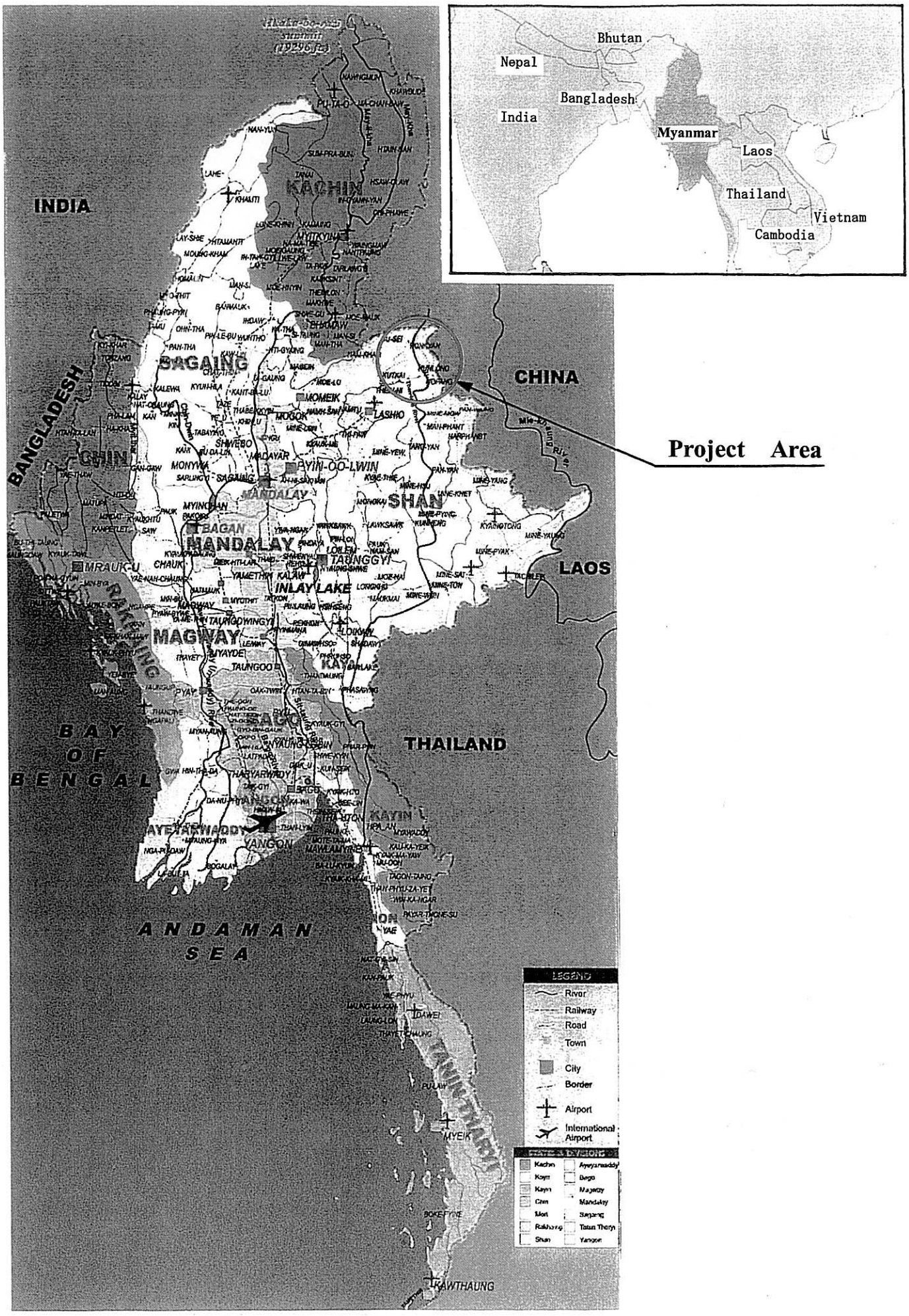
PART 2

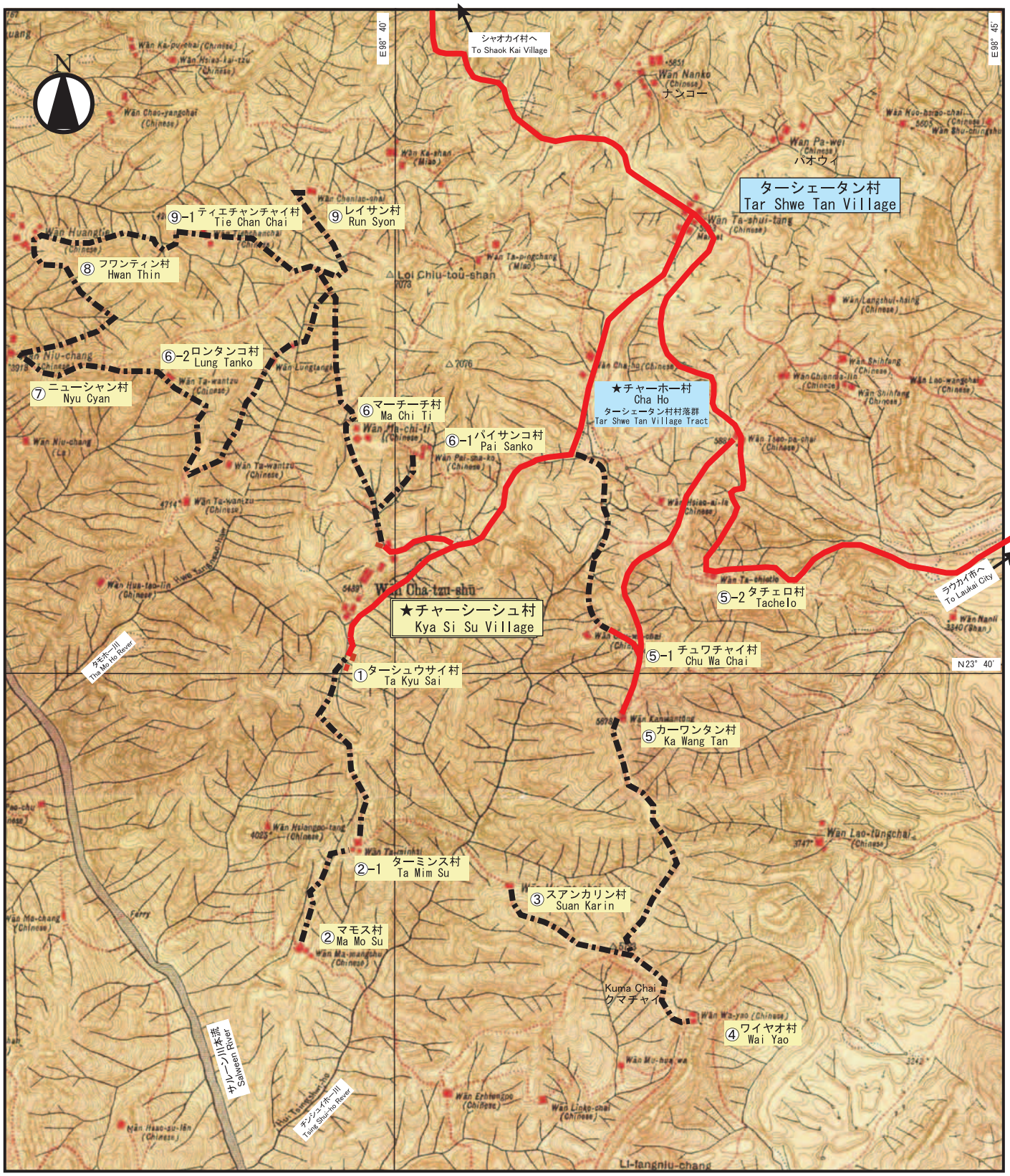
ELECTRIFICATION COMPONENT

The Project for Electrification of Kokang Region in Northern Shan State

YACHIYO ENGINEERING CO.,LTD.



Map of the Union of Myanmar



備考
Remarks

(1) 地図上の標高は、フィート表示。 (1FT=0.3048m)
Altitude on Map is shown by feet.

(2) 標高線間隔は、50フィート (約15.2m)
Counter line interval is 50 feet.

(3) ①～⑨の村は、チャーシーシュ村村落群に所属する村落を示す。
Villages marked with ①～⑨ are member of Kya Si Su Village Tract.

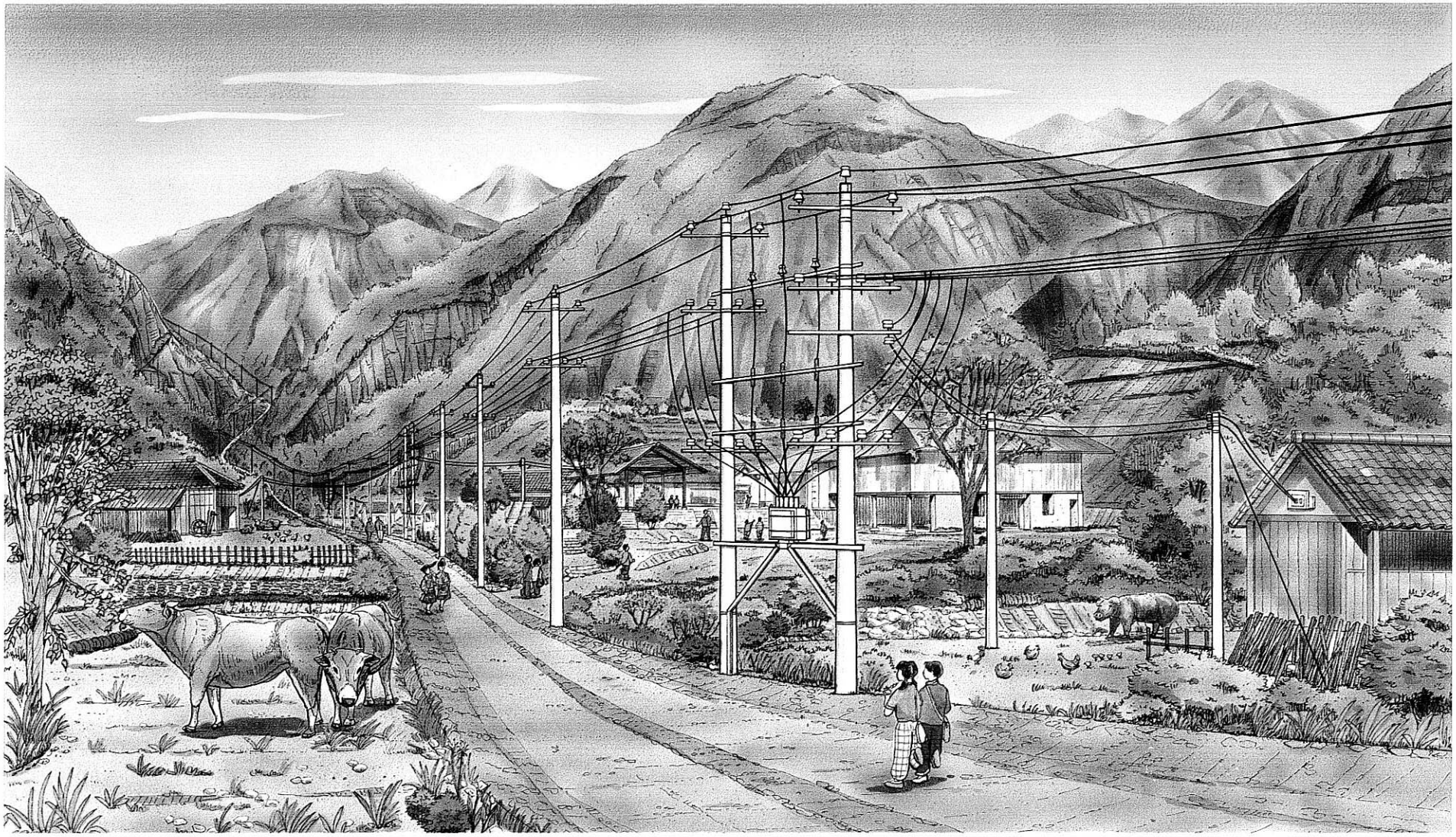
(4) ★印は本計画の電化対象村を示す。
★shows the project site.

凡例
Legend

道路 (車両通行可)
Vehicle Road

本計画で利用予定の山道 (車両通行不可)
Mountain Path for the Project (impassible by Vehicle)

本計画対象地地図
Map of Project Site



THE PROJECT FOR ELECTRIFICATION OF KOKANG REGION

IN NOTHERN SHAN STATE

IN

THE UNION OF MYANMAR

LIST OF FIGURES & TABLES

ABBREVIATIONS

E/N	Exchange of Notes
GDP	Gross Domestic Product
GNP	Gross National Product
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
JEAC	Japan Electric Association Code
JEC	Japanese Electrotechnical Committee
JEM	Standards of Japan Electrical Manufacturer's Association
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standards
KHA SA AH	Laukai District Organization and Administration Committee
MOEP	Ministry of Electric Power
MEPE	Myanmar Electric Power Enterprise
MOF	Metering out fit
O & M	Operation and Maintenance
OJT	On the Job Training
PBANRDA	Ministry of Progress of Border Areas and National Races and Development Affaires (Locally called as NATALA)

SUMMARY

The Union of Myanmar (hereinafter referred to as "Myanmar") is situated between 10°N and 28°N and between 93°E and 103°E and is surrounded by China, Thailand, Laos, India and Bangladesh. Its total land area of some 677,000 km^2 is approximately 1.8 times larger than that of Japan. The dominant topographical features include the KaChin Hills in the north, the Shan Plateau in the east and the Arakan Mountains in the west. Irrawaddy River runs through the centre, forming lowland. To the east, Than Lwin River originating in the northern Himalayas runs southwards. Myanmar belongs to the monsoon zone in terms of climate. The rainfall is concentrated in the rainy season and hardly any rain falls in the dry season from December to March.

Myanmar is a multi-ethnic country with 135 ethnic groups. The largest ethnic group is Burmese, accounting for some 70% of the total population of 47.25 million (1999), and the remaining minority groups live in the border areas. Kokang Region in Northen Shan State, i.e. the Project Area, is located in the remote area sandwiched between China and Than Lwin Riverand is inhabited by the Kokang Region, which is a Chinese-related ethnic group. The ethnic groups inhabiting Kokang Region are the Kokang (75%) and the Parawn (11%) with the remainder composed of many smaller groups. In terms of language, Kokang Language (Yunnan-based Chinese) is mainly spoken and the Chinese yuan is in circulation, illustrating the strong cultural and economic influence of China.

The Government of Myanmar established the Ministry of Progress of Border Areas and National Races and Development Affairs (hereinafter referred to as "the Ministry of Progress of Border Areas" or "PBANRDA") in 1992 for the purpose of achieving socioeconomic development and promoting friendship between different ethnic groups in border areas and has been making conscious efforts to improve the living conditions for ethnic minorities. At Kokang Region in Northern Shan State, Special Region No. 1 (Kokang) has been established for local autonomy by Chinese-related residents. The economic development in the area has been in progress with cooperation between the central and local governments. Given the location of Kokang Region in a steep mountainous area near the Chinese border, however, there is little cultivable land, resulting in a low self-sufficiency rate of some 40% for the production of rice, the main staple food. This situation has compelled local residents to cultivate the opium poppy as a cash crop, making the area one of the world's leading production areas of the raw material for opium and heroin. The Government of Myanmar has been promoting an opium poppy eradication programme in the area and the actual cultivation area has been gradually decreasing, a trend backed by the declaration of eliminating the opium poppy by the representative of the Special Region No. 1 (Kokang) in June, 2000. The

lack of alternative crops to replace the opium poppy which grows on wasteland even during the dry season and which offers a high earning level, however, means that local residents are suffering from poverty with poor living conditions. Against this background, the Government of Japan is implementing a technical cooperation project to promote the substitution from the opium poppy to buckwheat in line with the opium poppy eradication programme of the Government of Myanmar. At present, experts dispatched from Japan are playing an active role in this project at Kokang Region in Northern Shan State.

Although the Government of Myanmar is well aware of the critical importance of improving the local living conditions for poor people in rural areas in view of the establishment of law and order and economic development in border areas, the development of infrastructure, including electricity supply, to support local life and economic activities in border areas has been extremely slow. Because of the tight fiscal situation in Myanmar, the Government of Myanmar has found it difficult to extend the trunk transmission line to Kokang Region. In fact, the Special Region No. 1 (Kokang) has constructed a transmission line from a Chinese power station on its own initiative and has been developing infrastructure mainly in and around Laukai, which is the area's commercial centre, by buying electricity from China. In the meantime, the development of rural villages in mountain areas has been slow as indicated by the electrification rate of a mere by 2% in rural villages where some 70% of the population of Kokang Region live, compared to 100% in Laukai. As a result, people in rural villages are forced to use lamps. The two shift school education system suffers from insufficient classroom lighting while there are no clinics because of the difficulty of storing drugs properly. Moreover, people find it hard to obtain social information because of the lack of radio and other media, illustrating the paucity of local life.

Under these circumstances, the Government of Myanmar made a request to the Government of Japan for the provision of grant aid cooperation to facilitate the electrification of the Kya Si Su Village Tract in Kokang Region where the living standard is extremely low due to the slow progress of social infrastructure development despite it being the central area for the buckwheat project.

In response to this request, the Japan International Cooperation Agency was assigned by the Government of Japan to dispatch a Preliminary Study Team to Myanmar in October, 2000. Following the report submitted by this Preliminary Study Team, the Basic Design Study Team in the period from 5th March to 30th June, 2001 to reconfirm and discuss the contents of the request with the Myanmar side, to conduct a site survey and to obtain relevant information and reference materials.

As reported by the Preliminary Study team, the use of a small hydropower station was originally planned to electrify the target area. During the second visit by the government team in May, 2001, however, the Myanmar side made a request for alteration to electrification through extension of the existing distribution line, because the planned small hydropower station under the Project would use the same water source as the planned project for the construction of a water supply channel to Laukai; and this request was confirmed as being the final request by the Myanmar side. Upon their return to Japan, the Study Team members examined the necessity, expected socioeconomic effects and suitability of the Project based on the field survey findings and proposed the basic design and implementation programme for the optimum project. Based on such proposal, the JICA dispatched a team to Myanmar from 26th August to 9th September, 2001 to explain the outline of the basic design to the Myanmar side.

Kya Si Su, the village selected as the target village for electrification under the Project, is the centre for socioeconomic activities in the Kya Si Su Village Tract and has many public facilities, including a village office and a school. However, it has not yet been electrified even though the opium poppy eradication programme of the Government of Myanmar is in progress, assisted by a fairly large-scale buckwheat cultivation area under the relevant Japanese technical cooperation project.

The basic concept of the Project is to newly electrify Kya Si Su (area within a 1 km radius of the village centre), where such public facilities as a school, village office and clinic, etc. are concentrated in the Kya Si Su Village Tract, and Cho Ho along the new high voltage transmission route in order to primarily improve the standard of living in the Kya Si Su Village Tract in Kokang in Shan State. With the completion of the Project, not only will a stable supply of electricity for public facilities become a reality but also the use of electrical equipment (lighting equipment and radio, etc.) required for everyday village life will be possible in the subject villages. Moreover, the Project intends to contribute to the introduction of alternative crops to poppy in order to eradicate local poppy cultivation by allowing the use of modern equipment, such as threshing machines and power tools. For this purpose, the existing high voltage distribution line up to Tar Shwe Tan will be branched out and extended to Kya Si Su with the procurement and installation of 10.5 kV/0.4 kV distribution equipment and materials and the procurement of equipment and materials for service connection under the Project so that electricity can be supplied to Kya Si Su (area within a 1 km radius of the village centre) and Cha Ho along the extended high voltage transmission route.

The principal components of the Project compiled by the Basic Design Study team on its return to Japan and based on the results of consultations with the Myanmar side are shown in the following table.

Outline of the Project

Project Site	Area of a 1 km radius of central Kya Si Su [Kya Si Su and Cha Ho, (a village on the extended distribution route)]
Distribution Line Construction Plan	▪ Total length of new 10.5 kV high voltage distribution line: approximately 13 km ▪ Total length of new 0.4 kV low voltage distribution line: approximately 8.5 km ▪ Pole-mounted transformers: 20 kVA x 3 sets ▪ Pole-mounted transformers: 50 kVA x 3 sets ▪ Circuit breaker cubicle (with MOF): 1 set
Equipment Procurement Plan	▪ Distribution equipment and materials for user connection (poles, cables and integrating watt-hour meters for users): for 245 user premises (including those for public facilities) ▪ Spare parts: one set ▪ Tools: one set
Soft Components	Guidance by engineers dispatched by the Consultant on the following items relating to the service connection work to be conducted by the Myanmar side ▪ Planning of master and detailed plans ▪ Preparations for work implementation and required techniques/skills at the initial stage of the work ▪ Supervision and general evaluation at the completion stage of the work ▪ Establishment of an electricity charge collection system

In the case of the implementation of the Project with grant aid provided by the Government of Japan, the cost to be borne by the Myanmar side is approximately ¥1.5 million. The total length of the Project will be approximately 15 months, including the detailed design period. The main component of the work to be conducted by the Myanmar side will be the installation work of the equipment and materials for user connection which will be procured by the Japanese side. For the implementation of the Project, PBANRDA and the Special Region No. 1 (Kokang) will act as the supervisory body and the project implementation body respectively. The operation and maintenance of the new facilities following the completion of the Project will be conducted by the Power Division, the Planning and Industrial Department of the Special Region No. 1 (Kokang). The Power Division has 46 staff members and employs Chinese engineers where necessary. The operation conditions of hydropower plants,

substations and transmission/distribution lines in Special Region No. 1 (Kokang) are good, suggesting that staff members of the Power Division have basic technical expertise for the operation and maintenance of power facilities. Therefore, no problems are anticipated in regard to the implementation of the Project.

The direct effect of the implementation of the Project will be the electrification of Kya Si Su (the destination village for the new extension) and Cha Ho (a village along the newly extended 10.5 kV distribution line), allowing the use of lighting and other electrical equipment to improve the living conditions of a total of some 1,420 villagers of 237 households. In addition, the following indirect effects are expected to take place.

- Such modern equipment as threshing machines and power tools, etc. can be introduced in the subject area of the Buckwheat Project, resulting in the vitalisation of agriculture and improvement of productivity and enabling the production of highly value-added agricultural products. In turn, this will facilitate the shift from poppy cultivation to the cultivation of other agricultural products, contributing to the movement to eradicate poppy cultivation.

- In the field of local education, the introduction of school lighting equipment, etc. will stimulate educational activities, encouraging rectification of the educational gap between different areas.

- In the field of medical care, the installation and use of a refrigerator for the storage of medicines and other medical equipment using electricity will enable the provision of modern health and medical services.

- In the field of everyday life, the installation of water pumps will reduce the burden on women and children of fetching water. In addition, the use of radio and TV will enable local people to obtain social information.

- In the field of administration, the installation of lighting equipment, communication equipment and office equipment will improve the level of administrative services.

As described above, the Project will have wide-ranging positive effects and will contribute to improve of fundamental living conditions for local people, confirming the suitability of the provision of Japanese grant aid for part of the Project.

To ensure the positive effects of the Project, it will be essential for the Myanmar side to complete such work as the user connection work for the low voltage distribution line prior to the field testing of the 10.5 kV and 0.4 kV distribution lines to be constructed by Japanese side under the Project.

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CHAPTER 1

BACKGROUND OF THE PROJECT

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The development of areas inhabited by ethnic minorities in Myanmar lags behind other areas due to political and geographical constraints and the lack of basic infrastructure development has kept the local living standard at a noticeably low level. In the hill and mountain-dominated area of Kokang Region in Northern Shan State located near the border with China, Thailand and Laos in particular, the self-supply ratio of rice, the local main staple food, is only 40 – 50%, prompting the local tradition of growing opium poppies as a cash crop. As a result, the area has become a major production area of the raw material for opium and heroin.

The opium poppy cultivation area has been gradually decreasing in recent years due to conscious efforts by the Government of Myanmar to eradicate the cultivation of opium poppies. However, the lack of alternative crops which can grow on wasteland even during the dry season and which have high earning potential, the insufficient development of agricultural roads to transport production materials and equipment for farming as well as farm products and the slow development of electrification which is essential to improve local life mean persisting poverty for local farming households, keeping the living standard in rural areas extremely low. The Government of Myanmar is implementing an opium poppy eradication project which also aims at improving the living standard of ethnic minorities by means of (i) conversion of the local practice of opium poppy farming to other cash crops and (ii) the development of agricultural and rural infrastructure. As the progress of this project has been greatly hindered by a lack of sufficient funds and equipment, the Government of Myanmar has made a request to the Government of Japan for the provision of grant aid for the Improvement of Kokang Living Environment (road construction and electrification) (hereinafter referred to as "the Project").

The request by the Government of Myanmar is designed to promote the electrification programme in the Kya Si Su Village Tract to improve the living environment for local people in order to assist the introduction of alternative crops, including buckwheat, thus eradicating the practice of opium poppy cultivation. This Kya Si Su Village Tract (consisting of 10 hamlets based on the administrative classification and 16 hamlets based on the geographical classification) is the largest opium poppy cultivation area in Kokang Region and suffers from a very poor living standard due to the lack of electrification. This Village Tract is located within the boundaries of Tar Shwe Tan Village which is the central place for the Buckwheat Project which is assisted by Japan.

The electrification programme under the Project originally intended the construction of a small hydropower station and distribution lines to the Project Area as a precondition for project implementation as recommended by the report by the Preliminary Study which visited the area in October, 2000. At the time of the first study visit government team of the Basic Design Study in March, 2001, the basic approach was confirmed through discussions and was included in the Minutes of Discussions (M/D) to commence the Basic Design Study for the Project. Subsequently, the field survey for the electrification programme was completed in line with the M/D.

However, when the observation team for the Buckwheat Project, which is a technical cooperation project related to the present Project, visited Myanmar on 27th April, 2001, the Myanmar side expressed concern that the Project could cause a shortage of the water supply for daily life as the planned small hydropower station under the Project would use the same water source as the planned project for the construction of a water supply channel to Laukai, area. The Myanmar side then put forward a new request "to change the project content from the construction of a small hydropower station as agreed by the M/D to the extension of the existing 10.5 kV high voltage distribution line in order to avoid any adverse impacts on the future water supply channel construction project.

In response to this new request, the second government team of the Basic Design Study dispatched in May, 2001 consulted with the Myanmar side and concluded the new M/D, confirming that the final preference of the Myanmar side was for the extension of the existing 10.5 kV high voltage distribution line. Consequently, the principal feature of the Basic Design Study for the Project has been changed from electrification by the construction of a new small hydropower station to electrification by the extension of the existing high voltage distribution line.

CHAPTER 2

CONTENTS OF THE PROJECT

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2-1 Basic Concept of the Project

The cultivation of opium poppy in border areas closed to China, Lao and Thailand is a big subject for the government of Myanmar. The government has established branch offices of central ministries based on the peace agreement with each groups and propelled the eradication of opium poppy cultivation in those areas. Special Region No. 1 (Kokang), the concerned region of this study, sides with government policy to eradicate opium poppy cultivation and they proceeds the substitution of cash crops for poppy and the development of villages. However the life of farmers are still hard up and they still continue the cultivation of opium poppy in remote area, although total cultivated area in Kokang region has been decreasing.

Against those situation, PBANRDA requested Japan's Grant Aid for "Kokang Rural Development Project for Drug Control", which planning the construction of water supply system, irrigation system, mini-hydropower plant and procurement of road maintenance equipment, and it aims to proceed the eradication of opium poppy cultivation. (Overall Goal)

On the other hand, Japanese government approaches on those situation with technical assistant program "Rural Development for Border Area in Northern Shan State", and they have promoted buckwheat to be substituted for opium poppy in Kokang region too.

Among these activities, this project aims to support them by the improvement of living environment of villages through the improvement of road section, which is closely related with their daily life and farming activities, and the electrification of villages which is grading up their living standard. (Project Obligation)

The Project aims at achieving the above-mentioned objective by branching and extending the existing distribution line from Tar Shwe Tan through the construction of a new distribution network to an area of a 1 km radius of central Kya Si Su which is the centre of socioeconomic activities in the Kya Si Su Village Tract and where such public facilities as a village office, school, market, etc. are concentrated and Cha Ho, a village on the new distribution route. The Project also plans the transfer of operation and maintenance skills for the said network to staff members of the Power Division, Planning and Commerce Department of the Special Region No.1 (Kokang).

The construction of the new distribution network will assure the supply of electricity, which is an important part of the social infrastructure, in the central area of the Kya Si Su Village Tract and will vitalise the socioeconomic activities and improve the living environment in the subject area. The project components subject to Japanese assistance are (i) connection of the new distribution line to the existing 10.5 kV distribution line at Tar Shwe Tan (ii) the construction of a new 10.5 kV high voltage distribution line to an area of a 1 km radius of central Kya Si Su and Cha Ho on the route, and (iii) the procurement of low voltage distribution lines for house connection.

2-2 Basic Design for Requested Japanese Assistance

2-2-1 Design Policy

(1) Basic Principles

The targets of the Project are an area of 1 km radius of central Kya Si Su and Cha Ho on the route on the extended high voltage distribution line. A new distribution network for these target areas will be constructed and connected to the existing distribution line to create power supply facilities to ensure a stable power supply for five years after the completion of the Project.

(2) Principles Regarding Natural Conditions

1) Temperature

Although no statistical data on temperature and humidity is available for the Project Area, its monsoon type inland climate and high elevation suggest a relatively cooler climate and a lower level of humidity compared to the nearby city of Lashio (mean temperature of 28.8°C (maximum) and 14.9°C (minimum; mean relative humidity of 73.1%). Accordingly, the temperature of the Project Area should be within the standard operating range (between –20°C and 40°C; relative humidity of up to 80%) of ordinary electrical appliances throughout the year, making it unnecessary to consider special specifications in the selection of the equipment and materials for the Project.

2) Rainfall and Rainy Season

The annual rainfall is approximately 1,300 mm – 1,600 mm, most of which is concentrated in the rainy season from May to October. As difficulties for vehicle traffic and other obstacles to the Project-related work are anticipated during the

rainy season, careful planning of the schedule will be necessary, including the avoidance of full-scale installation work during the rainy season.

Thunderstorms also occur during the rainy season and the installation of arresters and other protective gear should be considered to prevent lightning damage to the distribution lines.

3) Earthquakes

While there is no statistical data on earthquakes in the Project Area, the narrow geological belt consisting of mainly volcanic rocks to the west of the Project Area has many faults, causing earthquakes from time to time. This situation makes the consideration of earthquakes in the design of the facilities and equipment necessary.

(3) Principles Regarding Socioeconomic Conditions

The Project Area is situated in the socioeconomic sphere of China and the language spoken is Kokang and not Myanmar. The special conditions in this area include the compulsory obligation for all foreigners in the area to communicate on a daily basis with the local government security office.

As mentioned earlier, the development of social infrastructure in the Project Area has been extremely slow. The lack of vehicle roads makes it very difficult to travel from one village to another while the virtual absence of hotel accommodation, medical care facilities and telephone or other telecommunications facilities signify the poor living conditions in the area. This situation makes the preparation of a realistic work plan which reflects the local conditions at the time of preparing a common temporary work plan essential, taking the deployment of a full-time interpreter and a person responsible for liaising with the security office, the provision of radio equipment to ensure an emergency communication system, temporary accommodation, etc., into consideration so that the people working for the Project can perform their work in a safe as well as appropriate manner.

(4) Principles Regarding Construction and Procurement Conditions

The procurement of local equipment and materials where possible will be the basic principle for the preparation of the work plan. As Kokang Region, the Project Area, is part of the economic sphere of China, Chinese products are widely marketed. Accordingly, it is possible to procure aggregate, cement and such distribution equipment as cables, concrete poles, etc., in Laukai and these will be used for the Project.

Transformers, circuit breakers and other functional products, however, cannot be procured locally and are usually ordered from China and other countries as required. As Chinese products are marred by uneven quality and frequent breakdowns, the Myanmar side strongly hopes for the procurement of such functional products from Japan. The procurement of Japanese products will, therefore, be considered.

(5) Principles Regarding Use of Local Construction Companies

There are general construction companies and electrical installation companies in Laukai and these companies are engaged in local construction work. This makes the local procurement of transport vehicles and construction equipment and the recruitment of local workers relatively easy. Therefore, the use of local companies as subcontractors for the planned construction of the distribution line is possible.

In order to implement the Project as scheduled, the dispatch of Japanese engineers will be essential for schedule control, quality control and safety control.

In view of the facts that distribution line construction work in mountain areas is rare in Myanmar, adjustment and test operation after installation will demand engineers with superior technical expertise and that it will be difficult to use a local company for this type of work other than for the purpose of recruiting local workers, the dispatch of Japanese engineers for quality control, technical guidance and schedule control will be essential.

(6) Principals Regarding Management and Maintenance Capabilities of Project Implementation Body

The Electricity Division, Planning and Industry Department of Special Region No.1 (Kokang) which will be responsible for the management of the Project has 46 staff members (of which 22 are engaged in work site operation at power stations, substations, etc.) The maintenance skills of this Division have now reached the level where daily inspection, including the preparation of daily and monthly reports, overhaul of generators and visual inspection of transmission/distribution lines, can be conducted without outside help since the construction of the Long Chin Power Station in 1999. However, further improvement of the technical expertise of the staff members by means of OJT by well experienced engineers and overseas training is still necessary in view of the systematic training of capable staff members.

For this reason, the transfer of operation and maintenance techniques will be conducted during the construction period by distribution engineers dispatched by the Contractor so

that the Myanmar side can learn appropriate maintenance techniques. In addition, the necessary spare parts and operation/maintenance manuals should be provided to ensure the transfer of the techniques required for the proper maintenance of the new facilities following the completion of the Project.

(7) Principles Regarding Facility and Equipment Grades

In consideration of the relevant conditions described above, the scope for facility construction and equipment procurement and the technical level under the Project will be determined based on the following principles.

1) Principles Regarding Scope of Facilities and Equipment

The minimum and necessary equipment configuration and specifications will be selected in relation to the connection with the existing 10.5 kV distribution line, the construction of a new 10.5 kV distribution line and the procurement of distribution equipment and materials for house connection, to enable a stable supply of power for households and public facilities, including schools, in the Kya Si Su Village Tract with a target year of the fifth year after completion of the Project.

2) Principles Regarding Grades

For the design of the distribution network to be constructed under the Project and the house connection equipment and materials to be provided under the Project, particular attention should be paid to their grades so that the technical level demanded by such facilities and equipment does not exceed the technical level of Special Region No.1 (Kokang) which will be responsible for their operation and maintenance following the completion of the Project. As the installation of low voltage distribution lines to households and other users will be conducted by the Myanmar side, Special Region No.1 (Kokang), the grades of the relevant equipment and materials must be determined to suit the technical level of the Special Region No.1 (Kokang).

(8) Principles Regarding Construction/Procurement Methods and Schedule

Given the poor development state of roads (which become almost impassable at the time of rain) and other social infrastructure components in the Project Area, it is anticipated that the implementation of full-scale construction work will be extremely difficult during the rainy season. Because of the lack of vehicle roads in the Project Area, it will be necessary to rely on animal trails. While construction materials, including aggregate, and

distribution materials, including cables, can be locally procured, the procurement of transformers and other functional products from Japan will be necessary.

For these reasons, construction work will be completed taking the effects of the rainy season, the equipment and material procurement sources and the necessary time for procurement and transportation into consideration.

2-2-2 Basic Plan (Construction Plan/Equipment Plan)

2-2-2-1 Estimated Power Demand in Project Area

(1) Population, Number of Households and Unit Power Demand

The state of housing, availability of public facilities and situation of water-fetching work from water sources, etc. appear to indicate that the standard of living in the Project Area is not high. Coupled with the absence of large-scale commercial or industrial activities in the area, the unit power demand per user in the subject area for electrification under the Project is roughly estimated as shown below.

Ordinary household/shop	:	0.2 kW/user (for lighting, radio, TV, video, etc.) Given the socioeconomic conditions of the Project Area, electrical appliances which are likely to be used by ordinary households are, for example, one incandescent lamp (60 W) and one TV or video (140 W), totalling 200 W.
Public facilities	:	0.2 – 0.3 kW/facility (lighting, radio, TV, video, radio equipment, water pump, etc., at schools and government offices)

(2) Rate of Power Demand Increase

The power demand generally increases in proportion to the rate of population increase. According to the Special Region No.1 (Kokang), the annual population increase rate in the rural areas of Kokang is approximately 3%. Meanwhile, the national average increase rate of the maximum power demand in Myanmar in the last 10 years (1988 – 1998) of 8.3% is relatively high as shown in Table 2.2.2.1-(1) and a similar rate of increase is expected to continue in the future.

Table 2.2.2.1-(1) National Rate of Increase of Power Demand in Last 10 Years

Year	Maximum Power Demand (MWh)	Rate of Increase	Remarks
1988/89	332.00		
1989/90	373.00	12.3%	Economic growth
1990/91	410.30	10.0%	
1991/92	430.44	4.9%	
1992/93	435.19	1.1%	
1993/94	491.70	13.0%	Expansion of private sector
1994/95	515.60	4.9%	
1995/96	616.90	19.6%	Development of housing and industrial complexes
1996/97	660.80	7.1%	
1997/98	682.60	3.3%	
Average between 1988/89 and 1997/98		8.3%	

Source: Myanmar Electric Power Enterprise

The Project Area is not linked to the national power grid. As it is an area of different economic and social conditions inside Myanmar, it is unlikely that the trend of the power demand increase on a national basis is applicable to this area without modification. Nevertheless, improvement of the living conditions through electrification may possibly stimulate economic growth comparable to the national picture. Accordingly, an annual power demand increase rate of 6%, i.e. average between the population growth rate in the Project Area and the power demand increase rate in Myanmar, is adopted for the project design.

(3) Estimated Power Demand in Project Area

Table 2.2.2.1-(2) shows the potential power demand and the estimated power demand in the future based on the population size, unit power demand and estimated power demand increase rate described above. The current potential power demand in the Project Area is approximately 131 kW. The power demand in the area of a 1 km radius of central Kya Si Su and Cha Ho on the new distribution route is expected to be approximately 52 kW in the fifth year after the commencement of power supply.

Table 2.2.2.1-(2) Estimated Power Demand in Project Area

(1/2)

Area	Name of village / Hamlet	Ordinary Households				Public Facilities (kw)											
						Primary Schools			Clinics			Water Supply Sites			Markets		
		No. of Ordinary Households	Population	Unit Power Demand (kW/ household)	Power Demand (kW)	No.	Unit Power Demand (kW/site)	Power Demand (kW)	No.	Unit Power Demand (kW/site)	Power Demand (kW)	No.	Unit Power Demand (kW/site)	Power Demand (kW)	No.	Unit Power Demand (kW/site)	Power Demand (kW)
Within 1 km Radius of Central Kya Si Su	Cha Ho	90	540	0.2	18.0	1.0	2.0	2.0				1.0	0.2	0.2			0.0
	Kya Si Su																
	1) Ping Chan	56	336	0.2	11.2	1.0	2.0	2.0	1.0	2.0	2.0	1.0	0.2	0.2	1.0	1.0	1.0
	2) Chun Chourn	Included in above															
	3) Ta Ying Fan	50	300	0.2	10.0												
	4) Syao Ying Fan	Included in above															
	5) Ta Hon Pyin	41	246	0.2	8.2							1.0	0.2	0.2			
	6) Hui Zi Ja Chang	Included in above															
	Sub-Total	237	1,422		47.4	2.0		4.0	1.0		2.0	3.0		0.6	1.0		1.0
Within 5 km Radius of Central Kya Si Su	① Ta Kyu Sai	156	936	0.2	31.2	1.0	2.0	2.0				1.0	0.2	0.2			
	②-1 Ta Minhai	Included in Ma Mo Su															
	⑤ Ka Wang Tan	20	120	0.2	4.0	1.0	2.0	2.0				1.0	0.2	0.2			
	⑤-1 Chu Wa Chai	27	162	0.2	5.4							1.0	0.2	0.2			
	⑤-2 Tachelo	9	54	0.2	1.8							1.0	0.2	0.2			
	⑥ Ma Ti Chi	35	210	0.2	7.0	1.0	2.0	2.0				1.0	0.2	0.2			
	⑥-1 Pai Sanko	19	114	0.2	3.8							1.0	0.2	0.2			
	⑥-2 Lung Tanko	32	192	0.2	6.4							1.0	0.2	0.2			
	⑨-1 Tie Chan Chai	Included in Run Syon															
	⑨ Run Syon	28	168	0.2	5.6							1.0	0.2	0.2			
	Sub-Total	326	1,956		65.2	3.0		6.0	0.0		0.0	8.0		1.6	0.0		0.0
Outside 5 km Radius of Central Kya Si Su	② Ma Mo Su	70	420	0.2	14.0							1.0	0.2	0.2			
	③ Suan Karin	46	276	0.2	9.2							1.0	0.2	0.2			
	④ Wai Yao	43	258	0.2	8.6							1.0	0.2	0.2			
	⑦ Nyu Cyan	42	252	0.2	8.4							1.0	0.2	0.2			
	⑧ Hwan Thin	93	558	0.2	18.6							1.0	0.2	0.2			
	Sub-Total	294	1,764		58.8	0.0		0.0	0.0		0.0	5.0		1.0	0.0		0.0
	Total	**857**	**5,142**		**171.4**	**5.0**		**10.0**	**1.0**		**2.0**	**16.0**		**3.2**	**1.0**		**1.0**

Area	Name of village / Hamlet	Public Facilities			(a) Total of Potential Power Demand (kW)	(b) Simultaneous Power Usage Factor	(a)×(b) Estimated Power Demand (kW)	Estimated Power Demand (kw)									
		Village Offices						After 1 Yr	After 2 Yrs	After 3 Yrs	After 4 Yrs	After 5 Yrs (Target Year)	After 6 Yrs	After 7 Yrs	After 8 Yrs	After 9 Yrs	After 10 Yrs
		No.	Unit Power Demand (kW/site)	Power Demand (kW)				1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Within 1 km Radius of Central Kya Si Su	Cha Ho		0.2	0.2	20.4	0.7	14.3	15.1	16.0	17.0	18.0	19.1	20.3	21.5	22.8	24.1	25.6
	Kya Si Su																
	1) Ping Chan	1.0	0.2	0.2	16.6	0.7	11.6	12.3	13.1	13.8	14.7	15.6	16.5	17.5	18.5	19.6	20.8
	2) Chun Chourn																
	3) Ta Ying Fan				10.0	0.7	7.0	7.4	7.9	8.3	8.8	9.4	9.9	10.5	11.2	11.8	12.5
	4) Syao Ying Fan																
	5) Ta Hon Pyin				8.4	0.7	5.9	6.2	6.6	7.0	7.4	7.9	8.3	8.8	9.4	9.9	10.5
	6) Hui Zi Ja Chang																
	Sub-Total	1.0		0.4	55.4		38.8	41.1	43.6	46.2	49.0	51.9	55.0	58.3	61.8	65.5	69.4
Within 5 km Radius of Central Kya Si Su	① Ta Kyu Sai				33.4	0.7	23.4	24.8	26.3	27.8	29.5	31.3	33.2	35.2	37.3	39.5	41.9
	②-1 Ta Minhai																
	⑤ Ka Wang Tan				6.2	0.7	4.3	4.6	4.9	5.2	5.5	5.8	6.2	6.5	6.9	7.3	7.8
	⑤-1 Chu Wa Chai				5.6	0.7	3.9	4.2	4.4	4.7	4.9	5.2	5.6	5.9	6.2	6.6	7.0
	⑤-2 Tachelo				2.0	0.7	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.4	2.5
	⑥ Ma Ti Chi				9.2	0.7	6.4	6.8	7.2	7.7	8.1	8.6	9.1	9.7	10.3	10.9	11.5
	⑥-1 Pai Sanko				4.0	0.7	2.8	3.0	3.1	3.3	3.5	3.7	4.0	4.2	4.5	4.7	5.0
	⑥-2 Lung Tanko				6.6	0.7	4.6	4.9	5.2	5.5	5.8	6.2	6.6	6.9	7.4	7.8	8.3
	⑨-1 Tie Chan Chai																
	⑨ Run Syon				5.8	0.7	4.1	4.3	4.6	4.8	5.1	5.4	5.8	6.1	6.5	6.9	7.3
	Sub-Total	0.0		0.0	72.8		51.0	54.0	57.3	60.7	64.3	68.2	72.3	76.6	81.2	86.1	91.3
Outside 5 km Radius of Central Kya Si Su	② Ma Mo Su				14.2	0.7	9.9	10.5	11.2	11.8	12.5	13.3	14.1	14.9	15.8	16.8	17.8
	③ Suan Karin				9.4	0.7	6.6	7.0	7.4	7.8	8.3	8.8	9.3	9.9	10.5	11.1	11.8
	④ Wai Yao				8.8	0.7	6.2	6.5	6.9	7.3	7.8	8.2	8.7	9.3	9.8	10.4	11.0
	⑦ Nyu Cyan				8.6	0.7	6.0	6.4	6.8	7.2	7.6	8.1	8.5	9.1	9.6	10.2	10.8
	⑧ Hwan Thin				18.8	0.7	13.2	13.9	14.8	15.7	16.6	17.6	18.7	19.8	21.0	22.2	23.6
	Sub-Total	0.0		0.0	59.8		41.9	44.4	47.0	49.9	52.8	56.0	59.4	62.9	66.7	70.7	75.0
	Total	**1.0**		**0.4**	**188.0**		**131.6**	**139.5**	**147.9**	**156.7**	**166.1**	**176.1**	**186.7**	**197.9**	**209.8**	**222.3**	**235.7**

Notes: (1) The potential demand is estimated based on the following unit power demand.
Ordinary households : 0.2 kW/household Primary schools : 2 kW/site Clinics : 2 kW/site
Water supply sites : 0.2 kW/site Markets : 1 kW/site Village offices : 0.2 kW/site
(2) At least one water supply site is accounted for, assuming the future installation of a water pump.
(3) Village No. marked with ○ shows the numbering on the Map of the Project site.

2-2-2-2 Distribution Line Construction Plan

(1) Outline

The subject area of electrification under the Project is an area of a 1 km radius of central Kya Si Su in the Kya Si Su Village Tract which covers an area of a some 8 km radius of central Kya Si Su. Accordingly, for the present distribution line construction plan, the analysis results are shown here based on the division of the Kya Si Su Village Tract into three zones based on the distance from central Kya Si Su (within a 1 km radius, within a 5 km radius and outside a 5 km radius), taking the possibility of extending the distribution network beyond the currently planned 1 km radius in the future into consideration. The basic distribution routes based on such planning are shown in Basic Design Drawing KK-GO1.

As the Kya Si Su Village Tract, i.e. the subject area of the Study, covers a wide area, the maintenance of the voltage drop within the standard value (10%) by means of the low voltage distribution method will be difficult, making it necessary for the Project design to employ the high voltage distribution method with a primary distribution voltage of 10.5 kV. For the installation of such a distribution system, the existing 10.5 kV distribution line will be extended and pole-mounted transformers will be installed in the necessary locations in the user area to step down to 400/230 V.

The following basic points will be adhered to for the construction of the new distribution line under the Project.

1) The distribution capacity, voltage drop at the distribution end and the minimisation of power cut areas at the time of an accident must be taken into careful consideration.
2) The system should be capable of responding to an increase of the power demand and power grid extension in the future and should ensure a high level of reliability.
3) The level of supply reliability, including the reduction of voltage fluctuations and the prevention of accidents, must be high.
4) Special attention must be paid to the equipment and material specifications so that the technical levels do not exceed those of the existing distribution network with which engineers and technicians in Myanmar are familiar to ensure easy and safe maintenance.
5) Standard equipment and materials with the least variety of items should be used to ensure the most economical design of the entire system.

(2) Distribution Method

In contrast to the standard high voltage distribution at 11 kV (based on British standards) in Myanmar, the distribution voltage used in Laukai and Tar Shwe Tan is 10.5 kV based on Chinese standards. The local low distribution voltage is 400/230 V. Given this situation, the planned distribution voltages under the Project are shown in Table 2.2.2.2-(1).

