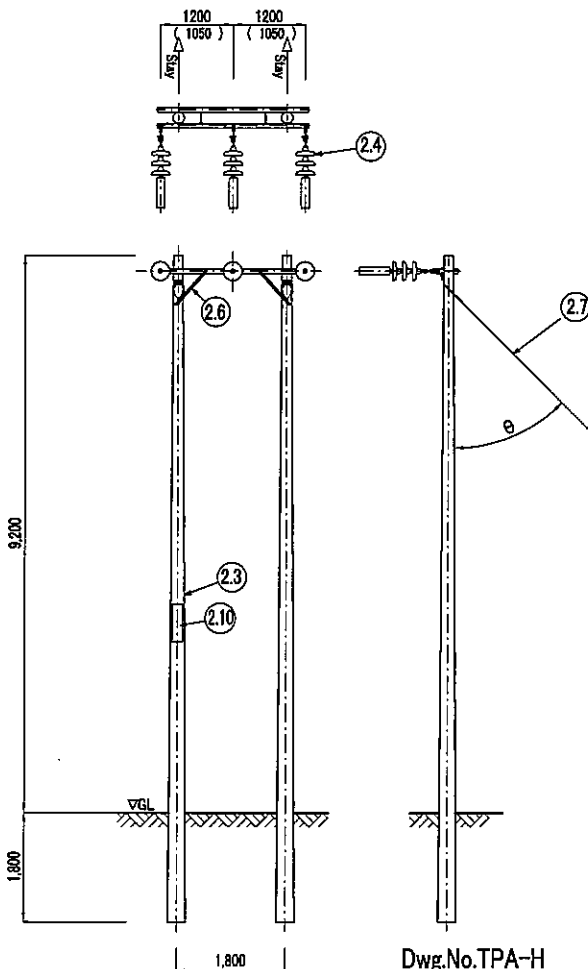


Dwg.No.TPA-G

P/NO.	DESCRIPTION	Q'TY	
1.1	Distribution Transformer (DTr)	配電用変圧器	0
1.2	Auto Recloser	自動再閉路装置	0
1.3	Load Isolator	負荷開閉器	0
1.4	Cutout Switch with Fuse	ヒューズ付きカットアウトスイッチ	0
1.5	Lightning Arrester	避雷器	0
1.6	Main Distribution Board(MDB)	主分電盤	0
2.1	Conductor (m)	電線 (m)	0
2.2	Connector	コネクター	0
2.3	Steel Pole (11m)	鋼管柱 (11m)	1
2.4	Strain Insulator Set	耐張碍子セット	3
2.5	Pin Insulator set	ピン碍子セット	5
2.6	Crossarm set	腕金セット	3
2.7	Stay Wire Set	支線セット	1
2.8	Earth Wire Set	接地線セット	0
2.9	LV Cabling Materials	低圧ケーブル材料	0
2.10	Plate set	プレートセット	1

Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$

11/33kV 分岐柱[型番 1G/3G]
11/33kV T-off Pole[Type 1G/3G]

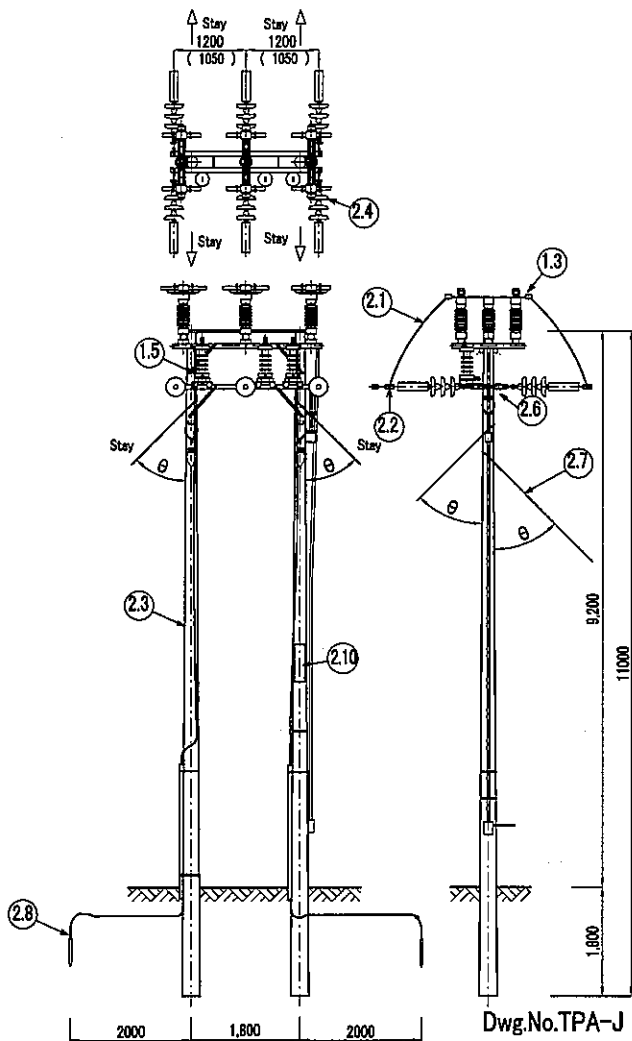


Dwg.No.TPA-H

P/NO.	DESCRIPTION	Q'TY	
1.1	Distribution Transformer (DTr)	配電用変圧器	0
1.2	Auto Recloser	自動再閉路装置	0
1.3	Load Isolator	負荷開閉器	0
1.4	Cutout Switch with Fuse	ヒューズ付きカットアウトスイッチ	0
1.5	Lightning Arrester	避雷器	0
1.6	Main Distribution Board(MDB)	主分電盤	0
2.1	Conductor (m)	電線 (m)	0
2.2	Connector	コネクター	0
2.3	Steel Pole (11m)	鋼管柱 (11m)	2
2.4	Strain Insulator Set	耐張碍子セット	3
2.5	Pin Insulator set	ピン碍子セット	0
2.6	Crossarm set	腕金セット	2
2.7	Stay Wire Set	支線セット	2
2.8	Earth Wire Set	接地線セット	0
2.9	LV Cabling Materials	低圧ケーブル材料	0
2.10	Plate set	プレートセット	1

