The Government of Uganda also recognizes the following needs for the effective use of the facilities to be constructed under the Project by Japan's grant aid over a long period of time in order to improve the power supply situation in Uganda:

1) The need to learn a wide range of technologies, from basic technologies relating to the composition and assembly of transformer facilities to advanced operation and maintenance technologies to be mastered through actual operation and maintenance work.

2) The need to learn maintenance technologies (techniques) relating to the vehicles to be provided under the Project to maintain the distribution network.

Because of the above reasons, the government of Uganda hopes that the Government of Japan will further provide the technical cooperation below following the implementation of the Project:

1) Training of operation and maintenance for substation facilities in Japan.

2) Training of vehicle maintenance in Japan.

It is deemed further study on the provision of the said technical cooperation is necessary.

4-2-8 Basic Policy for the Project

As described in the aforesaid section 4-1, for the efficient implementation of the Project which aims at improving the power supply situation in Kampala's economic center, the implementation is now divided into the following 2 phases:

Phase I : Construction of facilities and procurement of equipment and materials which should be given priority to urgently achieve the Project objective.

Phase II : Procurement of equipment and materials which will reinforce the beneficial effects of Phase I and further guarantee the successful achievement of the Project objective.

Table 4-5 shows comparison in contents between Ugandan Request and Project Plan.

Table 4-5 Comparison in Contents between Ugandan Request and Project Plan

Item	Original request	Project	
		Phase I	Phase II
(1) Reconstruction of 33KV and 11KV switchgears for Queensway Substation	o	o	—
(2) Reconstruction of 11KV switchgear for Motor Mart Switching Station	o	o	—
(3) Procurement of 11KV distribution materials	o	o (only for 11KV distribution network of subject stations)	o (distribution transformer and auto recloser, etc., for Kampala city which are not included in Phase I)
(4) Procurement of maintenance vehicles for distribution network	o	o (special vehicles and parts of lorries and 4 wheel drive vehicles)	o (parts of lorries and 4 wheel drive vehicles)
(5) Procurement of underground distribution cable for section between Queensway Substation and Motor Mart Switching Station (11KV cable, 185mm^2, 5km)	o	—	o
(6) Procurement of underground transmission cable for connection between Queensway Substation and Lugogo Substation (33KV cable, 185mm^2, 500m)	o	—	o
(7) Procurement of cable to connect existing 11KV distribution cables to new switchgear cubicle (11KV cable, 70mm^2, 400m)	o	o	—
(8) Procurement of 2 sets of new power transformers for Queensway Substation (33/11KV, 15/20MVA)	o	o	—

4-3 Project Descriptions

4-3-1 Execution Agency and Operational Structure

As described in 2-2-1, The execution agency of the Project in Uganda is UEB with direct responsibility borne by the Development, Distribution and Administration Divisions under the leadership of the Deputy Managing Director responsible for technical aspects.

Following the completion of the Project, the new facilities and vehicles will be operated and maintained by the Kampala District Office of UEB.

The inventory control of the equipment and materials for the 11KV distribution network will be conducted by the Store Department in Lugogo.

4-3-2 Plan of Operation (Activity)

The Government of Uganda strongly hopes that the Project will ① urgently improve the power supply situation and ② guarantee adequate maintenance of the distribution network in Kampala. Bearing these targets in mind, the Project will be formulated with following particular points:

(1) Facility Construction Plan

1) New switchgear will be installed at the Queensway Substation and Motor Mart Switching Station, both located in central Kampala, while paying due attention to coordination with the master distribution network plan prepared by UEB as part of the Second Power Project.

2) Maximum efforts will be made to shorten the construction period in general and the duration of power cuts in particular to avoid adverse effects on public life and industrial and economic activities in the subject area.

3) The existing facilities will be used where possible.

4) Consideration will be given to measures to prolong the mechanical life of the equipment and facilities and to facilitate their maintenance.

5) Attention will be paid to the safety and attractive appearance of the new facilities.

(2) Equipment and Materials Procurement Plan

1) Equipment and materials which are necessary for the urgent rehabilitation and subsequent maintenance of the existing 11KV distribution network in Kampala will be procured.

2) Vehicles which are necessary for the appropriate and quick maintenance of the distribution network in Kampala will be procured.

4-3-3 Locations and Conditions of Project Sites

As described in 4-2-6, the planned location for new switchgear cubicle are 1) Queensway Substation: an area near Queensway Road and former of existing 33KV bus line area on the Queensway Substation and 2) Motor Mart Switching Station: a carpark site near the present station.