Table 2.2.2.2-(1) Distribution Method

Type	Section	Distribution Method
Primary Distribution	From high voltage distribution line to pole-mounted transformer	3 phase, 3 wire; 10.5 kV; 50 Hz
Secondary Distribution	From pole-mounted transformer to low voltage trunk line	3 phase, 4 wire; 400 V/230 V; 50 Hz
Tertiary Distribution	From low voltage trunk line to each user	single phase, 2 wire; 230 V; 50 Hz

The distribution network is shown in Basic Design Drawing KK-EO1 while the distribution method is explained below. The connection work to each user is much easier than high voltage distribution work and can be conducted with the present technical capability of Myanmar. Therefore, while the procurement of equipment and materials for user connection is included in the scope of the Project, the actual connection work will be undertaken by the Myanmar side. The division of work between the Japanese and Myanmar sides is indicated in Basic Design Drawing KK-EO3.

- The 10.5 kV high voltage distribution line will be extended to the centre of each village/hamlet area and a pole-mounted transformer will be used to step down the voltage from 10.5 kV to 400/230 V.
- The low voltage trunk line (400/230 V) will be extended to each hamlet for further distribution to each user with the single phase, 2 wire method.

(3) Distribution Routes

A field reconnaissance survey was conducted along the planned distribution routes which had been roughly determined on the map (scale: 1 to 50,000) obtained in Japan. The name and location of each village/hamlet were checked locally and the location was confirmed using GPS. The distribution routes were then decided based on the confirmed

location of each hamlet, taking obstacles along the routes, including such natural obstacles as cliffs and rivers, into consideration.

The trunk 10.5 V distribution routes in the Project Area are shown in Basic Design Drawings KK-GO1 (10.5 kV Distribution Line Map) and KK-EO2 (Distribution Network).

- For the section from Tar Shwe Tan to Kya Si Su, the high voltage distribution line will be constructed along the existing road (which is passable by vehicles).
- The construction of the high voltage distribution line to those areas around Kya Si Su which are accessible by vehicle can basically be planned along existing mountain roads.

Table 2.2.2.2-(2) describes the conditions of the planned distribution routes.

Table 2.2.2.2-(2) Conditions of Planned Distribution Routes

Project Area	Subject Village/Hamlet	Length of Distribution Line (km)			Conditions
		10.5 kV	0.4 kV	10.5 kV/0.4 kV Joint Installation*	
1 km Radius from Central Kya Si Su	Central Route - Kya Si Su - Cha Ho	13.0	8.5	3.5	- Poles will be erected along the route (passable by vehicles) except for some sections. - Vehicles can be used to transport equipment and materials in the dry season, except for some sections, along this route.
5 km Radius from Central Kya Si Su	Central Route - Ta Kyu Sai - Ta Min Su Eastern Route - Chu Wa Chai - Ka Wang Tan - Tachelo Western Route - Ma Chi Ti - Pai Sanko - Lung Tanko - Run Syon - Tie Chan Chai	24.5	10.5	4.5	- Posts will be erected along mountain roads. - Vehicle access is impossible except for one village on the Central Route and two villages on the Eastern Route. - Equipment and materials will be transported manually or by donkey. - Equipment and materials will be light weight and dis-assembled for transportation.
Outside 5 km Radius of Central Kya Si Su	Central Route - Ma Mo Su Eastern Route - Wai Yao - Suan Karin	20.5	5.0	0.0	- Posts will be erected along mountain roads. - All roads are not usable by vehicles. - Equipment and materials will be transported manually or by donkey. - Mountain roads are very steep and located on steep hillsides. Equipment and materials will be transported in small unit.
Total		58.0	24.0	8.0	

* Joint installation means the installation of both 10.5 kV and 0.4 kV distribution lines on the same post. The length of joint installation in the table is included in the 10.5 kV or 0.4 kV distribution line length.

Note: □ indicates the scope of the Project.

(4) Types of Cables

In view of the estimated power demand in the Project Area, a small cable power transmission capacity appears sufficient for a while even though the mechanical strength to resist tensile force at the time of installation must be taken into consideration. As it is undesirable to introduce many types of cables from the maintenance point of view, those used by the existing system will be used as shown in Table 2.2.2.2-(3) to ensure the compatibility of the new and existing lines.

Table 2.2.2.2-(3) Types of Cables to be Used

Type of Cable	Cable to be Used	Size	Allowable Current (A)
10.5 kV High Voltage Distribution Line	ACSR (aluminium conductor steel reinforced)	35 mm^2	160
400 V Low Voltage Distribution Line	ACSR (aluminium conductor steel reinforced)	35 mm^2	160

(5) Insulators

LP insulators or low voltage insulators will be used for intermediate poles while a combination of tension insulators and LP insulators will be used for angle poles to achieve the best economy. The types and quantity of insulators to be used are shown in Table 2.2.2.2-(4).

Table 2.2.2.2-(4) Insulators to be Used (per Line)

Type of Cable	Place of Use	Type of Insulator		
		LP	Low Voltage	Tension
10.5 kV High Voltage Distribution Line	Straight Pull	1	-	-
	Angled (Anchor)	1 – 2	-	2 – 4
400 V Low Voltage Distribution Line	Straight Pull	-	1	-
	Angled (Anchor)	-	1 – 2	-

(6) Pole-Mounted Transformers

Pole-mounted type distribution transformers will be procured for low voltage distribution from the 10.5 kV high voltage distribution line to users. The capacities of these pole-mounted transformers will be uniformatised to 50 kVA and 20 kVA for

compatibility in the case of breakdown and for the simplification of maintenance work. One 50 kVA transformer will be installed at each hamlet in the case of Kya Si Su and Ta Kyu Sai and one 20 kVA transformer will be installed at each mountain village/hamlet based on the estimated demand described in 2-2-2-1.

Table 2.2.2.2-(5) lists the installation sites of the pole-mounted transformers to be procured under the Project. On the primary voltage (10.5 kV) side of each distribution transformer, an arrester and fused cut out switch will be installed to protect the transformer and the required quantities will be procured.

These pole-mounted transformers will be situated below the distribution line and a distance of 2.5 m from the ground will be secured as in the case of similar transformers in place in Myanmar to avoid any personal disaster. Fencing will not, therefore, be erected at the transformer installation sites.

Table 2.2.2.2-(5) Installation Sites of Pole-Mounted Transformers to be Procured Under the Project

Area	Subject Village/Hamlet	No. of Households	Public Facilities						Total	Estimated Maximum Power Demand (kW)	Estimated Max. Power Demand (kW)		10.5 kV/400 – 230 V Pole-Mounted Transformer	
			Primary Schools	Clinics	Water Supply Sites	Markets	Village Offices	Sub-Total			5 Years Later	10 Years Later	20 kVA	50 kVA
1 km Radius of Central Kya Si Su	Cha Ho	90	1		1			2	92	14.3	19.1	25.6	3	
	<Kya Si Su> 1) Ping Chang 2) Chun Choum	56 (included in above)	1	1	1	1	1	5	61 0	11.6 (as left)	15.6 (as left)	20.8 (as left)		1
	3) Ta Ying Fan 4) Syao Ying Fan	50 (included in above)							50 0	7.0 (as left)	9.4 (as left)	12.5 (as left)		1
	5) Ta Hong Ping 6) Hui Zi Ja Chang	41 (included in above)			1			1	41 1	5.9 (as left)	7.9 (as left)	10.5 (as left)		1
	Sub-Total	237	2	1	3	1	1	8	245	38.8	51.9	69.4	3	3
5 km Radius of Central Kya Si Su	① Ta Kyu Sai	156	1		1			2	158	23.4	31.3	41.9		2
	②-1 Ta Min Su	10			1			1	11	(included in Ma Mo Su)	(as left)	(as left)	1	
	⑤ Ka Wang Tan	20	1		1			2	22	4.3	5.8	7.8	1	
	⑤-1) Chu Wa Chai	27			1			1	28	3.9	5.2	7.0	1	
	⑤-2) Tachelo	9			1			1	10	1.4	1.9	2.5	1	
	⑥ Ma Chi Ti	35	1		1			2	37	6.4	8.6	11.5	1	
	⑥-1) Pai Sanko	19			1			1	20	2.8	3.7	5.0	1	
	⑥-2) Lung Tanko	32			1			1	33	4.6	6.2	8.3	1	
	⑨-1) Tie Chan Chai	9			1			1	10	(included in Run Syon)			1	
	⑨ Run Syon	19			1			1	20	4.1	5.4	7.3	1	
	Sub-Total	336	3		10			13	349	51.0	68.2	91.3	9	2
Outside 5 km Radius of Central Kya Si Su	② Ma Mo Su	60	1		1			2	62	9.9	13.3	17.8	1	
	③ Suan Karin	46			1			1	47	6.6	8.8	11.8	1	
	④ Wai Yao	43			1			1	44	6.2	8.2	11.0	1	
	⑦ Nyu Cyan	42			1			1	43	6.0	8.1	10.8	1	
	⑧ Hwan Thin	93			1			1	94	13.2	17.6	23.6	1	
	Sub-Total	284	1		5			6	290	41.9	56.0	75.0	5	
	Total	857	6	1	18	1	1	27	884	131.6	176.1	235.7	17	5

Note: ☐ indicates the scope of the Project.

(7) Circuit Breakers at Branch Points of Distribution Line

The planned distribution line under the Project will branch out from the existing distribution line at Tar Shwe Tan. With the completion of the Project, the extended distribution network will reach Kya Si Su in the steep mountain area. It will be possible in the future for this new distribution line to be further extended to cover the entire Kya Si Su Village Tract where villages/hamlets are scattered in a wide area. The realisation of such future extension means that the total length of the distribution lines will be fairly long and that the management of the new distribution system will be fairly complicated when a partial power cut is required for line work or when an accident involving a distribution line occurs. It will, therefore, be very important to quickly establish the location of an accident and to quickly and safely separate short-circuiting or other types of accidents from the rest of the system for continuing operation. For this purpose, a circuit breaker (vacuum type) for protection from earth faults and over-current, and a cut out switch for maintenance will be installed at the main branching points. The circuit breaker installation sites will be as follows.

- Branch point from existing distribution line (Tar Shwe Tan)
- Starting point of western route (Kya Si Su)
- Starting point of central route (Kya Si Su)
- Starting point of eastern route (Kya Si Su)

Given the possibility of the introduction of a different tariff system and a separate maintenance system for the new distribution network in Kya Si Su from the systems applied in areas served by the existing distribution line in Tar Shwe Tan, a metering out fit (hereinafter referred to as a MOF to avoid confusion with a watt-hour meter for users) will be installed at the branching point of the existing distribution line in Tar Shwe Tan as metering apparatus and an ammeter and a voltmeter will be installed at the above circuit breaker installation sites.

The circuit breaker, MOF and other necessary apparatus will be installed in an outdoor type cubical panel in consideration of the weather conditions of the Project Area. This outdoor type distribution panel will be located on concrete foundations and will be protected by perimeter fencing to ensure the safety of local residents.

2-2-2-3 Design Conditions

(1) Codes/Standards and Units to be Applied

For the design of the equipment and facilities for the Project, IEC, ISO and other international standards will be applied to their main functions while Japanese standards will be applied to the manufacture of equipment and materials. To be more precise, the following standards will be used and SI units will be used for the units.

a) IEC : applied to the main functions of general electrical products

b) ISO : applied to the performance evaluation of general industrial products

c) JIS : applied to general industrial products

d) JEC : applied to general electrical products

e) JEM : as above

f) JEAC : as above

g) JCS : applied to electrical wires and cables

h) Technical Standards for Electrical Facilities in Japan : applied to general electrical work

i) Other relevant Japanese and international standards : applied to general industrial products

For the selection of distribution equipment, the local weather conditions and other relevant factors will be taken into careful consideration. In addition, altitude correction of the insulation performance will be conducted in view of the fact that the altitude of the Project Area of approximately 1,650 m is well above 1,000 m.

(2) Design Wind Pressure

The design wind pressure load is set at 100 kg/m^2. This value is adopted as it is listed as the "Type A Wind Pressure Load" applicable to facilities in mountain areas in Japan by the "Technical Standards for Electrical Facilities in Japan". "Snow on electrical cables" is not considered as no snow is recorded locally in winter, i.e. the dry season.

(3) Strength Calculation Conditions and Safety Factor

Poles will be erected to achieve a safety factor of 2 or higher in accordance with the "Technical Standards for Electrical Facilities in Japan" (the safety factor is calculated by

dividing the allowable bending moment of a pole by the wind pressure load on the pole and cable).

(4) Types and Shapes of Poles

As the Project Area is a steep mountain area with virtually no vehicle roads and mainly animal trails, the poles, installation metalware, insulators, cables and other materials will be transported manually or by donkey. For this reason, the poles will, in principle, be lightweight built-up steel plate poles" which can be disassembled for transportation. However, the locally available concrete poles used at Laukai, Tar Shwe Tan, etc., will be used at those sites to which transportation by vehicle is feasible or believed to be relatively easy. Basic Design Drawing KK-EO4 shows the composition of the lightweight built-up steel plate poles.

Table 2.2.2.3-1 Specifications of Lightweight Built-Up Steel Plate Poles

Length	approx. 10 m
Pole End Diameter	approx. 200 mm
Ground Level Diameter	approx. 350 mm
Weight	approx. 220 kg

(5) Pole Distance

The distance between the poles is determined by the size of the cable to be used, the tensile load of the cable, the pole strength, etc. Having considered the state of the existing distribution line and the mountainous nature of the Project Area, the pole distance shown in Table 2.2.2.3-2 will be adopted for the Project.

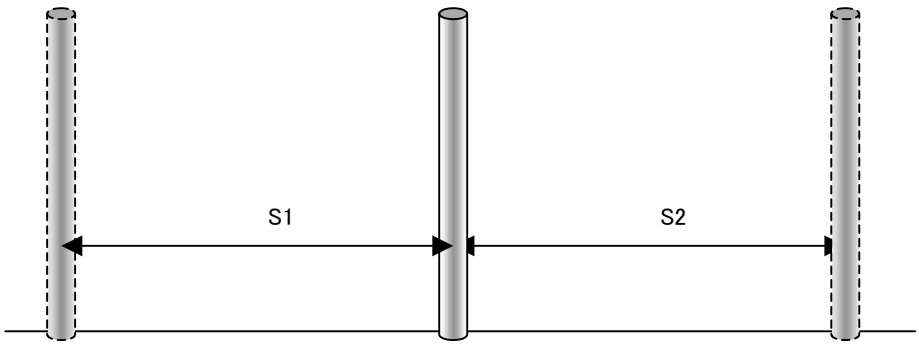


Fig. 2.2.2.3-1 Pole Distance

Table 2.2.2.3-2 Pole Distance

Conditions	Pole Distance	
	S1	S2
When the pole distance on both sides is the same	70 m	70 m
When the pole distance on both sides is not the same	can be extended to S1 – S2 = 70 m	

(6) Minimum Insulation Distance

The minimum distance between the cables is shown in Table 2.2.2.3-3 as required by the relevant local standards.

Table 2.2.2.3-3 Minimum Cable Distance

Cable Installation Situation		Minimum Distance Adopted Under the Project
Height above the ground	10.5 kV High Voltage Distribution Line	5.00 m
	400 V Low Voltage Distribution Line	5.00 m
Conductors on the same circuit (horizontal distance)	10.5 kV High Voltage Distribution Line	0.80 m
	400 V Low Voltage Distribution Line	0.533 m

(7) Height of Supporting Structure

According to the Technical Standards for Electrical Facilities in Japan, the line height should be more than 5.0 m for both the 0.4 kV low voltage distribution line and 10.5 kV high voltage distribution line when crossing a road with a low traffic volume. As a line height of more than 5.0 m with “sagging in the span” due to the conductor's own weight being taken into consideration can be achieved with a cross arm height of more than 6.0 m, a basic height of cross arm of at least 6.0 m is determined.

Fig. 2.2.2.3-2 shows the configuration of an intermediate pole when a lightweight built-up steel plate pole is used.

See Basic Design Drawings KK-L01 and KK-P01 through KK-P35 for the height of each component of the supporting structure and state of pole assembly.

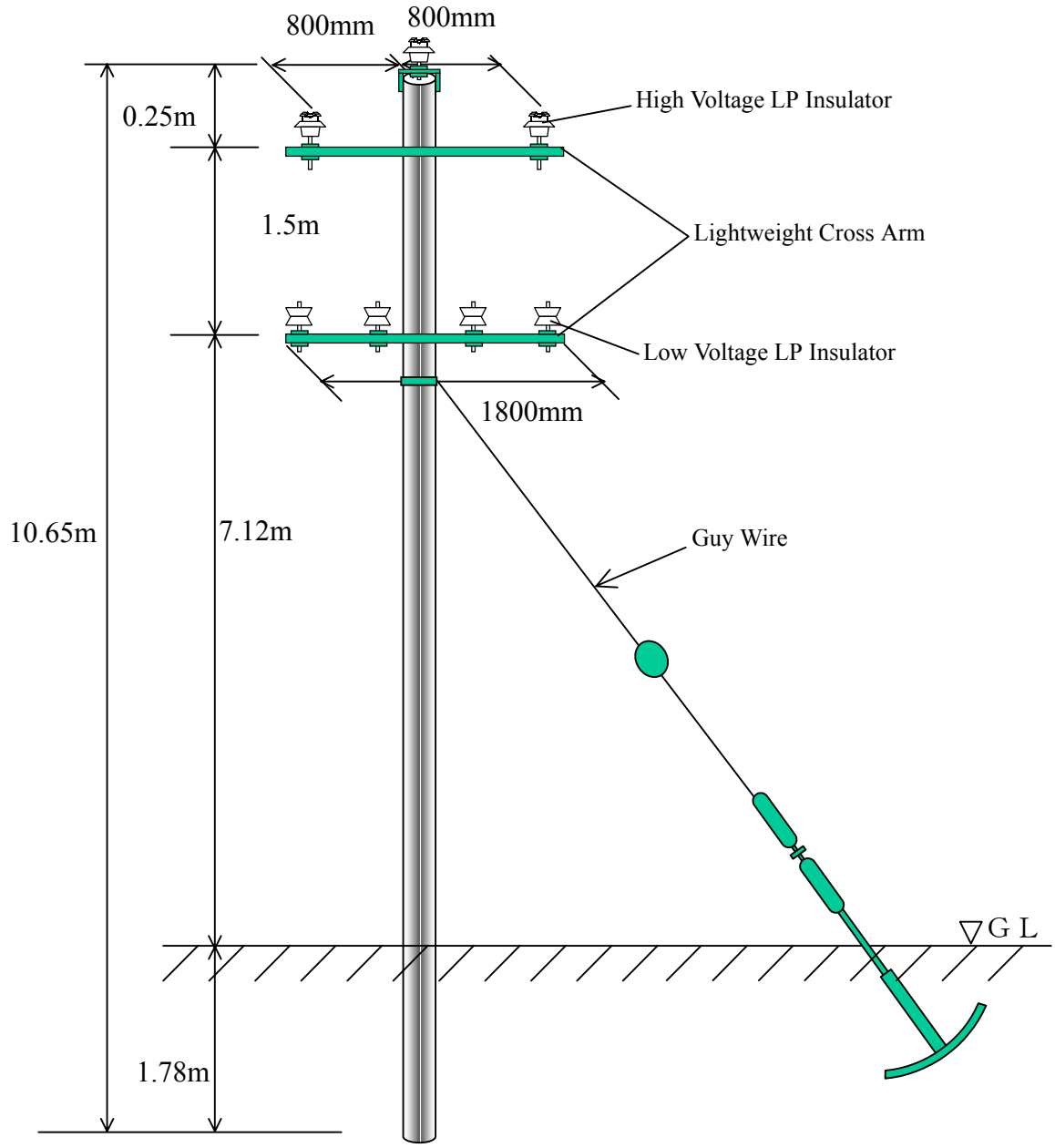


Fig. 2.2.2.3-2 Height of Supporting Structure

(8) Grounding Method

Built-in grounding is applied to the lightweight built-up steel plate pole	:	Type C grounding work (According to Technical Standards for Electrical Facilities in Japan)
Grounding is applied to the neutral point on the secondary side of the transformer	:	Type B grounding work (ditto)
Grounding of arrester	:	Type A grounding work (ditto)

(9) Thunderbolt-Proof Measure

An arrester will be installed to those poles with a transformer and those for the circuit breaker.

2-2-2-4 Equipment Plan

(1) Outline

The equipment plan is outlined in Table 2.2.2.4-1.

Table 2.2.2.4-1 Outline of Equipment Plan

	1 km Radius of Central Kya Si Su	5 km Radius of Central Kya Si Su	Outside 5 km Radius of Central Kya Si Su
Subject Village/ Hamlet	<Central Route> - Kya Si Su - Cha Ho	<Central Route> - Ta Kyu Sai - Ta Min Su <Eastern Route> - Chu Wa Chai - Ka Wang Tan - Tachelo <Western Route> - Ma Chi Ti - Pai Sanko - Lung Tanko - Run Syon - Tie Chan Chai	<Central Route> - Ma Mo Su <Eastern Route> - Wai Yao - Suan Karin <Western Route> - Nyu Cyan - Hwan Thin
Distribution Line Construction Plan	- 10.5 kV high voltage distribution line: approx. 13 km (conductors: approx. 44 km) - 0.4 kV low voltage distribution line: approx. 8.5 km (conductors: approx. 39 km) - Pole-mounted transformers: 20 kVA x 3 sets - Pole-mounted transformers: 50 kVA x 3 sets - Circuit breaker cubicle (with MOF) : 1 set	- 10.5 kV high voltage distribution line: approx. 24.5 km (conductors: approx. 83 km) - 0.4 kV low voltage distribution line: approx. 10.5 km (conductors: approx. 48 km) - Pole-mounted transformers: 50 kVA x 2 sets and 20 kVA x 9 sets - Circuit breaker cubicle : 3 sets	- 10.5 kV high voltage distribution line: approx. 20.5 km (conductors: approx. 70 km) - 0.4 kV low voltage distribution line: approx. 5 km (conductors: approx. 23 km) - Pole-mounted transformers: 20 kVA x 5 sets
Equipment Procurement Plan	- Equipment and materials for user connection (poles, conductors and watt-hour meters for users): 245 households (including public facilities) - Spare parts: 1 set - Tools: 1 set	- Equipment and materials for user connection (poles, conductors and watt-hour meters for users): 349 households (including public facilities) - Spare parts: 1 set - Tools: 1 set	- Equipment and materials for user connection (poles, conductors and watt-hour meters for users): 290 households (including public facilities) - Spare parts: 1 set - Tools: 1 set

Note: □ indicates the scope of the Project.

1) 10.5 kV High Voltage Distribution Line Construction Plan

The existing 10.5 kV high voltage distribution line which has so far been extended from Laukai to Tar Shwe Tan will branch out at Tar Shwe Tan and will be further extended to Kya Si Su via Cha Ho (one of the villages in the Tar Shwe Tan Village Tract). The newly constructed 10.5 kV high voltage distribution network will consist of the central, eastern and western distribution lines to supply power to villages/hamlets within approximately 8 km radius of central Kya Si Su.

2) Low Voltage Distribution Line Construction Plan

The following low voltage distribution line construction work will be conducted.

① Procurement and installation of equipment and materials for low voltage trunk distribution lines

② Procurement of equipment and materials for low voltage distribution lines for user connection

- For some 245 households (including public facilities): installation work to be conducted by the Myanmar side
- Service cables (PVC cables) 16 mm^2: 200 m/household
- Service poles: 2/household
- Watt-hour meters: 1/household

(2) Quantities of Cables and Equipment and Materials Required for the Project

1) High Voltage Distribution Line and Low Voltage Trunk Distribution Line (Within the Scope of Japanese Work)

① Bare Cables for Overhead Distribution Lines

The quantity of bare cables for the overhead distribution lines is calculated by multiplying the plane distance read on the map (scale: 1 to 50,000) by 1.13 (margin factor).

This margin factor is determined on the basis of commonly used values in Japan and 13% consists of 3% for sagging of the cable, 3% for work margin and 7% for work make-up. The resulting quantity of bare cables for the overhead distribution lines is shown in Table 2.2.2.4-2.

Table 2.2.2.4-2 Planned Procurement Quantity of Bare Cables for Overhead Distribution Lines

(Unit: km)

Item	1 km Radius	5 km Radius	Outside 5 km Radius	Total
10.5 kV High Voltage Distribution Line	approx. 44	Approx. 83	approx. 70	approx. 197
0.4 kV Low Voltage Distribution Line	approx. 39	Approx. 48	approx. 23	approx. 110

Note: □ indicates the scope of the Project.

② Poles

The poles which support the cables will, in principle, be concrete poles made in China at those sites to which transportation be vehicle is possible. These poles are currently used in Laukai. As described earlier, however, almost all of the sites outside a 1 km radius of Kya Si Su are inaccessible by vehicle because of their location in a steep mountain area, making it necessary to use steep animal paths. In the case of these sites, transportation must rely on humans or donkeys, making the use of lightweight built-up steel plate poles which can be disassembled for transportation essential.

< Standard Span >

The poles to be used for the Project will be concrete poles and built-up steel plate poles. As the standard pole length is approximately 10 – 15 m, the standard span is generally between 30 m and 80 m based on the tensile strength, extent of sagging and ground height of the cable. Both concrete poles and built-up steel plate poles are economical because they allow a long standard span to reduce the required number. In areas such as the Project Area where the topographical conditions are unfavourable with many undulations and much meandering, it is essential that the decision on the installation sites take the topography into careful consideration. Accordingly, the standard span is determined by the topographical factors.

In view of the state of road development and topographical factors in the Project Area, the following standard spans are adopted for the Project.

- Flat area : average span of 70 m
- Mountainous area : average span of 50 m

Although the above spans are adopted in principle, some installation sites face restrictions depending on the micro-topography and type of pole (angle pole or branch pole). Each case will be examined to finalise the pole procurement quantity. The number of poles in each section will be determined by dividing the section distance by the standard span (70 m for a flat area and 50 m for a mountainous area) and then multiplying by 1.075 for a mountainous area and 1.05 for a flat area in consideration of the work in the area for which an accurate map or survey data is hardly available (Guidelines for Cost Estimation of Electrical Installation Work of Japan Electrical Installers' Association).

The actual quantity of required poles is calculated for each of the following areas (sections).

- Flat area : entire distribution line from the branching out point from the existing distribution line in Tar Shwe Tan to Kya Si Su via Cha Ho
  4 km distribution lines within the work area of a 1 km radius of central Kya Si Su
- Mountainous area : other areas

In the case of insulators, assembly hardware and other materials, the work makes up at least 10% or one set is included in the procurement quantity.

The calculated quantity of poles based on the above conditions is shown in Table 2.2.2.4-3. Refer to Basic Design Drawings KK-L01 and KK-P01 through KK-P35 for the specifications and dimensions.

Table 2.2.2.4-3 Procurement Quantity of Poles

(Unit: pieces)

No.	Pole Code	Type	Voltage Category	Description	1 km Radius	5 km Radius	Outside 5 km Radius	Total
1	C10D	Concrete	10.5 kV	Branch pole	7	0	0	7
2	C10N	Concrete	10.5 kV	Intermediate pole	14	0	0	14
3	C10A-5	Concrete	10.5 kV	Angle pole: 5°-20°	20	0	0	20
4	C10A-20	Concrete	10.5 kV	Angle pole: 20°-35°	48	0	0	48
5	C10A-35	Concrete	10.5 kV	Angle pole: 35°-90°	48	0	0	48
6	C10S	Concrete	10.5 kV	Circuit breaker pole	2 (see Note 2)	1	0	3
7	C10S-MOF	Concrete	10.5 kV	Circuit breaker with MOF pole	1	0	0	1
8	S10D	Steel	10.5 kV	Branch pole	0	22	22	44
9	S10N	Steel	10.5 kV	Intermediate pole	0	47	43	90
10	S10A-5	Steel	10.5 kV	Angle pole: 5°-20°	0	70	66	136
11	S10A-20	Steel	10.5 kV	Angle pole: 20°-35°	0	164	153	317
12	S10A-35	Steel	10.5 kV	Angle pole: 35°-90°	0	164	153	317
13	C04D	Concrete	0.4 kV	Branch pole	0	0	0	0
14	C04N	Concrete	0.4 kV	Intermediate pole	0	0	0	0
15	C04A-5	Concrete	0.4 kV	Angle pole: 5°-20°	0	0	0	0
16	C04A-35	Concrete	0.4 kV	Angle pole: 35°-90°	0	0	0	0
17	C04E	Concrete	0.4 kV	Terminal pole	0	0	0	0
18	S04D	Steel	0.4 kV	Branch pole	5	8	5	18
19	S04N	Steel	0.4 kV	Intermediate pole	10	16	10	36
20	S04A-05	Steel	0.4 kV	Angle pole: 5°-20°	52	83	50	185
21	S04A-35	Steel	0.4 kV	Angle pole: 35°-90°	36	59	38	133
22	S04E	Steel	0.4 kV	Terminal pole	5	6	5	16
23	CCOD	Concrete	Combined (10.5 kV and 0.4 kV)	Branch pole	2	0	0	2
24	CCON	Concrete	Combined	Intermediate pole	4	2	0	6
25	CCOA-5	Concrete	Combined	Angle pole: 5°-20°	5	3	0	8
26	CCOA-20	Concrete	Combined	Angle pole: 20°-35°	8	4	0	12
27	CCOA-35	Concrete	Combined	Angle pole: 35°-90°	8	4	0	12
28	CCOT-20	Concrete	Combined	Transformer pole 20 kVA	3	0	0	3
29	CCOT-50	Concrete	Combined	Transformer pole 50 kVA	3	2	0	5
30	SCOD	Steel	Combined	Branch pole	1	1	0	2
31	SCON	Steel	Combined	Intermediate pole	3	1	0	4
32	SCOA-5	Steel	Combined	Angle pole: 5°-20°	5	2	0	7
33	SCOA-20	Steel	Combined	Angle pole: 20°-35°	12	3	0	15
34	SCOA-35	Steel	Combined	Angle pole: 35°-90°	12	3	0	15
35	SCOT-20	Steel	Combined	Transformer pole 20kVA	0	9	5	14
Total					314	674	550	1,538

Notes 1) The ratio of each pole type is determined as follows based on the distribution line length.
Flat area : branch pole (5%), intermediate pole (15%), angle pole 5° – 20° (20%), angle pole 20° – 35° (30%) and angle pole 35° – 90° (30%)
Mountain area : branch pole (5%), intermediate pole (10%), angle pole 5° – 20° (15%), angle pole 20°- 35° (35%) and angle pole 35° – 90° (35%)

2) In regard to the circuit breaker poles (C10S) to be procured and installed within "a 1 km radius", the procurement and installation of the circuit breaker panel is classified under "a 5 km radius" and a pole, arrester and cut-out switch will be installed to ensure power distribution within "a 1 km radius"

3) ☐ indicates the scope of the Project.

③ Pole-Mounted Transformers

The total number of pole-mounted transformers selected by the procedure described earlier is 22 as shown in Table 2.2.2.4-4.

Table 2.2.2.4-4 Procurement Quantity of Pole-Mounted Transformers

(Unit: piece)

Type	1 km Radius	5 km Radius	Outside 5 km Radius	Total
50 kVA	3	2	-	5
20 kVA	3	9	5	17
Total	6	11	5	22

Note: ☐ indicates the scope of the Project.

④ Arresters and Fused Cut-Out Switches

< Arresters >

Arresters will be introduced in combination with the pole-mounted transformers and circuit breakers in view of their protection and will be installed on the primary side of the transformer (10.5 kV side), primary side of the circuit breaker (10.5 kV side) and secondary side of the circuit breaker (0.4 kV side).

A 10% work make up is added to the design procurement quantity of the arresters in view of their possible breakage during the installation work, etc. The final procurement quantity of arresters is shown in Table 2.2.2.4-5.

< Fused Cut-Out Switches >

A fused cut-out switch will be installed on the primary side of the pole-mounted transformers in view of their protection and of the circuit breaker for opening of the circuit for maintenance inspection. A 10% work make up is added to the design procurement quantity of the fused cut-out switches in view of their possible breakage during the installation work, etc. The final procurement quantity of fused cut-out switches is also shown in Table 2.2.2.4-5.

Table 2.2.2.4-5 Procurement Quantities of Arresters and Fused Cut-Out Switches

(Unit: set)

Item		1 km Radius	5 km Radius	Outside 5 km Radius	Total
Arresters	① Design Quantity of Transformers	6	11	5	22
	② Design Quantity of Circuit Breakers	3	1	0	4
	③ Procurement Quantity of Arresters (①×1.1 + ②×2×1.1)	14	14	6	34
Fused Cut-Out Switches	① Design Quantity of Transformers	6	11	5	22
	② Design Quantity of Circuit Breakers	3	1	0	4
	③ Procurement Quantity of Cut-Out Switches (①×1.1 + ②×1.1)	10	13	6	29

Note: □ indicates the scope of the Project.

⑤ Insulators and Assembly Hardware

In addition to the items described so far, the materials used for the work include insulators and assembly hardware. The exact quantities of the insulators and assembly hardware to be procured for the Project must be comparable to the quantity of poles. In the case of pole, the procurement quantity is decided by carefully examining suitable installation sites as some sites are inappropriate depending on the topography and type of pole (angle pole and diversion pole). For such work materials as insulators and assembly hardware, a 10% or at least one set of work make up is added to the design quantity in view of their possible breakage during the installation work, etc.

⑥ Circuit Breakers

A circuit breaker will be installed at connection points with the existing distribution line and for each route to quickly separate a grounding accident point or short-circuiting accident point from an otherwise sound system. The locations and quantities for circuit breaker installation are shown in Table 2.2.2.4-6.

Table 2.2.2.4-6 Procurement Quantity of Circuit Breakers

(Unit: piece)

Installation Point	Village	Quantity
Extension point from existing distribution line (equipped with MOF)	Tar Shwe Tan	1
Starting point of western distribution route	Kya Si Su	1
Starting point of central distribution route	Kya Si Su	1
Starting point of eastern distribution route	Kya Si Su	1

Note: ☐ indicates the scope of the Project.

2) Equipment and Materials for Low Voltage Service Connection

① Watt-Hour Meters for Users

In principle, one watt-hour meter will be installed for each user. In the Project Area, however, it is possible for more than one family to live in the same house for separate charging in the future. In view of this prospect, the quantity of watt-hour meters for users will be 110% of the total number of households (including public facilities) as shown in Table 2.2.2.4-7.

Table 2.2.2.4-7 Procurement Quantity of Watt-Hour Meters for Users

Item	1 km Radius	5 km Radius	Outside 5 km Radius	Total
① Number of Households (including Public Facilities)	245	349	290	884
② Procurement Quantity of Watt-Hour Meters (①×1.1)	269	384	319	972

Note: ☐ indicates the scope of the Project.

② Service Cables and Poles

As in the case of watt-hour meters for users, the procurement quantities of service cables and poles will be based on the number of households as shown in Table 2.2.2.4-8. These will be procured by the Japanese side and installed by the Myanmar side. Refer to Basic Design Drawing KK-E04 for their specifications and dimensions.

Table 2.2.2.4-8 Procurement Quantity of Service Cables and Poles

Item	1 km Radius	5 km Radius	Outside 5 km Radius	Total
① Number of Households (including Public Facilities)	245	349	290	884
② Procurement Quantity of Service Cables (①×0.2) (km)	49.0	69.8	58.0	176.8
③ Procurement Quantity of Service Poles (①×2) (pieces)	490	698	580	1,768

Note: ☐ indicates the scope of the Project.

2-2-3 Basic Design Drawings

The Basic Design Drawings for the Project are listed below.

(1) 10.5 kV/0.4 kV Distribution Route Map

Drawing No.	Title	Remarks
KK-G01	10.5 kV Distribution Line Map	
KK-E01	Distribution Network	
KK-E02	Planned 10.5 kV Distribution Network	

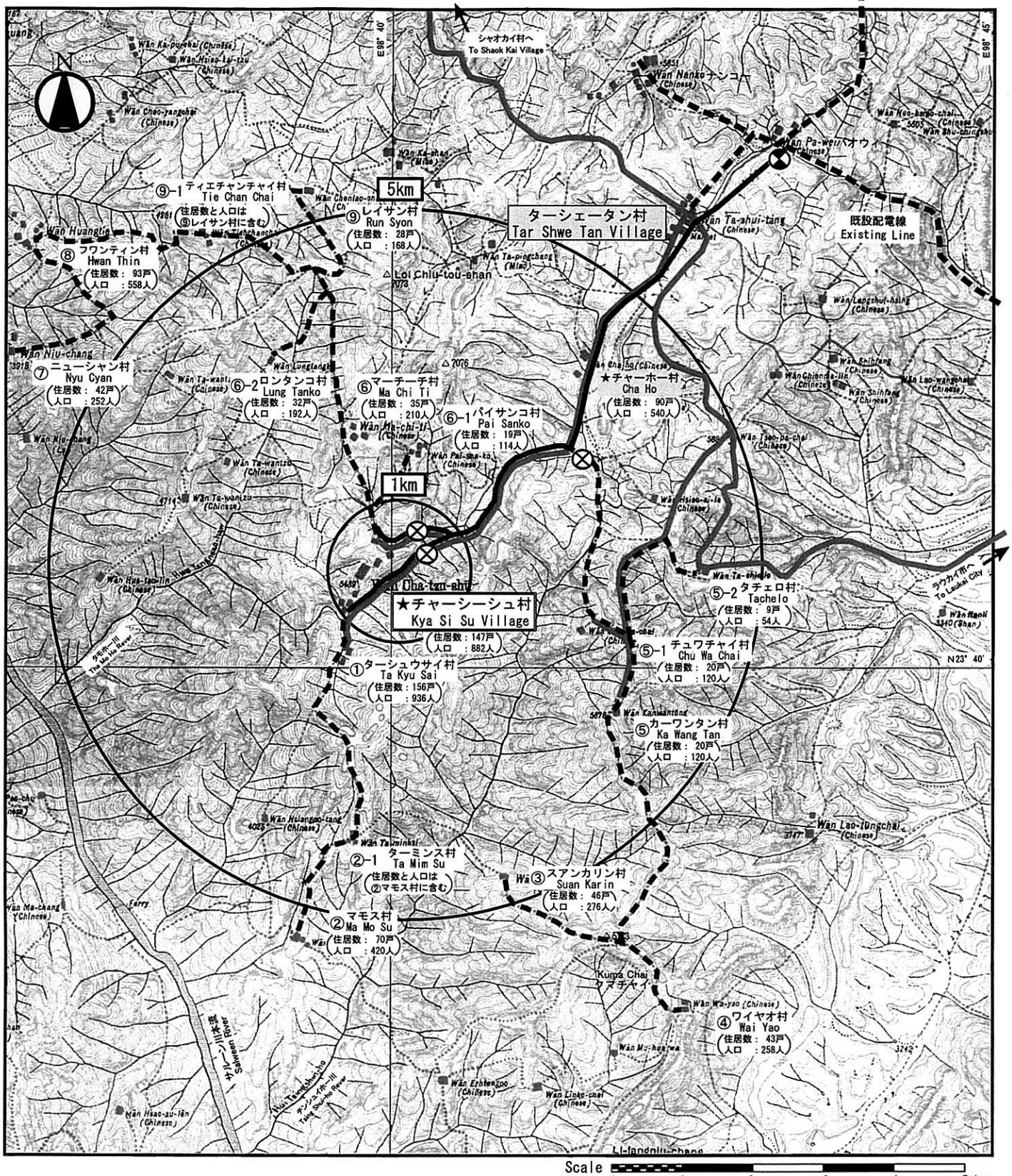
(2) Standard Work Division Drawing

Drawing No.	Title	Remarks
KK-E03	Work Demarcation	

(3) Pole Drawing

Drawing No.	Type	Title	Remarks
KK-E04	—	Lightweight Built-Up Steel Plate Pole; Low Voltage Service Steel Pipe	
KK-L01 (1/4)	—	10.5 kV/0.4 kV Pole Assembly Equipment List 1/4	
KK-L01 (2/4)	—	10.5 kV/0.4 kV Pole Assembly Equipment List 2/4	
KK-L01 (3/4)	—	10.5 kV/0.4 kV Pole Assembly Equipment List 3/4	
KK-L01 (4/4)	—	10.5 kV/0.4 kV Pole Assembly Equipment List 4/4	
KK-P01	C10D	10.5 kV Branch Pole	Concrete pole
KK-P02	C10N	10.5 kV Intermediate Pole	Concrete pole
KK-P03	C10A-5	10.5 kV Angle Pole: 5° - 20°	Concrete pole

Drawing No.	Type	Title	Remarks
KK-P04	C10A-20	10.5 kV Angle Pole: 20° - 35°	Concrete pole
KK-P05	C10A-35	10.5 kV Angle Pole: 35° - 90°	Concrete pole
KK-P06 (1/3)	C10S	10.5 kV Circuit Breaker Pole	Concrete pole
KK-P06 (2/3)	―	Equipment Layout for C10S	
KK-P06 (3/3)	―	Outline and Single Line diagram for C10S	
KK-P07 (1/3)	C10S – MOF	10.5 kV Circuit Breaker with MOF pole	Concrete pole
KK-P07 (2/3)	―	Equipment Layout for C10S-MOF	
KK-P07 (3/3)	―	Outline and Single Line diagram for C10S-MOF	
KK-P08	S10D	10.5 kV Branch Pole	Steel pole
KK-P09	S10N	10.5 kV Intermediate Pole	Steel pole
KK-P10	S10A-5	10.5 kV Angle Pole: 5° – 20°	Steel pole
KK-P11	S10A-20	10.5 kV Angle Pole: 20° – 35°	Steel pole
KK-P12	S10A-35	10.5 kV Angle Pole: 35° – 90°	Steel pole
KK-P13	C04D	0.4 kV Branch Pole	Concrete pole
KK-P14	C04N	0.4 kV Intermediate Pole	Concrete pole
KK-P15	C04A-5	0.4 kV Angle Pole: 5° – 20°	Concrete pole
KK-P16	C04A-35	0.4 kV Angle Pole: 35° – 90°	Concrete pole
KK-P17	C04E	0.4 kV Terminal Pole	Concrete pole
KK-P18	S04D	0.4 kV Branch Pole	Steel pole
KK-P19	S04N	0.4 kV Intermediate Pole	Steel pole
KK-P20	S04A-05	0.4 kV Angle Pole: 5° – 20°	Steel pole
KK-P21	S04A-35	0.4 kV Angle Pole: 35° – 90°	Steel pole
KK-P22	S04E	0.4 kV Terminal Pole	Steel pole
KK-P23	CCOD	10.5/0.4 kV Branch Pole	Concrete pole
KK-P24	CCON	10.5/0.4 kV Intermediate Pole	Concrete pole
KK-P25	CCOA-5	10.5/0.4 kV Angle Pole: 5° – 20°	Concrete pole
KK-P26	CCOA-20	10.5/0.4 kV Angle Pole: 20° – 35°	Concrete pole
KK-P27	CCOA-35	10.5/0.4 kV Angle Pole: 35° – 90°	Concrete pole
KK-P28	CCOT-20	10.5/0.4 kV Transformer Pole: 20 kVA	Concrete pole
KK-P29	CCOT-50	10.5/0.4 kV Transformer Pole: 50 kVA	Concrete pole
KK-P30	SCOD	10.5/0.4 kV Branch Pole	Steel pole
KK-P31	SCON	10.5/0.4 kV Intermediate Pole	Steel pole
KK-P32	SCOA-5	10.5/0.4 kV Angle Pole: 5° – 20°	Steel pole
KK-P33	SCOA-20	10.5/0.4 kV Angle Pole: 20° – 35°	Steel pole
KK-P34	SCOA-35	10.5/0.4 kV Angle Pole: 35° – 90°	Steel pole
KK-P35	SCOT-20	10.5/0.4 kV Transformer Pole: 20 kVA	Steel pole



備考
Remarks

(1)地図上の標高は、フィート表示。 (1FT=0.3048m)
Altitude on Map is shown by feet.

(2)標高線間隔は、50フィート (約15.2m)
Counter line interval is 50 feet.

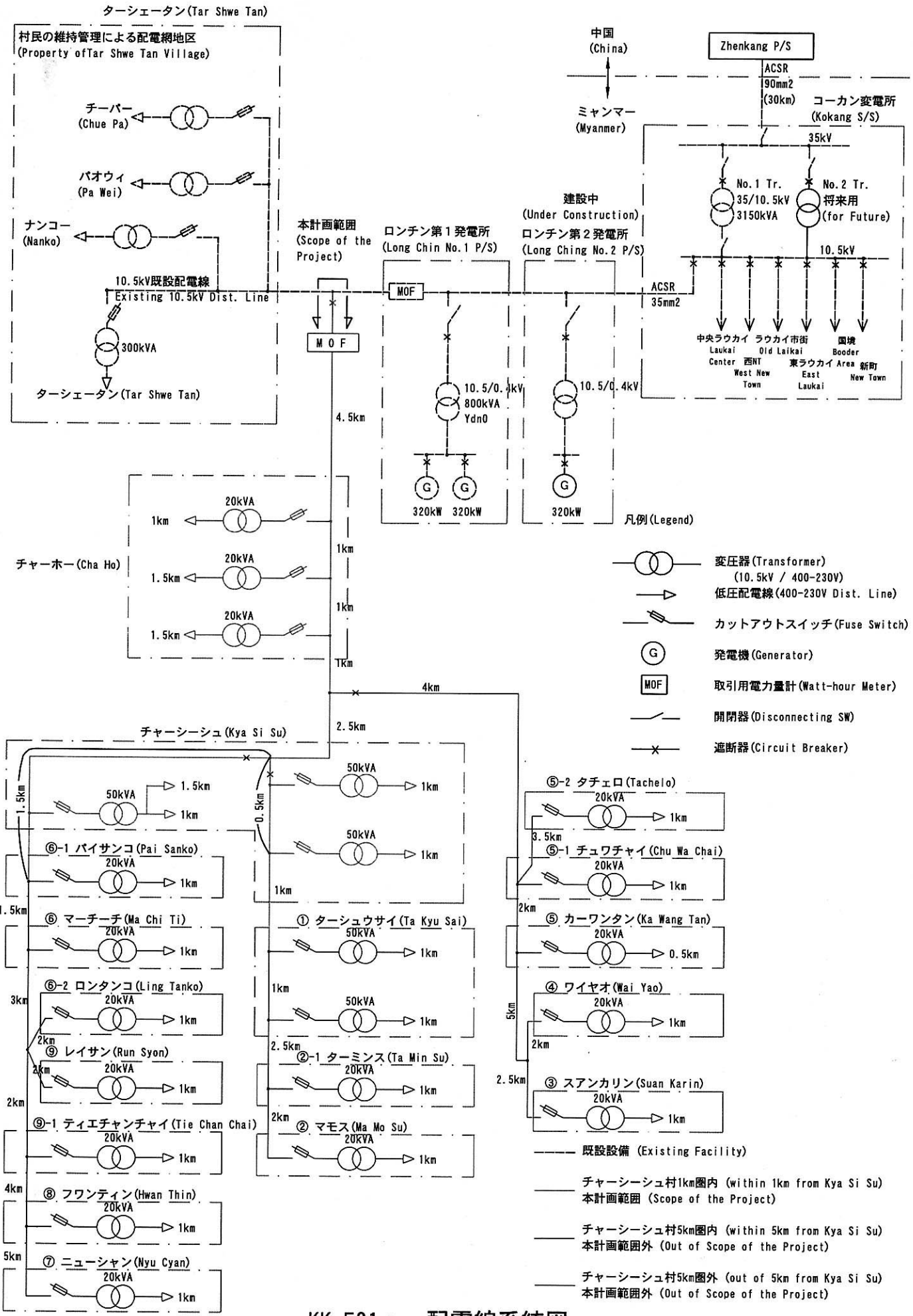
(3)①~⑨の村は、チャーシーシュ村村落群に所属する村落を示す。
Villages marked with ①~⑨ are member of Kya Si Su Village Tract.

(4)★印は本計画の電化対象村を示す。
★shows the project site.