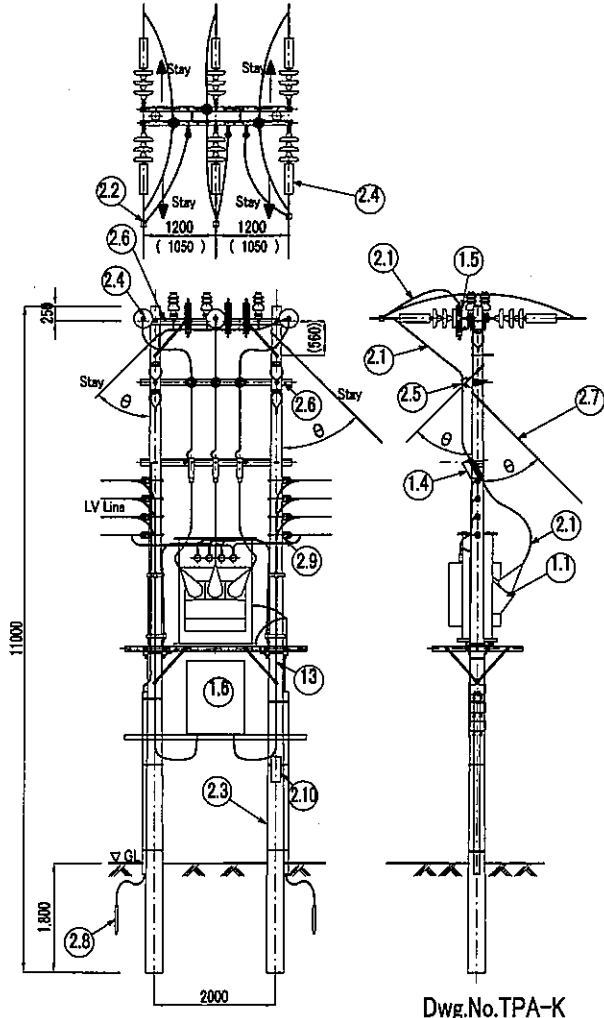
Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$

11/33kV 終端柱[型番 1H/3H]
11/33kV Terminal Pole[Type 1H/3H]



P/NO.	DESCRIPTION	Q'TY	
1.1	Distribution Transformer (DTr)	配電用変圧器	0
1.2	Auto Recloser	自動再閉路装置	0
1.3	Load Isolator	負荷開閉器	1
1.4	Cutout Switch with Fuse	ヒューズ付きカットアウトスイッチ	0
1.5	Lightning Arrester	避雷器	1
1.6	Main Distribution Board(MDB)	主分電盤	0
2.1	Conductor (m)	電線 (m)	30
2.2	Connector	コネクター	3
2.3	Steel Pole (11m)	鋼管柱 (11m)	2
2.4	Strain Insulator Set	耐張碍子セット	6
2.5	Pin Insulator set	ピン碍子セット	0
2.6	Crossarm set	腕金セット	2
2.7	Stay Wire Set	支線セット	4
2.8	Earth Wire Set	接地線セット	3
2.9	LV Cabling Materials	低圧ケーブル材料	0
2.10	Plate set	プレートセット	1

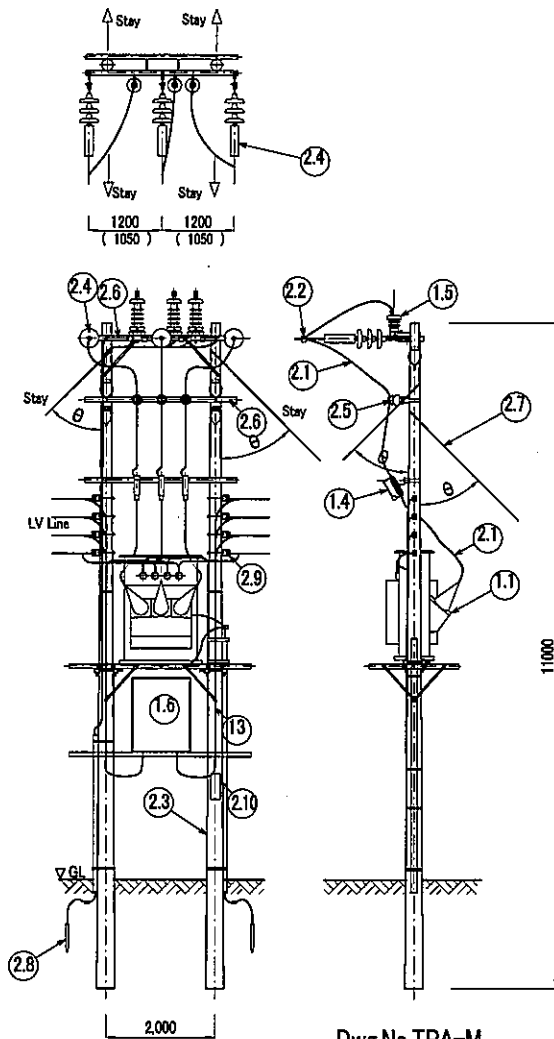
11/33kV負荷開閉器柱[型番 1J/3J]
11/33kV Load Isolator Pole[Type 1J/3J]



P/NO.	DESCRIPTION	Q'TY	
1.1	Distribution Transformer (DTr)	配電用変圧器	1
1.2	Auto Recloser	自動再閉路装置	0
1.3	Load Isolator	負荷開閉器	0
1.4	Cutout Switch with Fuse	ヒューズ付きカットアウトスイッチ	1
1.5	Lightning Arrester	避雷器	1
1.6	Main Distribution Board(MDB)	主分電盤	1
2.1	Conductor (m)	電線 (m)	50
2.2	Connector	コネクター	12
2.3	Steel Pole (11m)	鋼管柱 (11m)	2
2.4	Strain Insulator Set	耐張碍子セット	6
2.5	Pin Insulator set	ピン碍子セット	6
2.6	Crossarm set	腕金セット	3
2.7	Stay Wire Set	支線セット	4
2.8	Earth Wire Set	接地線セット	3
2.9	LV Cabling Materials	低圧ケーブル材料	1
2.10	Plate set	プレートセット	1

Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$

11/33kV 引通し用変圧器柱[型番 1K/3K]
11/33kV Intermediate Transformer Pole[Type 1K/3K]