As both sites are located in central Kampala facing main roads, the transportation of equipment and materials to the sites is expected to be conducted with little difficulty. A temporary yard (approximately 300m^2) will be created at UEB site next to the Queensway Substation for the temporary storage of equipment and materials.

Land preparation including embankment, site drainage system which will be required for both sites shall be executed by UEB.

4-3-4 Outline of Facilities, Equipment and Materials

The contents of the facility construction plan and the equipment and materials procurement plan for the Project are outlined as follows.

(1) Facility Construction Plan

The following facilities will be constructed for the rehabilitation of the existing substations.

1) Queensway Substation

a) Outdoor type switchgear cubicle

- 33KV bus bar and coupling section
- 33KV transformer feeder
- 33KV line feeder
- 33KV auxiliary cubicle
- 11KV bus bar and coupling section
- 11KV transformer feeder
- 11KV line feeder
- 11KV station transformer feeder
- SCADA interface board
- Battery board

b) Outdoor type power transformer

2) Motor Mart Switching Station

a) Outdoor type switchgear cubicle

- 11KV incoming line feeder
- 11KV outgoing line feeder
- 11KV bus coupling section
- 11KV station transformer feeder
- Battery board

b) Outdoor type station transformer

(2) Equipment and Materials Procurement Plan

1) The equipment and materials required for the maintenance of the 11KV distribution network (distribution area of the above substations) for a year will be procured.

2) The priority equipment (distribution transformers and surge arrestors) will be procured for the entire 11KV distribution network in Kampala.

3) The vehicles required for the maintenance of the distribution network in Kampala will be procured.

4-3-5 Operation and Maintenance Plan

(1) Basic Policy

Proper operation and maintenance (O&M) of the facilities and the preservation of an appropriate operating environment are essential to improve reliability of the power supply.

One fundamental factor causing the severe power situation in Uganda at present is the inefficient preventive maintenance due to the shortage of spare parts (see 3-1-2). The introduction of appropriate preventive maintenance and the implementation of proper operation and maintenance activities, both aiming at improving the reliability, safety and efficiency of the substations, are required to improve the situation, to reduce accident probability and to secure a reliable power supply for Kampala by maintaining the performance levels of these substations. The basic ideas for operation and maintenance are illustrated in Fig. 4-3.

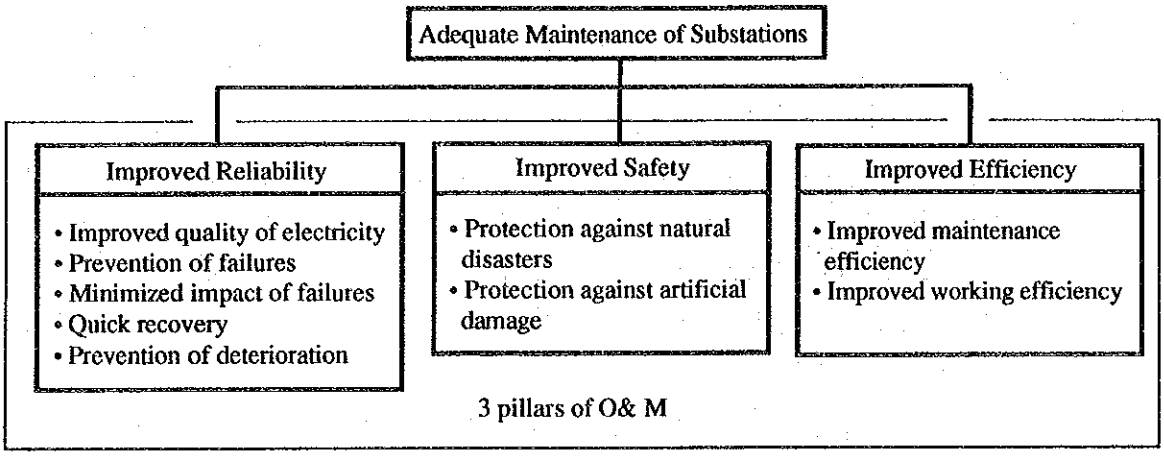


Fig. 4-3 Basic Concept for Maintenance of Substations

The basic principles for the formulation of the operation and maintenance plan for the substations are as follows.

1) Implementation of preventive maintenance

2) Systematic control

3) Effective use of records and data and their reflection in future plans

It is planned that OJT on the operation and maintenance of the new facilities/equipment will be provided as part of the Project by the Japanese engineers dispatched by the Japanese contractor to supervise the construction/installation work. As a result, the Ugandan side is requested to implement the appropriate maintenance following the completion of the Project in accordance with the O&M techniques to be learnt through the above OJT bearing the above-mentioned basic principles in mind.