凡例
Legend

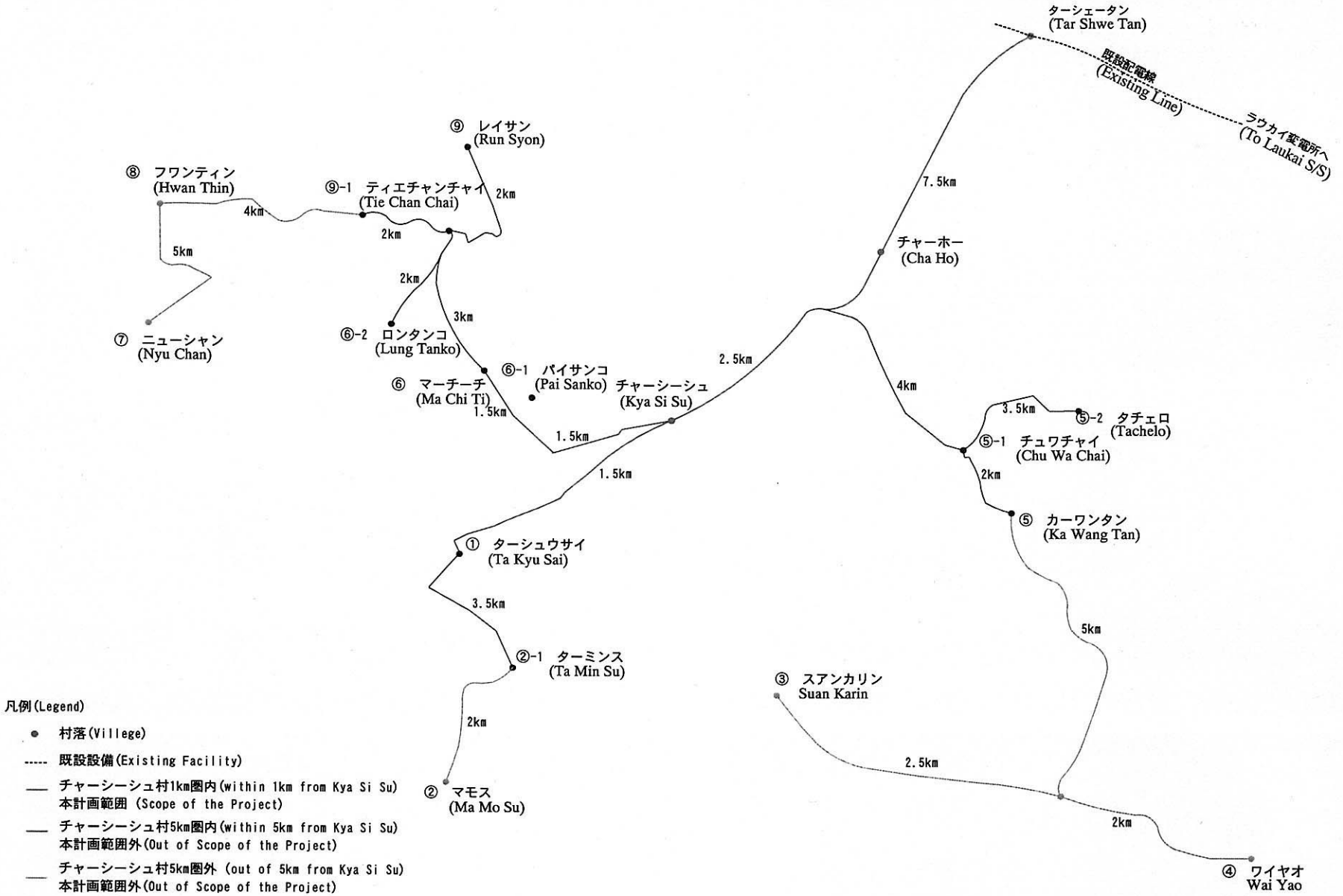
- 道路 (車両通行可) Vehicle Road
- 配電線ルート(本計画範囲) Route for Distribution Line(Scope of the Project)
- 配電線ルート(本計画範囲外) Route for Distribution Line(Out of Scope of the Project)
- 既設配電線ルート Existing Distribution Line
- 遮断器位置(本計画範囲) Circuit Breaker(Scope of the Project)
- 遮断器位置(本計画範囲外) Circuit Breaker(Out of Scope of the Project)

KK-G01: 10.5kV 配電線基本ルート図
10.5kV Distribution Line Map

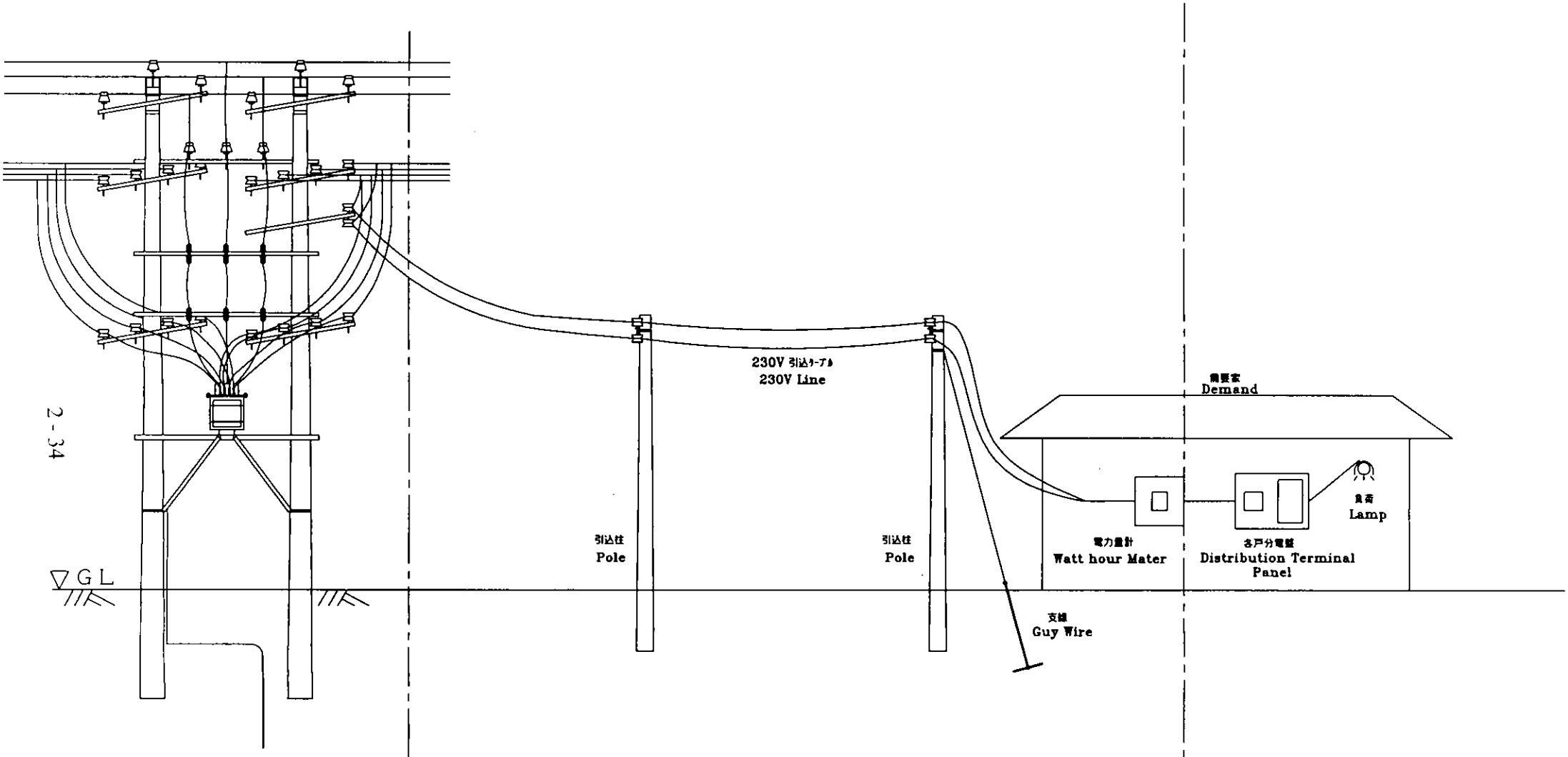


KK-E01： 配電線系統図

DISTRIBUTION NETWORK

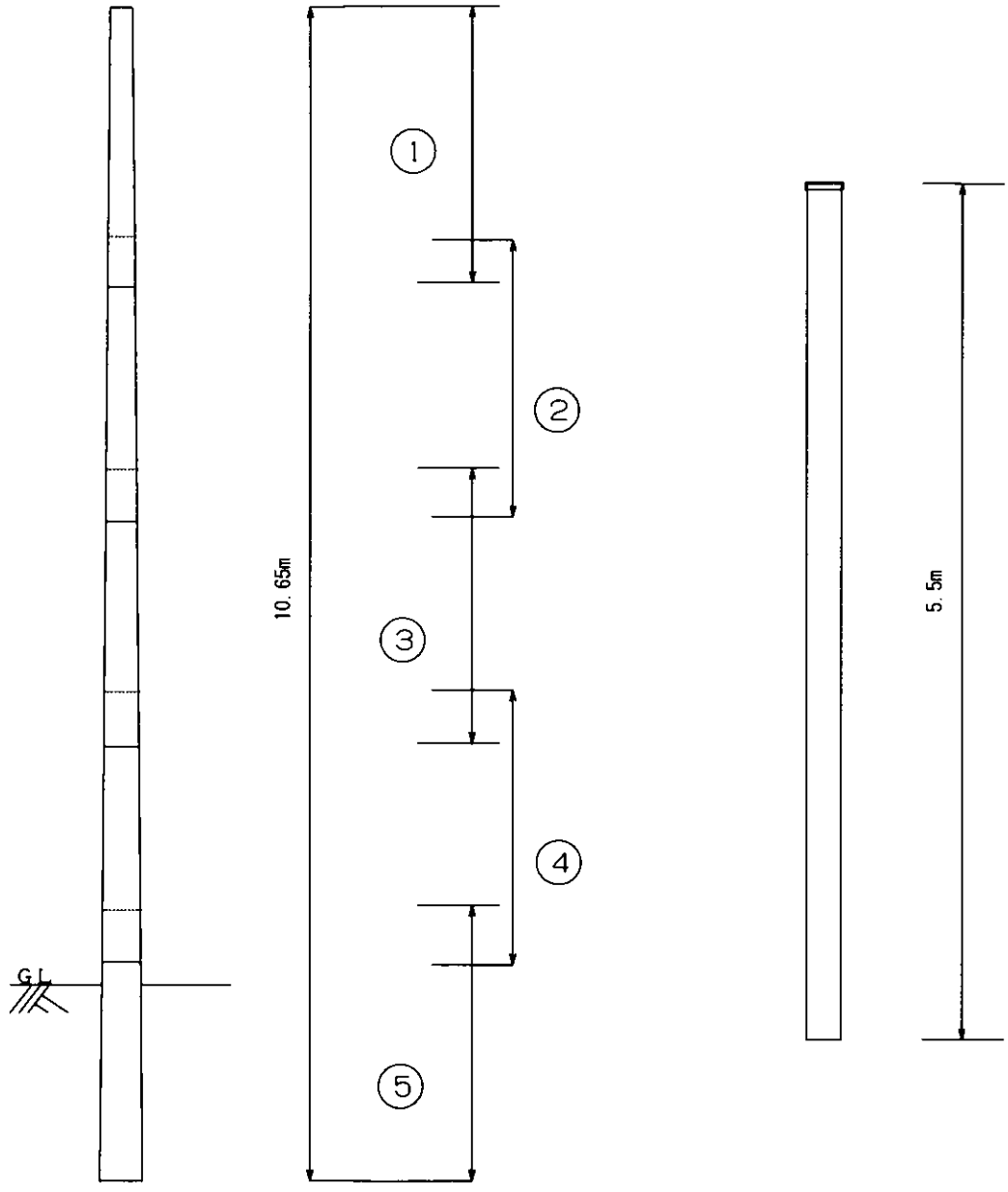


KK-E02: 10.5kV 配電線計画図
PLANNED 10.5kV DISTRIBUTION NETWORK



日本国側調達・据付範囲	日本国側調達・相手国側据付範囲	需要家負担範囲
Japan side supply and installation	Japan side supply / Myanmar side installation	Consumer side suppply and installation

KK－E03 ： 施工負担区分図
WORK DEMARCATION



10.5kV配電用鋼板柱（軽量組立式）
10.5kV Steel Pole (Light and Preformed type)

全長 (Total Length)： 10.65m
総重量 (Total Weight) ： Approx. 220 kg
根入れ (Length in ground)： Approx. 1.8m
材質 (Material)： 鋼板 (Mild Steel)

部品番号 Part No.	部材長 (m) Length	板厚 (mm) Thickness	元口外径 (mm) Dia. in buttom	重量 (kg) Weight	標準接合長 (mm) Length of joint
①	Approx. 2.5	Approx. 20	Approx. 250	Approx. 29	Approx. 380
②	Approx. 2.5	Approx. 21	Approx. 290	Approx. 35	Approx. 440
③	Approx. 2.5	Apporx. 23	Approx. 320	Approx. 44	Approx. 490
④	Approx. 2.5	Approx. 25	Approx. 350	Approx. 53	Approx. 540
⑤	Approx. 2.5	Approx. 26	Approx. 390	Approx. 60	

低圧(400-230V)引込用鋼管柱
LV (400-230V) Steel Pole

全長 (Total Length)： 5.5m
総重量 (Total Weight) ： Approx. 60 kg
根入れ (Length in ground)： Approx. 1.0m
材質 (Material)： 鋼板 (Mild Steel)

外形 (Diameter)： Approx. 114mm
管厚(Thickness)： Approx. 2mm
長さ (Length)： 5500mm
溶融亜鉛メッキ(Hot dip Galv.)

KK-E04： 軽量組立鋼板柱・低圧引込用鋼管柱図

Lightweight Built-Up Steel Plate Pole;
Low Voltage Service Steel pipe

KK-L01(1/4)　10.5kV/0.4kV配電柱装柱資材リスト 1/4
10.5kV/0.4kV Pole Assembly Equipment List 1/4

PARTS NO		Parts Name	Specification	Unit	Pole Type								
					C10D	C10N	C10A-05	C10A-20	C10A-35	C10S	C10S-MOF	S10D	S10N
1	A	軽量組立鋼管柱 Steel pole	10．65m	pc								1	1
	B	コンクリート柱 Concrete pole	10m	pc	1	1	1	1	1	4	4		
2	A	腕金 Crossarm	L60×60×3.2×1500	pc									
	B	腕金 Crossarm	L60×60×3.2×1800	pc	3	1	2	2	4			3	1
	C	腕金 Crossarm	L60×60×3.2×3000	pc									
	D	腕金 Crossarm	C80×40×3.2×3000	pc						8	8		
3	A	アームバンド(単) Crossarm Band (single)		pc	1	1				8	8	1	1
	B	アームバンド(抱き) Crossarm Band (double)		pc									
4	A	ピン碍子 Pin Insulator	10.5kV	pc	4	3	6	5	3	3	3	4	3
	B	ピン碍子取付金物(単) Insulator Band (single)		pc	1	1		1				1	1
	C	ピン碍子取付金物(抱) Insulator Band (double)		pc			1						
5		耐張碍子 Tension Insulator		pc	6			12	12	12	12	6	
		ボールアイ Ball Eye		pc	3			6	6	6	6	3	
		ソケットアイ Soket Eye		pc	3			6	6	6	6	3	
		U字クレビス U-Clevis		pc	3			6	6	6	6	3	
		引留ｸﾗﾝﾌﾟ Tension Clamp	10.5kV for dead-end insulator	pc	3			6	6	6	6	3	
6		低圧碍子 Spool insulator		pc									
7		避雷器 Lightning Arresters	10.5kV　5 kA	set						2	2		
8		ﾋｭｰｽﾞｶｯﾄｱｳﾄ ｽｲｯﾁ Fused Cut-out Switch	10.5kV for overhead line	set						1	1		
9		支線用玉碍子 Guy Insulator		pc	1		1	1	2			1	
		支線 25mm^2 Guy Wire 25mm^2	Galvanized Steel wire	m	10		10	10	20			10	
		ターンバックル Turnbuckle		pc	1		1	1	2			1	
		支線棒 Anchor Rod	φ13.0mm L=1500mm	pc	1		1	1	2			1	
10	A	リード付き接地棒 Ground Rod with lead wire	φ14mmx1500mm	pc						4	4	2	2
	B	接地線 16mm^2 Grounding Wire 16mm^2	PVC	m						20	20	10	10
11	A	ﾎﾞﾙﾄ･ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×120	pc									
	B	ﾎﾞﾙﾄ･ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×240	pc	4		4	4	8	12	12	4	
	C	ﾎﾞﾙﾄ･ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×350	pc									
	D	ﾎﾞﾙﾄ･ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×420	pc									
	E	座金 Square Washer		pc	4		4	4	8	12	12	4	
12	A	IV ケーブル70mm^2 IV Cable 70mm^2		m									
	B	銅管端子70mm^2 Copper Pipe Terminal 70mm^2		pc									
13	A	変圧器 50kVA Transformer 50KVA		pc									
	B	変圧器 20kVA Transformer 20KVA		pc									
14	A	遮断器盤 Curcuit Breaker Cubicle		set						1			
	B	遮断器盤(取引用電力量計) Curcuit Breaker Cubicle with MOF		set							1		

KK-L01(2/4)　10.5kV/0.4kV配電柱装柱資材リスト 2/4
10.5kV/0.4kV Pole Assembly Equipment List 2/4

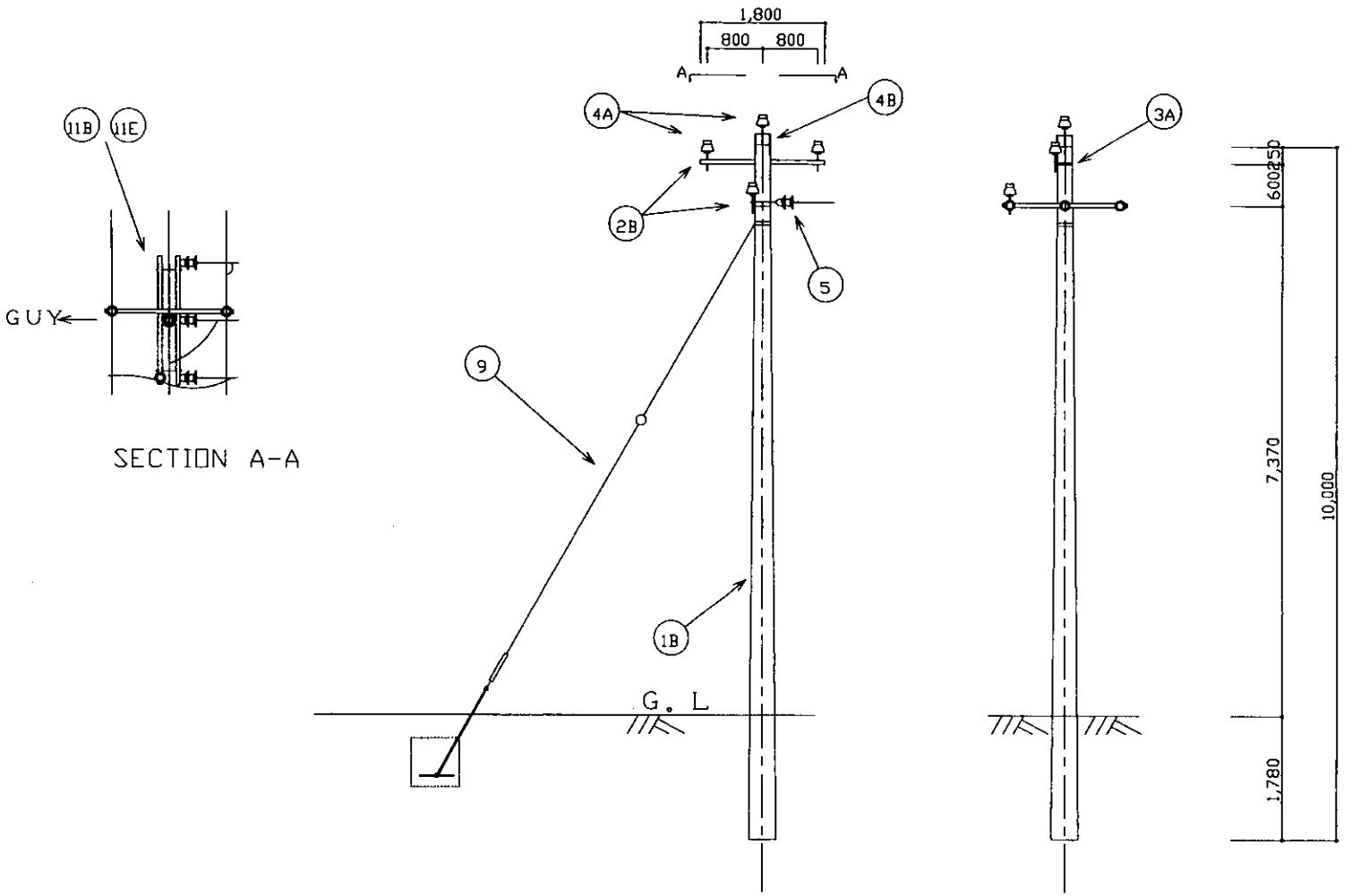
PARTS NO		Parts Name	Specification	Unit	Pole Type							
					S10A-05	S10A-20	S10A-35	C04D	C04N	C04A-05	C04A-35	C04E
1	A	軽量組立鋼管柱 Steel pole	10．65m	pc	1	1	1					
	B	コンクリート柱 Concrete pole	10m	pc				1	1	1	1	1
2	A	腕金 Crossarm	L60×60×3.2×1500	pc								
	B	腕金 Crossarm	L60×60×3.2×1800	pc	2	2	4	2	1	2	2	1
	C	腕金 Crossarm	L60×60×3.2×3000	pc								
	D	腕金 Crossarm	C80×40×3.2×3000	pc								
3	A	アームバンド(単) Crossarm Band (single)		pc				2	1		2	1
	B	アームバンド(抱き) Crossarm Band (double)		pc								
4	A	ピン碍子 Pin Insulator	10.5kV	pc	6	5	3					
	B	ピン碍子取付金物(単) Insulator Band (single)		pc		1						
	C	ピン碍子取付金物(抱) Insulator Band (double)		pc	1							
5		耐張碍子 Tension Insulator		pc		12	12					
		ボールアイ Ball Eye		pc		6	6					
		ソケットアイ Soket Eye		pc		6	6					
		U字クレビス U-Clevis		pc		6	6					
		引留ｸﾗﾝﾌﾟ Tension Clamp	10.5kV for dead-end insulator	pc		6	6					
6		低圧碍子 Spool insulator		pc				8	4	8	8	4
7		避雷器 Lightning Arresters	10.5kV 5 kA	set								
8		ﾋｭｰｽﾞｶｯﾄｱｳﾄ ｽｲｯﾁ Fused Cut-out Switch	10.5kV for overhead line	set								
9		支線用玉碍子 Guy Insulator		pc	1	1	2	1		1	2	1
		支線 25mm^2 Guy Wire 25mm^2	Galvanized Steel wire	m	10	10	20	10		10	20	10
		ターンバックル Turnbuckle		pc	1	1	2	1		1	2	1
		支線棒 Anchor Rod	φ13.0mm L=1500mm	pc	1	1	2	1		1	2	1
10	A	リード付き接地棒 Ground Rod with lead wire	φ14mmx1500mm	pc	2	2	2					
	B	接地線 16mm^2 Grounding Wire 16mm^2	PVC	m	10	10	10					
11	A	ﾎﾞﾙﾄ・ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×120	pc				8	4	8	8	4
	B	ﾎﾞﾙﾄ・ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×240	pc	4	4	8			4		
	C	ﾎﾞﾙﾄ・ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×350	pc								
	D	ﾎﾞﾙﾄ・ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×420	pc								
	E	座金 Square Washer		pc	4	4	8	8	4	12	8	4
12	A	IV ケーブル70mm^2 IV Cable 70mm^2		m								
	B	銅管端子70mm^2 Copper Pipe Terminal 70mm^2		pc								
13	A	変圧器 50kVA Transformer 50KVA		pc								
	B	変圧器 20kVA Transformer 20KVA		pc								
14	A	遮断器盤 Curcuit Breaker Cubicle		set								
	B	遮断器盤(取引用電力量計) Curcuit Breaker Cubicle with MOF		set								

KK-L01(3/4)　10.5kV/0.4kV配電柱装柱資材リスト 3/4
10.5kV/0.4kV Pole Assembly Equipment List 3/4

PARTS NO		Parts Name	Specification	Unit	Pole Type								
					S04D	S04N	S04A-05	S04A-35	S04E	CCOD	CCON	CCOA-05	CCOA-20
1	A	軽量組立鋼管柱 Steel pole	10．65m	pc	1	1	1	1	1				
	B	コンクリート柱 Concrete pole	10m	pc						1	1	1	1
2	A	腕金 Crossarm	L60×60×3.2×1500	pc									
	B	腕金 Crossarm	L60×60×3.2×1800	pc	2	1	2	2	1	5	2	4	4
	C	腕金 Crossarm	L60×60×3.2×3000	pc									
	D	腕金 Crossarm	C80×40×3.2×3000	pc									
3	A	アームバンド(単) Crossarm Band (single)		pc	2	1		2	1	3	2		
	B	アームバンド(抱き) Crossarm Band (double)		pc									
4	A	ピン碍子 Pin Insulator	10.5kV	pc						4	3	6	5
	B	ピン碍子取付金物(単) Insulator Band (single)		pc						1	1		1
	C	ピン碍子取付金物(抱) Insulator Band (double)		pc								1	
5		耐張碍子 Tension Insulator		pc						6			12
		ボールアイ Ball Eye		pc						3			6
		ソケットアイ Soket Eye		pc						3			6
		U字クレビス U-Clevis		pc						3			6
		引留ｸﾗﾝﾌﾟ Tension Clamp	10.5kV for dead-end insulator	pc						3			6
6		低圧碍子 Spool insulator		pc	8	4	8	8	4	8	4	8	8
7		避雷器 Lightning Arresters	10.5kV　5 kA	set									
8		ﾋｭｰｽﾞｶｯﾄｱｳﾄ ｽｲｯﾁ Fused Cut-out Switch	10.5kV for overhead line	set									
9		支線用玉碍子 Guy Insulator		pc	1		1	2	1	1		1	1
		支線 25mm^2 Guy Wire 25mm^2	Galvanized Steel wire	m	10		10	20	10	10		10	10
		ターンバックル Turnbuckle		pc	1		1	2	1	1		1	1
		支線棒 Anchor Rod	φ13.0mm L=1500mm	pc	1		1	2	1	1		1	1
10	A	リード付き接地棒 Ground Rod with lead wire	φ14mmx1500mm	pc	2	2	2	2	2				
	B	接地線 16mm^2 Grounding Wire 16mm^2	PVC	m	10	10	10	10	10				
11	A	ﾎﾞﾙﾄ・ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×120	pc	8	4	8	8	4	8	4	8	8
	B	ﾎﾞﾙﾄ・ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×240	pc			4			4		8	8
	C	ﾎﾞﾙﾄ・ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×350	pc									
	D	ﾎﾞﾙﾄ・ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×420	pc									
	E	座金 Square Washer		pc	8	4	12	8	4	12	4	16	16
12	A	IV ケーブル70mm^2 IV Cable 70mm^2		m									
	B	銅管端子70mm^2 Copper Pipe Terminal 70mm^2		pc									
13	A	変圧器 50kVA Transformer 50KVA		pc									
	B	変圧器 20kVA Transformer 20KVA		pc									
14	A	遮断器盤 Curcuit Breaker Cubicle		set									
	B	遮断器盤(取引用電力量計) Curcuit Breaker Cubicle with MOF		set									

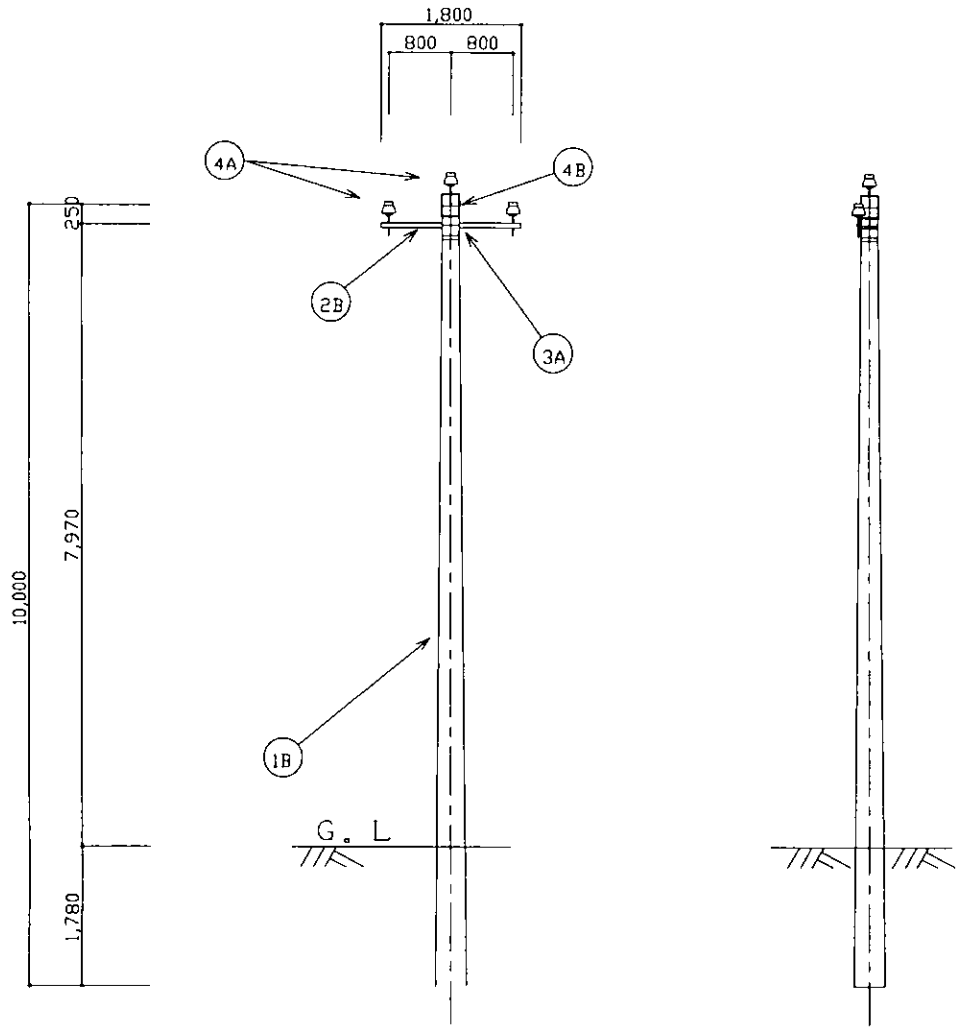
KK-L01(4/4)　10.5kV/0.4kV配電柱装柱資材リスト 4/4
10.5kV/0.4kV Pole Assembly Equipment List 4/4

PARTS NO		Parts Name	Specification	Unit	Pole Type								
					CCOA-35	CCOT-20	CCOT-50	SCOD	SCON	SCOA-05	SCOA-20	SCOA-35	SCOT-20
1	A	軽量組立鋼管柱 Steel pole	10．65m	pc				1	1	1	1	1	2
	B	コンクリート柱 Concrete pole	10m	pc	1	2	2						
2	A	腕金 Crossarm	L60×60×3.2×1500	pc		4	4						4
	B	腕金 Crossarm	L60×60×3.2×1800	pc	6	6	6	5	2	4	4	6	6
	C	腕金 Crossarm	L60×60×3.2×3000	pc		3	3						3
	D	腕金 Crossarm	C80×40×3.2×3000	pc		2	2						2
3	A	アームバンド(単) Crossarm Band (single)		pc	2	8	8	3	2			2	8
	B	アームバンド(抱き) Crossarm Band (double)		pc		4	4						4
4	A	ピン碍子 Pin Insulator	10.5kV	pc	3	6	6	4	3	6	5	3	6
	B	ピン碍子取付金物(単) Insulator Band (single)		pc		2	2	1	1		1		2
	C	ピン碍子取付金物(抱) Insulator Band (double)		pc						1			
5		耐張碍子 Tension Insulator		pc	12			6			12	12	
		ボールアイ Ball Eye		pc	6			3			6	6	
		ソケットアイ Soket Eye		pc	6			3			6	6	
		U字クレビス U-Clevis		pc	6			3			6	6	
		引留ｸﾗﾝﾌﾟ Tension Clamp	10.5kV for dead-end insulator	pc	6			3			6	6	
6		低圧碍子 Spool insulator		pc	8	16	16	8	4	8	8	8	16
7		避雷器 Lightning Arresters	10.5kV 5 kA	set		1	1						1
8		ﾋｭｰｽﾞｶｯﾄｱｳﾄ ｽｲｯﾁ Fused Cut-out Switch	10.5kV for overhead line	set		1	1						1
9		支線用玉碍子 Guy Insulator		pc	2			1		1	1	2	
		支線 25mm^2 Guy Wire 25mm^2	Galvanized Steel wire	m	20			10		10	10	20	
		ターンバックル Turnbuckle		pc	2			1		1	1	2	
		支線棒 Anchor Rod	φ13.0mm L=1500mm	pc	2			1		1	1	2	
10	A	リード付き接地棒 Ground Rod with lead wire	φ14mmx1500mm	pc		2	2	2	2	2	2	2	6
	B	接地線 16mm^2 Grounding Wire 16mm^2	PVC	m		10	10	10	10	10	10	10	30
11	A	ﾎﾞﾙﾄ・ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×120	pc	8	16	16	8	4	8	8	8	16
	B	ﾎﾞﾙﾄ・ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×240	pc	8			4		8	8	8	
	C	ﾎﾞﾙﾄ・ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×350	pc		16	16						
	D	ﾎﾞﾙﾄ・ﾅｯﾄ(亜鉛ﾒｯｷ品) Bolts and Nuts	M16×420	pc									16
	E	座金 Square Washer		pc	16	32	32	12	4	16	16	16	32
12	A	IV ケーブル70mm^2 IV Cable 70mm^2		m		40	40						40
	B	銅管端子70mm^2 Copper Pipe Terminal 70mm^2		pc		8	8						8
13	A	変圧器 50kVA Transformer 50KVA		pc			1						
	B	変圧器 20kVA Transformer 20KVA		pc		1							1
14	A	遮断器盤 Curcuit Breaker Cubicle		set									
	B	遮断器盤(取引用電力量計) Curcuit Breaker Cubicle with MOF		set									



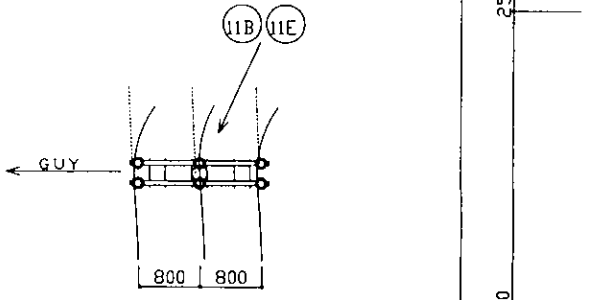
KK-P01 10.5kV 分岐回路柱(コンクリート柱)【種別 C10D】

10.5kV Branch Pole (Concrete Pole)【Type:C10D】

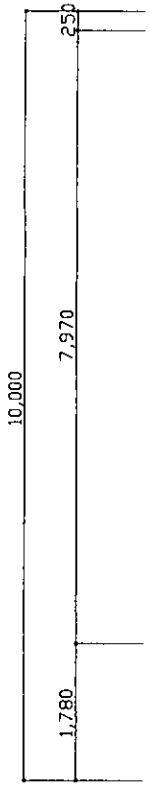


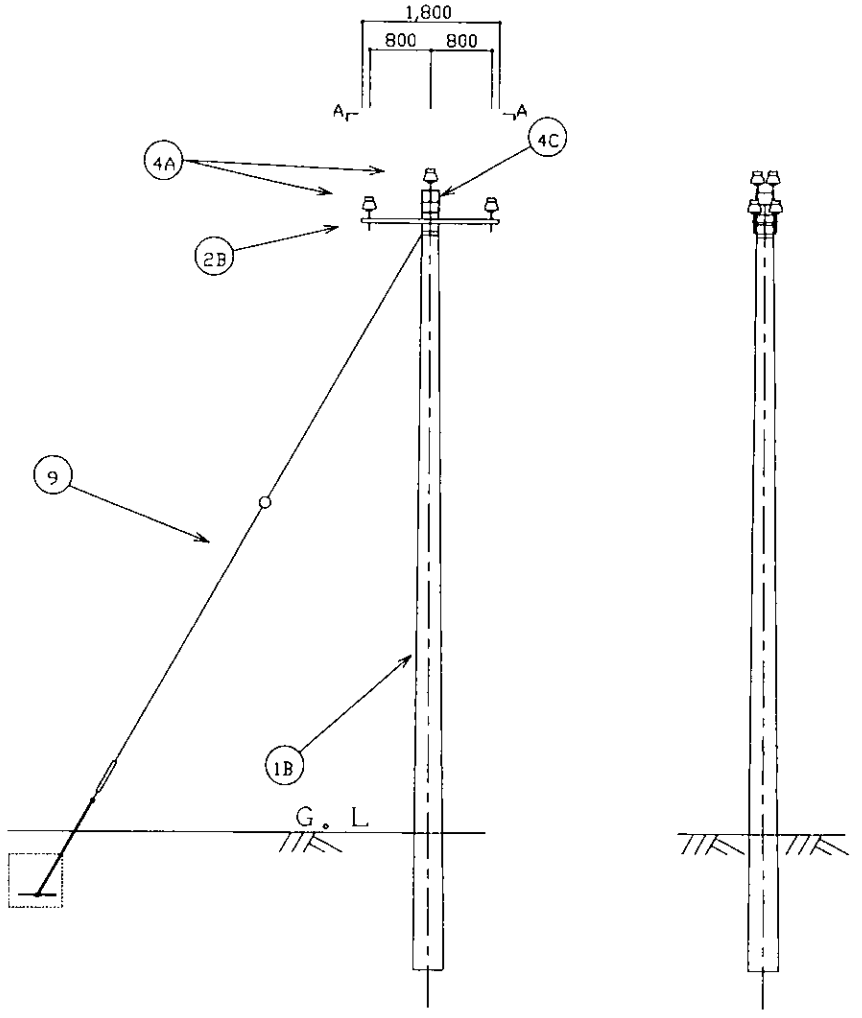
KK-P02 10.5kV 中間柱(コンクリート柱)【種別 C10N】

10.5kV Intermediate Pole(Concrete Pole)【Type:C10N】



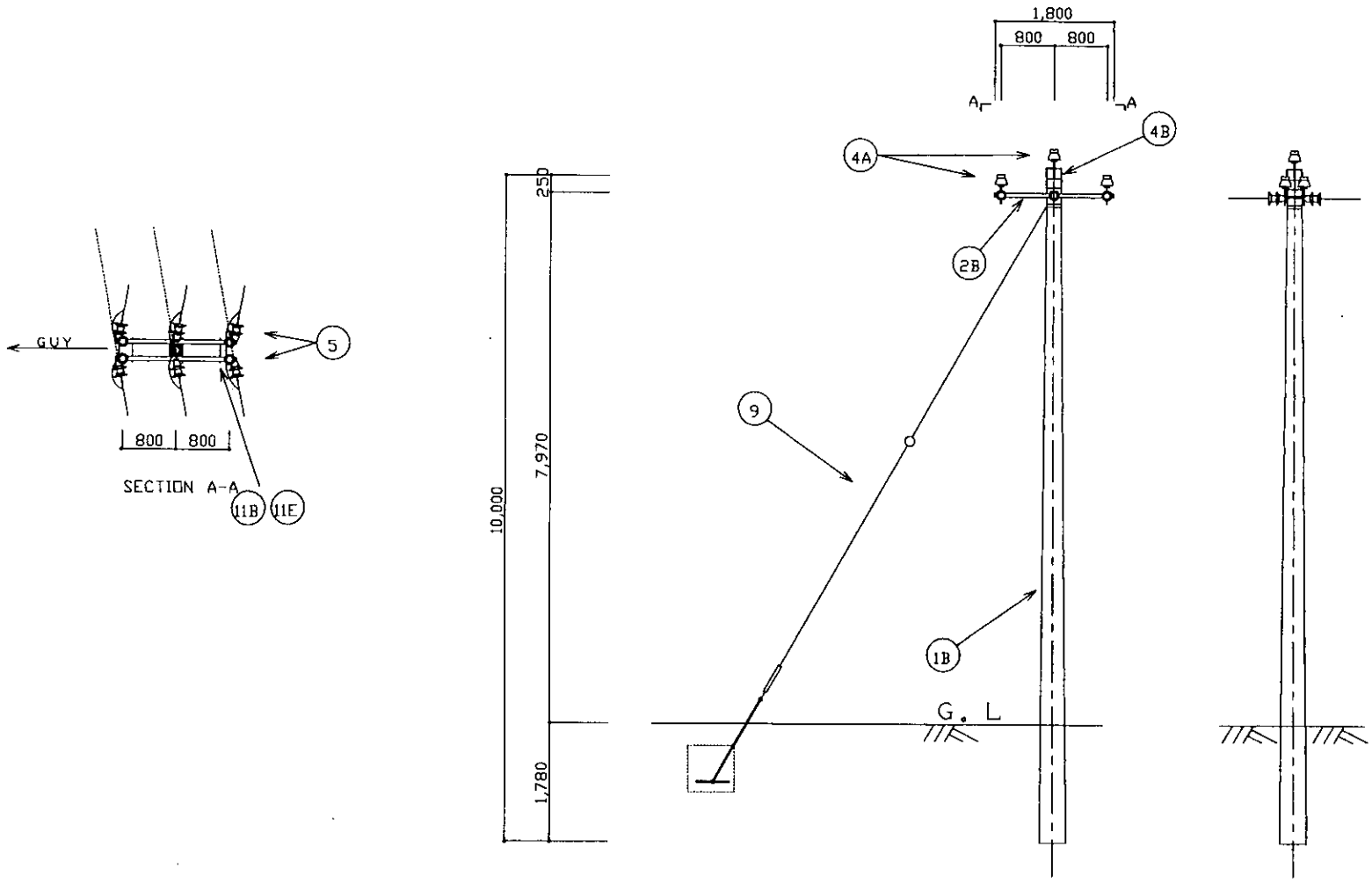
SECTION A-A





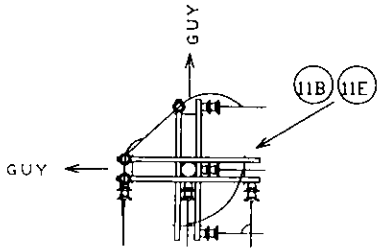
KK-P03 10.5kV 角度柱 5～20 度(コンクリート柱)【種別 C10A-5】

10.5kV Angle Pole (5deg～20deg) (Concrete Pole)【Type:C10A-5】

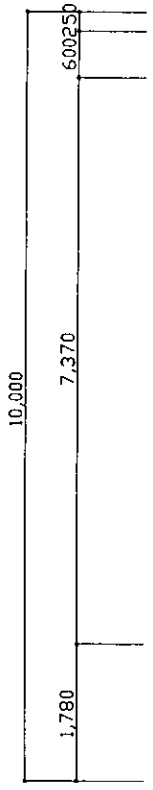


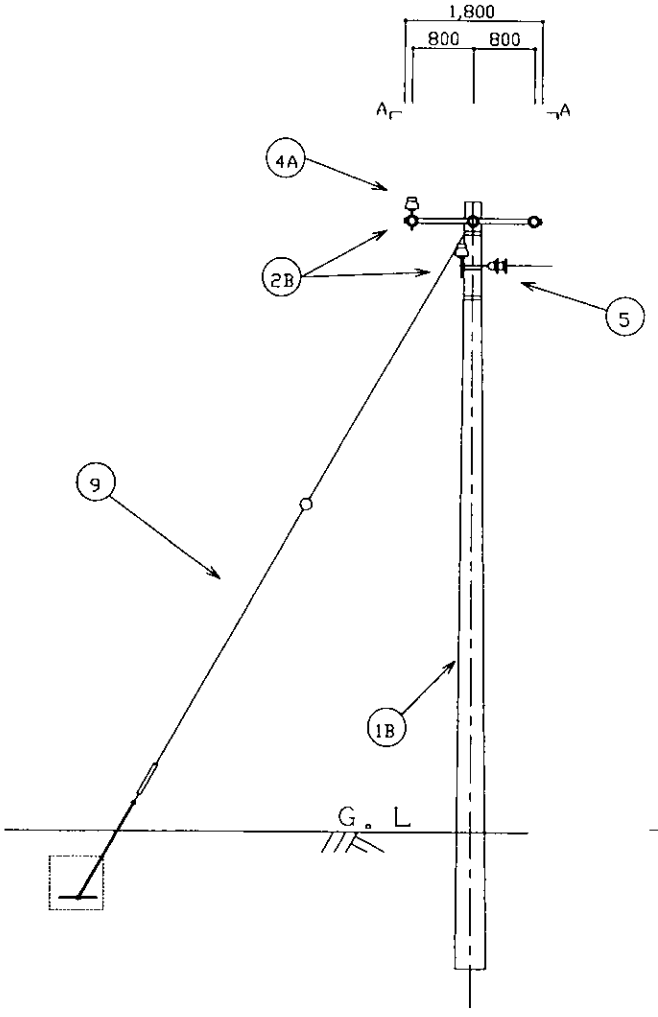
KK-P04 10.5kV 角度柱 20～35 度（コンクリート柱）【種別 C10A-20】

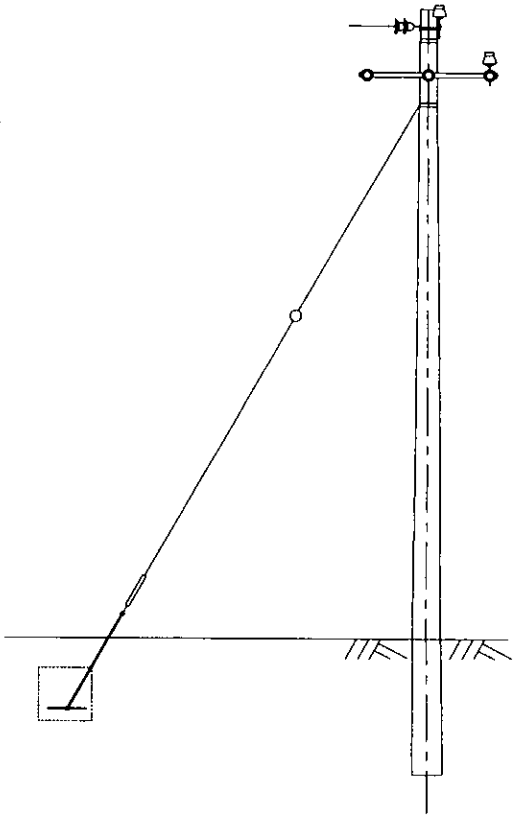
10.5kV Angle Pole (20deg～35deg) (Concrete Pole)【Type:C10A-20】