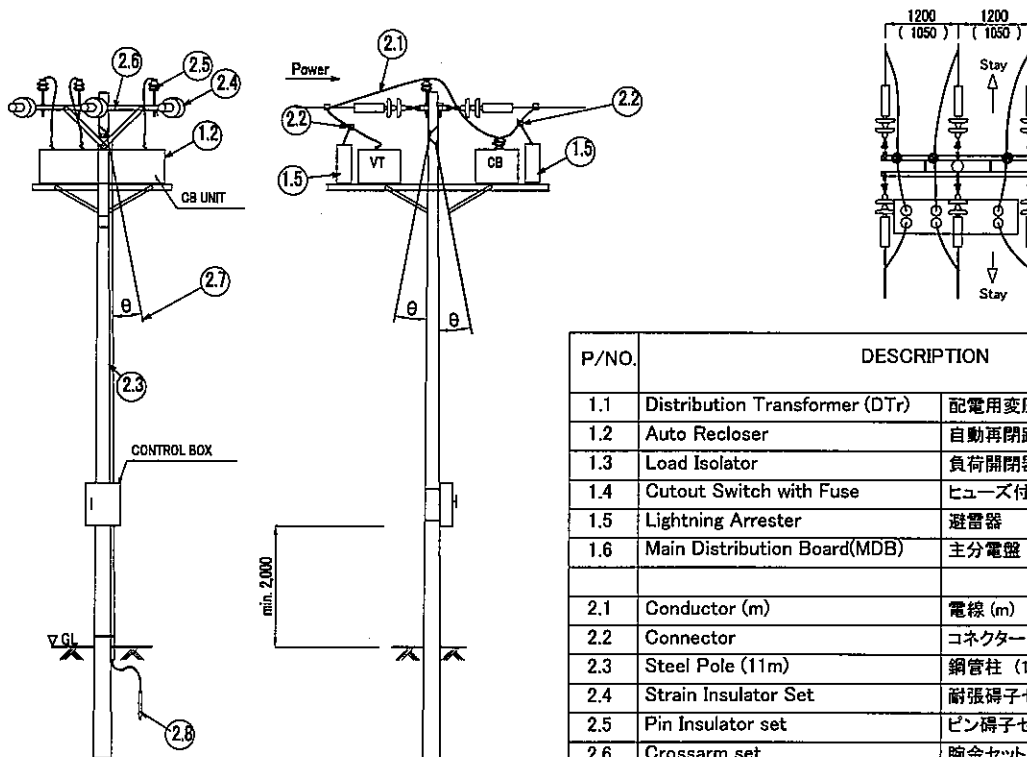


Dwg.No.TPA-M

11/33kV 終端用 変圧器柱[型番 1M/3M]
11/33kV Dead End Transformer Pole [Type 1M/3M]

P/NO.	DESCRIPTION	Q'TY	
1.1	Distribution Transformer (DTr)	配電用変圧器	1
1.2	Auto Recloser	自動再閉路装置	0
1.3	Load Isolator	負荷開閉器	0
1.4	Cutout Switch with Fuse	ヒューズ付きカットアウトスイッチ	1
1.5	Lightning Arrester	避雷器	1
1.6	Main Distribution Board(MDB)	主分電盤	1
2.1	Conductor (m)	電線 (m)	50
2.2	Connector	コネクター	6
2.3	Steel Pole (11m)	鋼管柱 (11m)	2
2.4	Strain Insulator Set	耐張碍子セット	3
2.5	Pin Insulator set	ピン碍子セット	3
2.6	Crossarm set	腕金セット	3
2.7	Stay Wire Set	支線セット	4
2.8	Earth Wire Set	接地線セット	3
2.9	LV Cabling Materials	低圧ケーブル材料	1
2.10	Plate set	プレートセット	1

Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$

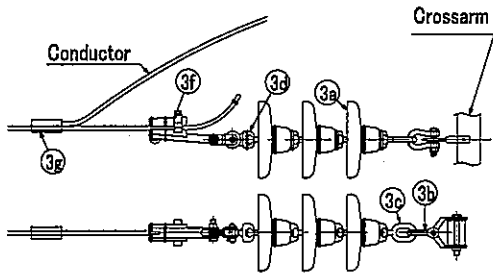


Dwg.No.TPA-N

11/33kV 自動再閉路柱[型番 1N/3N]
11/33kV Auto Recloser Pole [Type 1N/3N]

P/NO.	DESCRIPTION	Q'TY	
1.1	Distribution Transformer (DTr)	配電用変圧器	0
1.2	Auto Recloser	自動再閉路装置	1
1.3	Load Isolator	負荷開閉器	0
1.4	Cutout Switch with Fuse	ヒューズ付きカットアウトスイッチ	0
1.5	Lightning Arrester	避雷器	2
1.6	Main Distribution Board(MDB)	主分電盤	0
2.1	Conductor (m)	電線 (m)	45
2.2	Connector	コネクター	8
2.3	Steel Pole (11m)	鋼管柱 (11m)	1
2.4	Strain Insulator Set	耐張碍子セット	6
2.5	Pin Insulator set	ピン碍子セット	3
2.6	Crossarm set	腕金セット	2
2.7	Stay Wire Set	支線セット	2
2.8	Earth Wire Set	接地線セット	3
2.9	LV Cabling Materials	低圧ケーブル材料	0
2.10	Plate set	プレートセット	1

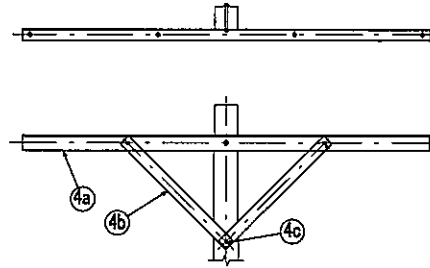
Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$



Strain Insulator Set

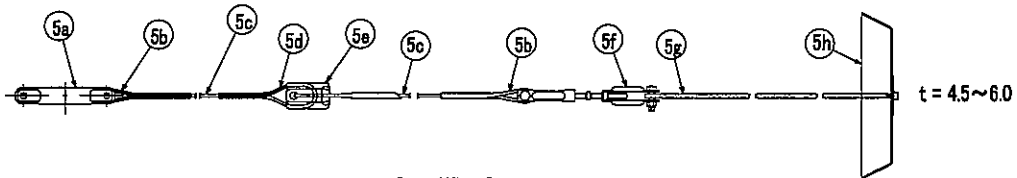
No.	Description	Q'TY per set
3a	Disc Insulator	3(2)
3b	Anchor Shackle	1
3c	Ball Eye	1
3d	Socket Eye	1
3f	Dead End Clamp	1
3g	Compression Connector	1

() for 11kV Line



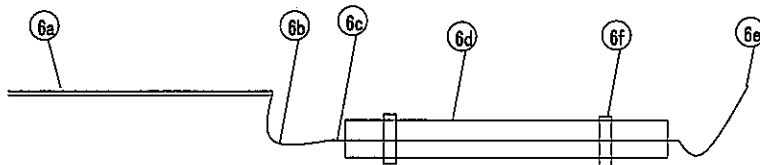
Crossarm Set

No.	Description	Q'TY per set
4a	Crossarm	1
4b	Crossarm Brace	2
4c	Bolt&Nut Set	4



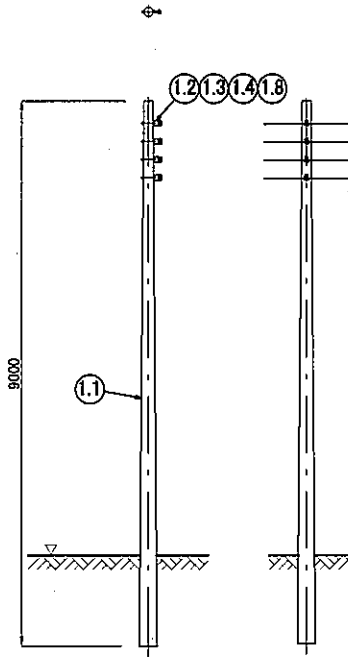
Stay Wire Set

No.	Description	Q'TY per set	No.	Description	Q'TY per set
5a	Stay Band	1	5e	33kV(11kV)Stay Insulator	1
5b	Dead End Grip for Thimble	2	5f	Turnbuckle	1
5c	Stay Wire	1	5g	Stay Rod	1
5d	Dead End Grip for Insulator	2	5h	Stay Anchor	1



Earthing Wire Set

No.	Description	Q'TY per set	No.	Description	Q'TY per set
6a	Grounding Rod	2	6e	Terminal Lug	1
6b	Earthing Terminal	1	6f	Band	1
6c	IV Wire (35sqmm)	12m			
6d	PVC (1inch)	2.5m			

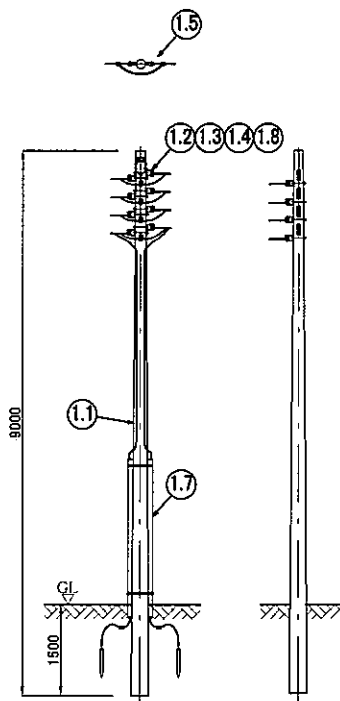


Material List

P/NO.	DESCRIPTION		Q'TY
1.1	Wood Pole	木柱	1
1.2	Bracket set	装柱金物セット	4
1.3	LV Shackle Insulator	低圧シャックル碍子	4
1.4	But, Nut & washer set	ボルト、ナット及びワッシャーセット	4
1.5	Conductor Connector set	電線コネクターセット	0
1.6	Stay Wire Assembly	支線セット	0
1.7	LV Neutral Earthing Assembly	低圧中性点接地線セット	0
1.8	Binding Wire	バインド線	4

Dwg.No.TPA-LA

低圧引通し柱[型番LA]
LV Intermediate Pole[Type LA]

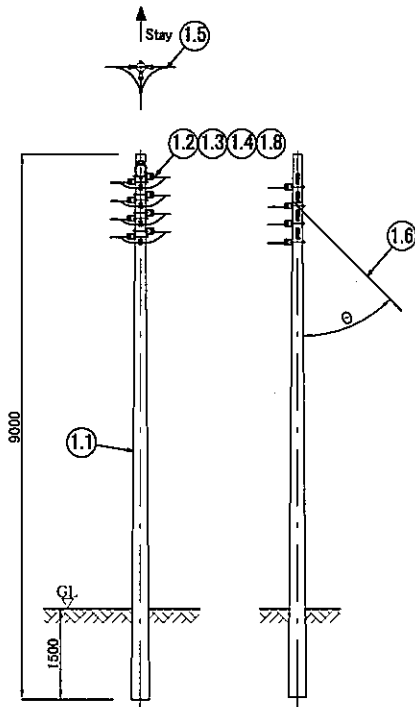


Material List

P/NO.	DESCRIPTION		Q'TY
1.1	Wood Pole	木柱	1
1.2	Bracket set	装柱金物セット	8
1.3	LV Shackle Insulator	低圧シャックル碍子	8
1.4	But, Nut & washer set	ボルト、ナット及びワッシャーセット	8
1.5	Conductor Connector set	電線コネクターセット	4
1.6	Stay Wire Assembly	支線セット	0
1.7	LV Neutral Earthing Assembly	低圧中性点接地線セット	2
1.8	Binding Wire	バインド線	8

Dwg.No.TPA-LB

低圧両引留柱[型番LB]
LV Section Pole[Type LB]



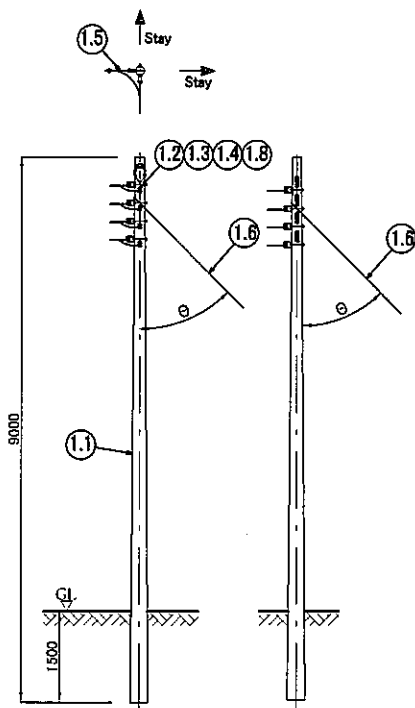
Material List

P/NO.	DESCRIPTION		Q'TY
1.1	Wood Pole	木柱	1
1.2	Bracket set	装柱金物セット	12
1.3	LV Shackle Insulator	低圧シャックル端子	12
1.4	But, Nut & washer set	ボルト、ナット及びワッシャーセット	12
1.5	Conductor Connector set	電線コネクターセット	12
1.6	Stay Wire Assembly	支線セット	1
1.7	LV Neutral Earthing Assembly	低圧中性点接地線セット	0
1.8	Binding Wire	バインド線	8

Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$

Dwg.No.TPA-LC

低圧分岐柱[型番LC]
LV T-off Pole[Type LC]



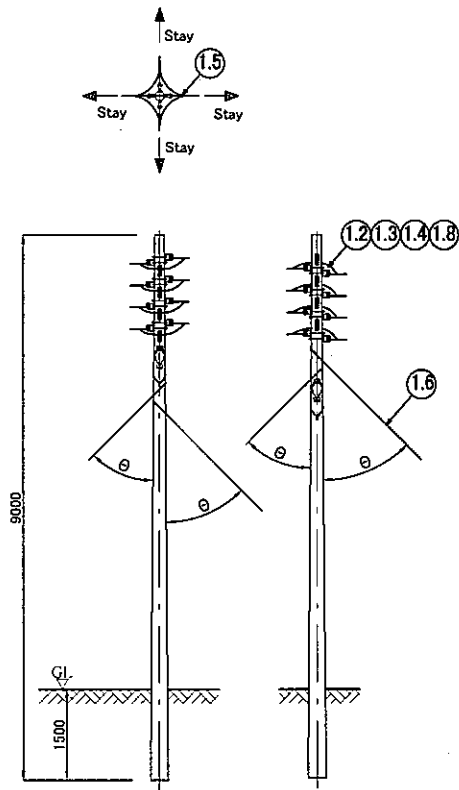
Material List

P/NO.	DESCRIPTION		Q'TY
1.1	Wood Pole	木柱	1
1.2	Bracket set	装柱金物セット	8
1.3	LV Shackle Insulator	低圧シャックル端子	8
1.4	But, Nut & washer set	ボルト、ナット及びワッシャーセット	8
1.5	Conductor Connector set	電線コネクターセット	4
1.6	Stay Wire Assembly	支線セット	2
1.7	LV Neutral Earthing Assembly	低圧中性点接地線セット	0
1.8	Binding Wire	バインド線	8

Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$

Dwg.No.TPA-LD

低圧直角柱[型番LD]
LV Right Angle Pole[Type LD]



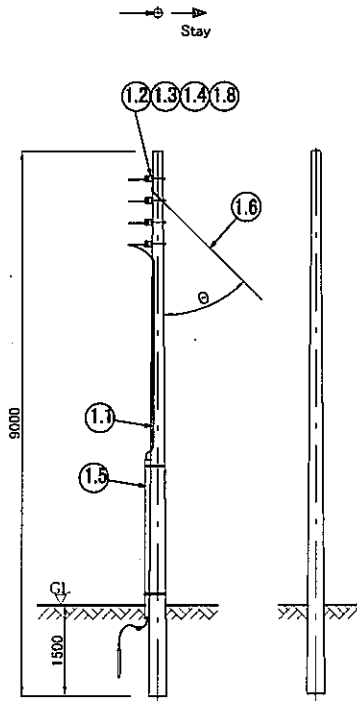
Material List

P/NO.	DESCRIPTION		Q'TY
1.1	Wood Pole	木柱	1
1.2	Bracket set	装柱金物セット	16
1.3	LV Shackle Insulator	低圧シャックル碍子	16
1.4	But, Nut & washer set	ボルト、ナット及びワッシャーセット	16
1.5	Conductor Connector set	電線コネクターセット	16
1.6	Stay Wire Assembly	支線セット	4
1.7	LV Neutral Earthing Assembly	低圧中性点接地線セット	0
1.8	Binding Wire	バインド線	16

Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$

Dwg.No.TPA-LE

低圧直交柱[型番LE]
LV Cross Pole[Type LE]



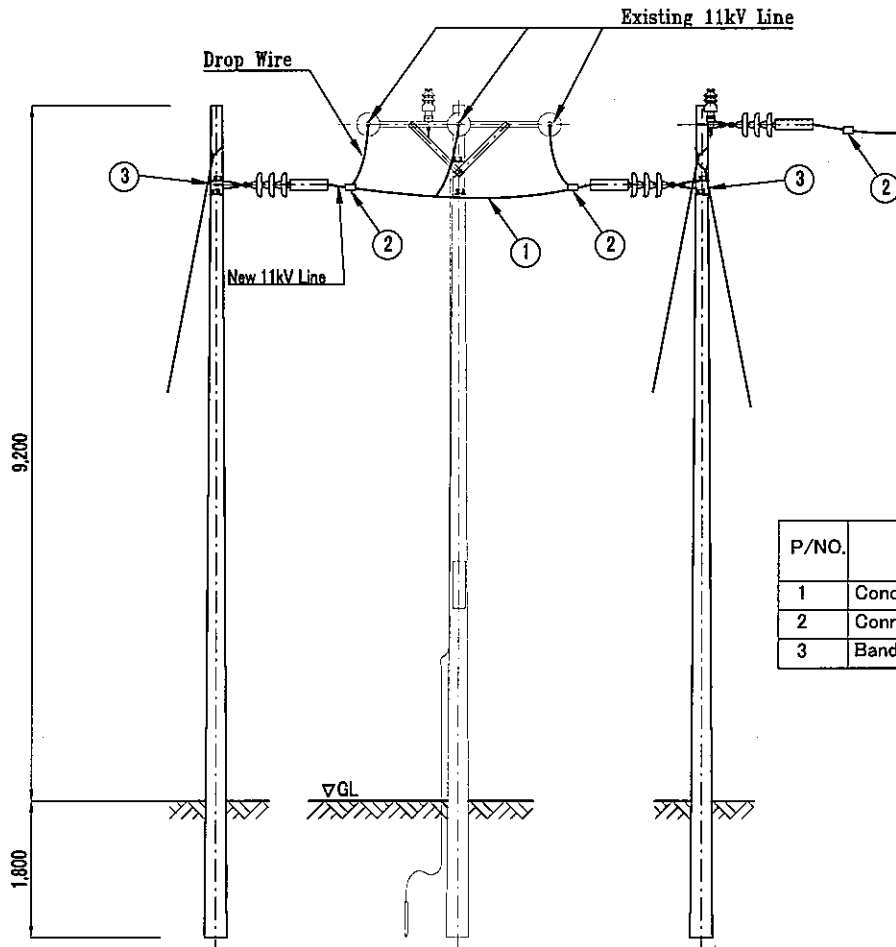
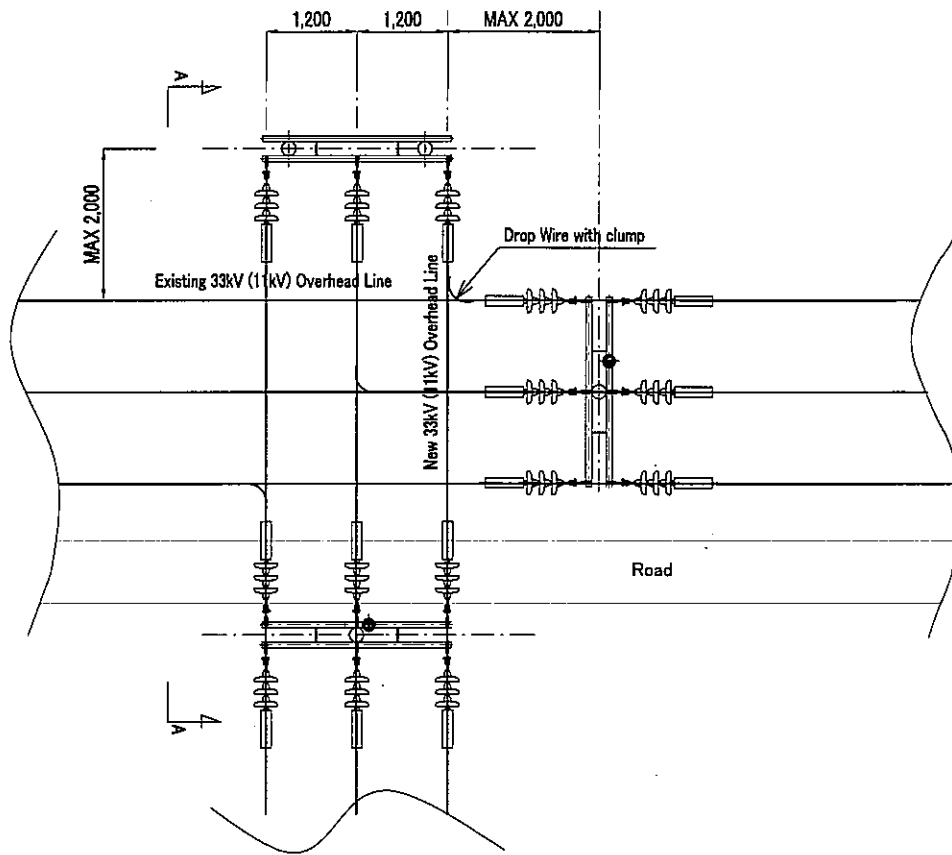
Material List