SECTION A-A

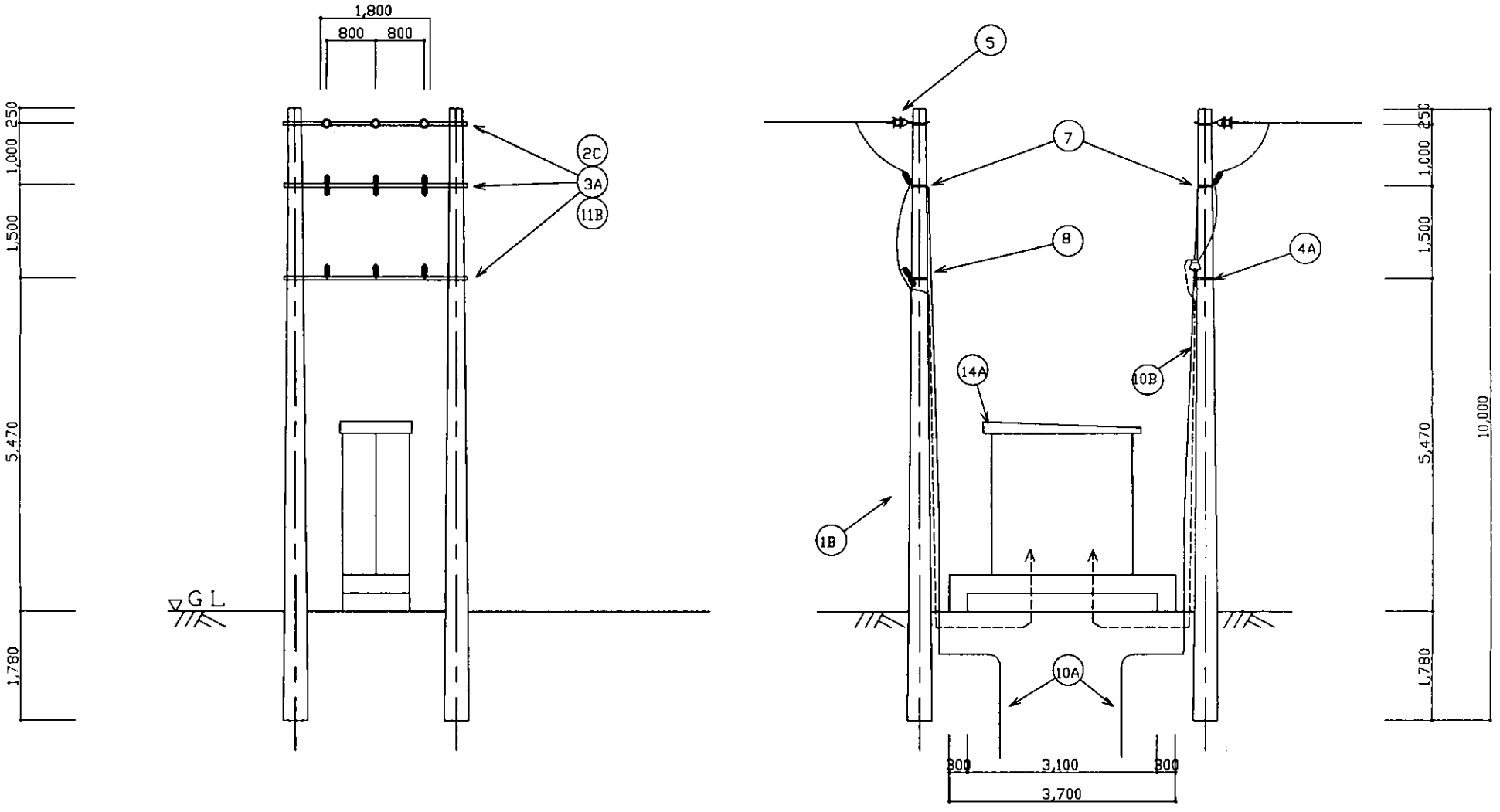






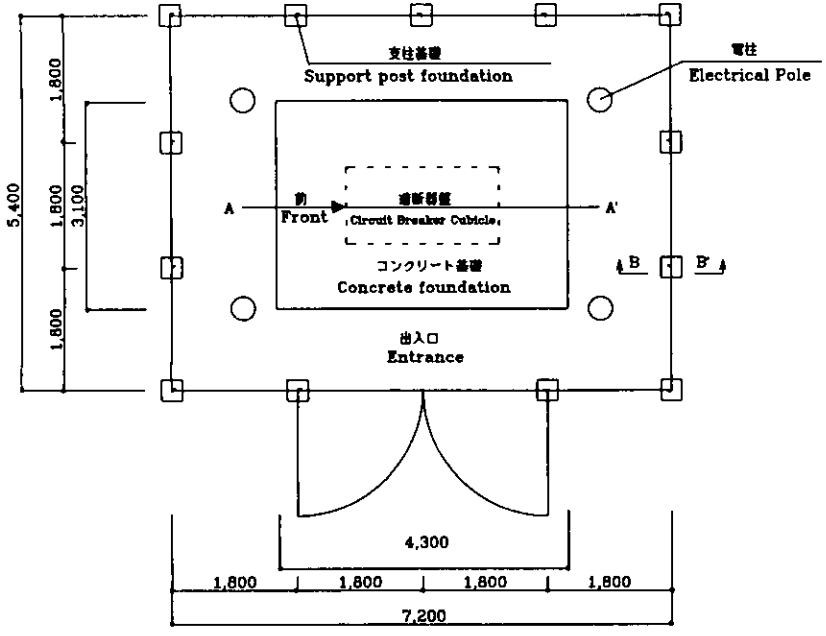
KK-P05 10.5kV 角度柱 35～90 度(コンクリート柱)【種別 C10A-35】

10.5kV Angle Pole (35deg～90deg) (Concrete Pole)【Type:C10A-35】



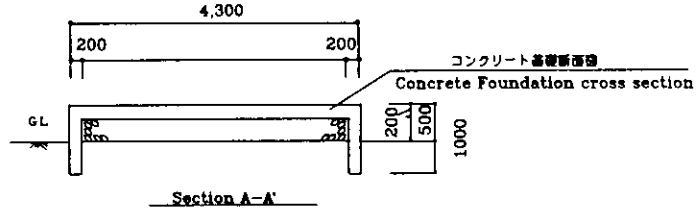
KK-06P (1/3) 10.5kV 遮断器柱(コンクリート柱)【種別 C10S】

10.5kV Circuit Breaker Pole (Concrete Pole)【Type:C10S】



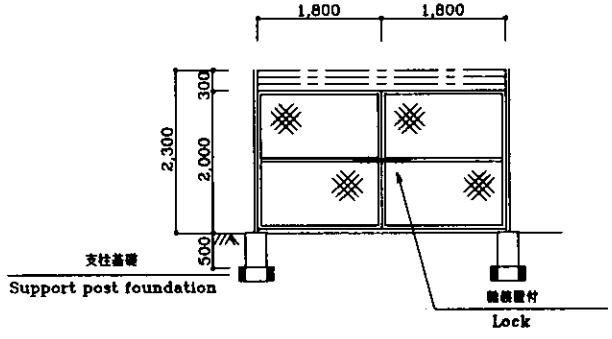
機器配置図

Equipment Arrangement Figure



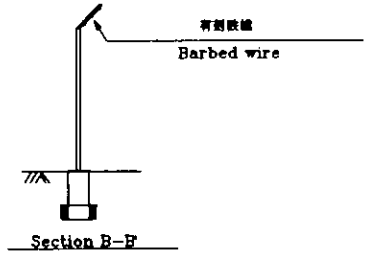
コンクリート基礎断面図

Concrete foundation cross section



ゲート詳細

Door details

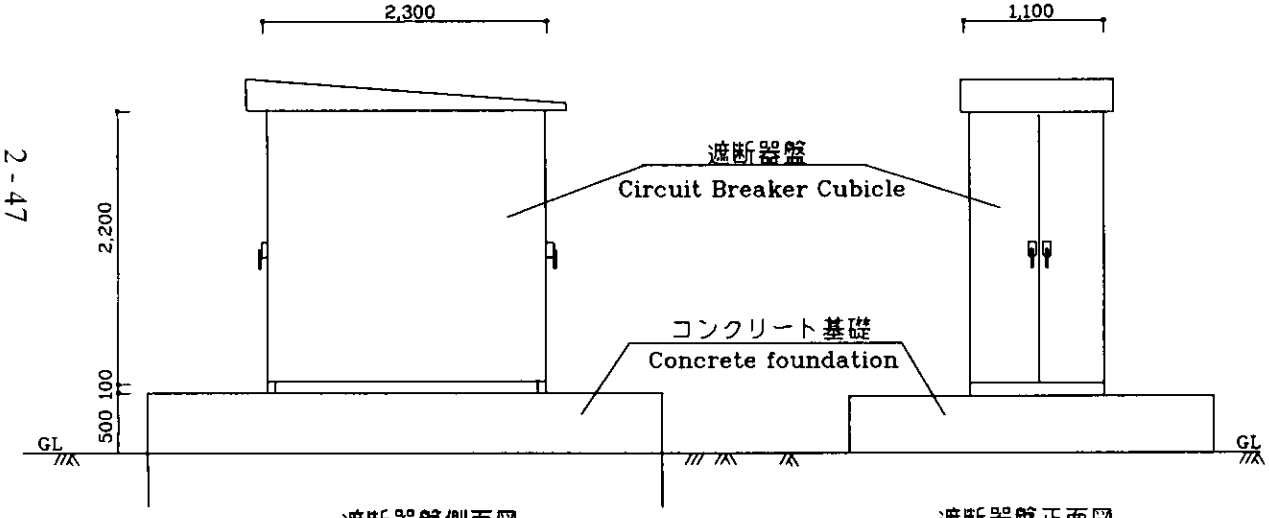


フェンス断面図

Fence cross section

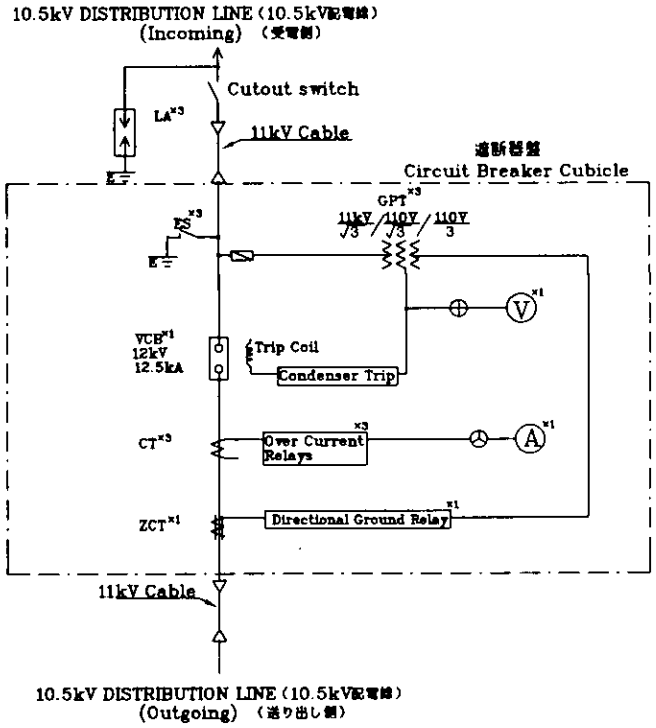
KK-P06 (2/3) C10S 用機器配置図【種別 C10S】

Equipment Layout for C10S【Type:C10S】



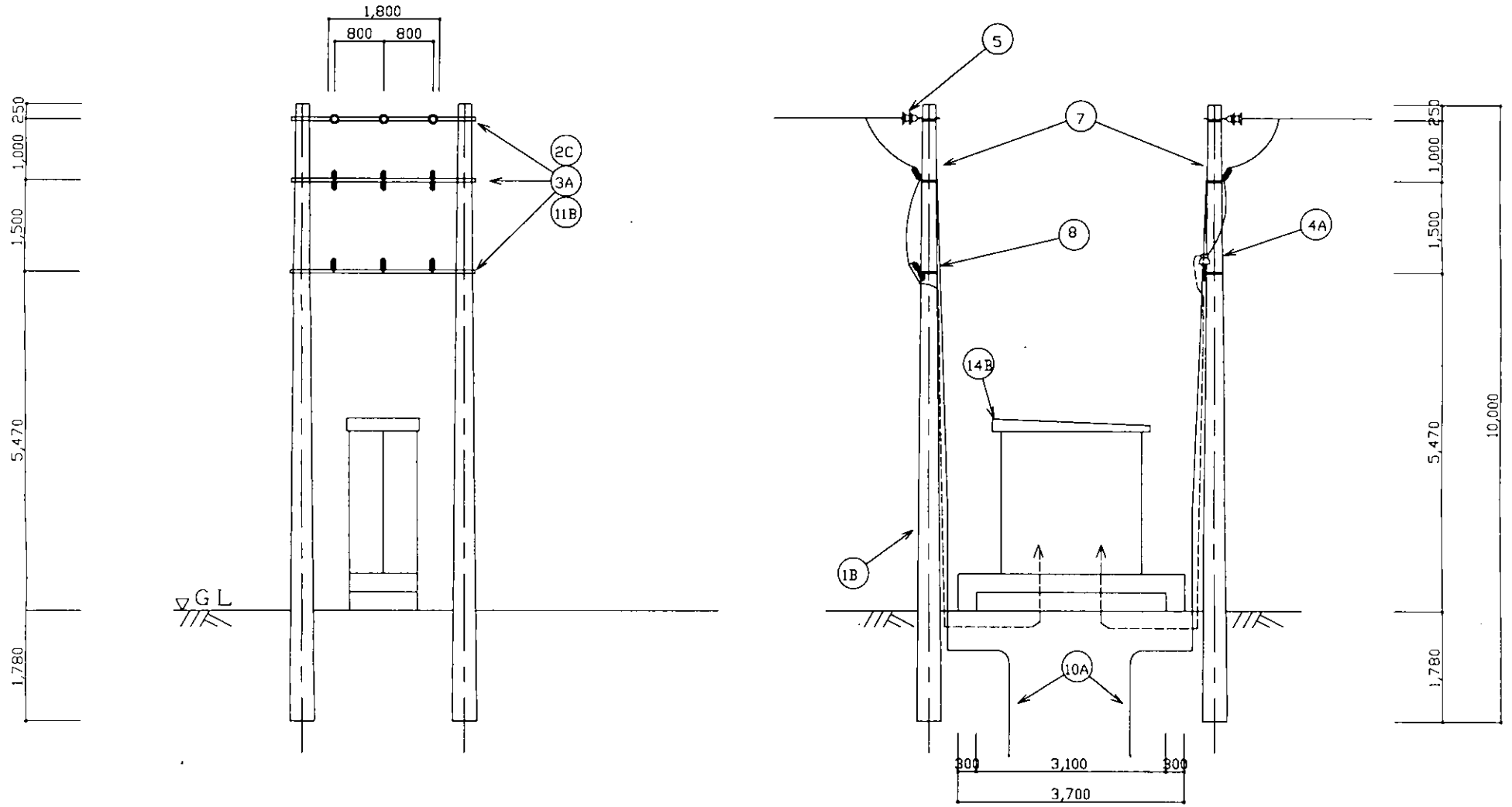
遮断器盤側面図
Circuit Breaker Cubicle side view

遮断器盤正面図
Circuit Breaker Cubicle front figure



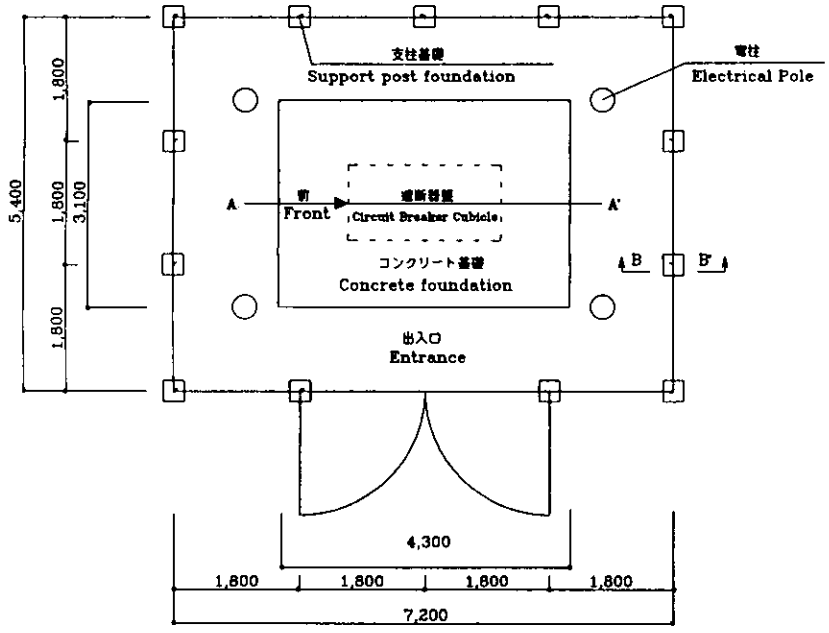
遮断器盤単線図
Single Line Diagram of Circuit Breaker Cubicle

KK-P06 (3/3) C10S 用遮断器外形図及び単線図【種別 C10S】
Outline and Single Line diagram for C10S【Type:C10S】



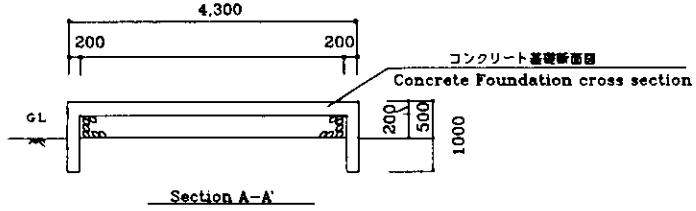
KK-P07 (1/3) 10.5kV 遮断器柱(MOF 付) (コンクリート柱)【種別 C10S-MOF】

10.5kV Circuit Breaker with MOF Pole (Concrete Pole)【Type: C10S-MOF】



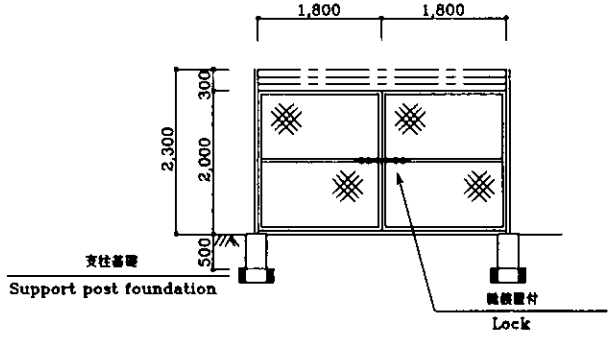
機器配置図

Equipment Arrangement Figure



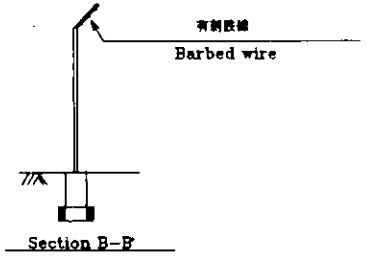
コンクリート基礎断面図

Concrete foundation cross section



ゲート詳細

Door details

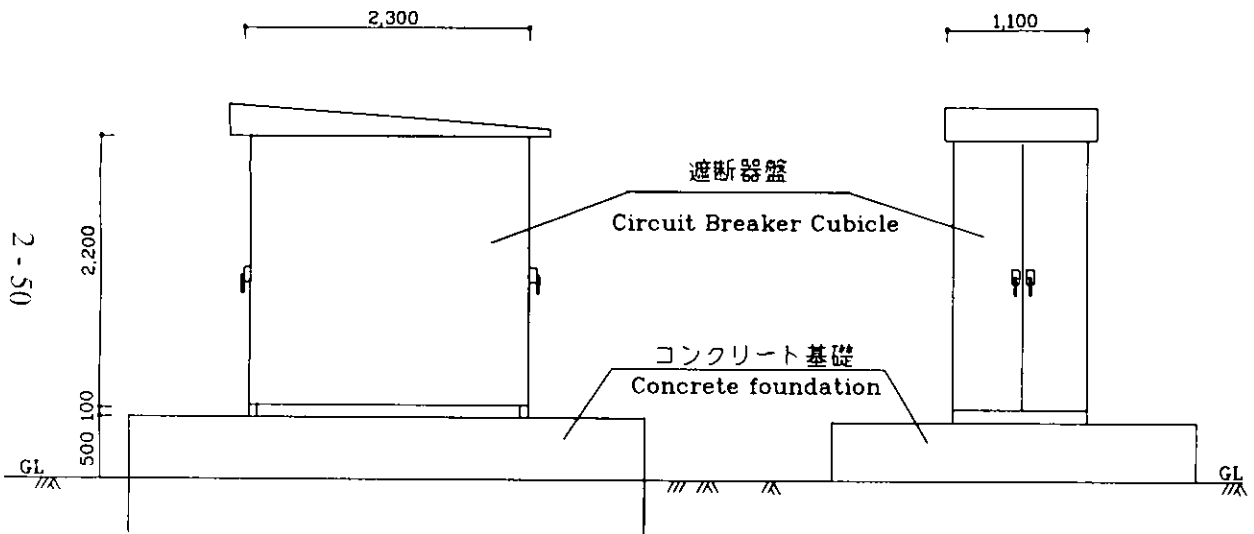


フェンス断面図

Fence cross section

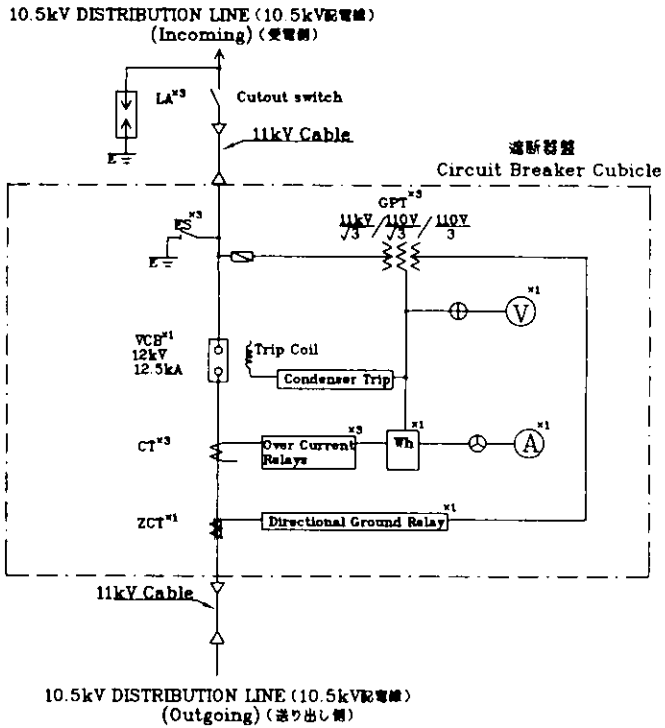
KK-P07 (2/3) C10S-MOF 用機器配置図【種別 C10S-MOF】

Equipment Layout for C10S-MOF【Type:C10S-MOF】



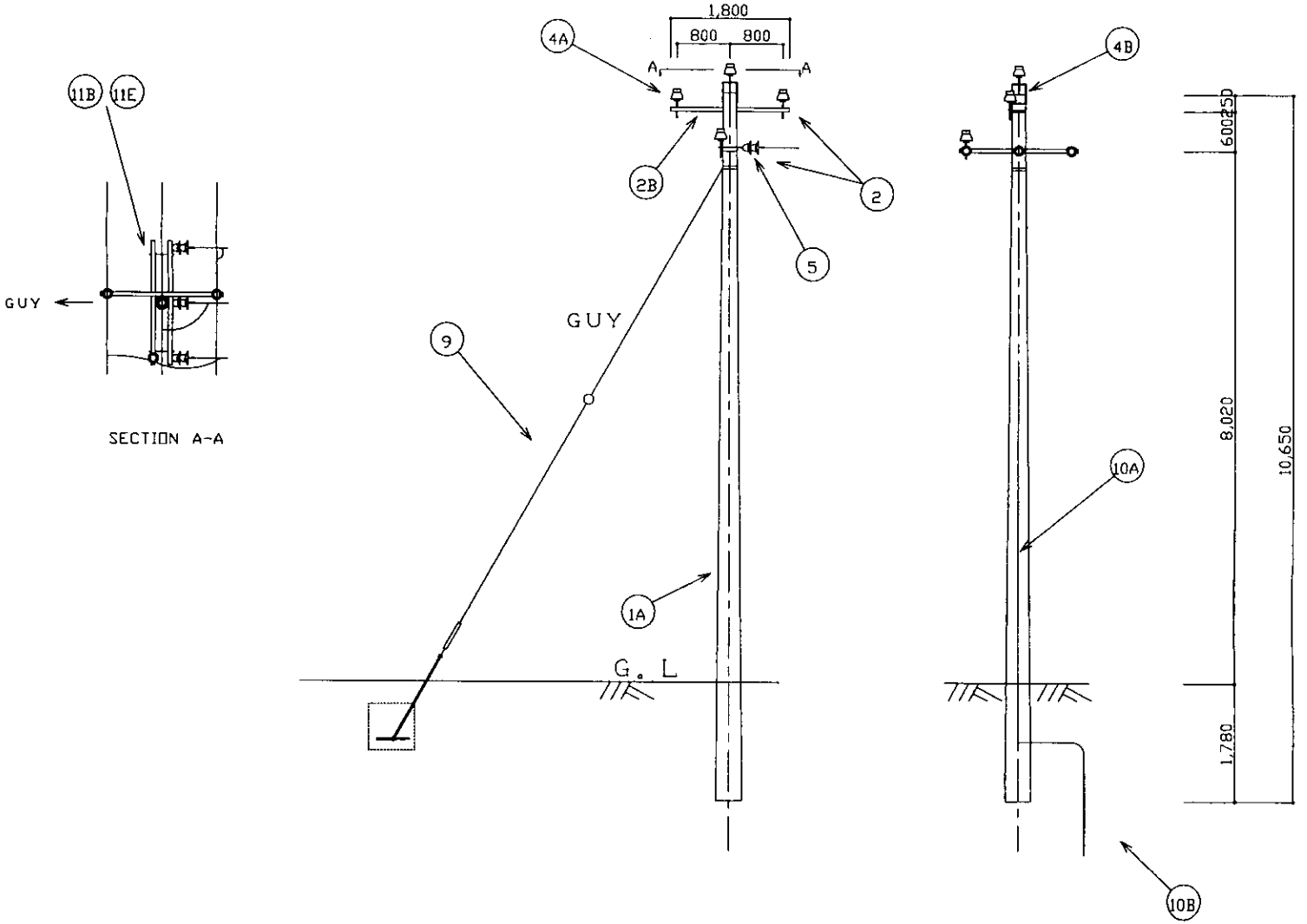
遮断器盤（取引用電力量計付）側面図
Circuit Breaker Cubicle side view

遮断器盤（取引用電力量計付）正面図
Circuit Breaker Cubicle front figure



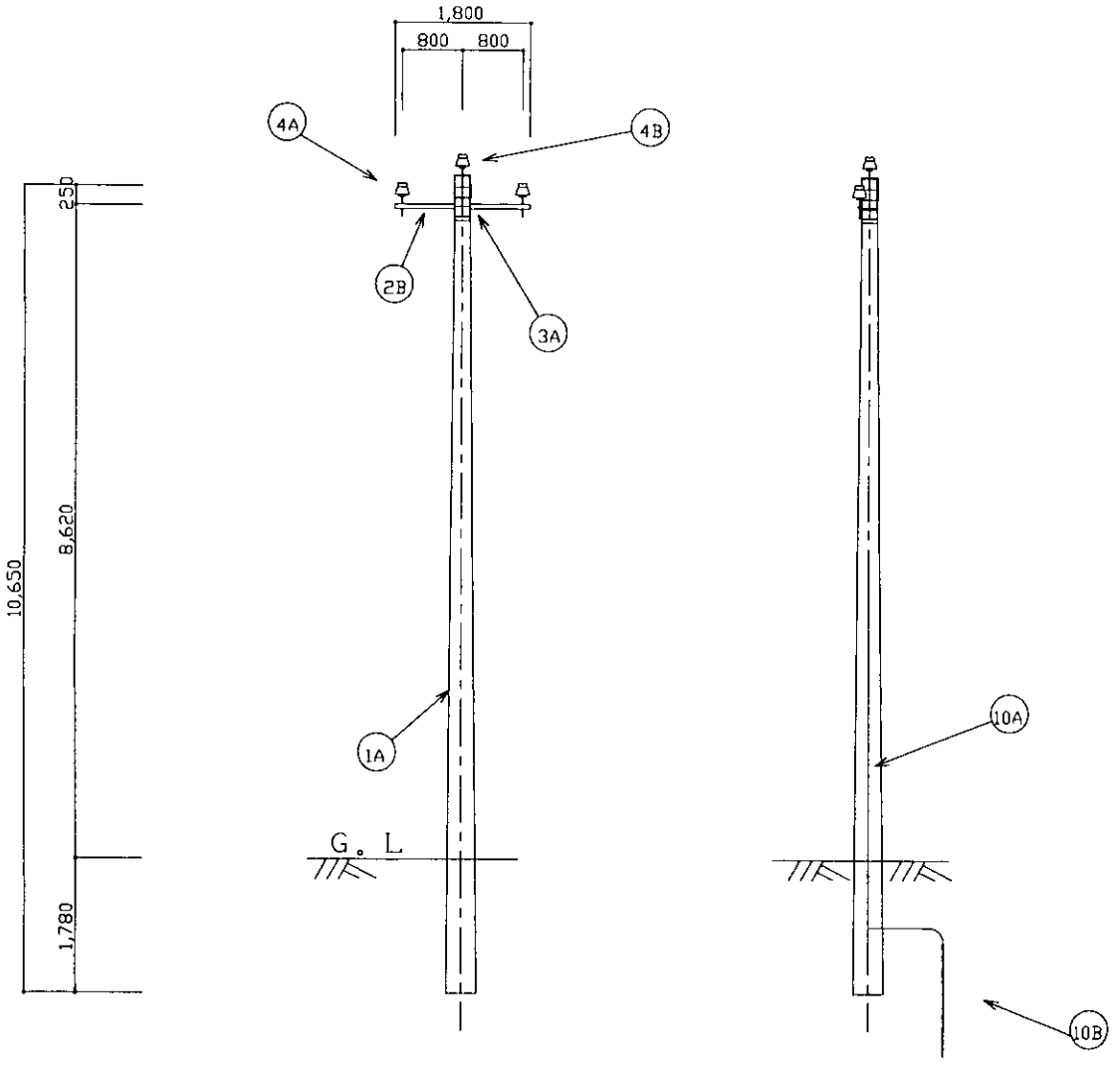
遮断器盤（取引用電力量計付）単線図
Single Line Diagram of Circuit Breaker Cubicle

KK-P07 (3/3) C10S-MOF 用遮断器外形図及び単線図【種別 C10S-MOF】
Outline and Single Line diagram for C10S-MOF【Type:C10S-MOF】



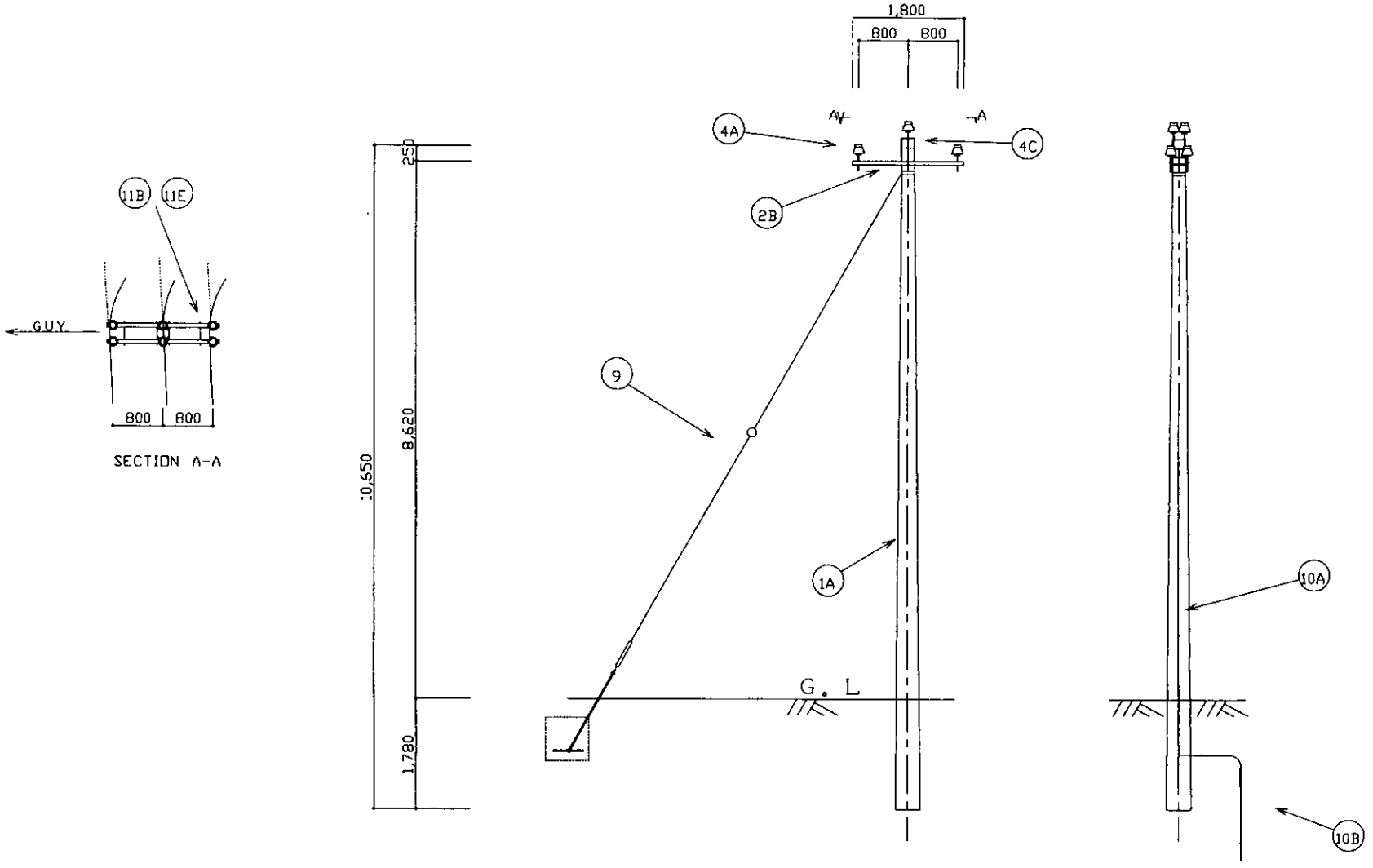
KK-P08 10.5kV 分岐回路柱(鋼板柱)【種別 S10D】

10.5kV Branch Pole (Steel Pole)【Type:S10D】



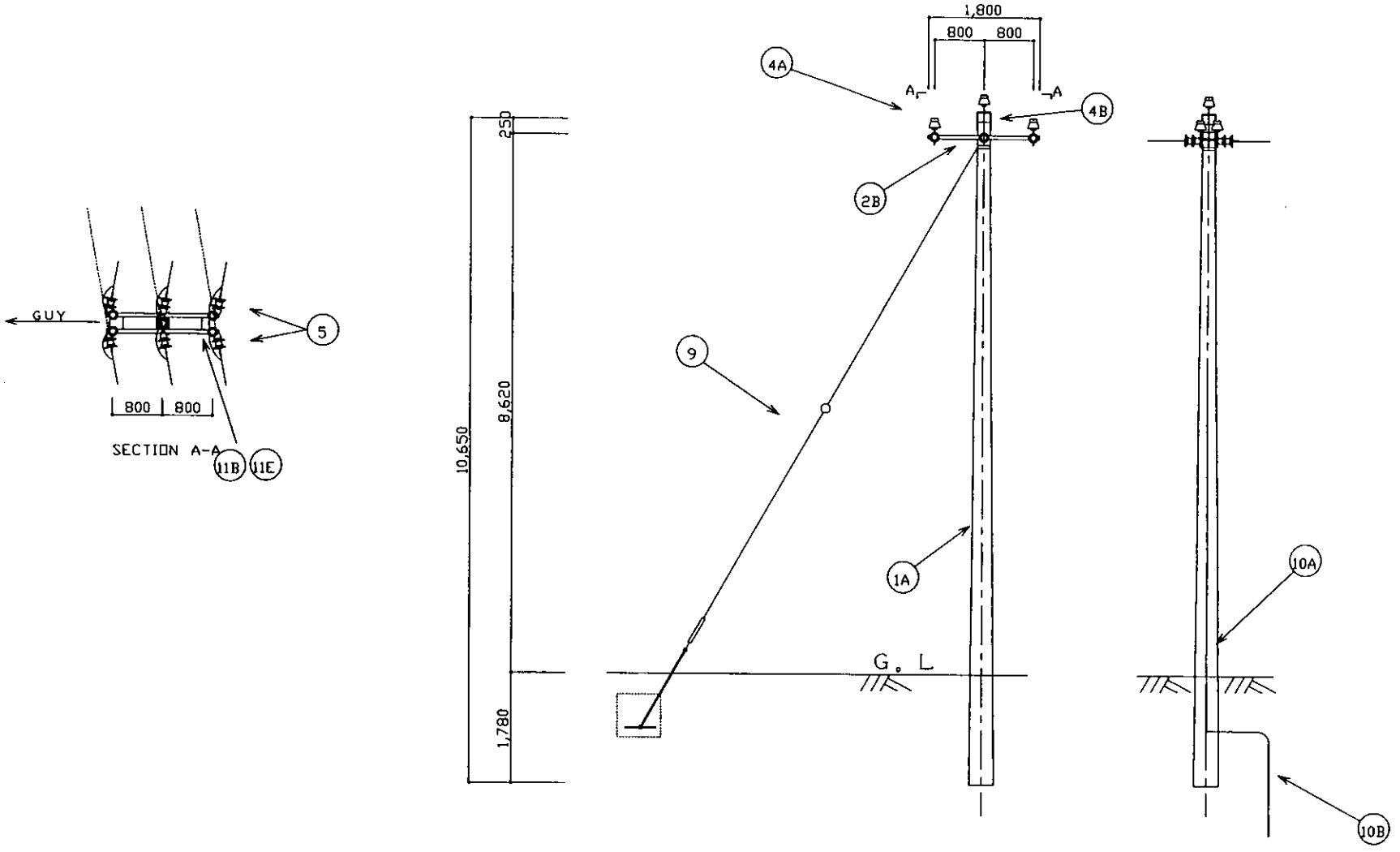
KK-P09 10.5kV 中間柱(鋼板柱)【種別 S10N】

10.5kV Intermediate Pole(Steel Pole)【Type:S10N】



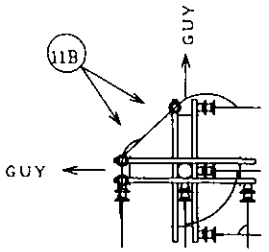
KK-P10 10.5kV 角度柱 5～20 度(鋼板柱)【種別 S10A-5】

10.5kV Angle Pole (5deg～20deg) (Steel Pole)【Type:S10A-5】

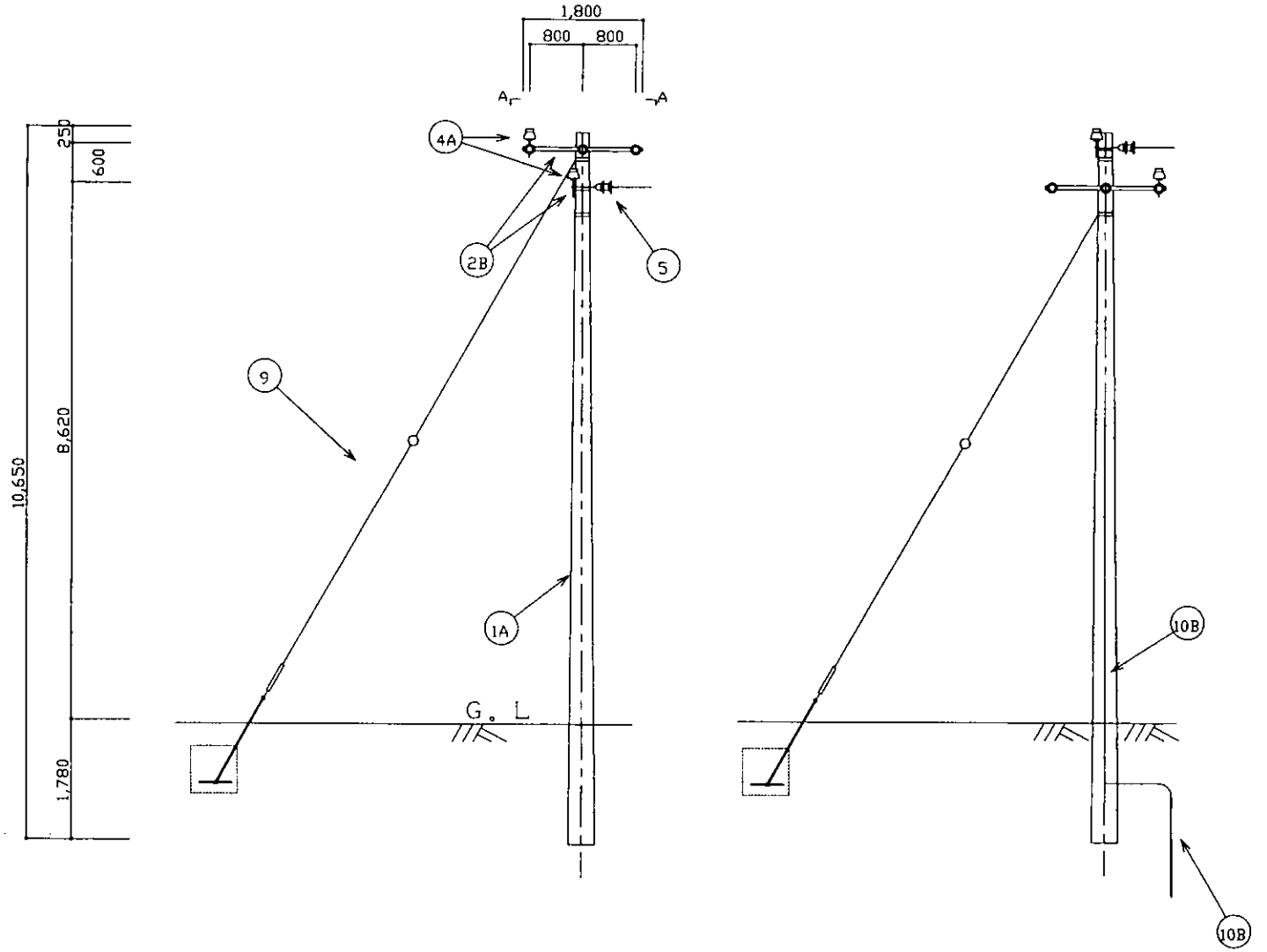


KK-P11 10.5kV 角度柱 20～35 度(鋼板柱)【種別 S10A-20】

10.5kV Angle Pole (20deg～35deg) (Steel Pole)【Type:S10A-20】

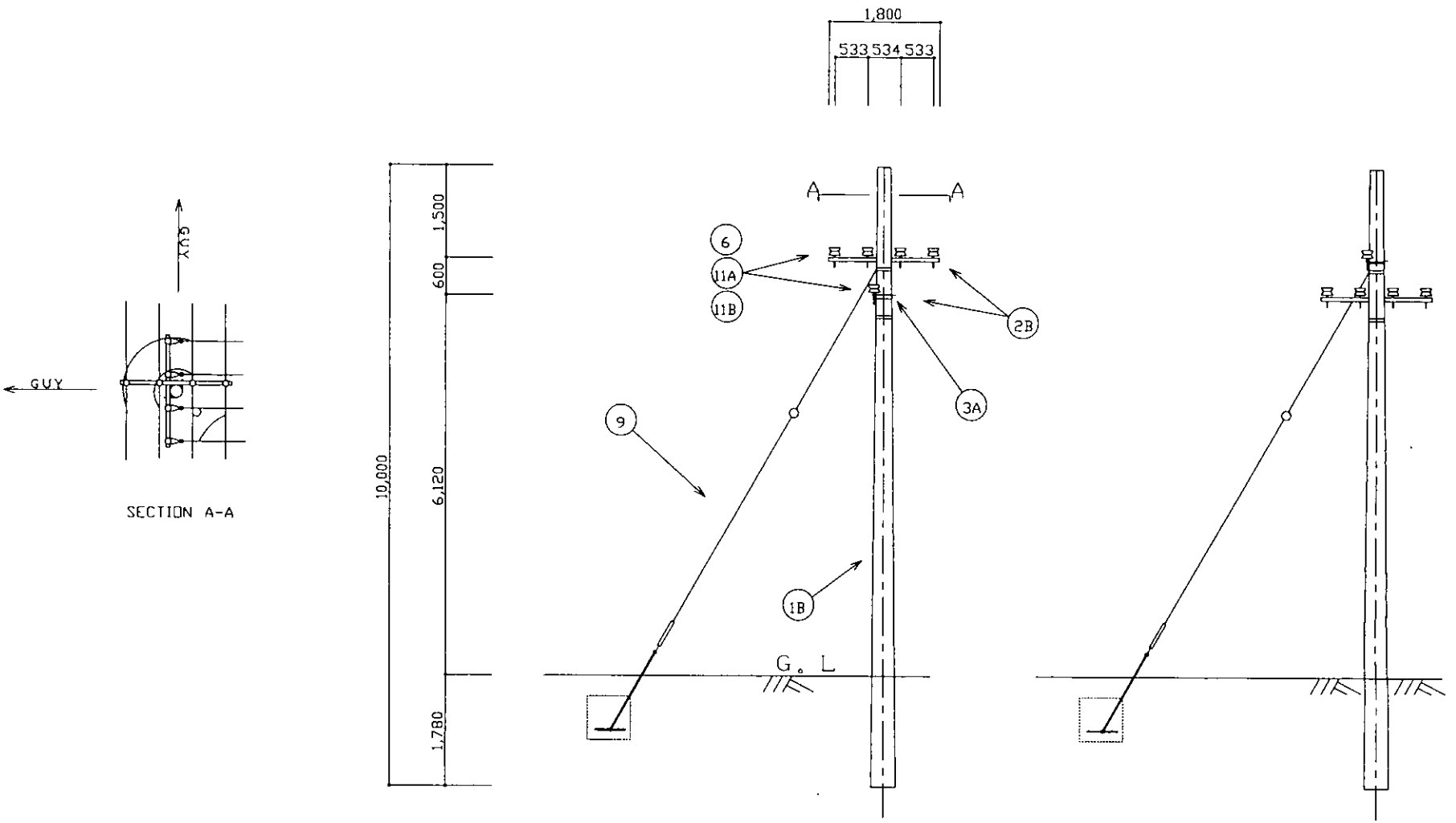


SECTION A-A



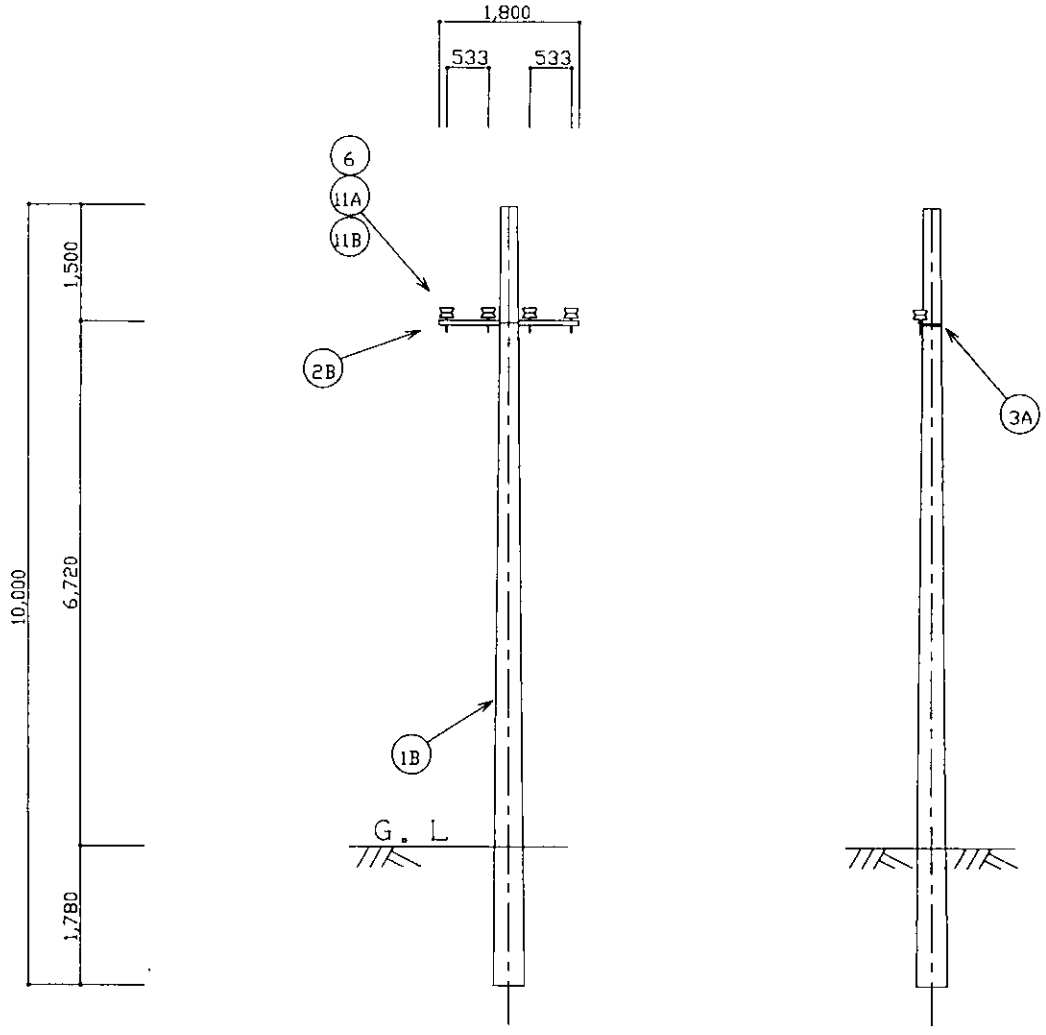
KK-P12 10.5kV 角度柱 35～90 度(鋼板柱)【種別 S10A-35】