P/NO.	DESCRIPTION		Q'TY
1.1	Wood Pole	木柱	1
1.2	Bracket set	装柱金物セット	4
1.3	LV Shackle Insulator	低圧シャックル碍子	4
1.4	But, Nut & washer set	ボルト、ナット及びワッシャーセット	4
1.5	Conductor Connector set	電線コネクターセット	0
1.6	Stay Wire Assembly	支線セット	1
1.7	LV Neutral Earthing Assembly	低圧中性点接地線セット	1
1.8	Binding Wire	バインド線	4

Preferable Stay Angle : $30^\circ \leq \theta \leq 45^\circ$

Dwg.No.TPA-LF

低圧終端柱D[型番LF]
LV Terminal Pole[Type LF]

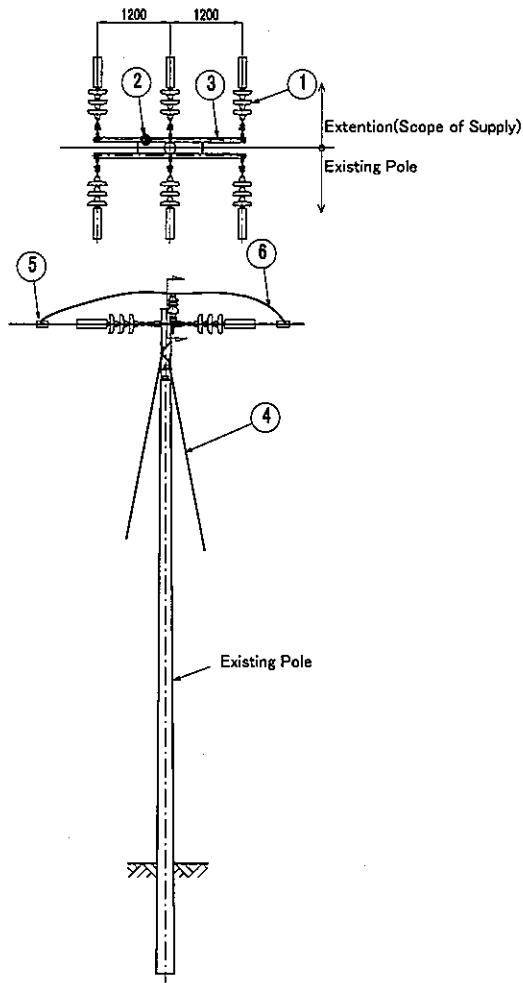


P/NO.	DESCRIPTION		Q'TY
1	Conductor	電線	10m
2	Connector	コネクター	6pcs
3	Band	バンド	2sets

Section A-A

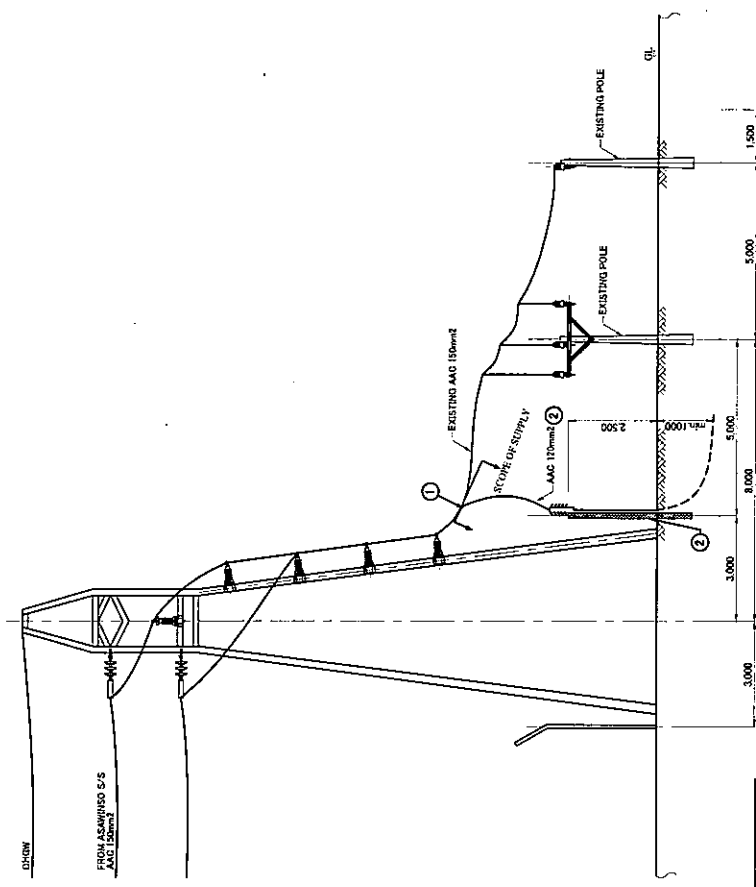
Dwg.No.TPA-X

標準分岐接続用 資機材構成図
Typical Connection Plan to the Existing Line (Cross Type)



Additional Materials (追加資機材リスト)

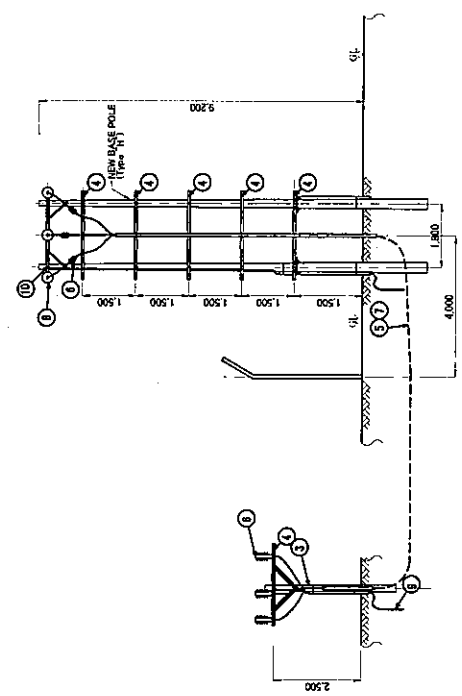
PART.NO.	DESCRIPTION		QTY
1	Strain Insulator Set	耐張碍子セット	3
2	Pin Insulator Set	ピン碍子セット	1
3	Crossarm Set	腕金セット	1
4	Stay Wire Set	支線セット	1
5	Connector	コネクター	3pcs
6	Conductor	電線	10m



SECTION : A-A

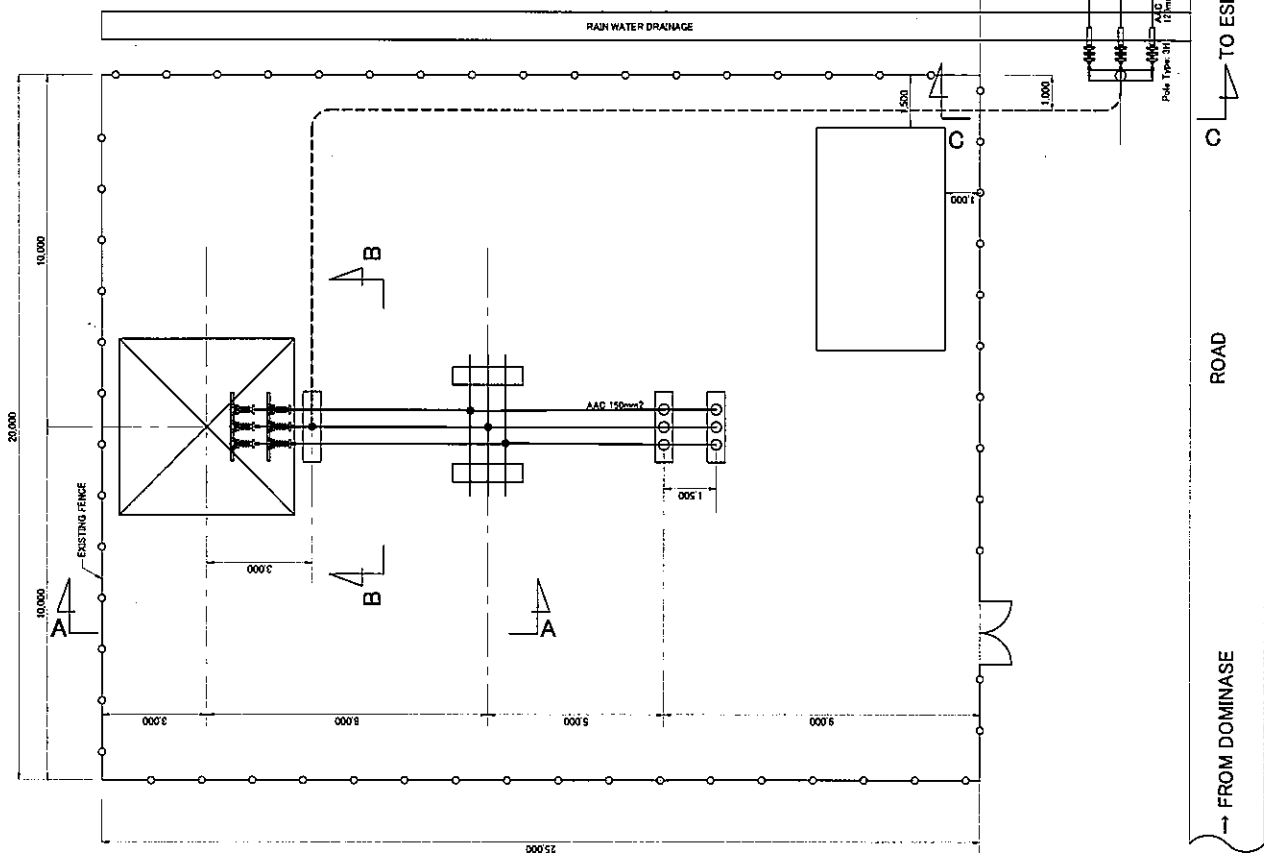
MATERIAL LIST

P/No.	Description	Unit	Qty per point
1	Clamp	pc	3
2	Conductor	m	10
3	Steel Pole	pc	2
4	Crossarm set	set	5
5	HV Cable	m	100
6	Cable Termination	set	6
7	Cable Conduit	m	10
8	Connector	pc	3
9	Earthing Set	set	1



SECTION : B-B

SECTION : C-C



PLAN VIEW

REMARKS
 1.T-CLAMP (RUN: 150, TAP: 120) SHALL BE SUPPLIED IN THIS PROJECT.
 2.XLPE SHALL BE OF COPPER CONDUCTOR WITH WIRE ARMOR.

Title
 33kVスクランダム鋼塔所接続用
 鉄構材構成図(アッパーデーンデラ地域)
 33kV Connection Plan at NK WANTANUM
 Switching Station (UPPER DENKYIRA AREA)

Draw. No.
 UD-2

6. POWER DEMAND FORECAST

7. Power Demand Forecast

Power Demand Forecast in West Akim Area in Eastern Region

(Unit: kW)