10.5kV Angle Pole (35deg～90deg) (Steel Pole)【Type:S10A-35】



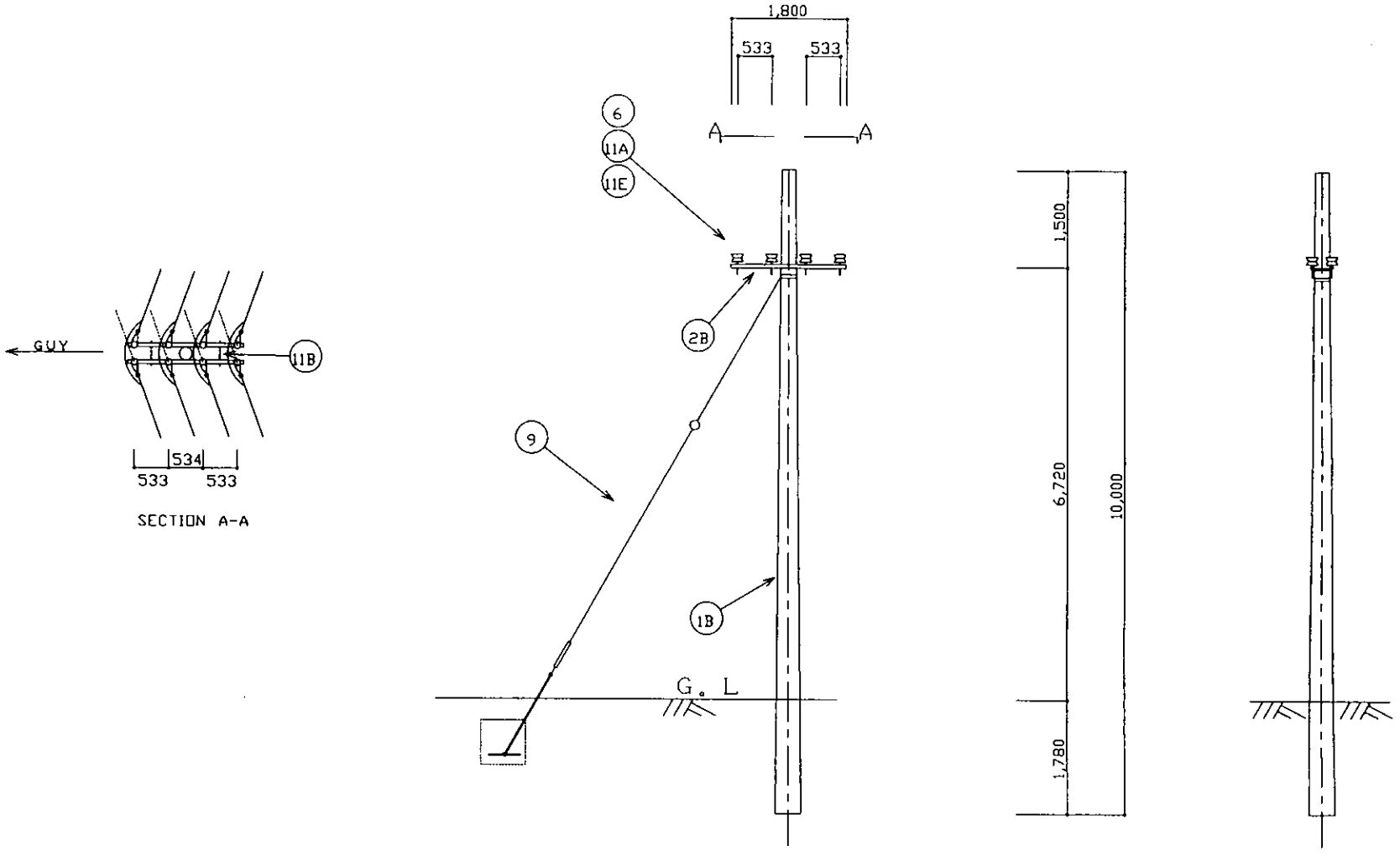
KK-P13 0.4kV 分岐回路柱(コンクリート柱)【種別 C04D】

0.4kV Branch Pole (Concrete Pole)【Type:C04D】



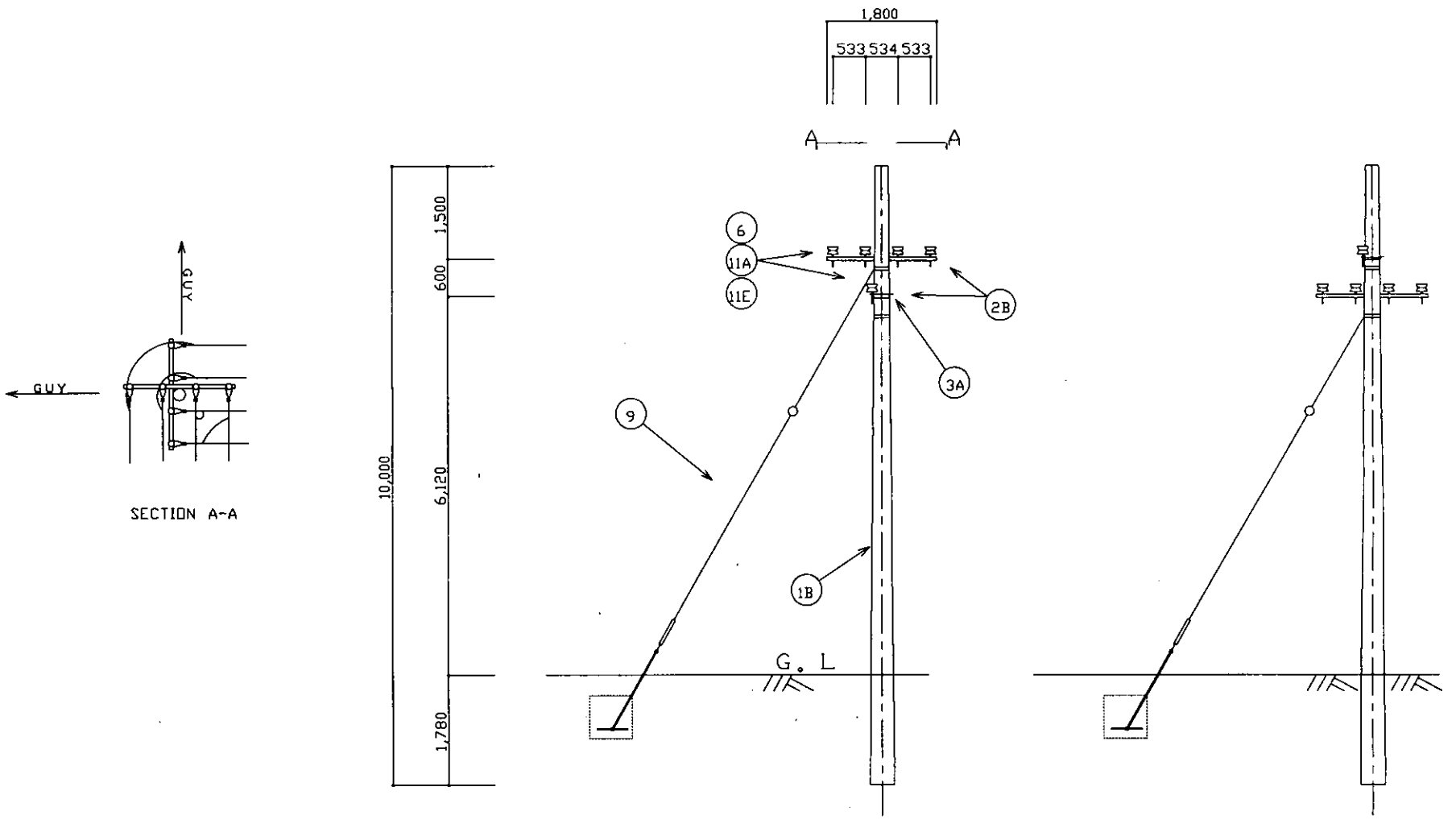
KK-P14 0.4kV 中間柱(コンクリート柱)【種別 C04N】

0.4kV Intermediate Pole(Concrete Pole)【Type:C04N】



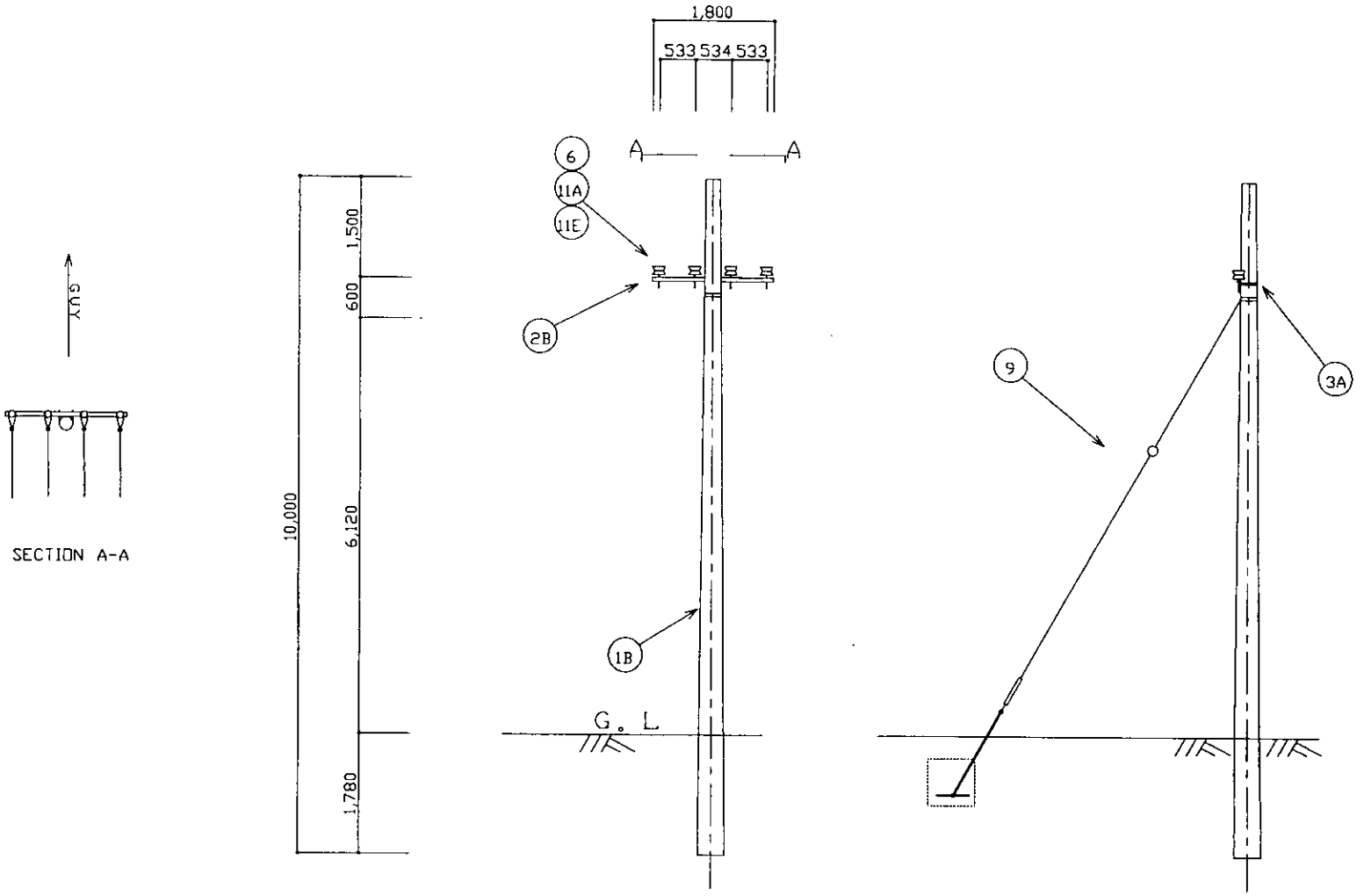
KK-P15 0.4kV 角度柱 5～20 度(コンクリート柱)【種別 C04A-5】

0.4kV Angle Pole (5deg～20deg) (Concrete Pole)【Type:C04A-5】



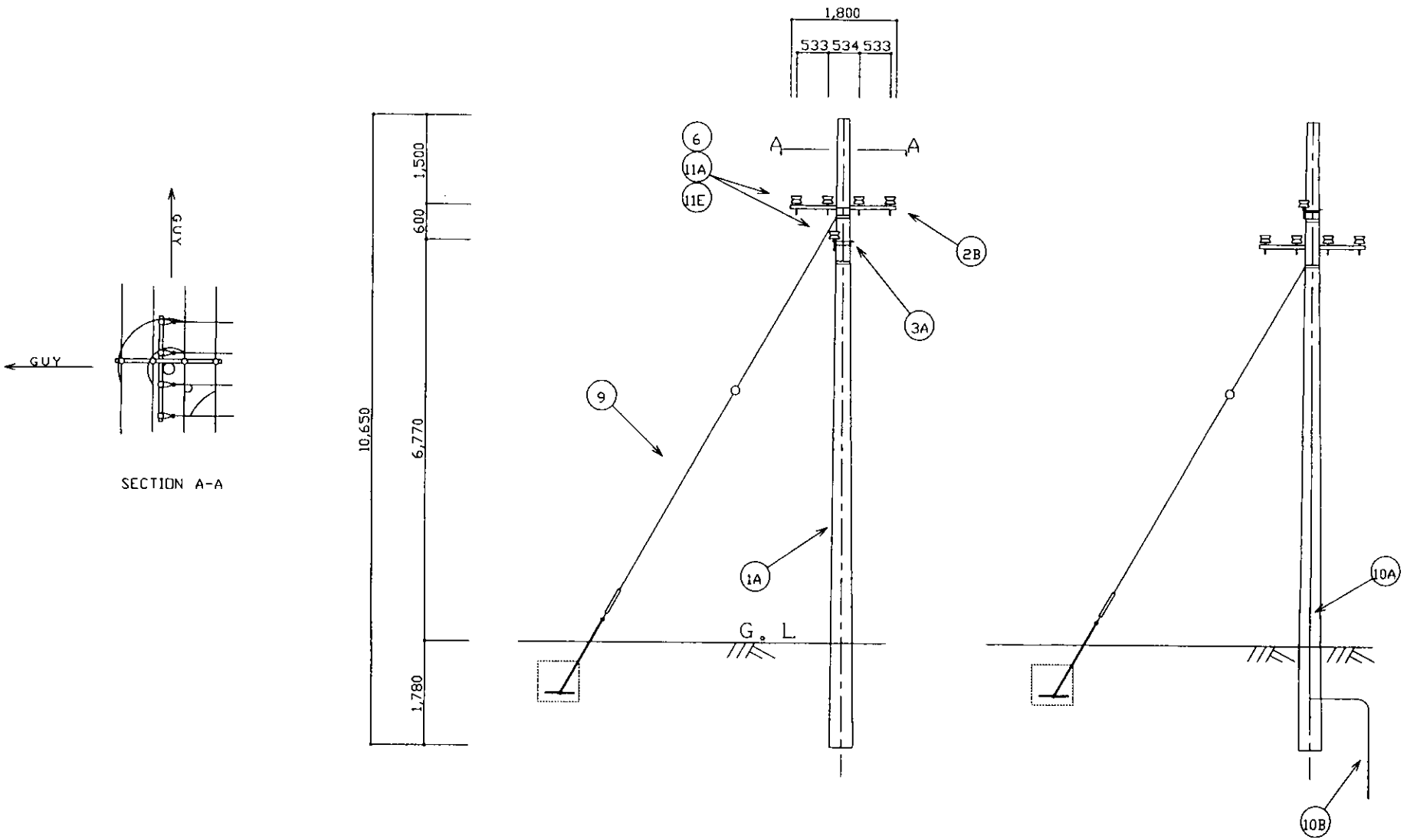
KK-P16 0.4kV 角度柱 35～90 度(コンクリート柱)【種別 C04A-35】

0.4kV Angle Pole (35deg～90deg) (Concrete Pole)【Type:C04A-35】



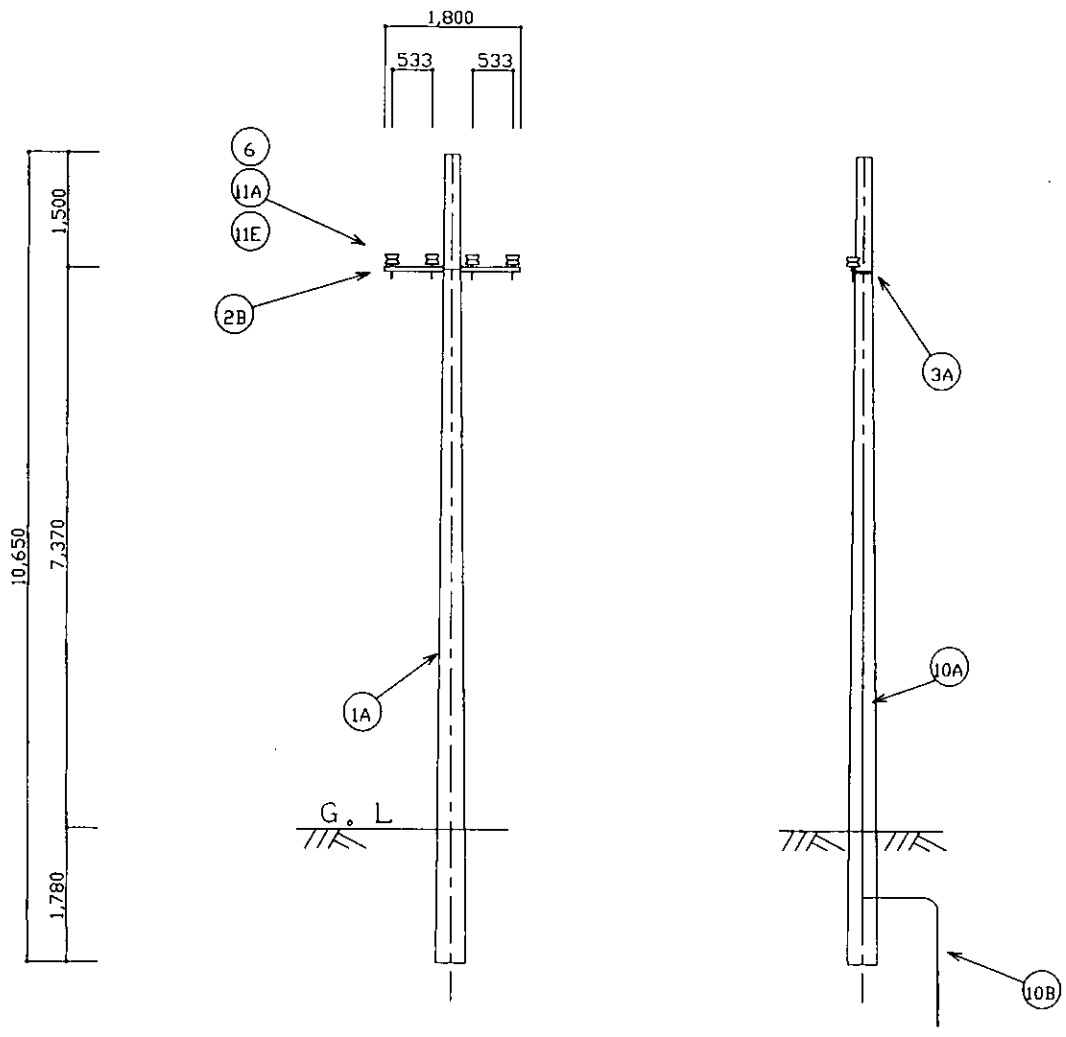
KK-P17 0.4kV 終端柱(コンクリート柱)【種別 C04E】

0.4kV Terminal Pole(Concrete Pole)【Type:C04E】



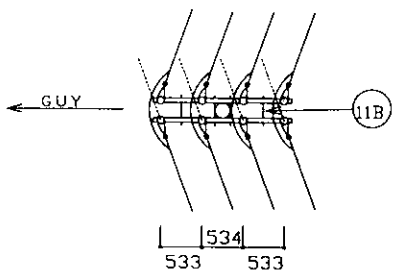
KK-P18 0.4kV 分岐回路柱(鋼板柱)【種別 S04D】

0.4kV Branch Pole (Steel Pole)【Type:S04D】



KK-P19 0.4kV 中間柱(鋼板柱)【種別 S04N】

0.4kV Intermediate Pole(Steel Pole)【Type:S04N】



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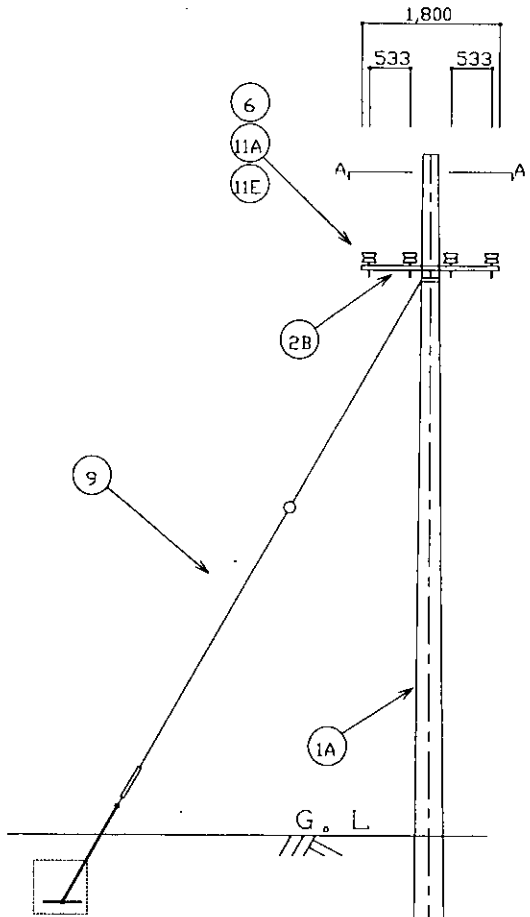
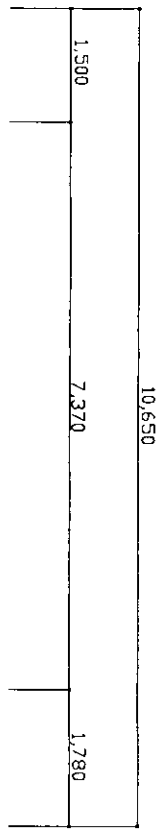
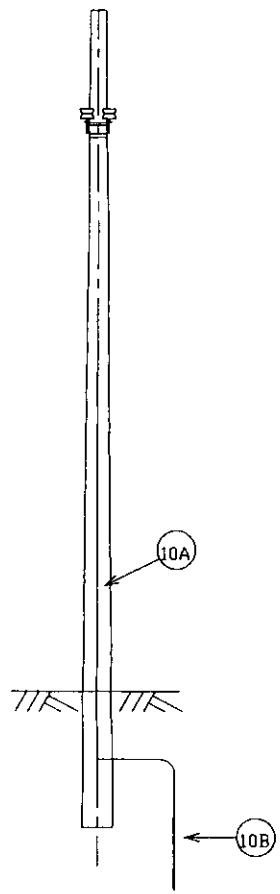
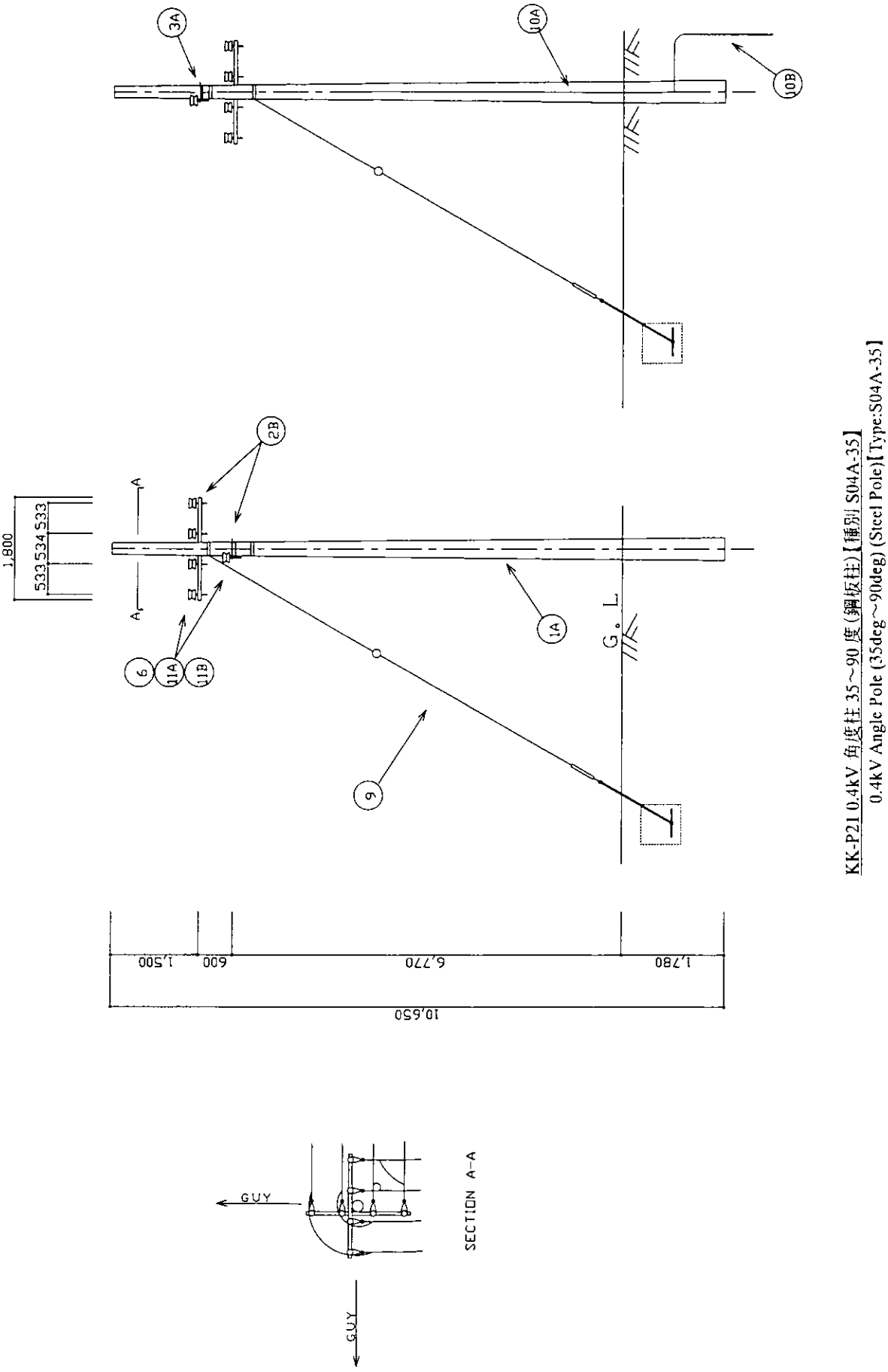




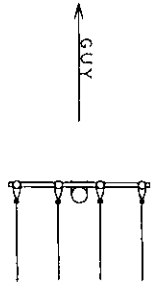


KK-P20 0.4kV 角度柱 5～20 度(鋼板柱)【種別 S04A-05】

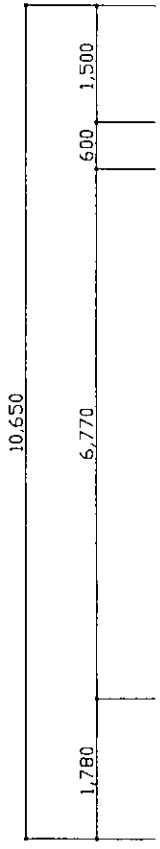
0.4kV Angle Pole (5deg～20deg) (Steel Pole)【Type:S04A-05】

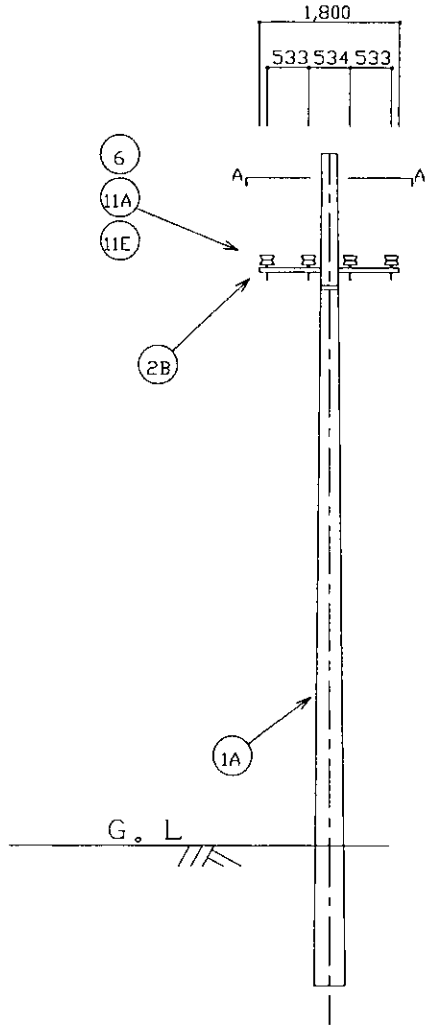


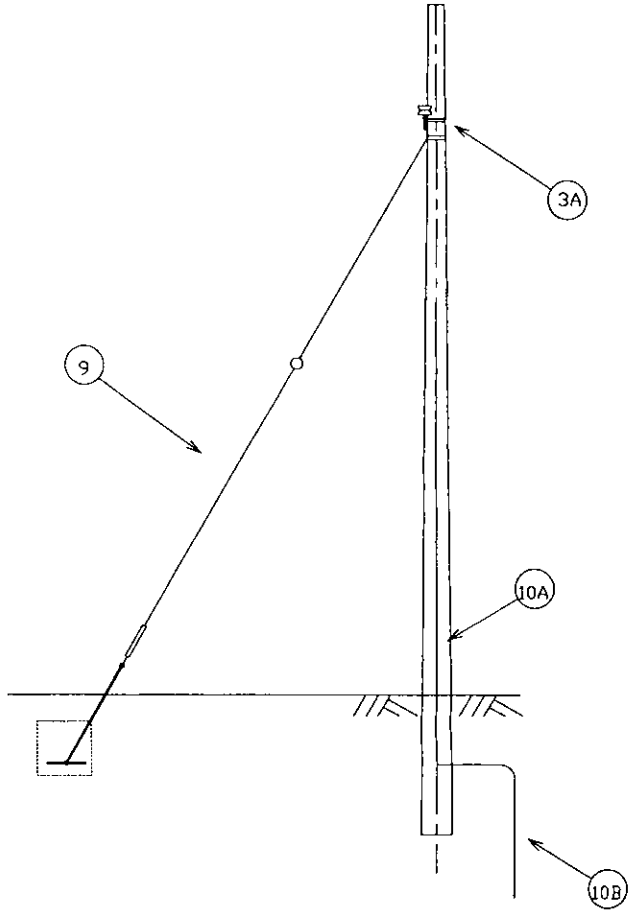
KK-P21 0.4kV 角度柱 35～90 度(鋼板柱)【種別 S04A-35】
0.4kV Angle Pole (35deg～90deg) (Steel Pole)【Type:S04A-35】



SECTION A-A

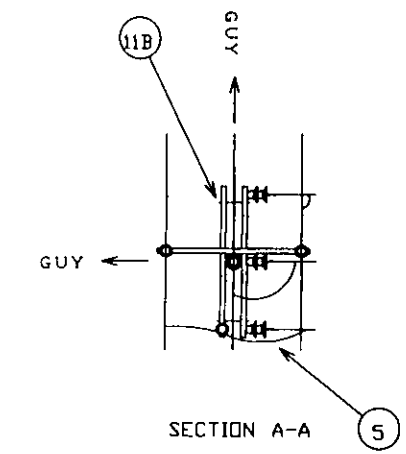






KK-P22 0.4kV 終端柱(鋼板柱)【種別 S04E】

0.4kV Terminal Pole(Steel Pole)【Type:S04E】



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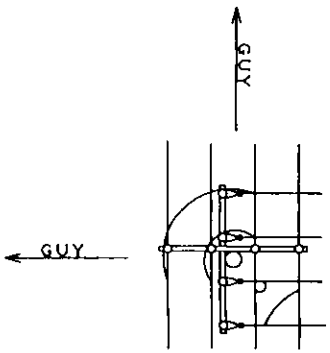
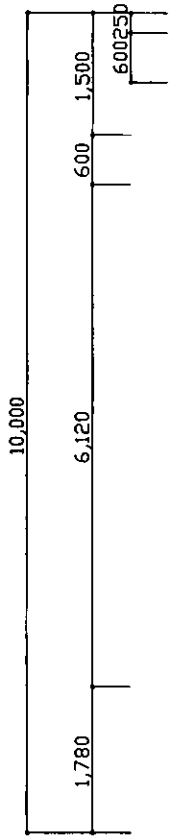
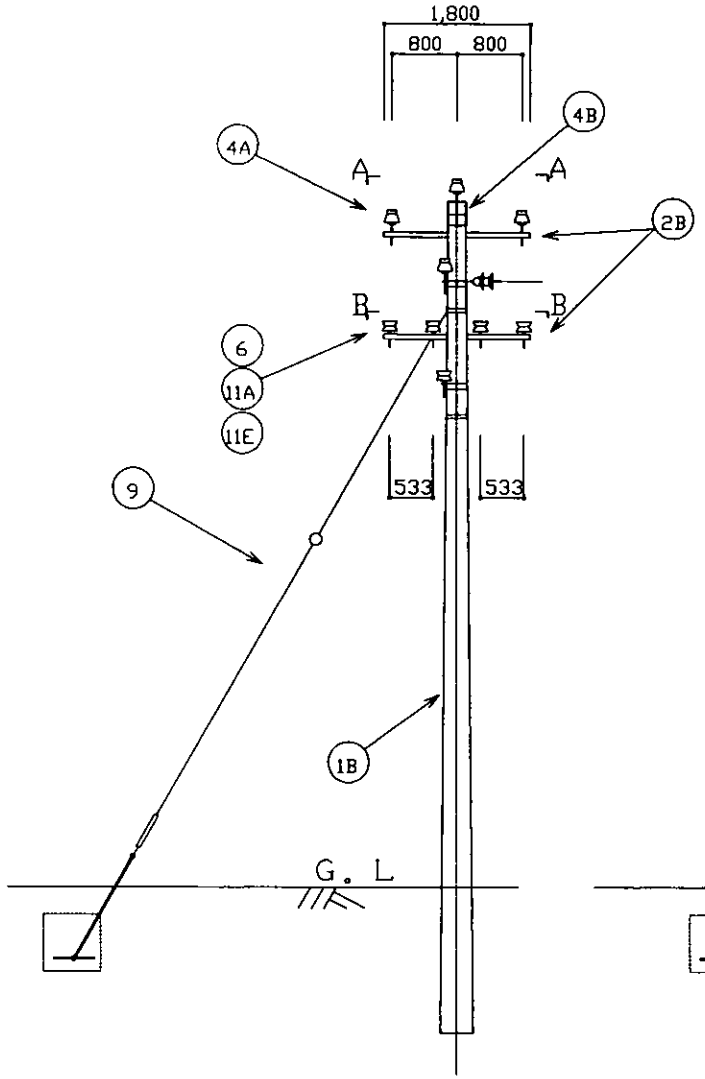
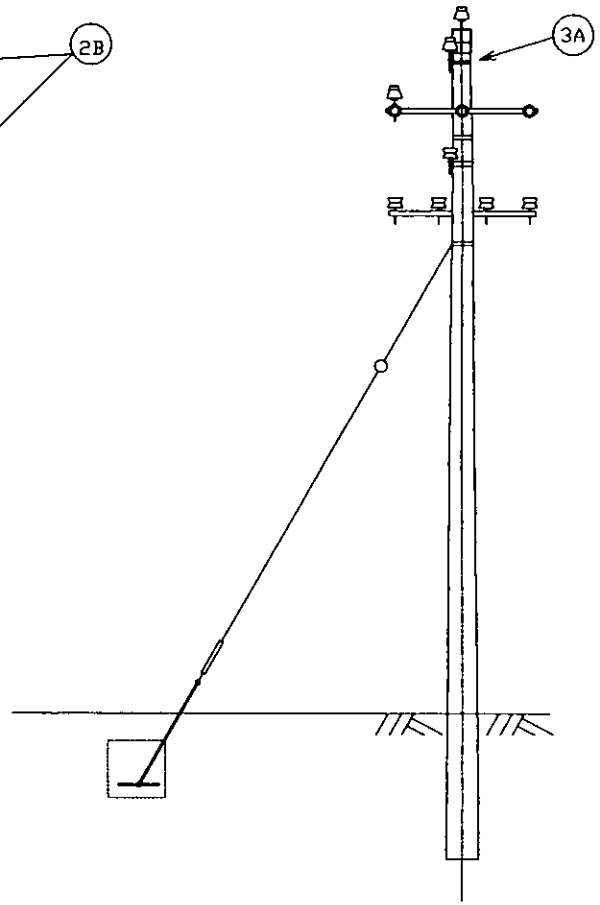


SECTION B-B

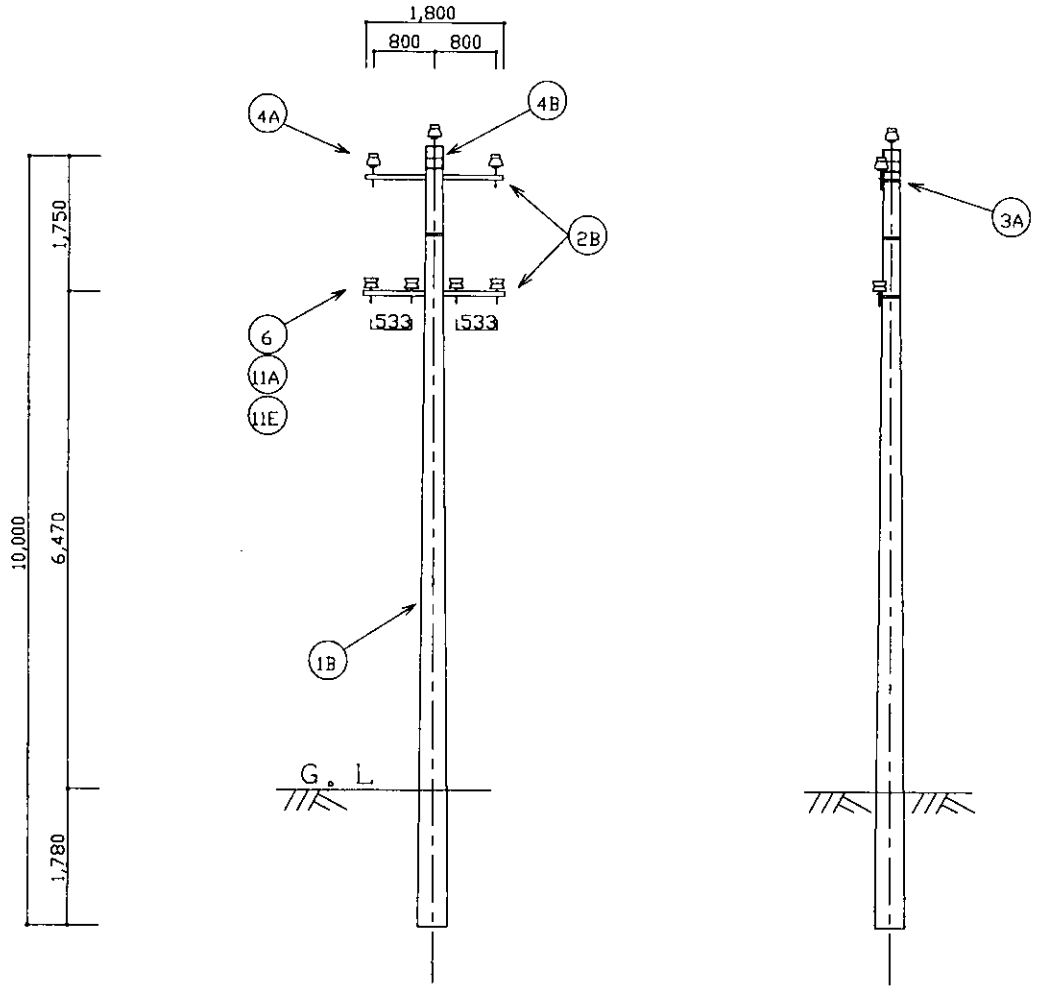






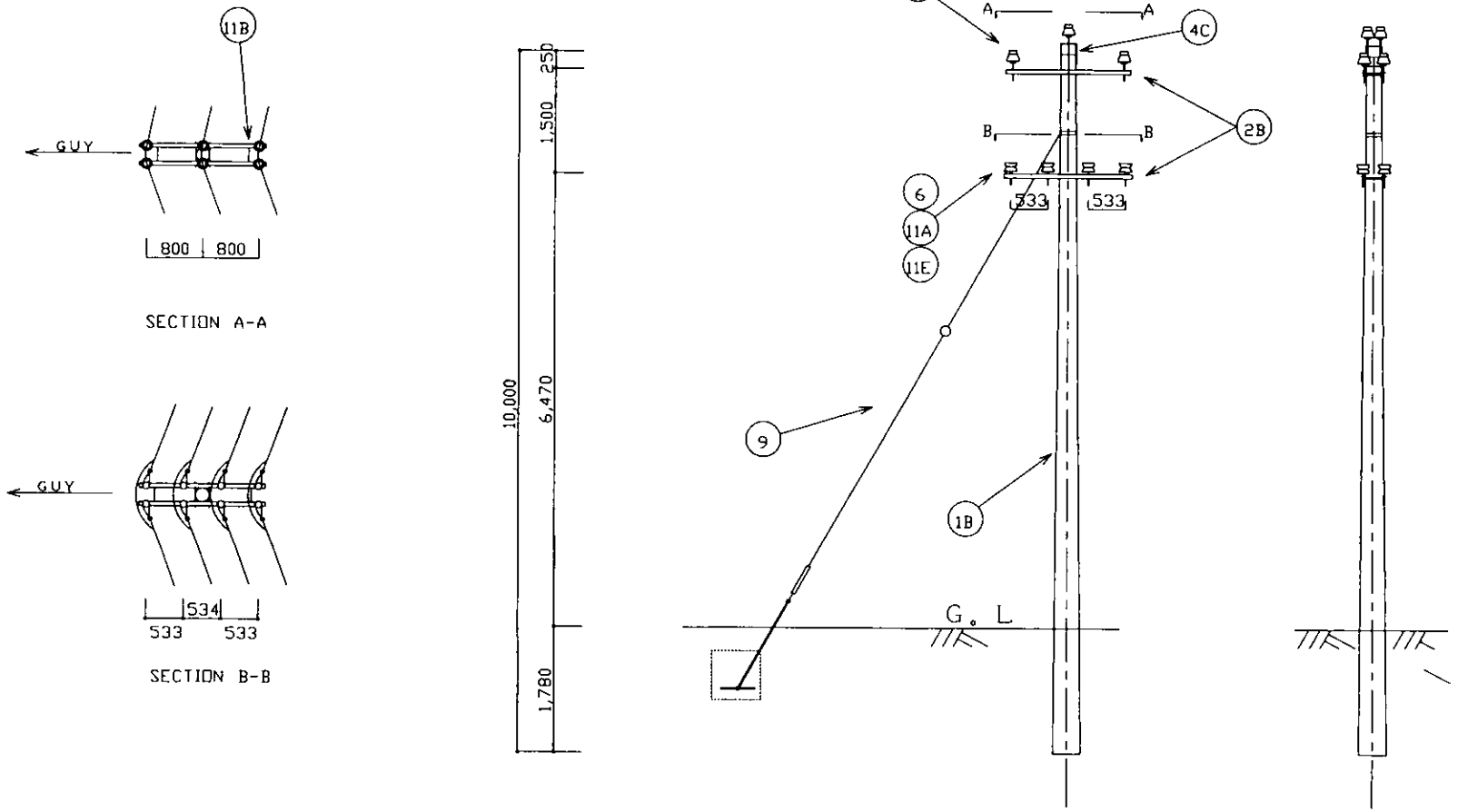
KK-P23 10.5/0.4kV 分岐回路柱(コンクリート柱)【種別 CCOD】

10.5/0.4kV Branch Pole (Concrete Pole)【Type:CCOD】



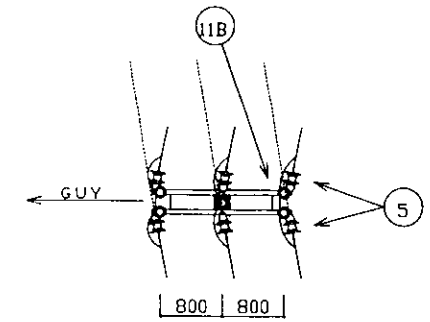
KK-P24 10.5/0.4kV 中間柱(コンクリート柱)【種別 CCON】

10.5/0.4kV Intermediate Pole(Concrete Pole)【Type:CCON】



KK-P25 10.5/0.4kV 角度柱 5～20 度(コンクリート柱)【種別 CCOA-5】

10.5/0.4kV Angle Pole (5deg～20deg) (Concrete Pole)【Type:CCOA-5】



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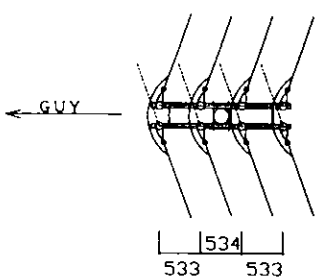
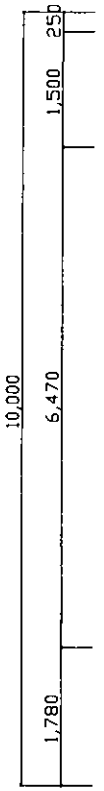
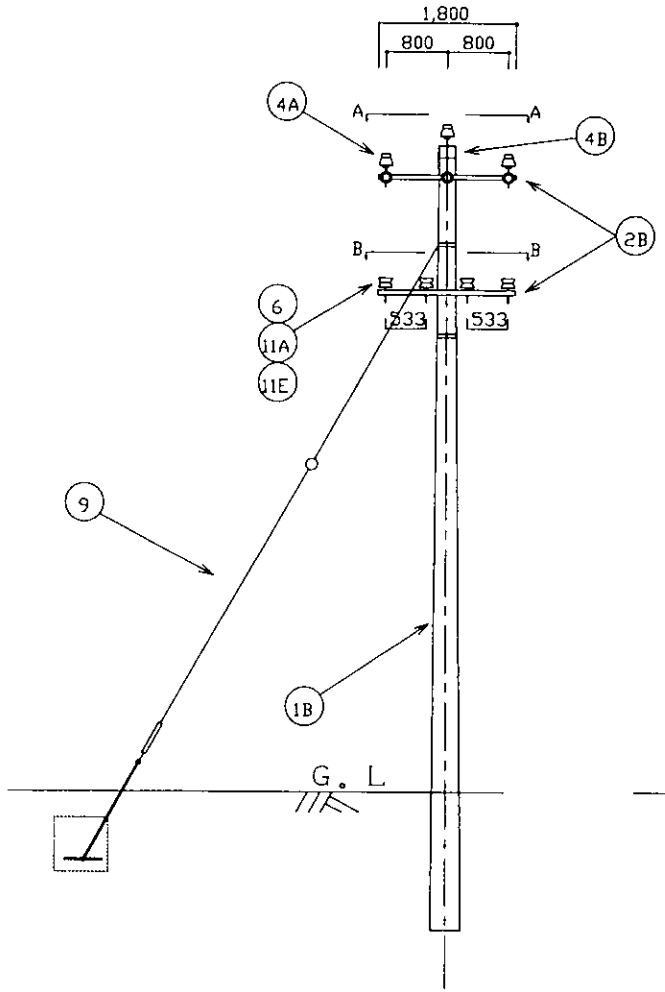
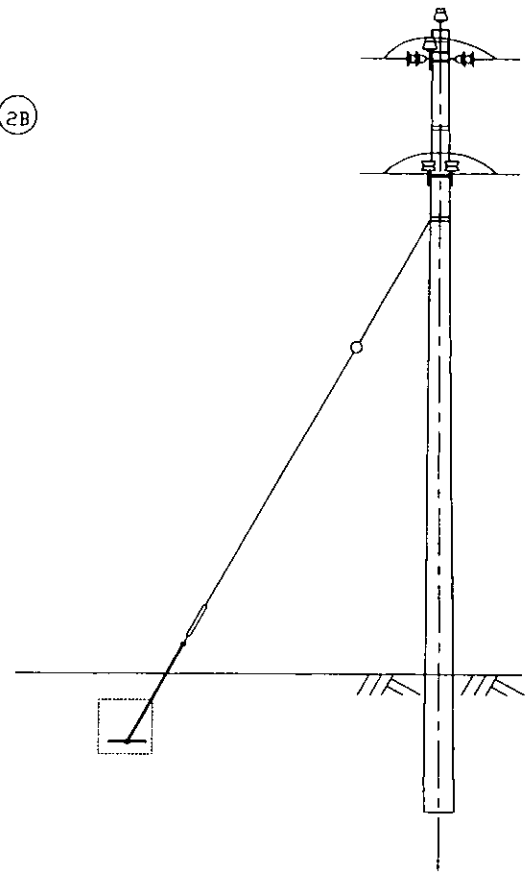