No.	Name of Community	Population	①	Public and Commercial Facilities				2005	Population Growth				Power Demand Growth								
				②	③	④	⑤		2006 (+2.5%)	2007 (+2.5%)	2008 (+2.5%)	2009 (+5%)	2010 (+5%)	2011 (+5%)	2012 (+5%)	2013 (+5%)	2014 (+5%)	2015 (+5%)	2016 (+5%)	2017 (+5%)	2018 (+5%)
1	Asuofori	1,700	170	2		7		38	39	40	42	44	46	49	51	54	56	59	62	65	68
2	Akwadum	700	100	1	0	1	1	18	18	19	20	21	22	23	24	25	27	28	29	31	32
3	Akanteng	4,000	400			10	6	78	80	82	86	90	95	100	105	110	115	121	127	133	140
4	Kobriso	1,040	214	2			2	35	36	37	39	41	43	45	47	49	52	54	57	60	63
5	Afranse	4,000	400	3		6	2	73	75	77	81	85	89	93	98	103	108	113	119	125	131
6	Brekumanso	1,010	176	2	1	4	4	39	40	41	43	45	47	50	52	55	58	60	63	67	70
7	Ammarko	3,000	200	3	0	5	4	43	44	45	47	49	52	54	57	60	63	66	69	73	76
8	Oworam	7,000	700	3	1	5	8	122	125	128	135	141	148	156	164	172	180	189	199	209	219
9	Pabi	3,000	300	2	1	5	12	63	65	66	69	73	77	80	84	89	93	98	103	108	113
10	Anum Apapam	6,500	615	4	1	8	5	113	116	119	125	131	138	145	152	159	167	176	185	194	204
11	Mfranor	1,500	100	2	0	3	2	23	23	24	25	26	27	29	30	32	33	35	37	39	40
12	Kuano	3,800	449	3	0	6	5	82	84	86	90	95	100	105	110	115	121	127	133	140	147
13	Sowatey	1,135	190	1	0	2	2	34	34	35	37	39	41	43	45	47	50	52	55	57	60
14	Takorase	1,500	100	2	0	3	2	23	23	24	25	26	27	29	30	32	33	35	37	39	40
15	Krodua	4,000	400	4		8	2	77	79	81	85	89	94	98	103	108	114	120	125	132	138
16	Akim Breman	4,390	440	2		3	2	74	75	77	81	85	89	94	99	103	109	114	120	126	132
17	Nyanoa	1,450	347	3		6	2	65	67	68	72	75	79	83	87	92	96	101	106	111	117
18	Obinyimna	1,230	170	2		5	1	36	36	37	39	41	43	45	48	50	52	55	58	61	64
19	Abankrom	2,042	270	4	1	5	2	56	57	58	61	64	68	71	74	78	82	86	90	95	100
20	Kumikrom	4,000	400	2		4	5	71	72	74	78	82	86	90	95	99	104	109	115	121	127
21	Esaaso	1,000	100	1		2	2	20	21	21	22	23	24	26	27	28	30	31	33	34	36
22	Nkurankan	690	110	1		4	3	25	26	26	28	29	30	32	34	35	37	39	41	43	45
23	Nyakoma	1,600	160	2		2	4	31	32	33	34	36	38	40	42	44	46	48	51	53	56
24	Anomakojo	1,400	210	2		2	2	38	38	39	41	43	46	48	50	53	55	58	61	64	67
25	Atokrom	1,200	100	1	0	2	2	20	21	21	22	23	24	26	27	28	30	31	33	34	36
26	Danso	1,647	350	2		2	3	59	60	62	65	68	72	75	79	83	87	92	96	101	106
27	Krofofrom	1,200	100	1	0	2	2	20	21	21	22	23	24	26	27	28	30	31	33	34	36
28	Odjade	2,750	280	2	0	4	3	52	53	54	57	60	63	66	69	73	76	80	84	88	93
29	Abuchenso	1,500	100	2	0	3	2	23	23	24	25	26	27	29	30	32	33	35	37	39	40
30	Bunso	4,000	400	3	0	6	5	75	76	78	82	86	91	95	100	105	110	116	121	127	134
31	Kofikyere	1,800	120	2	0	3	2	26	26	27	28	30	31	33	34	36	38	40	42	44	46
	Total	75,784	8,171	66	5	128	99	1,546	1,584	1,624	1,705	1,790	1,880	1,974	2,073	2,176	2,285	2,399	2,519	2,645	2,777

Remarks: [Target-1] means the target for the estimation of transformer capacity and Target-2 means the target for distribution line capacity.

(1) Maximum Demand per Customer (kW)

- ①: Residential (250Wx0.6=150) 0.15
- ②: School 1.00
- ③: Clinic 2.50
- ④: Corn mill 1.50
- ⑤: Others (Well, Shop, etc.) 0.50

(2) Basic Parameters

- 1: Growth rate (%) of Maximum Power Demand 1.050
- 2: Growth rate (%) of Residential Increase 1.025

Power Demand Forecast in Upper Denkyira Area in Central Region

(Unit: kW)

No.	Name of Community	Popula- tion	①	Public and Commercial Facilities				2005	Residential Growth				Power Demand Growth								
				②	③	④	⑤		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
									(+2.5%)	(+2.5%)	(+2.5%)	(+5%)	(+5%)	(+5%)	(+5%)	(+5%)	(+5%)	(+5%)	(+5%)	(+5%)	(+5%)
											▽ Commencement of Operation									▽ Target-2	
1	Brofoyedru	1,000	200	1	0	1	2	34	34	35	36	38	40	42	44	46	48	51	53	56	59
2	Bremang	2,500	250	2	0	2	7	46	47	48	50	52	55	57	60	63	66	70	73	77	81
3	Dominase	6,000	1,200	5	2	6	20	209	214	220	225	236	248	261	274	287	302	317	333	349	367
4	Abora	1,500	350	1	0	1	8	59	60	62	64	67	70	74	77	81	85	89	94	99	103
5	Anwiawa	1,500	300	2	0	1	9	53	54	56	57	60	63	66	69	73	76	80	84	89	93
6	Beseasi	4,200	500	2	0	2	13	87	89	91	93	98	103	108	113	119	125	131	138	145	152
7	Nkroful	1,500	200	3	0	1	11	40	41	42	43	45	47	50	52	55	58	61	64	67	70
8	Treposo	1,800	250	1	0	1	6	43	44	45	46	49	51	54	56	59	62	65	68	72	75
9	Esienkyen	2,000	350	1	0	1	7	59	60	61	63	66	69	73	77	80	84	89	93	98	103
10	Asaaman	2,500	300	2	0	2	10	55	56	58	59	62	65	69	72	76	79	83	88	92	96
11	Akwaboso	2,500	450	2	0	3	7	78	79	81	83	88	92	97	101	107	112	117	123	129	136
12	Afiefisc	1,500	400	4	1	2	7	73	75	77	79	83	87	91	96	100	105	111	116	122	128
13	Ameyaw	2,500	400	3	0	2	9	71	72	74	76	80	84	88	92	97	102	107	112	118	124
14	Subin	2,000	340	2	1	3	8	64	66	67	69	72	76	80	84	88	92	97	102	107	112
15	Anhwiaso	800	80	3	0	2	10	23	24	24	25	26	27	29	30	32	33	35	37	38	40
16	Nyinawusu	1,800	300	0	0	1	8	51	52	53	54	57	60	63	66	69	73	77	80	84	89
	Total	35,600	5,870	34	4	31	142	1,042	1,068	1,095	1,122	1,178	1,237	1,299	1,364	1,432	1,504	1,579	1,658	1,741	1,828

Remarks: [Target-1] means the target for the estimation of transformer capacity and Target-2 means the target for distribution line capac

(1) Maximum Demand per Customer (kW)

- ①: Residential (250Wx0.6=150) **0.15**
- ②: School **1.00**
- ③: Clinic **2.50**
- ④: Corn mill **1.50**
- ⑤: Others (Well, Shop, etc.) **0.50**

(2) Basic Parameters

- 1: Growth rate (%) of Maximum Power Demand** **1.050**
- 2: Growth rate (%) of Residential Increase** **1.025**