SECTION B-B

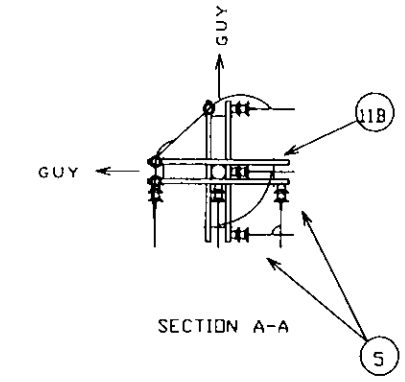




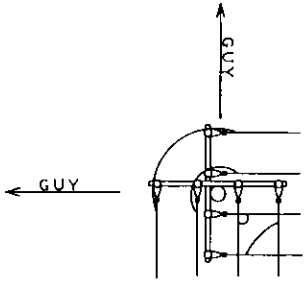


KK-P26 10.5/0.4kV 角度柱 20～35 度(コンクリート柱)【種別 CCOA-20】

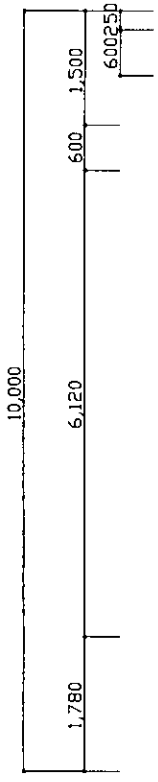
10.5/0.4kV Angle Pole (20deg～35deg) (Concrete Pole)【Type:CCOA-20】

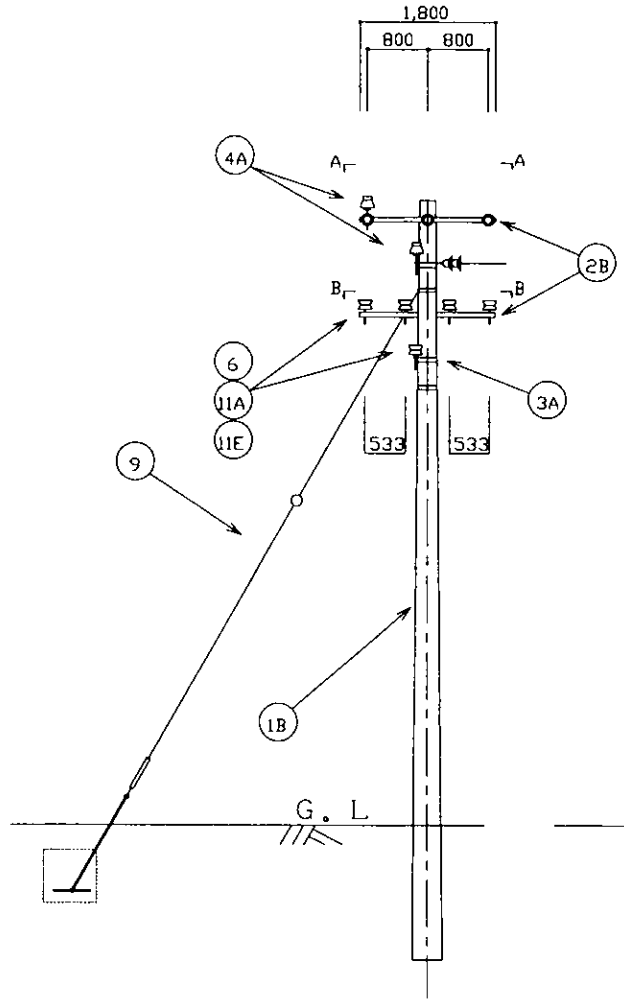


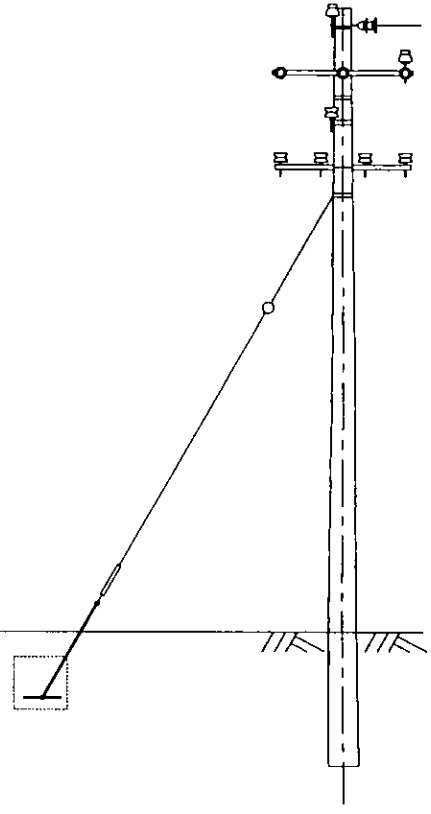
SECTION A-A



SECTION B-B

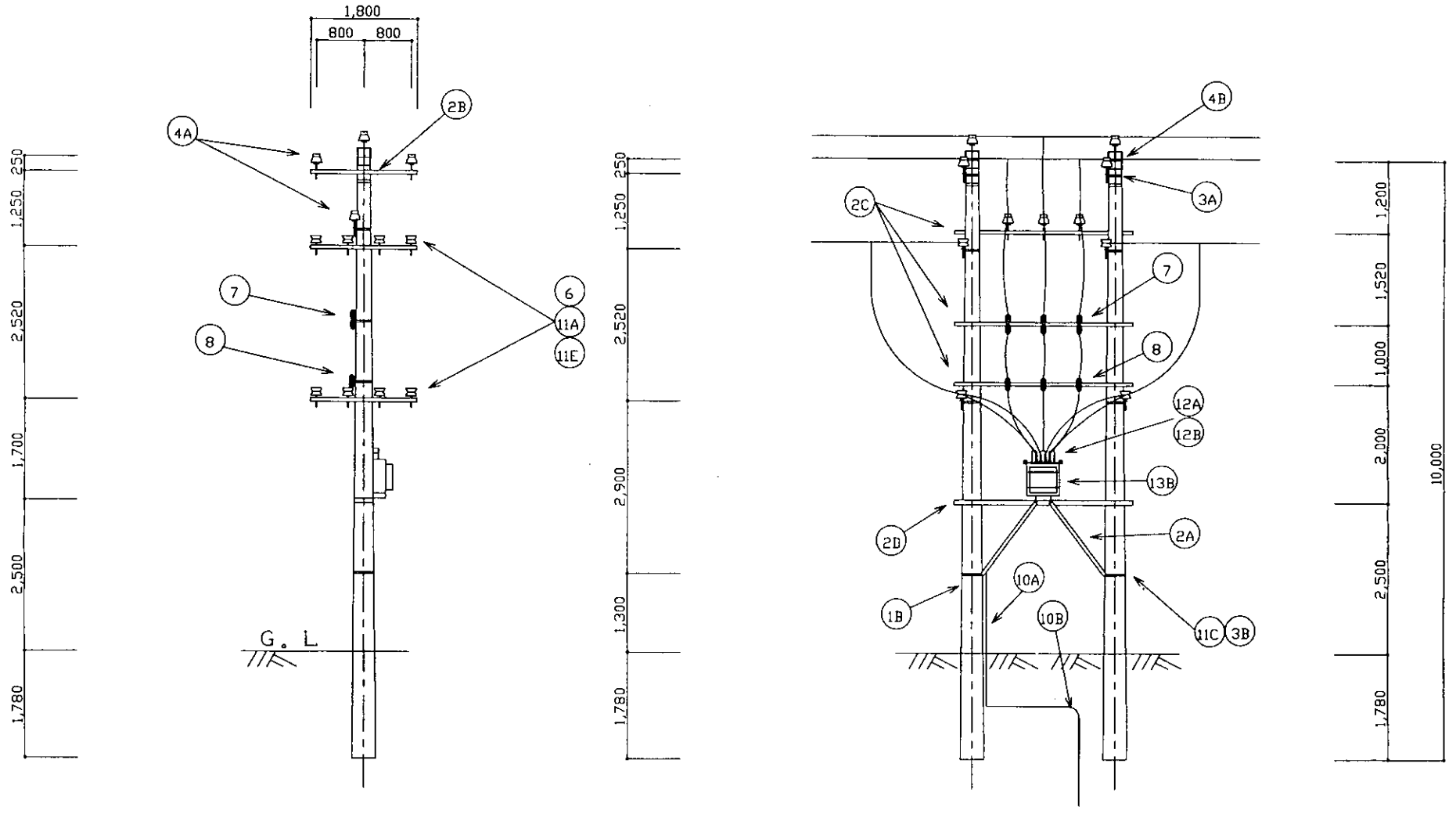






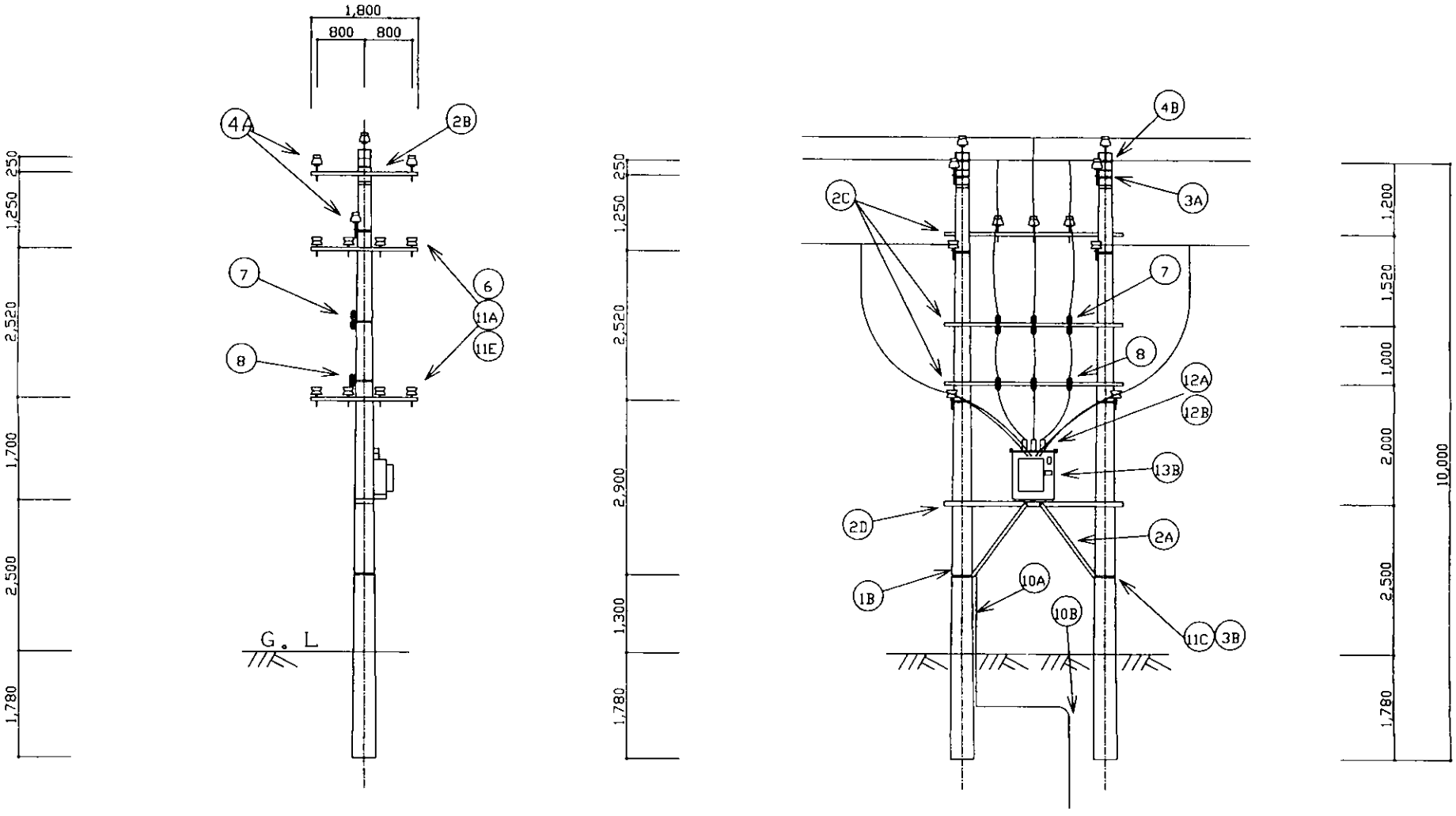
KK-P27 10.5/0.4kV 角度柱 35～90 度(コンクリート柱)【種別 CCOA-35】

10.5/0.4kV Angle Pole (35deg～90deg) (Concrete Pole)【Type:CCOA-35】



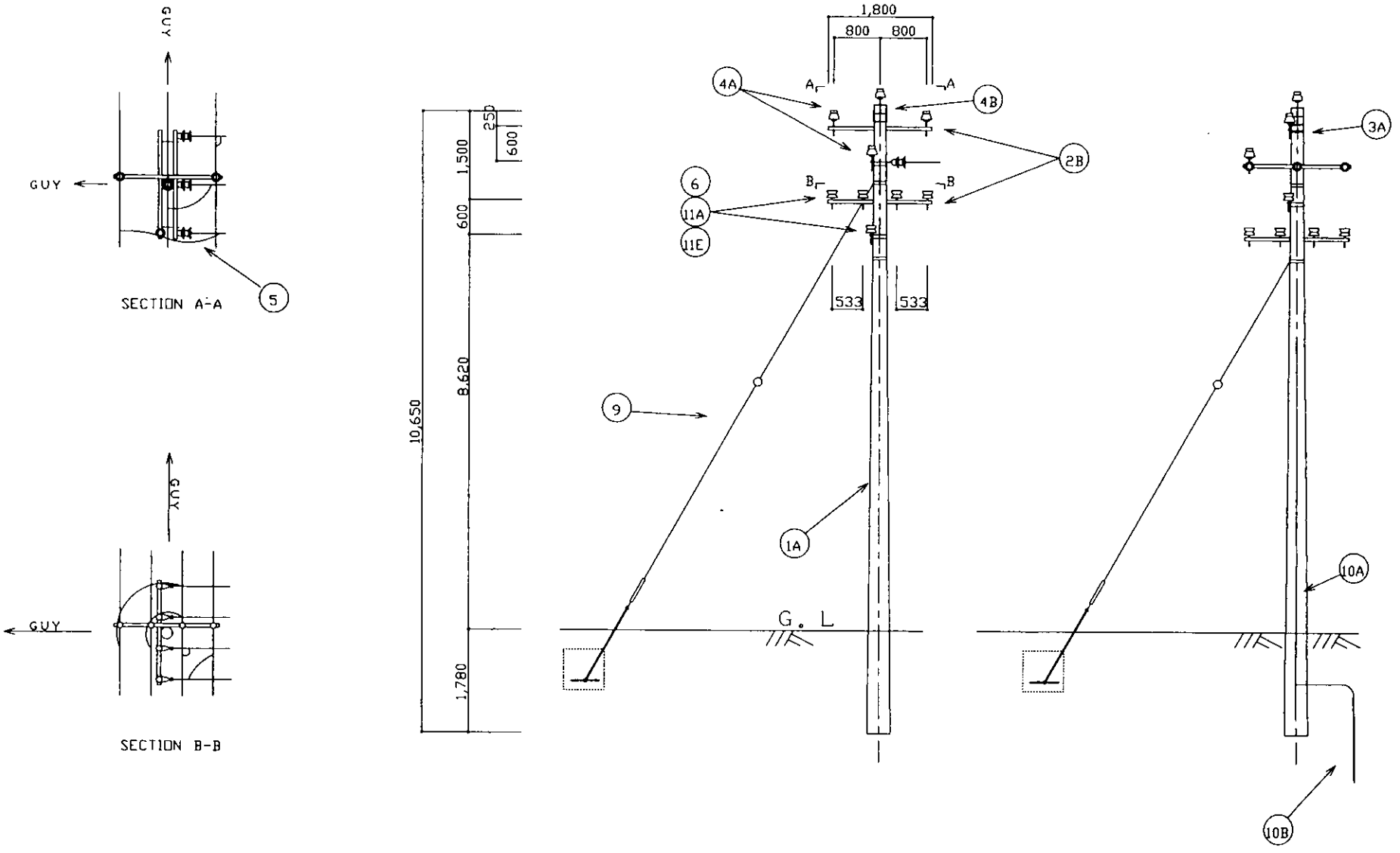
KK-P28 10.5/0.4kV 変圧器柱 20kVA(コンクリート柱)【種別 CCOT-20】

10.5/0.4kV Transformer Pole 20kVA (Concrete Pole)【Type:CCOT-20】



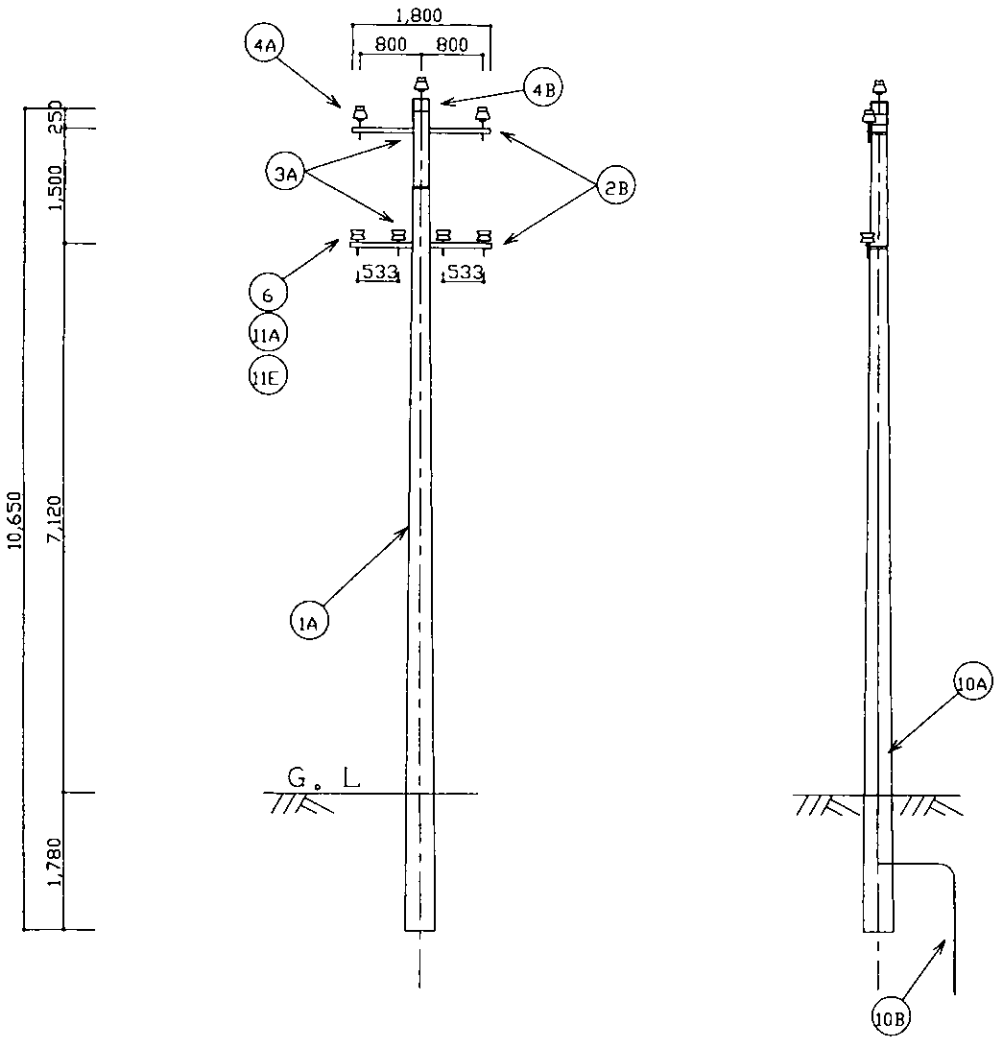
KK-P29 10.5/0.4kV 変圧器柱 50kVA(コンクリート柱)【種別 CCOT-50】

10.5/0.4kV Transformer Pole 50kVA (Concrete Pole)【Type:CCOT-50】



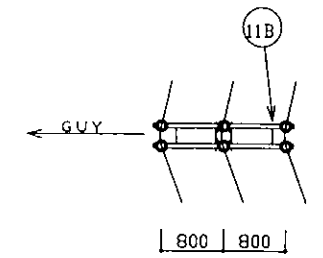
KK-P30 10.5/0.4kV 分岐回路柱(鋼板柱)【種別 SCOD】

10.5/0.4kV Branch Pole (Steel Pole)【Type:SCOD】

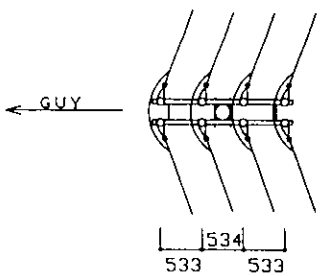


KK-P31 10.5/0.4kV 中間柱(鋼板柱)【種別 SCON】

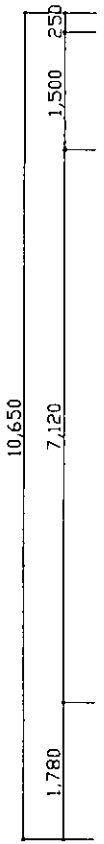
10.5/0.4kV Intermediate Pole(Steel Pole)【Type:SCON】

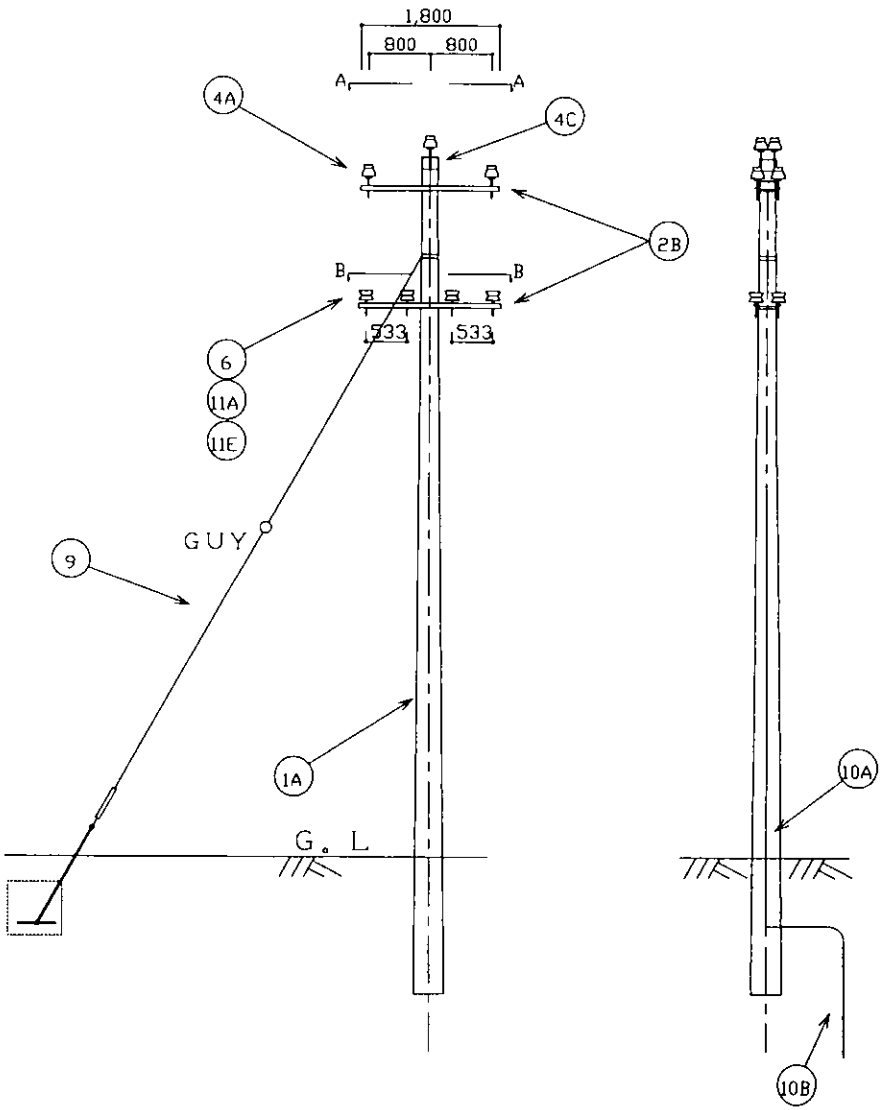


SECTION A-A



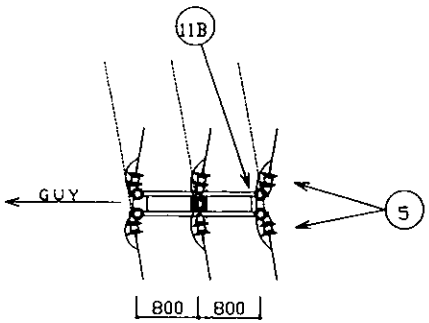
SECTION B-B



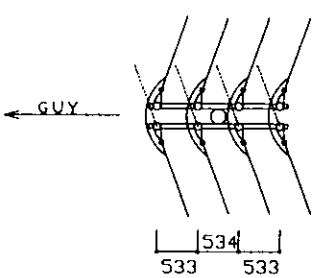


KK-P32 10.5/0.4kV 角度柱 5～20 度(鋼板柱)【種別 SCOA-5】

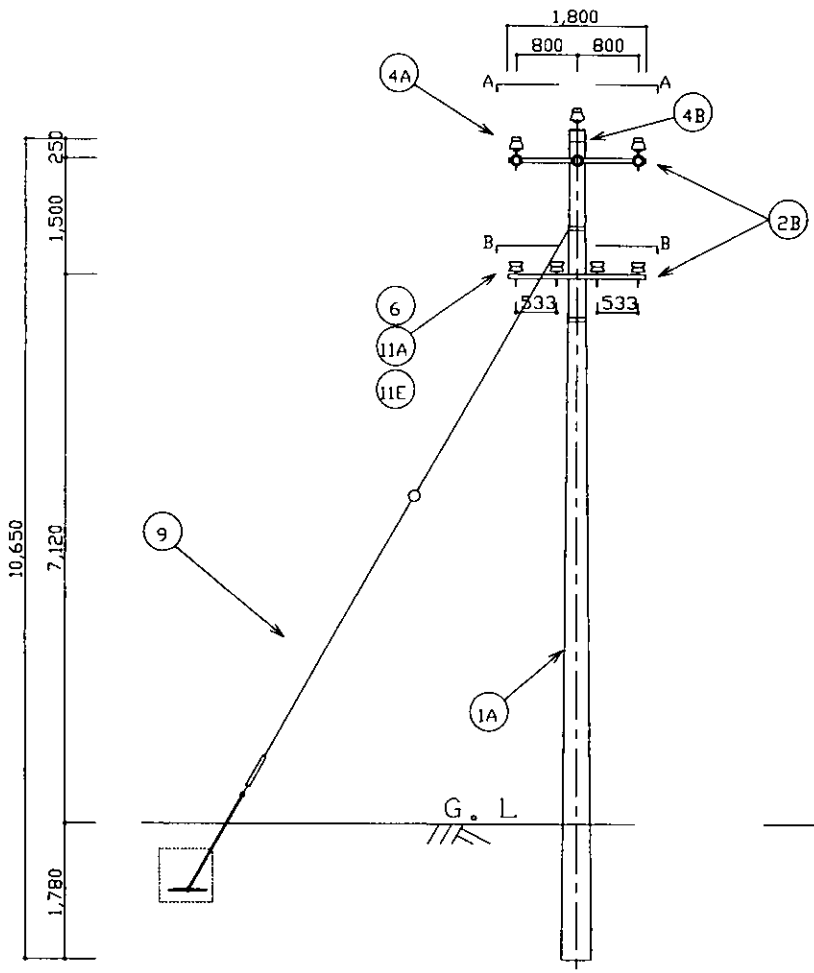
10.5/0.4kV Angle Pole (5deg～20deg) (Steel Pole)【Type:SCOA-5】

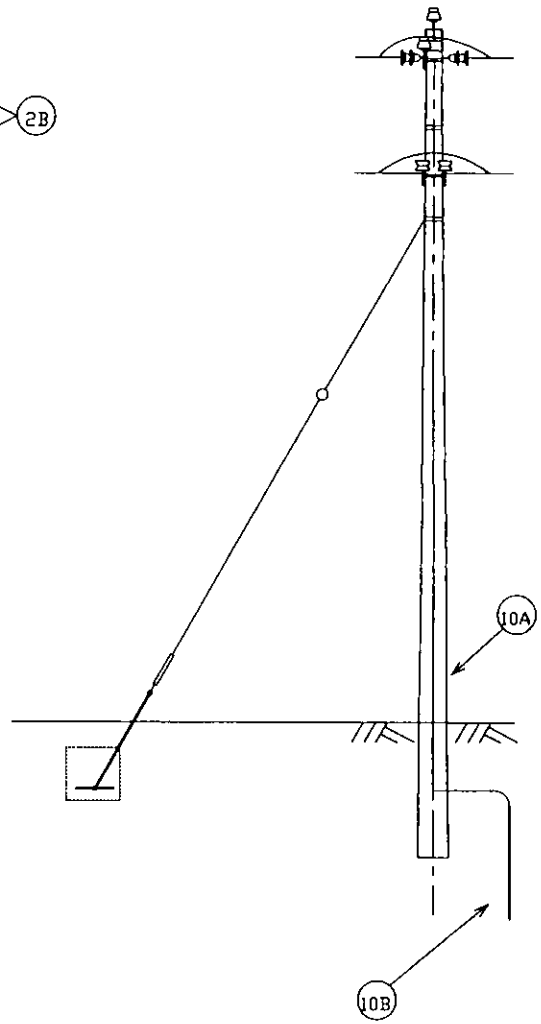


SECTION A-A



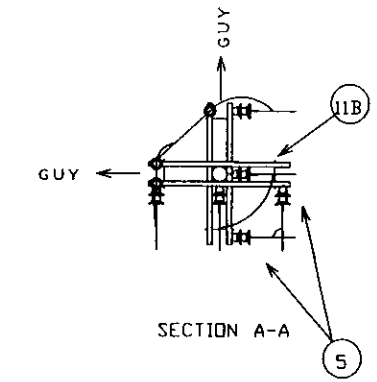
SECTION B-B

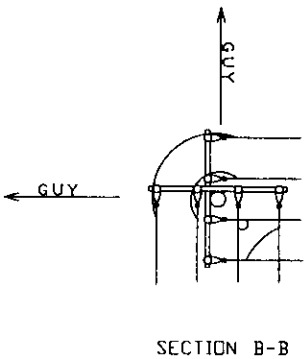


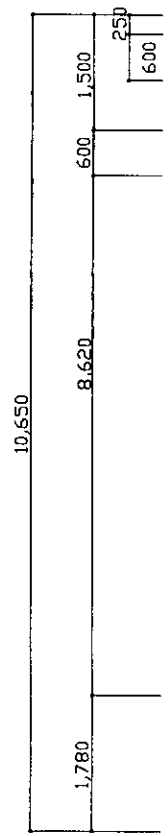


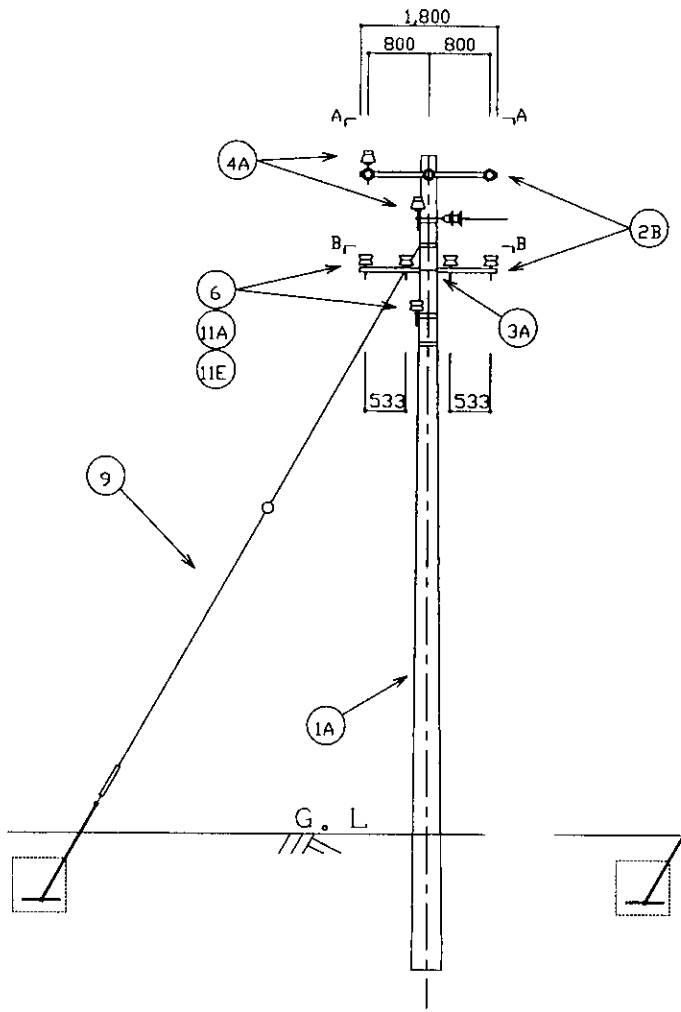
KK-P33 10.5/0.4kV 角度柱 20～35 度(鋼板柱)【種別 SCOA-20】

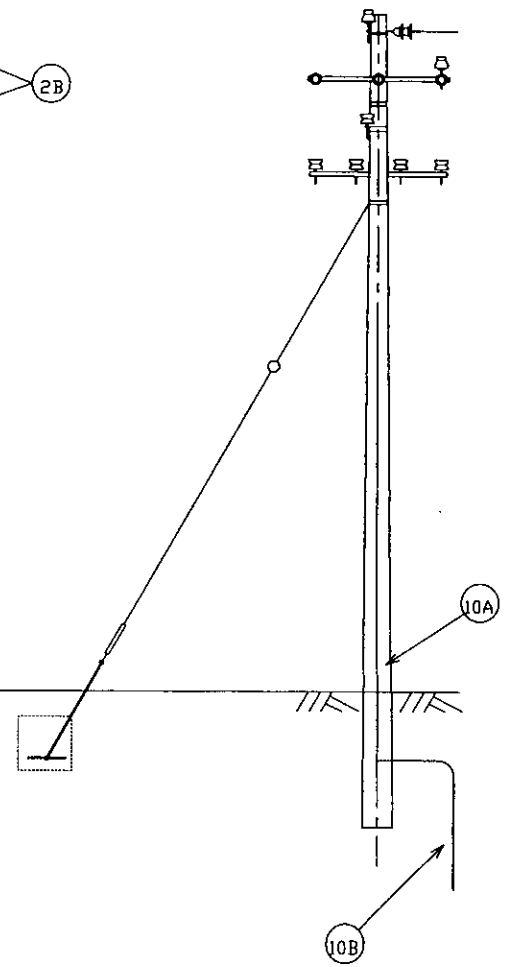
10.5/0.4kV Angle Pole (20deg～35deg) (Steel Pole)【Type:SCOA-20】





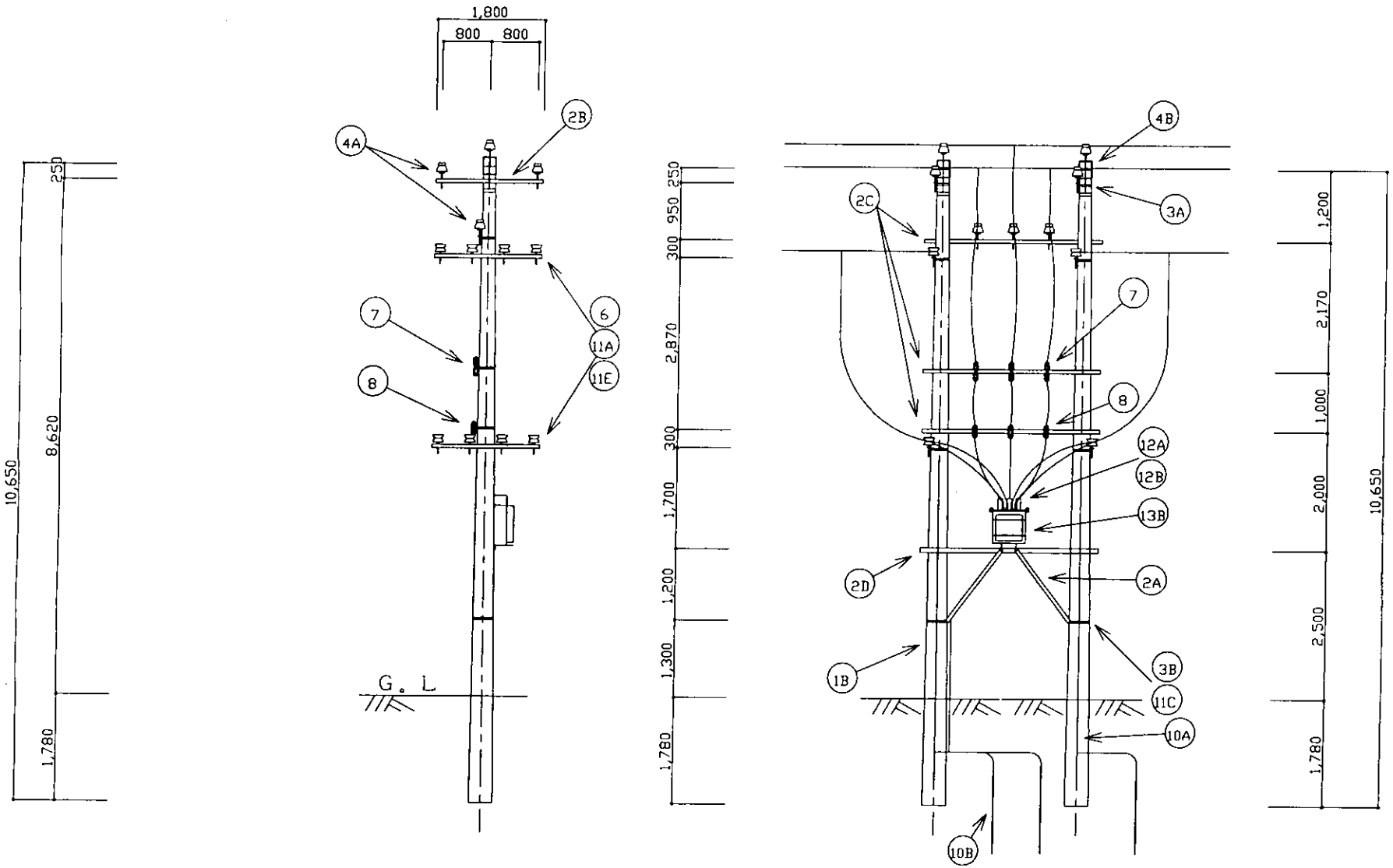






KK-P34 10.5/0.4kV 角度柱 35～90 度(鋼板柱)【種別 SCOA-35】

10.5/0.4kV Angle Pole (35deg～90deg) (Steel Pole)【Type:SCOA-35】



KK-P35 10.5/0.4kV 変圧器柱 20kVA (鋼板柱)【種別 SCOT-20】

10.5/0.4kV Transformer Pole 20kVA (Steel Pole)【Type:SCOT-20】

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

The Project will be implemented within the framework of the grant aid system of the Government of Japan. Accordingly, the Project will only be implemented after its approval by the Government of Japan and the formal Exchange of Notes between the Government of Japan and the Government of Myanmar. The basic issues and special points for consideration for the implementation of the Project are described below.

(1) Project Implementation Body

The organization responsible for the implementation of the Project on the Myanmar side is the Progress of Border Area and National Races Department of the Ministry of Progress of Border Areas and National Races and Development Affaires (PBANRDA), while the Power Division (46 staff members), Planning and Commerce Department of the Special Region No.1 (Kokang) will be in charge of the operation and maintenance of the new facilities after the commencement of their service. Accordingly, the Power Division must closely liase and consult with the Japanese Consultant and Contractor and should appoint a person to be responsible for the Project in order to ensure the smooth implementation of the Project. The person appointed will be required to explain the contents of the rural power distribution network to be constructed under the Project to staff members of the Power Division and villagers in the Project Area to obtain their full understanding in view of enlisting their cooperation for the implementation of the Project.

(2) Consultant

In order to conduct the procurement and installation of the materials and equipment and to construct the power distribution facilities under the Project, the Consultant will conclude a consultancy agreement with the Progress of Border Area and National Races Department of (PBANRDA) and will conduct the detailed design and work site supervision for the Project. The Consultant will also prepare the tender documents and will execute the tender on behalf of the PBANRDA and the Special Region No.1 (Kokang).

(3) Contractor

The Contractor, which will be a Japanese corporation selected by the Myanmar side by means of open tender in accordance with Japan’s grant aid system, will conduct the

construction of the planned facilities and the procurement of equipment and materials. As it is deemed necessary for the Contractor to provide after-care in terms of the supply of spare parts and the repair of breakdowns in regard to the new equipment, the Contractor must given proper consideration to the establishment of a liaisoning system to come into operation after the handing over of the said facilities and equipment.

(4) Necessity for Dispatch of Japanese Engineers

The rural power distribution network construction work to be conducted under the Project over a long period of time will be complex work incorporating the procurement, transportation and installation of equipment and the construction of distribution lines, making coordinated management essential. The dispatch of a site manager from Japan will be essential for consistent management and guidance on schedule, quality, progress and safety control throughout the work period.

As the Power Division has so far entrusted private Chinese companies to construct power supply facilities and distribution lines, skilled workers conversant with installation, testing and adjustment work are not available locally. Staff members of the Division itself may not fully understand the latest technologies and techniques even though they may have acquired expertise relating to common technologies. Accordingly, the equipment manufacturers or electrical installation companies will be required to dispatch experts at appropriate times to supervise the installation, testing and adjustment of the new equipment and materials.

(5) Consultant Supervision of Work by Myanmar Side

The Special Region No.1 (Kokang) will be responsible for the installation of the service connection materials for the distribution of power from the low voltage trunk distribution line (400/230 V) to be constructed by the Japanese side. This service connection work must be completed in line with the completion of the high voltage and low voltage trunk distribution lines by the Japanese side to complete the entire distribution network to materialise the expected effects of the Project.

For this reason, the Japanese side will supervise the schedule, quality, progress and safety control of the work to be conducted by the Myanmar side in addition to similar supervision of the work for which the Japanese side is responsible. The transfer of techniques/skills on planning, technical control, accident prevention, etc., will be conducted to the Power Division to improve the latter's weakness in these areas.

2-2-4-2 Implementation Conditions

(1) Conditions of Construction Industry in Myanmar

Although urban type construction work involving land preparation and the construction of commercial buildings is taking place in Laukai and Tar Shwe Tan in Special Region No.1 (Kokang), such large-scale work is monopolised by a Chinese construction company operating in the area. The workforce is also dominated by Chinese people from neighbouring Yunnan Province. Partly because of the low wages paid to these Chinese workers seeking work abroad, a large number of workers can be seen at construction sites to the extent that little construction machinery is seen. The situation is similar in the case of power facility construction work. For example, the Long Chin No.2 Power Station and distribution network construction work currently in progress has been contracted to a Chinese company and the work directly conducted by the Power Division is restricted to relatively simple common repair work. Accordingly, while it is possible to recruit workers and to procure materials and equipment for the distribution work from local companies, it is difficult to secure the services of local engineers who are capable of conducting the equipment installation and power distribution work under the Project.

This situation makes reliance on local construction companies for the supply of construction materials, equipment and workers necessary in relation to the construction work of the rural distribution network under the Project. The dispatch of engineers from Japan will be necessary for quality, schedule, progress and safety control, testing and adjustment of the installed equipment. During the construction period, these Japanese engineers will transfer the relevant techniques/skills to engineers of the Power Division through OJT.

As the work to construct the low voltage trunk distribution lines of the planned rural distribution network will use roads best described as animal trails for the transportation of the distribution materials and equipment, the cooperation of villagers to provide labour or donkeys will be essential. It will be possible to make a request for such cooperation via the village heads at the implementation stage of the Project.

(2) Use of Locally Available Materials and Equipment

For the preparation of the work plan, locally available materials and equipment will be included as much as possible. The items available for local procurement in Special Region No.1 (Kokang) are aggregate, cement, form materials, reinforcing bars, etc., for the civil engineering and building work and Chinese-made concrete poles, cables, insulators, assembly hardware, etc., for the distribution line construction work. These

will be used as much as possible for the construction of the rural distribution network under the Project. However, in the case of such functional products as transformers, circuit breakers, etc., as Chinese products cannot guarantee uniform quality and frequently break down, these will be procured in Japan. Built-up steel plate poles and other special items will also be procured in Japan as they are not produced locally.

In view of the above situation, it will be necessary to take (i) the ease of operation and maintenance of the equipment by engineers working for the Special Region No.1 (Kokang) and (ii) the availability of after-services in relation to the supply of spare parts and response to equipment breakdowns, etc., into consideration when deciding the supply sources for the equipment and materials for the rural distribution network construction work under the Project.

(3) Use of Local Companies

It is relatively easy to recruit/procure workers, transport vehicles and small construction machinery in Special Region No.1 (Kokang), partly because of the presence of a Chinese-affiliated construction company. However, large construction machinery must be brought in from Yangon and other places. The scope of usage of local companies for the Project includes the recruitment of engineers to support Japanese engineers, organizers, skilled workers and labourers and the supply of transport vehicles and small construction machinery. Accordingly, the work plan must take the use of human resources and construction machinery, etc., which can be employed/procured locally into consideration.

Meanwhile, distribution line construction work is rare in the Project Area and demands special skills of a high level. As it will, therefore, be difficult to rely on local companies, the dispatch of Japanese engineers will be necessary to provide technical guidance and to conduct quality as well as schedule control.

(4) Safety Measures

As the Project Area has not yet been electrified, it is assumed that local people have little knowledge of the dangers posed by high voltage. The safety of local people vis-à-vis the high voltage distribution line must, therefore, be ensured. While the distribution cables will be installed a safe distance above the ground, circuit breaker panels will be installed on the ground and the latter will be fenced off to ensure the safety of local people.

2-2-4-3 Scope of Work

The Japanese side will be responsible for the procurement, installation, testing and adjustment of the equipment for the 10.5 kV high voltage and 400/230 V low voltage trunk distribution lines.

The Japanese side will also be responsible for the procurement of the poles (steel poles), cables, insulators, watt-hour meters for users and accessories for the low voltage distribution lines (single phase, 230 V) for house connection from the low voltage trunk distribution line (0.4 kV) while the Myanmar side (Special Region No.1 (Kokang)) will be responsible for the installation work using these materials and equipment. The indoor distribution work after the watt-hour meters for users will be paid for by each user.

The more detailed scope of work for the Japanese and Myanmar (Special Region No.1 (Kokang)) sides is shown in Table 2.2.4.3-1 and Basic Design Drawing KK-E03.

Table 2.2.4.3-1 Scope of Work for Japanese and Myanmar (Special Region No.1 (Kokang)) Sides

	Responsible Side		Remarks
	Japan	Myanmar	
1. Construction of 10.5 kV High Voltage and 400/230 V low voltage trunk distribution lines			
(1) Procurement and installation of bare conductors, insulators, assembly hardware, etc.	○		
(2) Procurement and installation of poles (concrete and steel)	○		
(3) Procurement and installation of pole-mounted transformers, circuit breakers, MOFs, arresters and accessories	○		
(4) Procurement of spare parts and tools	○		Spare parts: one years supply
(5) Implementation of field test prior to handing over	○		
2. Construction of low voltage distribution lines for house connection			
(1) Procurement of poles, cables and watt-hour meters for users	○		
(2) Installation of the above equipment and materials and cabling work		○	

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

2-2-4-4 Consultant Supervision

The Consultant will organize a project team responsible for the detailed design and work supervision in accordance with the grant aid scheme of the Government of Japan and the concept and principles of the basic design in order to smoothly proceed with the implementation of the Project. At the work supervision stage, the Consultant should be fully aware of the fact that the Project Area is a special administrative region in Myanmar and must ensure the integrity of the schedule, quality, completed form and safety control. The Consultant will dispatch engineers in accordance with the progress of the construction of the distribution lines, test running, adjustment and delivery testing, etc., to supervise the work assigned to the Contractor. Given the fact that the presence of a Chinese interpreter (Mandarin) will be necessary when dealing with officials of the Special Region No.1 (Kokang), which is the project implementation body, as few of them speak English, the recruitment of such an interpreter must be considered at the project implementation stage. Furthermore, the Consultant will conduct the factory inspection of the equipment to be manufactured in Japan and the pre-delivery inspection of the distribution equipment and materials to be procured in Myanmar in order to prevent any problems with the equipment and materials after delivery to the construction sites.

(1) Supervision Principles

The Consultant will supervise the work and procurement progress to ensure punctual completion within the planned period for each phase and will supervise and guide the Contractor in order to achieve the work quality indicated in the contract without accidents or other problems at the sites. The main points to be noted for the supervisory work are described below.

1) Schedule Control

The Consultant will make weekly and monthly comparisons between the actual work progress and the contract schedule submitted by the Contractor at the time of signing the contract on the following items. If the Consultant foresees any delay of the work, he will issue a warning to the Contractor, requesting that the latter submit a remedial plan to ensure the completion of the construction work and delivery of equipment and materials within the planned work period.

① Quantity of the work conducted (including the volume of work completed at the distribution line construction sites, the volume of manufactured equipment by the manufacturers and the volume of delivery completed)

② Quantity of the equipment and materials delivered (distribution materials and equipment)

③ Confirmation of the preparations for temporary work and construction machinery (where necessary)

④ Work efficiency and actual number of engineers, technicians and workers at work

2) Quality and Completed Form Control

The Consultant will supervise the Contractor through the following means to ensure that the facilities constructed and the equipment and materials manufactured, delivered and installed meet the quality and completed form demanded by the contract documents. If the checking results indicate the possibility that the required quality and/or completed form are not met, the Consultant will immediately demand the Contractor to correct, change or modify any failing.

① Checking of the distribution line construction work drawings and specifications for the equipment to be used

② Checking of the shop drawings and specifications for equipment

③ Witnessing of the factory inspection of equipment or checking of the factory inspection results

④ Checking of the installation drawings and installation manuals for equipment

⑤ Checking of the test operation, adjustment/testing and inspection manuals

⑥ Supervision of the site installation of equipment and witnessing of the testing operation, adjustment/testing and inspection

3) Safety Control

The Consultant will discuss and cooperate with the representative of the Contractor with a view to supervising the on-site construction and installation work to prevent any accidents to workers with due attention paid to the following safety control principles.

① Establishment of safety control rules and appointment of a person responsible for work safety

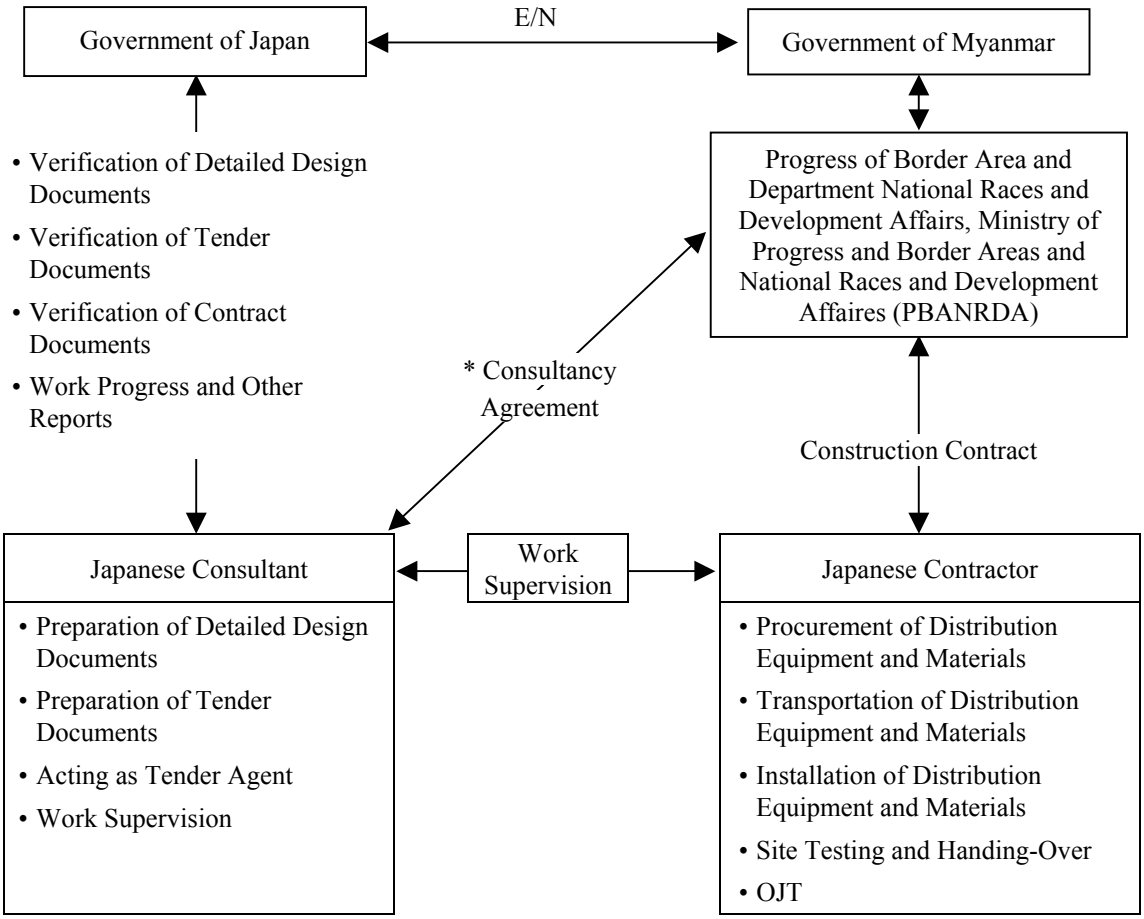
② Prevention of accidents to workers by means of the periodical inspection of the construction machinery

③ Introduction of travelling routes for work vehicles and construction machinery, etc. and the thorough enforcement of safe driving on the site

④ Enforcement of welfare measures and days-off for workers

(2) Project Implementation Regime

The project implementation regime, i.e. relationship between the parties involved in the implementation of the Project, including at the work supervision stage, is shown in Fig. 2.2.4.4-1.



* The consultancy agreement and construction contract must be verified by the Government of Japan.

Fig. 2.2.4.4-1 Project Implementation Regime

(3) Work Supervisors

The Contractor will procure and deliver the equipment and materials required for the construction of the rural distribution network and its facilities and will install such equipment and materials. Although it is likely that the Contractor will employ local

companies in Special Region No.1 (Kokang) as subcontractors for the said installation work, the Contractor must dispatch engineers with previous experience of similar projects to provide guidance and education for the local subcontractors so that these subcontractors fully understand the contents of the subcontractor agreement to meet the work schedule, quality, completed form and safety as stipulated by the agreement. Given the size and the contents of the work to be conducted under the Project, the Contractor's appointment of at least those engineers listed in Table 2.2.4.4-1 as full-time on-site supervisors is highly desirable.

Table 2.2.4.4-1 Engineers to be Dispatched by the Contractor

Type of Engineer	No.	Work Assignment	Assignment Period
Site Manager	1	General management; obtaining of necessary approval/permission; procurement of equipment and materials; customs clearance; labour control; accounting	Entire work period
Electrical Engineer (1)	1	Installation of transformers and circuit breakers	Equipment installation period
Electrical Engineer (2)	1 – 3	Construction of distribution lines	Distribution line construction period
Testing and Adjustment	1	Testing and adjustment of equipment	Testing and adjustment period
Coordinator	1	Coordination with the Ministry of Progress of Border Areas and National Races and Development Affairs (PBANRDA) and Special Region No.1 (Kokang) throughout the work period	Immediately before the work commencement and final stage of the construction

2-2-4-5 Quality Control Plan

As most of the locally available equipment and materials for the distribution line construction work are made in China, strict quality inspection prior to their delivery to the sites is essential. In addition to the equipment and materials mentioned above, it will be necessary to check those items to be procured in Japan prior to their shipment to confirm that the technical specifications meet the Consultant's requirements.

In the case of those items to be worked on site, criteria based on the work management standards adopted at the planning stage of the work plan should be determined as the guidelines for their quality control.

2-2-4-6 Procurement Plan

Among the distribution equipment and materials to be procured and installed under the Project, bare conductors (ACSR), concrete poles, insulators, etc., made in China can be purchased locally. In regard to materials for the civil engineering work, aggregate, cement, reinforcing bars, steel, timber, paint, etc., made in either China or Myanmar are readily available in the Project Area and, therefore, can be easily obtained locally. However, the import of transformers and other functional products and special products, including built-up steel plate poles, will be necessary as these are not locally available.

Temporary materials to be used for the installation of equipment and transport vehicles can be either leased or procured locally, posing no obstacle to the implementation of the Project. The supply sources of the equipment and materials to be used for the Project are listed below.

(1) Equipment and Materials to be Locally Procured

- Civil engineering materials: cement; sand; concrete aggregate; concrete blocks; bricks; reinforcing bars; small steels; paint; timber; petrol; diesel oil; small vehicles for construction work; materials for temporary facilities
- Distribution line equipment and materials: concrete poles; bare conductors; (ACSR) cables; watt-hour meters for users; insulators; assembly hardware; accessories

(2) Equipment and Materials to be procured in Japan

- Distribution line equipment and materials: built-up steel plate poles; steel pipe poles for service connection; pole-mounted transformers; arresters; fused cut-out switches; circuit breakers; MOF; accessories

The packaging for those items to be procured in Japan must be strong enough to withstand their maritime transportation, landing at a port and inland transportation to and storage at the project sites. A possible port of landing is Port Yangon. As this port is equipped with major landing facilities, no problems are anticipated in regard to the landing of cargoes from Japan. The some 1,000 km long inland transportation route from Port Yangon to the Project Area is used as a trunk road from the capital to Special Region No.1 (Kokang) even though some sections have poor paving or are narrow with a series of sharp curves. It will, therefore, be necessary to carefully consider the types of transport vehicles to be used and their loadage when preparing the transportation plan.

The customs clearance procedure at Port Yangon usually takes approximately one month and the Contractor should prepare the necessary documents in advance and consult with

the related government offices to shorten the period for customs clearance as much as possible in order to maintain the work schedule for the Project.

2-2-4-7 Implementation Schedule

In accordance with the grant aid scheme of the Government of Japan, the Project will be implemented with the following schedule.

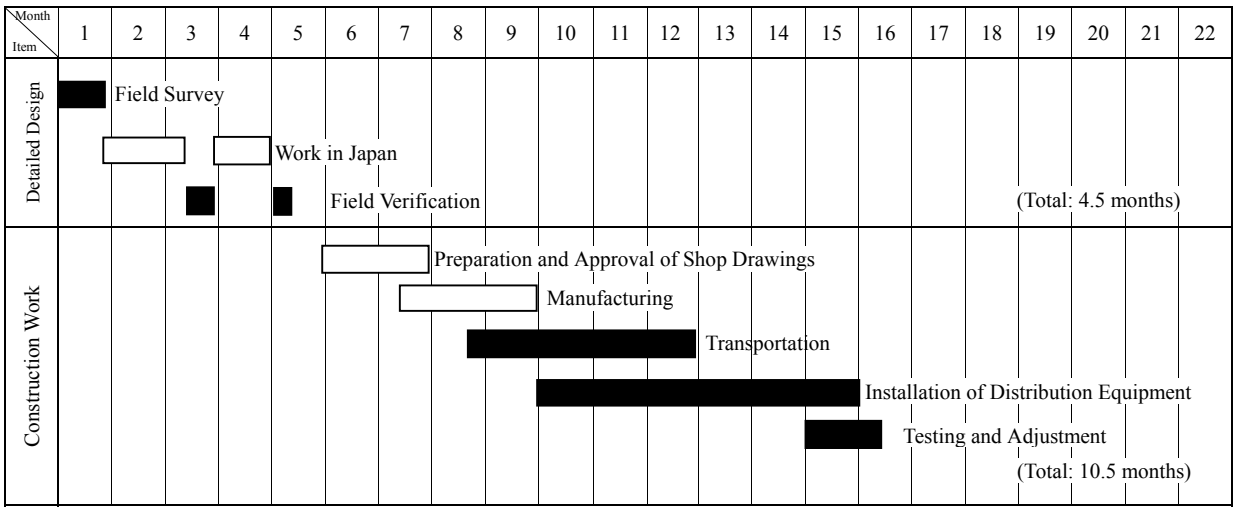


Fig. 2.2.4.7-1 Project Implementation Schedule

2-3 Obligations of Recipient Country

As part of the implementation of the Project, the Myanmar side will be responsible for the following in addition to those items classified under the scope of work for the Myanmar side in 2.2.4.3.

(1) Provision of necessary data and information for the Project

(2) Acquisition of land for the distribution facilities prior to the commencement of work by the Japanese side

(3) Exemption of goods used for the Project from taxes, their customs clearance and speedy unloading at the port of landing and airport in Myanmar

(4) Accordance of Japanese nationals whose services may be required in connection with the supply of products and services under verified contracts such facilities as may be necessary for their entry into Myanmar and stay therein for the performance of their work

(5) Meeting of the cost of customs duties, internal taxes and other fiscal levies which may be imposed on a Japanese corporation or Japanese nationals in Myanmar in respect of the supply of products and services under verified contracts and the implementation of any necessary measures for tax exemption

(6) Bearing of the commission of a Japanese bank for banking services based on the banking arrangements

(7) Bearing of all expenses other than those to be borne by the Japanese grant aid necessary for the execution of the Project

(8) Appointment of engineers and technicians as full-time counterparts for the Project to witness the equipment inspection and to receive the transfer of operation and maintenance techniques

(9) Introduction of procedures which must be followed for any necessary power cuts during the equipment installation work

(10) Proper use and maintenance of the equipment and materials to be procured by Japanese grant aid

(11) Installation of the low voltage distribution equipment to be procured under the Project for house connection in accordance with the schedule which is required by Japan's grant aid scheme

(12) Removal of any obstacles along the distribution routes

Moreover, the cost for the work, i.e., Service connection cabling, to be done by the Myanmar side will be estimated as some US$ 12,250.

2-4 Project Operation Plan

2-4-1 Basic Principles

The proper operation and maintenance of the distribution facilities and the adequate maintenance of their operating environment will be essential to ensure a stable supply of power for new users in the Project Area. In order to maintain the proper performance and functions of the equipment to be procured under the Project to ensure the said stable power supply, the implementation of appropriate preventive maintenance designed to reduce the breakdown rate for each equipment to improve its reliability, safety and efficiency is highly desirable. Fig. 2.4.1-1 shows the basic concept of such maintenance.

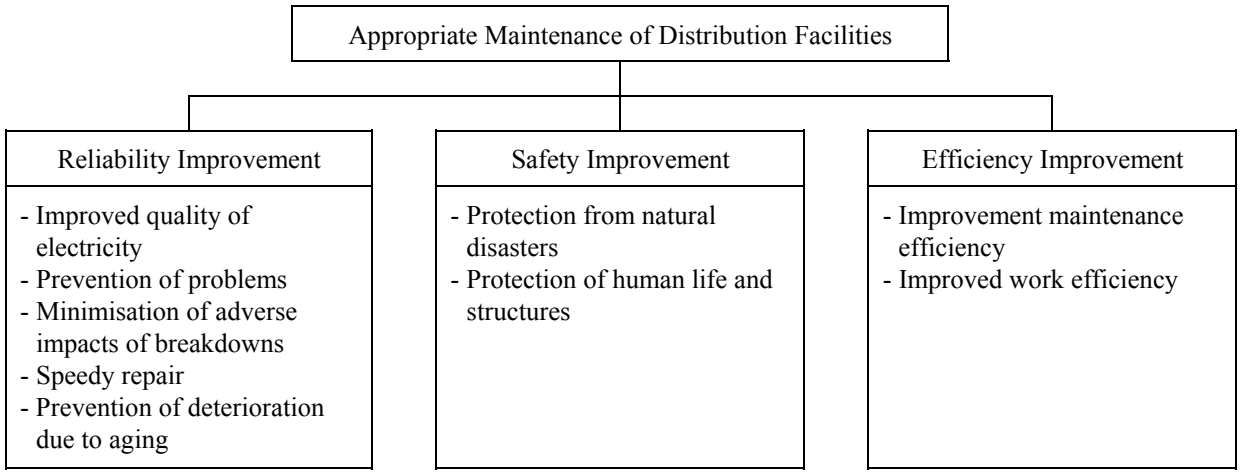


Fig. 2.4.1-1 Basic Concept of Maintenance of Distribution Facilities

The maintenance of the equipment to be procured and installed and of the facilities to be constructed under the Project should focus on preventive maintenance based on the above maintenance concept.

As part of the Project, OJT on the operation and maintenance of the new distribution equipment will be provided during the installation and testing/adjustment periods by engineers to be dispatched by the Japanese Contractor. The Special Region No.1 (Kokang) should, therefore, conduct maintenance after the commencement of power supply in accordance with the operation and maintenance techniques transferred through this OJT, bearing the basic maintenance principles in mind.

2-4-2 Regular Inspection Items

(1) Regular Inspection of Distribution Equipment

The standard regular inspection items for the equipment to be procured and installed under the Project, such as transformers, circuit breakers, fused cut-out switches, etc., are shown in Table 2.4.2-1. As the table shows, the inspection of the generating and distribution equipment is classified as (i) patrolling inspection" which is conducted daily using the human senses to check any abnormal heating, sound, etc., of the equipment, (ii) "standard inspection" to check loaded sections beyond the daily patrolling inspection, including the fastening conditions of bolts, etc., of the equipment and the cleanliness of or damage to the surface of insulated items, etc., and (iii) "detailed inspection" to check the proper functioning of the interlocking mechanism between equipment and the accuracy of instruments, etc.

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 is desirable based on confirmation of the characteristics as well as frequency of use of such parts. These include the fuses, measuring instruments, relays, etc., installed inside the distribution panels and others which are liable to performance deterioration, including the insulation performance, abrasion of the contact points and changes of the characteristics.

Table 2.4.2-1 Regular Inspection Items for Standard Generating and Distribution Equipment

Subject	Inspection Item (Method)	Patrolling Inspection	Standard Inspection	Detailed Inspection
Equipment Outlook	Abnormality indicator and operating status indicator	○	○	
	Abnormal sound or odour	○	○	
	Thermal discolouration of terminals	○	○	
	Cracks, damage or staining of bushing and insulating tubes	○	○	
	Rust on casings and frames	○	○	
	Abnormal temperature (thermometer)	○	○	
	Fastening of bushing terminals (mechanical check)	○	○	
Operating Apparatus and Control Panels	Correct indication by various instruments	○	○	○
	Counter indication		○	○
	Condensation, rust and damage inside console and panels		○	○
	State of oil supply and cleaning		○	○
	Fastening of cable terminals	○	○	○
	Operating status indicator		○	○
	Air leakage and oil leakage		○	○
	State before and after operation		○	○
	Working of instruments		○	○
	Rust, deformation and/or damage to springs	○	○	○
	Abnormality of fastening pins		○	○
	Auxiliary and protection relays		○	○
	Control power source	○		
Measurement/ Testing	Measurement of insulation resistance		○	○
	Measurement of contact resistance			○
	Breaking of heater cable		○	○
	Testing of relay function		○	○

(2) Regular Inspection of Distribution Lines

One of the most important user services is the maintenance of distribution lines by means of detecting breakdowns and damage through regular patrolling and immediate repair. When a grounding accident, etc., is believed possible because of the contact of a distribution line with a tree, etc., a preventive measure, such as cutting of the tree, should be employed. The major check items for patrolling are listed below.

a. Cut bare conductor
b. Damaged insulator
c. Contact between a conductor, tree, etc.
d. Damaged pole
e. Swaying pole
f. Improper positioning and/or oil leakage of pole-mounted transformer
g. Malfunctioning of various switches

2-4-3 Maintenance System

The Special Region No.1 (Kokang) will be responsible for the operation and maintenance of the distribution facilities to be constructed under the Project. As the Project Area is located far from Laukai, the cooperation of each village/hamlet will be essential for the regular maintenance of the facilities and collection of the electricity charge.

The Kya Si Su Village Tract has a village committee, the head office of which is located in Kya Si Su for the administration of nearby villages and hamlets. This committee will be used as the central body for the conveyance and collection of operation and maintenance information on the distribution network to and from the villages subject to electrification under the Project for equipment and facility maintenance purposes.

Each village to be newly electrified should appoint a person (village head) responsible for the local distribution line and this person will be assisted by an engineer who conducts regular inspections and an electricity charge collector. This maintenance system is shown in Fig. 2.4.3-1 and the Myanmar side (Special Region No.1 (Kokang)) must establish the said system by the time of the completion of the Project so that proper maintenance can be conducted in the post-Project period.

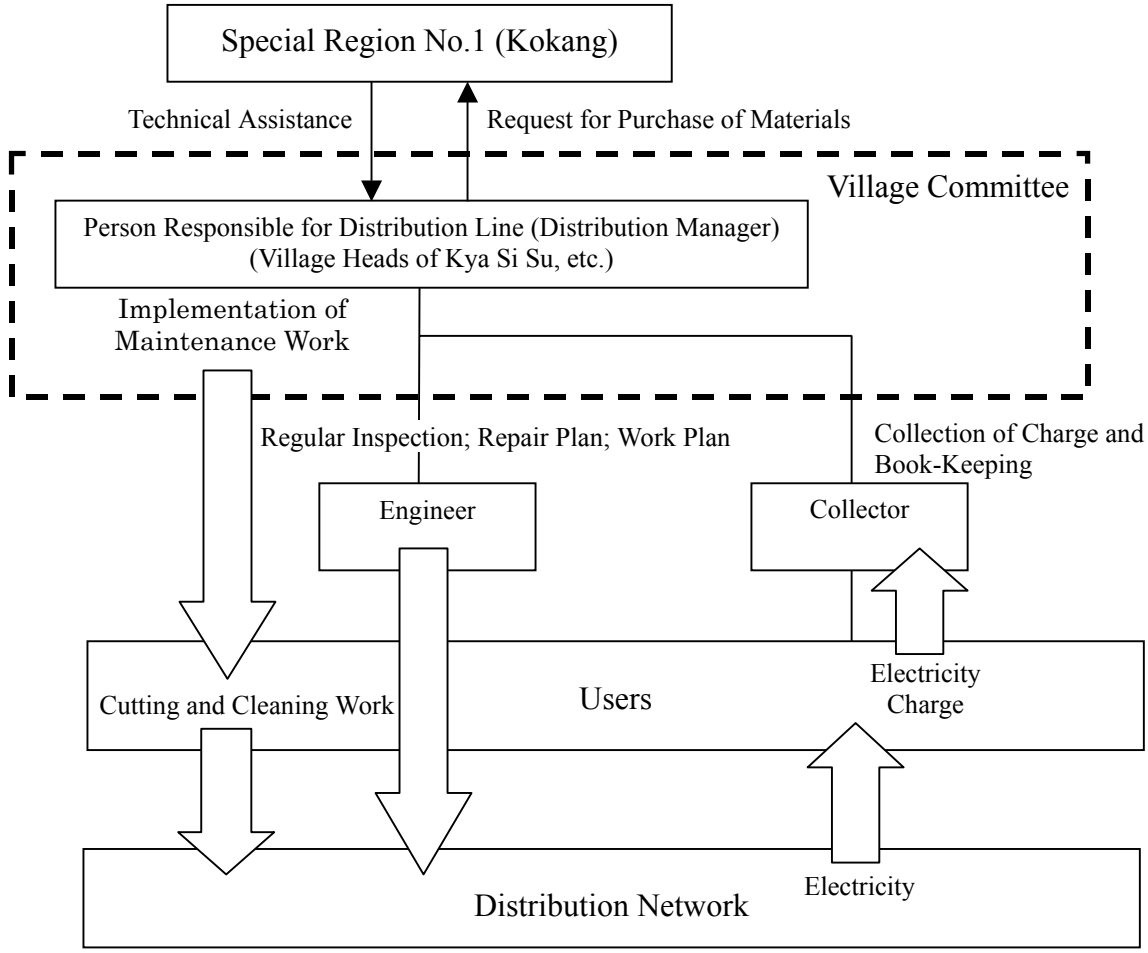


Fig. 2.4.3-1 Maintenance System of New Distribution Network

2-4-4 Spare Parts Procurement Plan

The spare parts for the distribution equipment consist of those to be replaced in accordance with their state of deterioration and emergency spare parts which are required at the time of a breakdown. The Myanmar side must procure those spare parts which are found to be necessary at the time of the regular inspection described earlier.

One years supply of spare parts as the minimum required and various maintenance tools as listed in Table 2.4.3-1 will be provided under the Project. However, it will be necessary for the Myanmar side to prepare the budget allocation for additional spare parts by the end of the first year following the completion of the Project (some US$ 580/year), and for maintenance workers (some US$ 300/year). Because of the nature of the maintenance tools in question, i.e. dealing with power equipment, these tools must have safety features to protect the workers using them and must also be capable of ensuring the prevention of accidental damage to the

equipment and suitable work quality. Workers must, therefore, have sufficient knowledge of the mechanism and handling requirements, etc. of these tools and receive appropriate training through OJT.

Table 2.4.3-1 Spare Parts and Maintenance Tools to be Provided Under the Project

Item	Unit	Quantity			
		1 km Radius	5 km Radius	Outside 5 km Radius	Total
1. 10.5/0.4 kV System					
1.1 50 kVA Transformer					
1) 50 kVA Transformer	No.	1	1	0	2
2) High Voltage Side Bushing	No.	1	1	0	2
3) Low Voltage Side Bushing	No.	1	1	0	2
4) Low Voltage Side Neutral Bushing	No.	1	1	0	2
1.2 20 kVA Transformer					
1) 20 kVA Transformer	No.	1	1	1	3
2) High Voltage Side Bushing	No.	1	1	1	3
3) Low Voltage Side Bushing	No.	1	1	1	3
4) Low Voltage Side Neutral Bushing	No.	1	1	1	3
1.3 Circuit Breaker					
1) Closing Coils	No.	1	1	0	2
2) Opening Coils	No.	1	1	0	2
3) Various Lamps	%	100	100	0	100
4) Various Fuses	%	100	100	0	100
5) MCCB (for Control Circuit)	Set	1	1	0	2
6) Various Protective Relays	No.	1	1	0	2
7) Various Auxiliary Relays	No.	1	1	0	2
8) Various Meters (KWh meter, Ammeter, Voltmeter)	No.	1	1	0	2
9) Various Current Transformer	No.	1	1	0	2
10) Various Potential Transformers	No.	1	1	0	2
11) MOFs	No.	1	1	0	2
12) Various Change-Over Switches	No.	1	1	0	2
1.4 Fused Cut-Out Switches					
1) Fuses (each type)	No.	1	1	1	3
2) Cut-Out Switches	No.	1	1	1	3
1.5 Arrester					
1) Arrester	No.	1	1	1	3
2. Maintenance Tools					
2.1 Testing Apparatus					
1) Insulating Oil Testers	No.	1	0	0	1
2) Analogue Type Testers	No.	7	10	5	22
3) Phase Testers (Low Voltage)	No.	3	1	0	4
4) Voltage Detectors (High Voltage)	No.	3	1	0	4
5) Voltage Detectors (Low Voltage)	No.	7	10	5	22
6) Detector Checkers	No.	3	1	0	4
7) Simplified Relay Testers	No.	1	0	0	1
8) Meggers (500 V)	No.	1	0	0	1
9) Meggers (1,000 V)	No.	1	0	0	1
10) Simplified Earth-Resistance Meters	No.	3	1	0	4
11) Digital Multi-Meters	No.	1	0	0	1
12) Clamp Type Testers	No.	3	1	0	4

Item	Unit	Quantity			
		1 km Radius	5 km Radius	Outside 5 km Radius	Total
2.2 Tools					
1) Compression Tool (manual)	No.	4	0	0	4
2) Cable Cutters	No.	4	0	0	4
3) Wire Strippers	No.	4	0	0	4
4) Hand Tool Sets	Set	7	10	5	22
5) Earth wire	No.	3	0	0	3
6) Wire Grips	No.	18	0	0	18
7) Live Wire Grips	No.	4	0	0	4
8) Bolt Clippers	No.	6	0	0	6
9) Cable Supply Tables	No.	4	0	0	4
10) Four Side Rollers (5 Wheel Type)	No.	45	0	0	45
11) Fused Cut-Out Switch Operating Rod	No.	2	2	2	6
12) Chain Blocks	No.	2	0	0	2
13) Hand Winch Sets	Set	2	0	0	2
14) Portable Rock Drills	No.	2	0	0	2
15) Generators (3 kVA)	No.	2	0	0	2
16) Electrical Work Drums	No.	2	0	0	2
17) Work Scaffolds	No.	5	0	0	5
18) Ladders (3 Sections) (8 m)	No.	2	0	0	2

Notes 1. The number of spare is either 2% of the quantity used for the work, excepting work supply, or at least one for each item.
2. The hand tool set includes cutting pliers, cutting plier sack, driver, knife, monkey spanner, ratchet spanner, nipper, measure, tool bag, safety helmet and safety belt for pole work.
3. ▭ indicates the scope of the Project.

2-5 Other Relevant Issues

As part of the Project, it is planned that the Myanmar side will install the low voltage distribution equipment and materials procured by the Japanese side for service connection. It is essential that this work is completed prior to the completion of the distribution line construction work by the Japanese side so that power supply can immediately commence to achieve the positive effects of the implementation of the Project. The Project should also be implemented taking its link with the buckwheat project into consideration.

As the Special Region No.1 (Kokang), which is the project implementation body on the Myanmar side, has experienced ordinary overhead distribution line installation work using local subcontractors, no special difficulties are anticipated in regard to the planned work under the Project. However, the Project implementation body in Myanmar is less experienced with large-scale projects and, thus, its ability in terms of planning, technical supervision and preventive maintenance, etc., making it necessary for the Japanese side to advice on the relevant skills / techniques to improve the ability of said body. Accordingly, the Japanese Consultant will dispatch a technical supervisor to provide technical guidance for (soft

component) those responsible for the equipment installation work for the service connection to be conducted by the Myanmar side with a view to ensuring the work progress and the quality finish of the work. In addition, this supervisor will provide guidance on the establishment of an electricity charge collection system and equipment maintenance system.

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 3
PROJECT EVALUATION AND RECOMMENDATIONS

3-1 Project Effects

The implementation of the Project is expected to have the following effects.

(1) Direct Effects

Current Situation and Problems	Improvement Measures Under the Project	Project Effects and Degree of Improvement
People living in the Kya Si Su Village Tract, i.e. the Project Area, are suffering from extremely poor living conditions and are obliged to use lamps because of the lack of electricity supply.	An urgently required 10.5 kV high voltage distribution network and low voltage distribution network will be constructed to meet the power demand up to the target year (five years after the start of service).	Kya Si Su, which is the centre of socioeconomic activities in the Kya Si Su Village Tract, and Cha Ho village along the high voltage distribution route (total benefitting population: 1,422) will be electrified to improve the living conditions of local people, including the use of electrical appliances, such as lighting equipment at public facilities.

(2) Indirect Effects

Current Situation and Problems	Improvement Measures Under the Project	Project Effects and Degree of Improvement
1. The lack of electricity supply in the Project Area has long delayed the modernisation and efficiency improvement of local agriculture and the processing of farm products is difficult. As a result, the substitution of opium poppy cultivation by other products has been very slow.	An urgently required 10.5 kV high voltage distribution network and low voltage distribution network will be constructed to meet the power demand up to the target year (five years after the start of service).	The introduction of threshing machines, power tools and other power equipment in the central area of the Buckwheat Project will improve the productivity and enable the processing of harvested buckwheat, etc., producing highly value-added products. This will make it possible to facilitate the substitution of the main farming product from opium poppies to other products, contributing to the eradication of opium poppy cultivation.
2. In the educational field, many schools in the Project Area employ a two shift teaching system: morning and evening. The lack of electricity means that the classrooms are dark in the evening, resulting in poor teaching efficiency.	As above	The introduction of lighting equipment, etc. will make active school education and should stimulate the desire of pupils to learn. Education using computers and videos will be possible for efficient teaching/learning, contributing to rectification of the educational gap.

Current Situation and Problems	Improvement Measures Under the Project	Project Effects and Degree of Improvement
3. In the medical care field, the lack of important infrastructure, including power supply, in the Project Area means the absence of clinics and hospitals. Even though private stores selling pharmaceutical products is available, there are no refrigerators for the storage of medicine. The level of hygiene is also low.	As above	The use of refrigerators to store drugs and medical equipment requiring power supply will contribute to the provision of a modern health care service for local people.
4. In regard to daily life, the lack of water pumps, etc., due to the lack of power supply means that women and children are involved in the hard work of water fetching. The absence of TVs, radios, etc., isolate the Project Area from the rest of Myanmar because of the lack of information.	As above	Electrification will enable the use of water pumps, liberating women and children from the hard work of water fetching. The wider use of TVs, radios and videos will enable local people to obtain much needed social information and will provide family entertainment, improving the living environment.
5. In the administration field, the Village Committee Office, which is the central administrative office in the Project Area, lacks communication and office equipment due to the lack of power supply. As a result, it is difficult to execute administrative work in a modern manner.	As above	Electrification will make it possible to use lighting, communication and office equipment, improving the administrative services in the area.

3-2 Recommendations

The Myanmar side should properly address the following issues to ensure the achievement and continuance of the expected project effects.

(1) In line with the schedule for the 10.5 kV as well as low voltage trunk distribution lines of which the procurement and installation will be conducted by the Japanese side, the Myanmar side should set up a construction team to be responsible for the installation of distribution equipment for service connection to users, i.e. the work to be conducted by the Myanmar side, so that adequate schedule, personnel and procurement plans are formulated to ensure the smooth implementation of the said work.

(2) Pole monted transformers capable of meeting the expected power demand in the Project Area up to the fifth year after the commencement of service will be procured under the Project. The Myanmar side should review the power demand from time to time to formulate a plan for the installation of additional pole-mounted transformers in the post-Project period and should make suitable budgetary appropriation for additional equipment to accommodate an increase of the power demand in the future.

(3) The Myanmar side should conduct the regular patrolling of the distribution routes and should conduct preventive maintenance, including the cutting of trees which interfere with the distribution lines, for the purpose of reducing the likelihood of accidents involving such lines to ensure a stable supply of power.

(4) The Myanmar side should install a watt-hour meter at all users and should conduct proper meter readings and collection of the electricity charge in order to establish a fair charge collection system.

(5) The Myanmar side should appoint a person to be responsible for the operation and maintenance of the distribution facilities of the Project and the user service in the Project Area in order to establish a proper operation and maintenance system at the beginning of the new service.

(6) The Myanmar side should swiftly appoint engineers to participate in the soft component and OJT to be conducted under the Project and should make arrangements to spread the new knowledge and techniques to other engineers who do not participate in the OJT.

(7) The most appropriate tap value should be selected for each pole-mounted transformer to improve the quality of the electricity supplied and to reduce the distribution loss.

(8) As the existing transformer capacity at the Laukai Substation linked to the transmission line from China has little surplus, the Myanmar side should conduct an exercise to forecast the power demand in the Project Area, at an appropriate time with a view to installing additional transformers if required.

APPENDIX

APPENDIX 1

MEMBER LIST OF THE STUDY TEAM

1 Basic Design Study Team

Name	Work Assignment	Current Position
Mr. Yoshikazu YAMADA	Team Leader (Second Term)	Director Third Project Management Division Grant Aid Management Department JICA
Mr. Satoshi UMENAGA	Leader (First Term)	Deputy Director Third Project Management Division Grant Aid Management Department JICA
Mr. Minoru MIURA	Chief Consultant/ Road Operation & Maintenance Planner	Katahira Engineering International Co., Ltd.
Mr. Masatsugu KOMIYA	Deputy Chief Consultant/ Power Civil Engineer/ Power Plan	Yachiyo Engineering Co., Ltd.
Mr. Hidetaka SAGARA	Road Improvement Planner	Katahira Engineering International Co., Ltd.
Mr. Kazuyuki HIRAOKA	Road Surveyor	Katahira Engineering International Co., Ltd.
Mr. Masao AIZAWA	Civil Geologist	Katahira Engineering International Co., Ltd.
Mr. Kiyofusa TANAKA	Generator & Auxiliary Planner	Yachiyo Engineering Co., Ltd.
Mr. Toshio NAKAGAWA	Mini-Hydro Power Surveyor	Yachiyo Engineering Co., Ltd.
Nr. Masahiro IIDA	Rural Development Surveyor	Katahira Engineering International Co., Ltd.
Mr. Tetsuo YATSU	Construction Planner/ Procurement Planner/ Cost Estimator	Yachiyo Engineering Co., Ltd.
Mr. Keiichi MURAKAMI	Coordinator	Katahira Engineering International Co., Ltd.
Mr. Tadashi SATO	Senior Coordinator	Katahira Engineering International Co., Ltd.

2 Draft Report Explanation Team

Name	Work Assignment	Current Position
Mr. Susumu UEDA	Team Leader	Diplomat Grant Aid Division Economic Cooperation Bureau Ministry of Foreign Affairs
Mr. Katsutoshi KOMORI	Coordinator	Third Project Management Division Grant Aid Management Department JICA
Mr. Minoru MIURA	Chief Consultant/ Road Operation & Maintenance Planner	Katahira Engineering International Co., Ltd.
Mr. Masatsugu KOMIYA	Deputy Chief Consultant/ Power Civil Engineer/ Power Plan	Yachiyo Engineering Co., Ltd.
Mr. Hidetaka SAGARA	Road Improvement Planner	Katahira Engineering International Co., Ltd.
Mr. Satoshi KOGAWA	Road Equipment Planner	Katahira Engineering International Co., Ltd.
Mr. Keiichi MURAKAMI	Coordinator	Katahira Engineering International Co., Ltd.

APPENDIX 2

STUDY SCHEDULE

1. Basic Design Study

No.	Date	Hydropower Engineering Group		Site Survey and Construction Planning Group	
		Member: Mr. Masatsugu KOMIYA & Mr. Kiyofusa TANAKA		Member: Mr.Tetsuo YATSU & Mr. Toshio NAKAGAWA	
		Contents of Field Survey	Stay in	Contents of Field Survey	Stay in
1	05 Mar '01 (Mon)	**11:00** Lv. Tokyo/Narita by JL717 **15:55** Ar. Bangkok **17:45** Lv. Bangkok by TG305 **18:30** Ar. Yangon	Yangon		
2	06 Mar '01 (Tue)	Courtesy Call to EOJ and JICA Office	Yangon		
3	07 Mar '01 (Wed)	Meeting with Ministry for Progress of Boarder Areas and National Races and Development (PBANRDA) Meeting with Ministry of Education	Yangon		
4	08 Mar '01 (Thu)	**10:00** Lv. Yangon by 6T807 **12:00** Ar. Mandalay Mandalay ⇒ Lashio by Car (≒6.0hrs)	Lashio (Car No.2)		
5	09 Mar '01 (Fri)	Meeting with JICA/Laukai Office (Prof. Ujihara, Mr.Yoshida and Mr. Oike of JICA Expert) Traveling: Lashio ⇒ Laukai by Car (≒6.0hrs)	Laukai (Car No.2)		
6	10 Mar '01 (Sat)	Meeting with Regional Office of PBANRDA Courtesy Call to DAKASA and Special Region No.1 (Kokang)	Laukai (Car No.2)		
7	11 Mar '01 (Sun)	Site Survey for Road Laukai ⇒ Tar Shwe Tan ⇒ Shao Kai ⇒ Kon Kyan (Total Length: 63.8km x 2=127.6km)	Laukai (Car No.2)		
8	12 Mar '01 (Mon)	Site Survey for Road and Hydropower Laukai ⇒Tar Shwe Tan ⇒ Kya Si Shu Village ⇒ "Char-Ho" for Hydropower Site A ⇒"Tamo-Ho" for Hydropower Site B ⇒ Kya Si Shu Village ⇒Tar Shwe Tan ⇒Laukai (9 hours)	Laukai (Car No.2)		
9	13 Mar '01 (Tue)	Visit for Existing Laukai Hydraulic Power Station, and Survey for the Existing Distribution Network in Laukai	Laukai (Car No.2)		
10	14 Mar '01 (Wed)	Meeting with PBANRDA and Special Region No.1 (Kokang)	Laukai (Car No.2)		

11	15 Mar '01 (Thu)	Meeting with Dakasa Meeting with PBANRDA, Special Region No.1 (Kokang) and DPDC Discussions and Signing on M/D	Laukai (Car No.2)	Traveling; **11:00** Lv. Tokyo/Narita by JL717 **15:55** Ar. Bangkok **17:45** Lv. Bangkok by TG305 **18:30** Ar. Yangon	Yangon
12	16 Mar '01 (Fri)	Courtesy call to PBANRDA, Special Region No.1 (Kokang) and DPDC	Laukai (Car No.2)	Courtesy Call to JICA Office	Yangon
13	17 Mar '01 (Sat)	Mr.Komiya/Mr.Tanaka (with Mr. Umenaga/Mr.Miura) Move from Laukai to Lashio by car Meeting with JICA/Lashio office	Lashio (Car No.2)	**06:15** Lv. Yangon by HK001 **07:30** Ar. Mandalay Mandalay ⇒ Lashio by Car Meeting with JICA/Lashio office Internal Meeting with Mr. Komiya/Mr.Tanaka at Lashio	Lashio (Car No.6)
14	18 Mar '01 (Sun)	Mr.Komiya (with Mr. Umenaga/Mr.Miura) Move from Lashio to Mandalay by car **12:30** Lv. Mandalay by HK012 **14:00** Ar. Yangon	(Car No.1) Yangon	Traveling with Mr.Tanaka (Lashio ⇒ Laukai by Car)	Laukai (Car No.6)
		Mr. Tanaka Traveling (Lashio ⇒ Laukai by Car) (≒6.0hrs)	Laukai (Car No.2)		
15	19 Mar '01 (Mon)	Mr.Komiya (with Mr.Miura) Meeting with JICA	Yangon	Same task with Mr.Tanaka	Laukai (Car No.6)
		Mr.Tanaka Site Survey for Temporary Road Route to Hydropower Site-A (Char Ho)	Laukai (Car No.2)		
16	20 Mar '01 (Tue)	Mr.Komiya (with Mr.Miura) **06:45** Lv. Yangon by HK005 **08:55** Ar. Mandalay Mandalay ⇒ Lashio by Car (≒6.0hrs)	Lashio (Car No.1)	Same task with Mr.Tanaka	Laukai (Car No.6)
		Mr. Tanaka Visit for Existing Laukai Hydraulic Power Station, and Survey for the Existing Distribution Network in Laukai	Laukai (Car No.2)		
17	21 Mar '01 (Wed)	Mr.Komiya (with Mr.Miura) Meeting with JICA/Laukai Office Mr.Yoshida Lashio ⇒ Laukai by Car (≒6.0hrs)	Laukai (Car No.1)	Same task with Mr.Tanaka	Laukai (Car No.6)

		Mr.Tanaka Site Survey for Hydropower Site-A (Char-Ho)	Laukai (Car No.2)		
18	22 Mar '01 (Thu)	Site Survey for Hydropower Site-A (Char-Ho)	Laukai (Car No.2)	Same as left	Laukai (Car No.6)
19	23 Mar '01 (Fri)	Confirmation of location of small villages at the Char-ho site view spot	Laukai (Car No.2)	Same as left	Laukai (Car No.6)
20	24 Mar '01 (Sat)	Study and review on data collected	Laukai (Car No.2)	Same as left	Laukai (Car No.6)
21	25 Mar '01 (Sun)	Off	Laukai (Car No.2)	Off	Laukai (Car No.6)
22	26 Mar '01 (Mon)	Site Survey for Hydropower Site-A (Char-Ho) **with Topographic Surveyor**	Laukai (Car No.2)	Site Survey for Hydropower Site-A (Char-Ho) **with Topographic Surveyor**	Laukai (Car No.6)
23	27 Mar '01 (Tue) (National Holiday)	Site Survey for **"⑥Ma Chi Ti"** (3 hours walk)	Laukai (Car No.2)	Same as left	Laukai (Car No.6)
24	28 Mar '01 (Wed)	Site survey for **"⑤Ka Wang Tang"** (by car)	Laukai (Car No.2)	Same as Left	Laukai (Car No.6)
25	29 Mar '01 (Thu)	Meeting with Special Region No.1 (Kokang)	Laukai (Car No.2)	Same as Left	Laukai (Car No.6)
26	30 Mar '01 (Fri)	Meeting with Special Region No.1 (Kokang)	Laukai (Car No.2)	Same as Left	Laukai (Car No.6)
27	31 Mar '01 (Sat)	Study and review on data collected	Laukai (Car No.2)	Same as Left	Laukai (Car No.6)
28	01 Apr '01 (Sun)	Off	Laukai (Car No.2)	Off	Laukai (Car No.6)
29	02 Apr '01 (Mon)	Cutesy call to DAKASA, Special Region No.1 (Kokang) Study and review on data collected	Laukai (Car No.2)	Mr. Yatsu Study and review on data collected	Laukai
				Mr. Nakagawa Topographic Survey **(Topographic survey work will be start at site)**	Laukai (Car No.6)

30	03 Apr '01 (Tue)	Traveling; Laukai ⇒ Lashio by Car (≒6.0hrs) Visit for Existing Nam Hsawn Chaung Hydraulic Power Station at Kunlong Town Meeting with JICA/Lashio Office	Lashio (Car No.2)	Mr. Yatsu Site Survey for **"Ta-minhai and ②Ma-Mo-Su"**(6 hours walk)	Laukai (with Mr.Iida)
				Mr. Nakagawa Ditto	Laukai (Car No.6)
31	04 Apr '01 (Wed)	Traveling; Lashio ⇒ Mandalay by Car (≒6.0hrs) **17:35** Lv. Mandalay by 6T502 **19:00** Ar. Yangon	(Car No.2) Yangon	Mr. Yatsu Study and review on data collected	Laukai (with Mr.Iida)
				Mr. Nakagawa Ditto	Laukai (Car No.6)
32	05 Apr '01 (Thu)	Meeting with JICA and EOJ Meeting with PBANRDA Meeting with UNDCP	Yangon	Mr. Yatsu Site Survey for "Ka Wang Tan" ⇒**"③Suan Karin"** ⇒**"④ Wai Yao"** (7 hours walk)	**Wai Yao** (with Mr.Iida)
				Mr. Nakagawa Ditto	Laukai (Car No.6)
33	06 Apr '01 (Fri)	Meeting with Ministry for Electric Power (MOEP), Myanmar Electric Power Enterprise (MEPE), Ministry of Agriculture and Irrigation (MOAI)	Yangon	Mr. Yatsu Site Survey for **"Wai Yao"** ⇒**"⑤Ka Wang Tan"** (6 hours walk)	Laukai (with Mr.Iida)
				Mr. Nakagawa Ditto	Laukai (Car No.6)
34	07 Apr '01 (Sat)	Traveling; **10:20** Lv. Yangon by TG304 **12:05** Ar. Bangkok	Bangkok	Mr. Yatsu Study and review on data collected	Laukai
				Mr. Nakagawa Ditto	Laukai (Car No.6)
35	08 Apr '01 (Sun)	Traveling; **08:45** Lv. Bangkok by JL708 **16:35** Ar. Tokyo/Narita	-	Off	Laukai (Car No.6)
36	09 Apr '01 (Mon)			Mr. Yatsu Site Survey for **"Pai-sha-ko"** ⇒**"⑨Run Syon"** ⇒**"⑧ Hwan Thin"** (4 hours walk)	**Hwan Thin** (with Mr.Iida)
				Mr. Nakagawa Topographic Survey	Laukai (Car No.6)
37	10 Apr '01 (Tue)			Mr. Yatsu Site Survey for Hwan Thin⇒**"⑦Nyu Cyan"** ⇒Lung Tanko ⇒Ta Kyu Sai **(**6 hours walk)	Laukai (with Mr.Iida)

				Mr. Nakagawa Ditto	Laukai (Car No.6)
38	11 Apr '01 (Wed)			Mr. Yatsu Site Survey for **"⑥ Ma Chi Ti"** (3hours walk)	Laukai (with Mr.Iida)
				Mr. Nakagawa Ditto	Laukai (Car No.6)
39	12 Apr '01 (Thu)			Mr. Yatsu Study and review on data collected	Laukai
				Mr. Nakagawa Ditto	Laukai (Car No.6)
40	13 Apr '01 (Fri)			Mr. Yatsu Study and review on data collected	Laukai
				Mr. Nakagawa Ditto	Laukai (Car No.6)
41	14 Apr '01 (Sat)			Mr. Yatsu Study and review on data collected Market survey in Kokang Region	Laukai (Car No.6)
				Mr. Nakagawa Study and review on data collected	
42	15 Apr '01 (Sun)			Off	Laukai (Car No.6)
43	16 Apr '01 (Mon)			Mr. Yatsu Study and review on data collected	Laukai (Car No.6)
				Mr. Nakagawa Preparing Topographic Survey Drawings with the Surveyor	
44	17 Apr '01 (Tue) (Myanmar's New Year)			Mr. Yatsu Study and review on data collected	Laukai (Car No.6)
				Mr. Nakagawa Study and review on data collected	
45	18 Apr '01 (Wed)			Mr. Yatsu Study and review on data collected Market survey in Kokang Region	Laukai (Car No.2)
				Mr. Nakagawa Preparing Topographic Survey Drawings with the Surveyor	Laukai (Car No.6)
46	19 Apr '01 (Thu)			Mr. Yatsu Study and review on data collected Market survey in Kokang Region	Laukai (Car No.2)

				Mr. Nakagawa Ditto	Laukai (Car No.6)
47	20 Apr '01 (Fri)			Mr. Yatsu Study and review on data collected Market survey in Kokang Region	Laukai (Car No.2)
				Mr. Nakagawa Ditto **(Topographic Survey for Hydropower Site will be completed.)**	Laukai (Car No.6)
48	21 Apr '01 (Sat)			Study and review on data collected	Laukai (Car No.6)
49	22 Apr '01 (Sun)			Off	Laukai (Car No.6)
50	23 Apr '01 (Mon)			Mr. Yatsu Study and review on data collected	Laukai (Car No.6)
				Mr. Nakagawa Topographic survey for road project with the Katahira Int.	Laukai
51	24 Apr '01 (Tue)			Mr. Yatsu Ditto	Laukai (Car No.6)
				Mr. Nakagawa Ditto	Laukai
52	25 Apr '01 (Wed)			Mr. Yatsu Ditto	Laukai (Car No.6)
				Mr. Nakagawa Ditto	Laukai
53	26 Apr '01 (Thu)			Mr. Yatsu Data Collecting for Market Survey	Laukai (Car No.6)
				Mr. Nakagawa Ditto	Laukai
54	27 Apr '01 (Fri)			Mr. Yatsu Meeting with DAKASA, Special Region No.1 (Kokang)	Laukai (Car No.6)
				Mr. Nakagawa Ditto	Laukai

55	28 Apr '01 (Sat)			Mr. Yatsu Traveling; Laukai ⇒ Mandalay by Car (≒11.0hrs) Meeting with JICA/Lashio office	(Car No.6) Mandalay
				Mr. Nakagawa Ditto	Laukai
56	29 Apr '01 (Sun)			Mr. Yatsu Traveling; Mandalay ⇒ Yangon **14:35** Lv. Mandalay by 6T808 **16:00** Ar. Yangon	(Car No.6) Yangon
				Mr. Nakagawa Off	Laukai
57	30 Apr '01 (Mon)			Mr. Yatsu Meeting with JICA Study and review on data collected	Yangon
				Mr. Nakagawa Topographic survey for road project with the Katahira Int.	Laukai
58	01 May '01 (Tue) National Holiday (May Day)			Mr. Yatsu Off	Yangon
				Mr. Nakagawa Off	Laukai
59	02 May '01 (Wed)			Mr. Yatsu Meeting with PBANRDA in Yangon Study and review on data collected	Yangon
				Mr. Nakagawa Topographic survey for road project with the Katahira Int.	Laukai
60	03 May '01 (Thu)			Mr. Yatsu **10:20** Lv. Yangon by TG304 **12:05** Ar. Bangkok	Bangkok
				Mr. Nakagawa Topographic survey for road project with the Katahira Int.	Laukai
61	04 May '01 (Fri)			Mr. Yatsu **08:45** Lv. Bangkok by JL708 **16:35** Ar. Tokyo/Narita	-

				Mr. Nakagawa Topographic survey for road project with the Katahira Int.	Laukai
62	05 May ’01 (Sat)			Ditto	Laukai
63	06 May ’01 (Sun)			Off	Laukai
64	07 May ’01 (Mon)			Mr. Nakagawa Topographic survey for road project with the Katahira Int.	Laukai
65	08 May ’01 (Tue)			Ditto	Laukai
66	09 May ’01 (Wed)			Ditto	Laukai
67	10 May ‘01 (Thu)			Ditto	Laukai
68	11 May ’01 (Fri)			Ditto	Laukai
69	12 May ’01 (Sat)			Off	Laukai
70	13 May ’01 (Sun)	Mr.Komiya (with JICA/Mr. Yamada) **11:00** Lv. Tokyo/Narita by JL717 **15:55** Ar. Bangkok **17:45** Lv. Bangkok by TG305 **18:30** Ar. Yangon	Yangon	Off	Laukai
71	14 May ’01 (Mon)	Courtesy Call to EOJ and JICA Office Meeting with Ministry for Progress of Boarder Areas and National Races and Development (PBANRDA) Courtesy Call to National Planning and Economic Development (NPED), and UNDCP	Yangon	Topographic survey for road project with the Katahira Int.	Laukai
72	15 May ’01 (Tue)	**06:30** Lv. Yangon by 6T401 **08:40** Ar. Mandalay Mandalay ⇒ Lashio by Car (≒6.0hrs) Meeting with JICA/Laukai Office (Prof. Ujihara, Mr.Yoshida and Mr. Oike of JICA Expert)	Lashio	Ditto	Laukai
73	16 May ’01 (Wed)	Traveling: Lashio ⇒ Laukai by Car (≒6.0hrs) Meeting with Regional Office of PBANRDA Courtesy Call to Special Region No.1 (Kokang), KHA SA AH and Dakasa	Laukai	Ditto	Laukai

74	17 May '01 (Thu)	Site Survey for Road and Hydropower Laukai ⇒Tar Shwe Tan ⇒ Kya Si Shu Village ⇒ "Char-Ho" for Hydropower Site A ⇒ Kya Si Shu Village ⇒Tar Shwe Tan ⇒Laukai (10 hours)	Laukai	Ditto	Laukai
75	18 May '01 (Fri)	Discussion on M/D with PBANRDA, Special Region No.1 (Kokang) and KHA SA AH Signing on M/D	Laukai	Ditto	Laukai
76	19 May '01 (Sat)	Traveling; Laukai ⇒ Lashio ⇒ Mandalay by Car (≒11.0hrs)	Mandalay	Off	Laukai
77	20 May '01 (Sun)	**14:35** Lv. Mandalay by 6T808 **16:00** Ar. Yangon	Yangon	Off	Laukai
78	21 May '01 (Mon)	Meeting with EOJ and JICA Office Courtesy call to PBANRDA Meeting with UNDCP	Yangon	Topographic survey for road project with the Katahira Int.	Laukai
79	22 May '01 (Tue)	**10:20** Lv. Yangon by TG304 **12:05** Ar. Bangkok	Bangkok	Ditto	Laukai
80	23 May '01 (Wed)	**08:45** Lv. Bangkok by JL708 **16:35** Ar. Tokyo/Narita	-	Mr. Nakagawa Ditto **(to be continued until 28 June '01)**	Laukai

A1	10 June '01 (Sun)	Mr.Komiya /Mr. Tanaka **11:00** Lv. Tokyo/Narita by JL717 **15:55** Ar. Bangkok **17:45** Lv. Bangkok by TG305 **18:30** Ar. Yangon	Yangon	Mr.Yatsu Same as left	Yangon
A2	11 June '01 (Mon)	Courtesy Call to JICA Office Meeting with Ministry for Progress of Boarder Areas and National Races and Development (PBANRDA)	Yangon	Mr.Yatsu Same as left	Yangon
A3	12 June '01 (Tue)	**06:30** Lv. Yangon by 6T401 **08:40** Ar. Mandalay Mandalay ⇒ Lashio by Car (≒6.0hrs) Meeting with JICA/Lashio Office (Prof. Ujihara, Mr.Yoshida and Mr. Oike of JICA Expert)	Lashio	Mr.Yatsu Same as left	Lashio
A4	13 June '01 (Wed)	Traveling: Lashio ⇒ Laukai by Car (≒6.0hrs) Meeting with Regional Office of PBANRDA Courtesy Call to Special Region No.1 (Kokang), KHA SA AH and Dakasa	Laukai	Mr.Yatsu Same as left	Laukai
A5	14 June '01 (Thu)	Site Survey for the Existing 10.5kV line Laukai Substation ⇒Tar Shwe Tan ⇒ Kya Si Shu Village	Laukai	Mr.Yatsu Same as left	Laukai
A6	15 June '01 (Fri)	Discussion with Special Region No.1 (Kokang) and KHA SA AH	Laukai	Mr.Yatsu Same as left	Laukai
A7	16 June '01 (Sat)	Mr. Komiya Traveling; Laukai ⇒ Lashio ⇒ Mandalay by Car (≒11.0hrs)	Mandalay	Mr.Yatsu Same as Mr. Tanaka	Laukai
		Mr. Tanaka Site Survey for connection point at Tar Shwe Tan	Laukai		
A8	17 June '01 (Sun)	Mr. Komiya **14:35** Lv. Mandalay by 6T808 **16:00** Ar. Yangon	Yangon	Off	Laukai

		Mr. Tanaka Off	Laukai		
A9	18 June '01 (Mon)	Mr. Komiya Meeting with JICA Office Courtesy call to PBANRDA	Yangon	Mr. Yatsu	Laukai
		Mr. Tanaka Site Survey for 10.5kV line route Tar Shwe Tan ⇒ Kya Si Shu Village	Laukai	Same as Mr. Tanaka	
A 10	19 June '01 (Tue)	Mr. Komiya **10:20** Lv. Yangon by TG304 **12:05** Ar. Bangkok	Bangkok	Ditto	Laukai
		Mr. Tanaka Site Survey for 10.5kV line route Tar Shwe Tan ⇒ Kya Si Shu Village	Laukai		
A 11	20 June '01 (Wed)	Mr. Komiya **08:45** Lv. Bangkok by JL708 **16:35** Ar. Tokyo/Narita	-	Ditto	Laukai
		Mr. Tanaka Discussion with Special Region No.1 (Kokang)	Laukai		
A 12	21 June '01 (Thu)	Mr. Tanaka Discussion with Special Region No.1 (Kokang)	Laukai	Ditto	Laukai
A 13	22 June '01 (Fri)	Ditto	Laukai	Ditto	Laukai
A 14	23 June '01 (Sat)	Ditto	Laukai	Ditto	Laukai
A 15	24 June '01 (Sun)	Off	Laukai	Off	Laukai
A 16	25 June '01 (Mon)	Discussion with Special Region No.1 (Kokang) and KHA SA AH	Laukai	Mr. Yatsu Same as Mr. Tanaka	Laukai
A 17	26 June '01 (Tue)	Traveling; Laukai ⇒ Lashio ⇒ Mandalay by Car (≒11.0hrs)	Mandalay	Mr. Yatsu (with Mr. Nakagawa) Same as Mr. Tanaka	Mandalay
A 18	27 June '01 (Wed)	**14:35** Lv. Mandalay by 6T808 **16:00** Ar. Yangon	Yangon	Ditto	Yangon

A 19	28 June '01 (Thu)	Meeting with EOJ and JICA Office Courtesy call to PBANRDA Meeting with UNDCP	Yangon	Ditto	Yangon
A 20	29 June '01 (Fri)	**10:20** Lv. Yangon by TG304 **12:05** Ar. Bangkok	Bangkok	Ditto	Bangkok
A 21	30 June '01 (Sat)	**08:45** Lv. Bangkok by JL708 **16:35** Ar. Tokyo/Narita	-	Ditto	-

2. Explanation on Draft Report

	Official	Consultant		
	Mr. Ueda・and Mr. Komori	Mr. Miura, Mr. Komiya and Mr. Sagara	Mr. Murakami	Mr. Furukawa
21 August '01 (Tue)			Tokyo/Narita→(JL717)Bangkok Bangkok→(TG305) Yangon	
22 August '01 (Wed)			Meeting with JICA Office Discussion with Ministry for Progress of Boarder Areas and National Races and Development (PBANRDA)	
23 August '01 (Thu)			Discussion with PBANRDA	Tokyo/Narita→(JL717)Bangkok Bangkok→(TG305) Yangon
24 August '01 (Fri)			Internal Meeting	
25 August '01 (Sat)			Internal Meeting	
26 August '01 (Sun)	Tokyo→(JL718)Bangkok Bangkok→(TG305)Yangon		Internal Meeting	
27 August '01 (Mon)	Meeting with EOJ and JICA Office Meeting with PBANRDA			
28 August '01 (Tue)	Internal Meeting			
29 August '01 (Wed)	Discussion with PBANRDA Internal Meeting			
30 August '01 (Thu)	Yangon→(6T501) Mandalay			
31 August '01 (Fri)	Mandalay→(by car) Laukai Meeting with JICA Expert (Soba Project)			
1 September '01 (Sat)	Discussion with Special Region No.1 (Kokang) and KHA SA AH Signing on M/D			
2 September '01 (Sun)	Laukai→(by car) Lashio			
3 September '01 (Mon)	Lashio→(by car) Mandalay, Mandalay→(6T336) Yangon			
4 September '01 (Tue)	Discussion with PBANRDA Report to EOJ and JICA office			
	Yangon→(TG306) Bangkok	Study on data and information		
5 September '01 (Wed)	Bangkok→(JL708)Tokyo/Narita	Study on data and information		Yangon→(TG304) Bangkok
6 September '01 (Thu)		Study on data and information		Bangkok→(JL708)Tokyo/Narita
7 September '01 (Fri)		Study on data and information		
8 September '01 (Sat)		Yangon→(TG304) Bangkok		
9 September '01 (Sun)		Bangkok→(JL708)Tokyo/Narita		

APPENDIX 3

LIST OF PARTIES CONCERNED IN THE RECIPIENT COUNTRY

List of Parties Concerned in the Recipient Country

Progress of Border Areas and National Races Department; PBANRDA

Mr. Than Swe	Director General
Mr. Mint Swe	Deputy Director General
Mr. Maj Thay Myint	Director (Northern Shan State)
Mr. Nyi Nyi	Director (International Relation)
Mr. Aye Lwin	Deputy Director
Mr. Tun Aung	Assistant Director
Mr.Thet Lwin	Staff Officer
Mr. Meung Meung	Laukai Office Manager

Special Region No. 1 (Kokang)

Mr. Phon Jia Xing	Chairman
Mr. Leo Kan Chui	Vice Chairman
Mr. Phon Ta Shwin	Head of Planning & Commerce Department
Mr. Poi Saw Chin	Deputy Head of Planning & Commerce Dep. (Road)
Mr. Myint Swe	Director of Planning & Commerce Dep. (Power)
Mr. Li Chen Bing	Member of Planning & Commerce Dep. (Kokang TV)
Mr. Phon Ta Shwin	Head of Security Department
Mr. Li Win Kum	Deputy Head of Training and Education Department
Mr. Cheang	Teacher of Kokang Elementary School Teacher
Mr. Wan Kan Gyok	Deputy Head of Security Department
Mr. Lee Chin Phu	Deputy Head of Communication Department
Mr. Sai Aung Mint	Secretary 1 of Communication Dep.
Mr. Kim Maong Sew	Secretary
Mr. Lee Chong Chen	Secretary
Mr. Lionel Song	Secretary

KHA SA AH

Mr. Zaw Win	1st Leader
Mr. Tin Ohn	2nd Leader

Ministry of Electric Power

Dr. Thein Tun	Director General
Mr. U Kyaw Tin	Deputy Director
Mr. U Aung Khaing	Director

Myanmar Electric Power Enterprise

Mr. Win Kyaw	Deputy Chief Engineer Hydroelectric Department
Mr. U Yan Naing	Managing Director

Ministry of Agriculture and Irrigation

Mr. Hla Kyaw	Director
Mr.Toe Aung	Deputy Director General

UNDCP

Mr. Jean Luc Lemahieu	Representative
Ms. Yasuyo Yamaguchi	Programme Officer

Kya Si Su Village

Mr. Yui Ko Show	1st Leader

Chu Wa Chai Village

Mr. Lee Su Lon	Leader

Tar Shwe Tan Village

Mr. Ury Tay Tan	1st Leader
Mr. Lee Sun Lin	2nd Leader

Ma Chi Ti Village

Mr. Chin Lon Wai	Leader

Embassy of Japan in Myanmar

Mr. Kiyoshi Koinuma	Minister/Deputy Chief of Mission
Mr. Naoki Ito	Counselor
Mr. Rokuichiro Michii	Counselor
Mr. Kazuhiro Furukawa	Second Secretary (Economic)
Mr. Masamichi Hashimoto	Second Secretary

Technical Cooperation Section of Embassy of Japan (JICA)

Mr. Tochimichi Aoki	Resident Representative
Mr. Eiji Kozuka	Assistant Resident Representative
Mr. Toshiya Sato	Assistant Representative
Mr. Masaru Imamura	JICA Expert
Mr. Kyaw Lwin Oo	Programme Assistant

Project for Border Areas Development and Buckwheat Cultivation (JICA)

Prof. Akio Ujihara	JICA Expert
Mr. Tetsuya Ishi	JICA Expert
Mr. Yuji Oike	JICA Expert
Mr. Minoru Yoshida	JICA Expert

APPENDIX 4

MINUTES OF DISCUSSIONS

Minutes of Discussions
On the Basic Design Study
On the Project for Improvement of Kokang Living Environment
In Northern Shan State
In the Union of Myanmar

Based on the results of the Preparatory study, the Government of Japan decided to conduct a Basic Design Study on the project for Improvement of Kokang Living Environment in Northern Shan State (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to the Union of Myanmar (hereinafter referred to as "Myanmar") the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Mr. Satoshi Umenaga, Deputy Director, Third Project Management Division, Grant Aid Management Department, JICA and is scheduled to stay in the country from March 5 to May 22, 2001.

The Team held discussions with the officials concerned of the Government of Myanmar and conducted a field survey at the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Laukai, March 15, 2001

Satoshi Umenaga
Leader
Basic Design Study Team
Japan International Cooperation
Agency (JICA)

(Myint Swe, Deputy Director General)
for Than Swe
Director General
Ministry for Progress of Boarder Areas
and National Races and Development Affairs
(PBANRDA)

Phong Jia Xing
Chairman
Special Region No.1 (Kokang)

(Witness)

Brig: General, Zaw Win

Zaw Win
First Leader
Laukai District Organization and
Administration Committee (KHA SA AH)

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve living environment in Kokang Region in Northern Shan State by means of improvement of road condition and electrification at selected villages, hence contributing eradication of opium poppy cultivation.

2. Project sites

The Project sites for the Basic Design Study are shown in Annex-1. However, the sites for the road condition improvement will be selected in the shown stretch.

3. Responsible and Implementing Agency

3-1. The Responsible Agency is Ministry for Progress of Border Areas and National Races and Development Affairs (PBANRDA).

3-2. Implementing Agency is Special Region No.1 (Kokang).

The organization chart is shown in Annex-2.

4. Items requested by the Government of Myanmar

After discussions with the Team, the components of the Project were finally requested by the Myanmar side as follows;

(1) Improvement of the road condition in selected sections between Laukai and Kon Kyan, and between Tar Shwe Tan and Kya Si Shu.

(2) Installation of the new mini hydro power plant and necessary distribution lines which will supply electricity to Kya Si Shu Village Tract (Total 10 Villages).

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

5. Japan's Grant Aid Scheme

5-1. The Myanmar side understands the Japan's Grant Aid Scheme explained by the Team, as described in Annex-3.

5-2. The Myanmar side will take the necessary measures, as described in Annex-4, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. Schedule of the Study

6-1. The consultants will proceed to further studies in Myanmar until May 22, 2001.

6-2. JICA will dispatch another mission consisting of officials to discuss the components of the Project in the middle of May 2001.

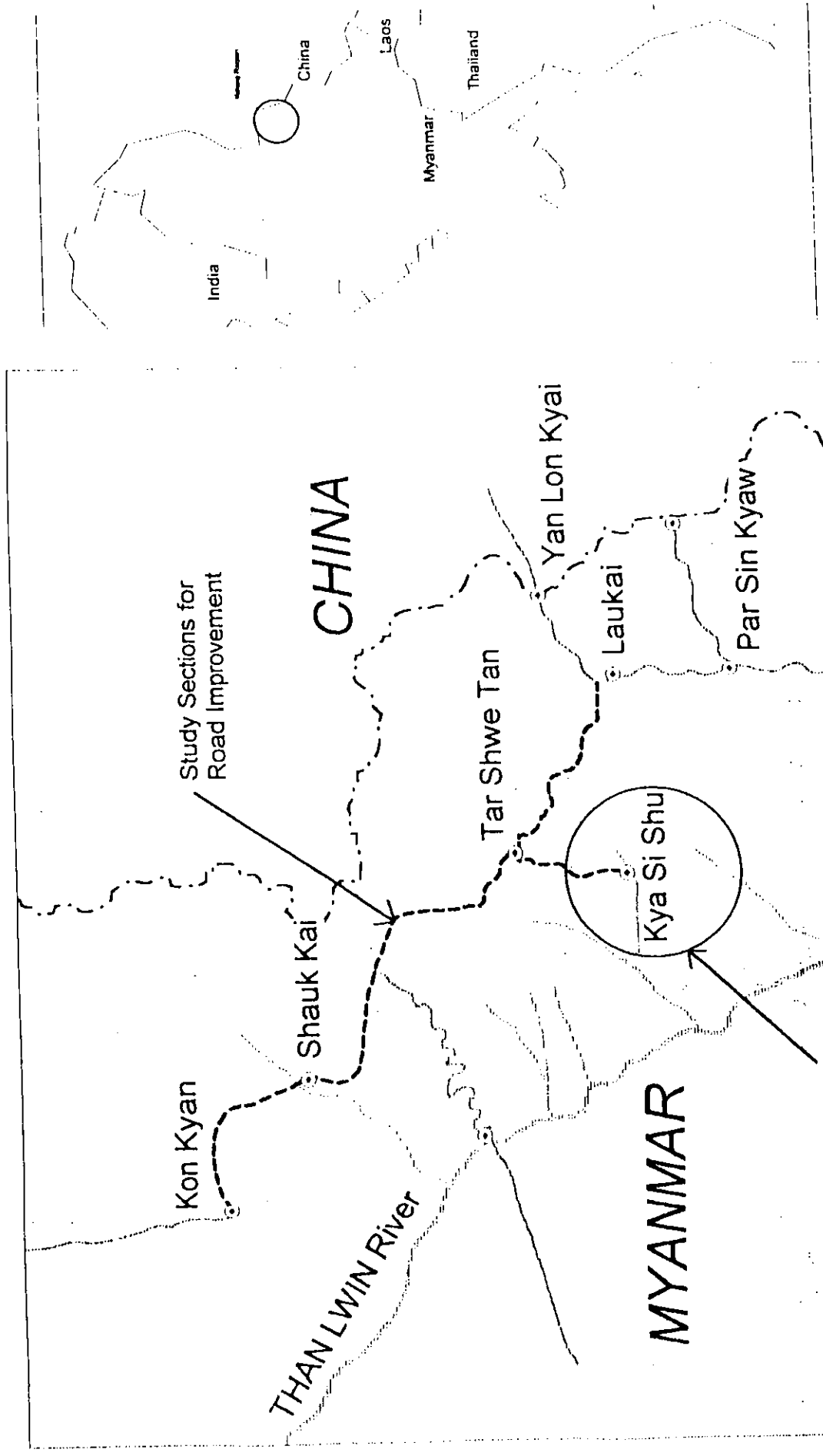
7. Other relevant issues

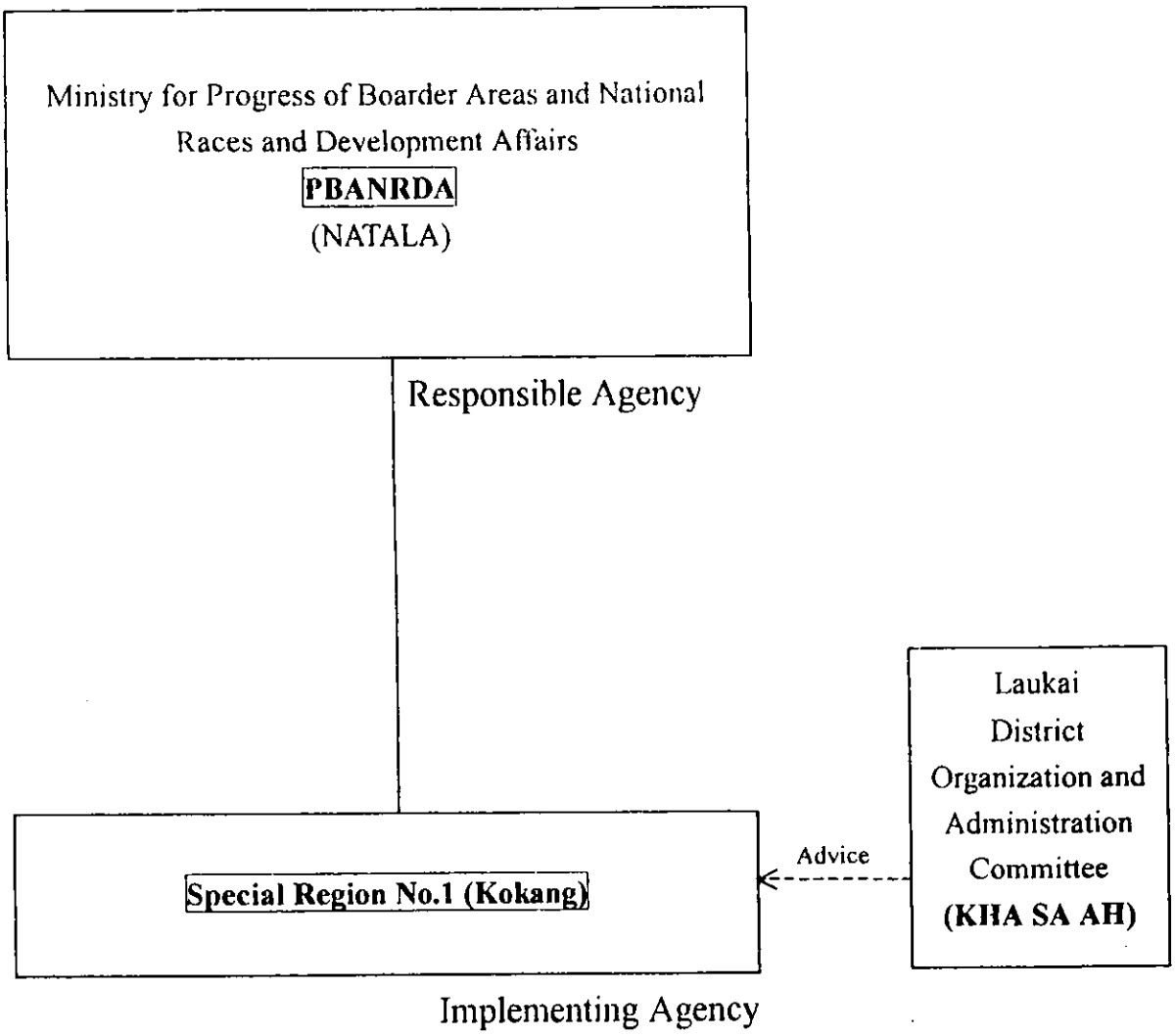
7-1. The Myanmar side will provide necessary data and information for the study.

7-2. The Myanmar side will take possible measures to secure safety for the concerned people of the Team during the study, including assignment of MI for each party of the Team.

7-3. The Myanmar side will secure the permission for entry to Kokang Region for the Team.

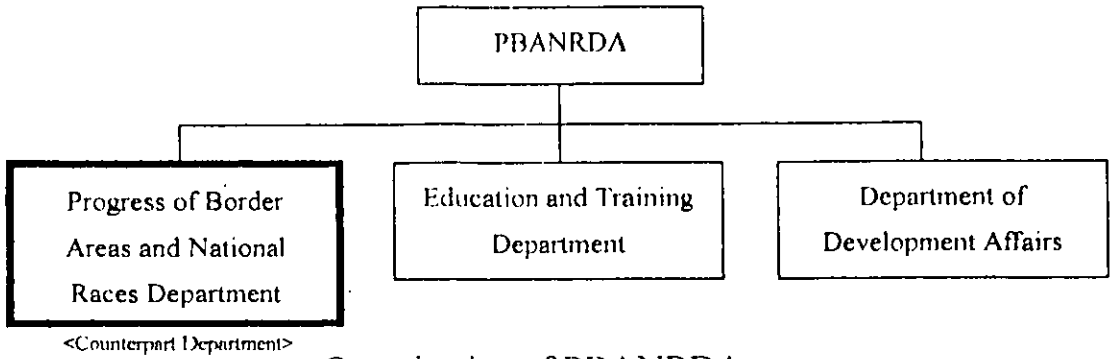
7-4. Special Region No.1 (Kokang) should assign full time counterparts for the Team in the area of road and electricity.


India
China
Laos
Myanmar
Thailand
CHINA
Study Sections for
Road Improvement
Yan Lon Kyai
Laukai
Par Sin Kyaw
Tar Shwe Tan
Kya Si Shu
Shauk Kai
Kon Kyan
THAN LWIN River
MYANMAR
Study Area
for Electrification

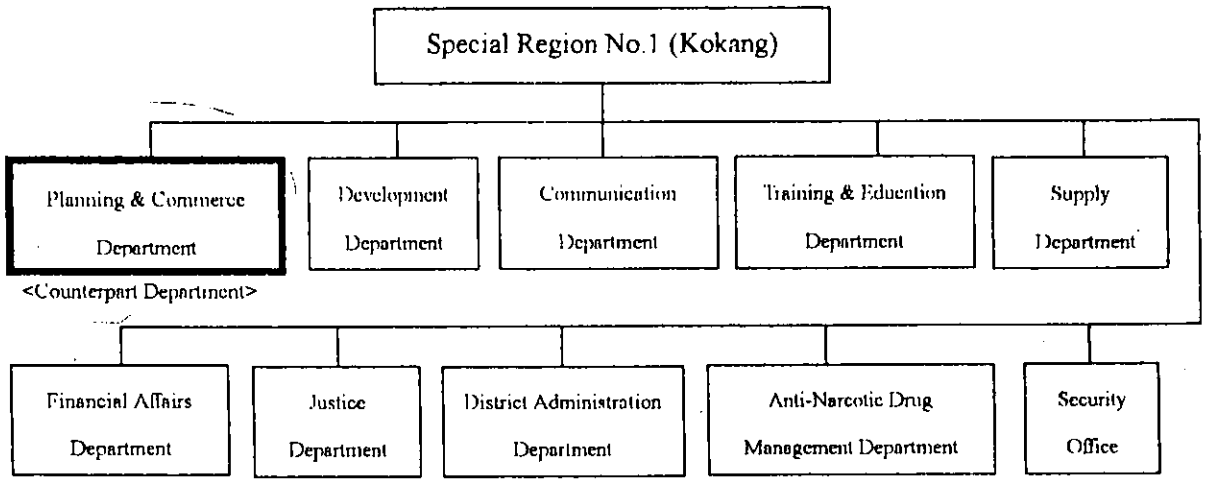


Organization for the Project Implementation

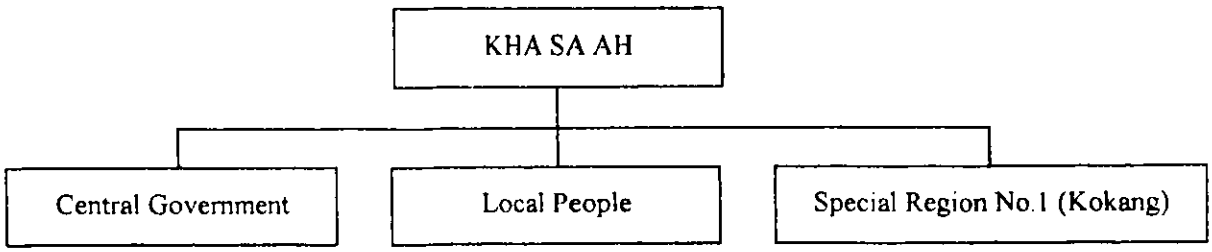
Note: ( ) shows name of the organization in Myanmar language.



Organization of PBANRDA



Organization of Special Region No.1 (Kokang)



Organization of KHA SA AH

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 a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the 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 Japanese consulting firms.

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 smooth 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 (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter 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 upon by both parties concerning the basic concept of the Project.
- Preparation of a basic design of the Project.
- Estimation of cost 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 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 through 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 registered consulting firms. JICA selects firms based on proposals submitted by interested firms. The firms selected carry out a Basic Design Study and write a report, based upon terms of reference set by JICA.

The consulting firms used for the Study 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 procedure such as exchanging of the Notes, concluding contracts with consulting firms and contractors and final payment to them must be completed.

However, in case of delays in delivery, installation or construction due to unforeseen factors such as natural 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, 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, contracting 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 the 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 of Japanese taxpayers.

5) Undertakings required to 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 expense and prompt execution 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 supply of the products and services under the Verification 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 operate and maintain the facilities constructed and 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 Arrangement (B/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.
- 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 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.

Major Undertakings to be taken by Each Government

NO	Items	To be covered by Grant Aid	To be covered by Recipient
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To construct the building	●	
5	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising Commission of A/P		●
	2) Payment commission		●
6	To ensure prompt unloading and customs clearance at the port of disembarkation in 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 site	●	
7	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
8	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 contract		●
9	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
10	To bear all the expense, other than those to be borne by the Grant Aid, necessary for construction of the facilities		●

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

Minutes of Discussions
On the Basic Design Study
On the Project for Improvement of Kokang Living Environment
In Shan State
In the Union of Myanmar

Based on the results of the Preparatory study, the Government of Japan decided to conduct a Basic Design Study on the project for Improvement of Kokang Living Environment (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to the Union of Myanmar (hereinafter referred to as "Myanmar") the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Mr. Yoshikazu Yamada, Director, Third Project Management Division, Grant Aid Department, JICA and is scheduled to stay in the country from May 13 to May 22, 2001.

The Team held discussions with the officials concerned of the Government of Myanmar and conducted a field survey at the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Laukai, May 18, 2001

Y. Yamada

Yoshikazu Yamada
Leader
Basic Design Study Team
Japan International Cooperation
Agency (JICA)

Col.
Lt. Col. Myint Swe, Deputy Director General
for

Than Swe
Director General
Ministry for Progress of Boarder Areas
and National Races and Development Affairs
(PBANRDA)

Phong Jia Xing
Chairman
Special Region No.1 (Kokang)

(Witness)

Brig. General

Zaw Win
First Leader
Laukai District Organization and
Administration Committee (KHA SA AH)

ATTACHMENT

1. Items requested by the Government of Myanmar

(1) The both sides confirmed the component finally requested by Myanmar side as follows;

- Improvement of the road condition in selected sections between Laukai and Kon Kyan, and between Tar Shwe Tan and Kya Shi Shu.

(2) The Implementing Agency (Special Region No.1 (Kokang)) requested the following item instead of installation of mini hydro power plant:

- Extension of 10.5kV distribution line from Tar Shwe Tan to Kya Shi Shu village tract.

Myanmar side (Responsible Agency: PBANRDA, and Implementing Agency: Special Region No.1 (Kokang)) shall coordinate each other; and Myanmar side shall inform the result (Extension of 10.5kV distribution line or Installation of mini hydro power plant) to JICA Myanmar Office in written notice by the early June 2001.

JICA will assess the appropriateness of the request, consider the components of the Project, taking account of the priority concerning road districts and villages to be supplied electricity, and will recommend the final components agreed by both sides to the Government of Japan for approval.

2. Japan's Grant Aid Scheme

The Myanmar side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of the Myanmar as explained by the Team and described in ANNEX-3 and ANNEX-4 of the Minutes of Discussions signed by both parties on March 15, 2001.

3. Schedule of the Study

3-1. The consultants will proceed to further studies in Myanmar until the end of June 2001.

3-2. JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around August 2001.

3-3. In case that the contents of the report are accepted in principle by the Government of Myanmar, JICA will complete the final report and send it to the Government of Myanmar by November 2001.

4. Other relevant issues

4-1. The Myanmar side will take possible measures to secure safety for the concerned people during the study and implementation of the Project on condition that the Grant Aid by the Government of Japan, including assignment of MI.

4-2. The Myanmar side will secure the permission for entry, construction, etc. needed for the implementation of the Project in Kokang Region.

4-3. The Team will consider the procurement of Road Construction and Maintenance Equipment.

4-4. The Implementing Agency (Special Region No.1 (Kokang)) strongly requested to the Team necessity of the water supply project for eastern part of Kokang Area. The Team informed that official request should be submitted to the Government of Japan from PBANRDA.

Minutes of Discussions
On the Basic Design Study
On the Project for Improvement of Kokang Living Environment
In Northern Shan State
In the Union of Myanmar
(Explanation on Draft Report)

In March 2001, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study Teams on the Project for Improvement of Kokang Living Environment (hereinafter referred to as "the Project") to the Union of Myanmar (hereinafter referred to as "Myanmar"), and through discussion, field survey and technical examination of the results in Japan, JICA prepared a draft report of the study.

In order to explain and to consult the Myanmar on the components of the draft report, JICA sent to Myanmar the Draft Report Explanation Team (hereinafter referred to as "Team"), which is headed by Mr. Susumu Ueda, Diplomat, Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs, from August 26 to September 8, 2001.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Laukai, September 1, 2001

Susumu Ueda
Leader
Basic Design Study Team
Japan International Cooperation
Agency (JICA)

Than Swe
Director General (PBANRD)
Ministry for Progress of Boarder Areas and
National Races and Development Affairs
(PBANRDA)

Phong Jia Xing
Chairman
Special Region No.1 (Kokang)

(Witness)

Zaw Win
First Leader
Laukai District Organization and
Administration Committee (KHA SA AH)

ATTACHMENT

1. Components of the Draft Report

The Myanmar side agreed and accepted in principle the components of the draft report explained by the Team.

2. Japan's Grant Aid Scheme

The Myanmar side understands the Japan's Grant Aid scheme and the necessary measures to be taken by the Government of Myanmar as explained by the Team and described in Annex-3 and Annex-4 of the Minutes of Discussions signed by both parties on March 15, 2001.

3. Schedule of the Study

JICA will complete the Final Report in accordance with the confirmed items and send it to the Government of Myanmar around December 2001.

4. Other Relevant Issues

4-1. Both sides agreed to change the Implementing Agency for Road Improvement from Special Region No.1 (Kokang) to PBANRDA. PBANRDA will establish the necessary unit for Road Improvement in Kokang Region. The organization chart is shown in Annex-1. But the Implementing Agency for Electrification remains Special Region No.1 (Kokang) and the Responsible Agency for both Road Improvement and Electrification remains PBANRDA.

4-2. Both sides agreed that the road construction equipment procured in the project was possessed by PBANRDA and placed in the workshop constructed in Kokang Region

4-3. PBANRDA ~~will establish the Road Department and secure the necessary budget for maintaining~~ assign the Roads/Bridges Sub-Committee to maintain the road construction equipment and ~~implementing~~ implement the road improvement work with it, and submit the staff list ~~and the organization chart of the Road Department~~ of the Roads/Bridges Sub-Committee to the Team through JICA Myanmar Office by ~~7~~4th, this September.

4-4. PBANRDA will maintain the road construction equipment procured in the project properly and implement road improvement work with it in Kokang Region, with close cooperation with Special Region No.1 (Kokang).

4-5. Both sides agreed that the construction equipment procured in the project would be handed to PBANRDA in the workshop at the completion of road improvement work by Japanese side.

4-6. ~~The Myanmar side~~ PBANRD will secure personnel and budget necessary for the Project, after obtaining the consent of the Myanmar Governme

4-7. The Myanmar side will take necessary measures to secure safety for the concerned people during the study and implementation of the Project on condition that the Grant Aid by the Government of Japan.

4-8. The Myanmar side will secure the permission for entry, construction, etc. needed for the implementation of the Project in Kokang Region.

4-9. The Myanmar side will assign engineers and technicians as full-time counterparts for the project to witness equipment inspection and to receive the transfer of operation and maintenance techniques.

4-10. Concerning Road Improvement, the Myanmar side will undertake the following measures;

a) To acquire a lot for workshop, which is constructed by the Japanese side, and reform a lot including leveling, distribution of electricity, water supply and sewage,

b) To execute the road improvement work on the concerned section except implemented by the Japan's Grant Aid,

c) To maintain and use properly constructed workshop and supplied equipment.

4-11. Concerning Electrification, the Myanmar side will undertake the following measures;

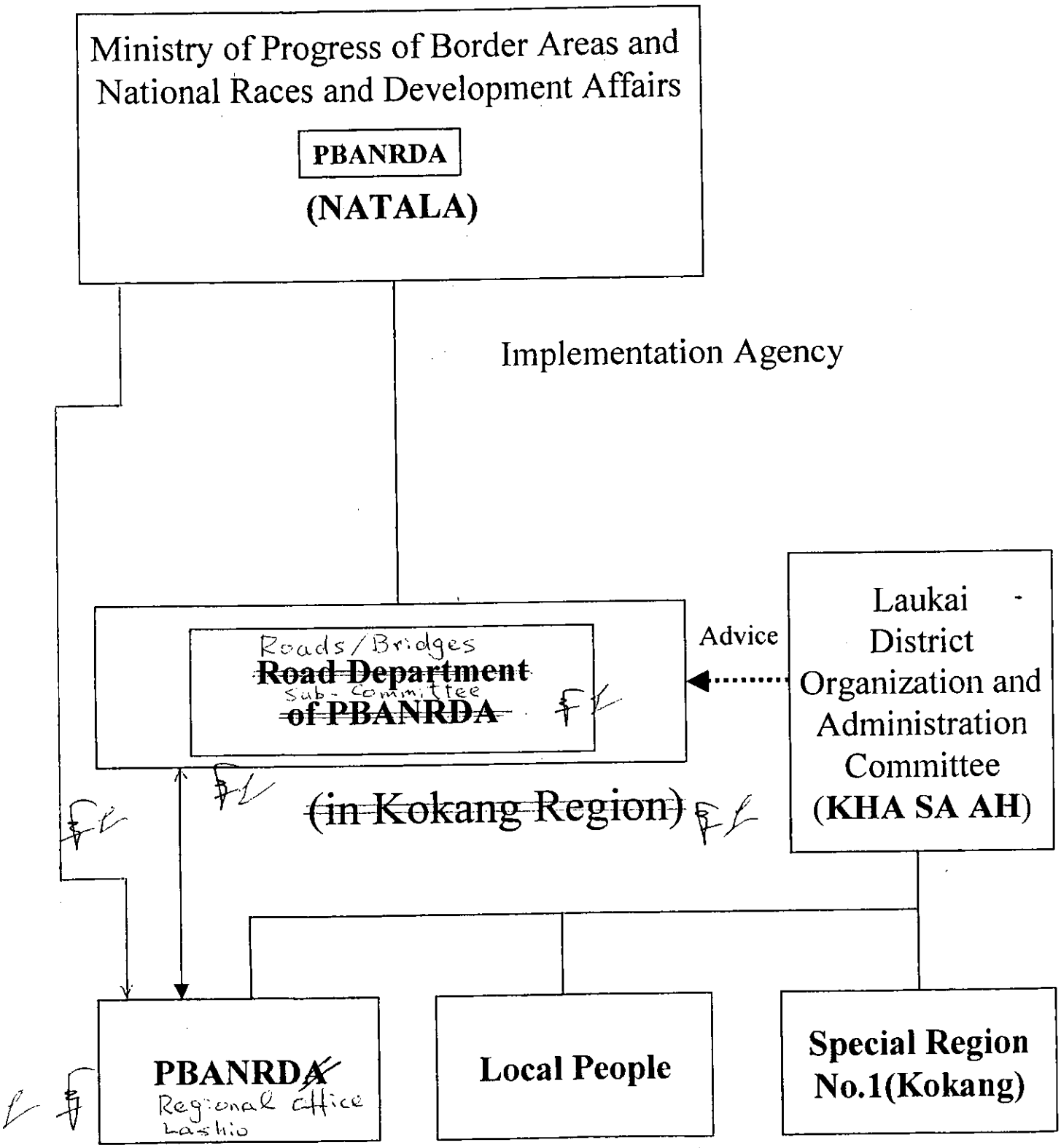
a) To acquire land for the distribution facilities prior to the commencement of work by the Japanese side,

b) To take necessary procedures for any necessary power cuts during the equipment installation work,

c) To install the low voltage distribution equipment and materials for user connection to be procured under the Project, in accordance with the schedule required for the Project,

d) To remove any obstacles along the distribution line routes.

Annex-1



Organization for the Project Implementation (Road Improvement)

APPENDIX 5

COST ESTIMATION BORNE BY RECIPIENT COUNTRY

Appendix 5 Cost Estimation Borne by Recipient Country

The scope of work to be undertaken by the Myanmar side under the Project is described in 2-3 Obligations of Recipient Country. The cost breakdown of the low voltage distribution line installation work (service poles, cables and integrating watt-hour meters for users are supplied by the Japanese side) for service connection, which will account for most of the cost to be borne by the Myanmar side, is shown in the table below. For this cost estimation, the unit cost per household is assumed to be US$ 50.

Breakdown of Cost to be Borne by Myanmar Side

Geographical Zone	Village/Hamlet	No. of Households	Population	Cost (unit:US$)
Within 1 Km Radius of Kya Si Su	Cha Ho	92	540	4,600
	[Kya Si Su]			3,050
	1) Ping Chang	61	336	
	2) Chun Choum	included in 1)		
	3) Ta Yin Fan	50	300	2,500
	4) Shao Ying Fan	included in 3)		
	5) Ta Ho Pyin	42	246	2,100
	6) Hui Zi Ja Chang	included in 5)		
Total		245	1,422	12,250