UEB employees to be responsible for the operation and maintenance of the new facilities will be allocated from the Kampala District Office of UEB's Distribution Division (see 4-2-2).

(2) Regular Inspection Items

An outdoor type switchgear cubicle will be installed under the Project to shorten the construction period and to avoid the further construction of a building to house the cubicle. The standard maintenance requirements for the cubicle are listed in Table 4-6. The following 3 types of inspection are required.

1) Daily inspections using the 5 senses to check for any abnormality

2) Regular inspections to find such abnormalities as loosened joints and insufficient insulation, etc., which cannot be detected by daily inspections

3) Detailed inspections checking every detail, including the interlocking function, etc.

It is desirable that those parts of which the performance can deteriorate over a period of time due to general aging or abrasion be regularly changed at the time of regular or detailed inspections. These parts include fuses, instruments and auxiliary relays, etc.

Table 4-6 Standard Inspection Items of Cubicle Type Switchgear

Item	Inspection Requirements	Daily	Regular (every 1~2 years)	Detailed (every 4 years)
General exterior	indication of lamps	o	o	
	abnormal noise or odor	o	o	
	damage to jointing parts	o	o	
	damage to bushings and insulators	o	o	
	damage and rust to painted parts	o	o	
	abnormal temperature (temperature gauge)	o	o	
	fastening of terminals (mechanical check)	o	o	
Operating and control board	pressure gauge display (air pressure gauge, etc.)	o	o	o
	operational counter (operation unit, oil pump and gas compressor)		o	o
	moisture, residual water, rust and damage inside cubicle		o	o
	oil and cleaning		o	o
	fastening of low voltage cable terminals	o	o	o
	indication of lamps		o	o
	pressure gauge reading before and after operation (air pressure gauge, etc.)		o	o
	air or oil leakage		o	o
	functioning of meters		o	o
	rust, deformation or damage of springs	o	o	o
	abnormality of stroke joints (readjustment)	o	o	o
	abnormality of fastened sections		o	o
	abnormality of auxiliary switches		o	o
Testing	insulation resistance		o	o
	contact resistance			o
	heater circuit		o	o
	relay function		o	o

4-4 Technical Cooperation

The necessity to provide technical cooperation in association with the Project has already been described in 4-2-7. Ugandan side hopes the transfer of operation and maintenance technologies to the Ugandan side through a Japanese technical cooperation, because it appears essential to guarantee the implementation of appropriate operation and maintenance of the new facilities following the completion of the Project. The contents of the technical cooperation requested by Ugandan side are outlined in Table 4-7.

Table 4-7 Contents of Technical Cooperation Requested by Ugandan Side

Item	Objective
Training relating to substation operation and maintenance in Japan	Transfer of substation operation and maintenance technologies/techniques to the Ugandan side
Training relating to vehicle maintenance in Japan	Transfer of vehicle maintenance technologies/techniques to the Ugandan side for the maintenance of the distribution network

CHAPTER 5 BASIC DESIGN

CHAPTER 5 BASIC DESIGN

5-1 Design Policy

5-1-1 Policy on Natural Conditions

(1) Temperature and Humidity

Kampala has a mild climate with an almost constant temperature throughout the year between 16°C and 28°C. As the anticipated new facilities are outdoor cubicle types attention should be paid to their structure to prevent the internal temperature of the cubicles rising too high in order to maintain the normal functioning of the equipment.

The humidity fluctuates between 60% and 90%. In view of this relatively high humidity, highly damp-proof equipment must be selected together with a well designed ventilation system to maintain low humidity inside the cubicles.

(2) Rain

Kampala has 2 rainy season, i.e., from March to May and from September to December. The monthly rainfall during the rainy seasons tends to exceed 100mm, demanding extra care in the installation of the equipment during the rainy seasons.

5-1-2 Policy on Local Construction Conditions

(1) Construction Companies

Many buildings are under construction in Kampala by local construction companies (mainly affiliated to European companies). These companies appear to have sufficient experience in civil engineering and building work and, therefore, it is desirable that a local company be appointed to conduct the foundation work (concrete work, etc.) for the Project. However, few companies have experience in the installation of substation equipment and it is likely that the dispatch of engineers from Japan will be necessary to supervise the installation work.

(2) Construction Materials

In principle, the construction materials will be procured locally. In practice, however, only sand, stone and cement, the local supply and quality of which are stable, will be procured locally in view of the poor quality and high price of locally produced reinforcing rods and the Ugandan dependence on imports for other types of

construction materials. These materials will be supplied from Japan or from any third country which can provide them with competitive quality and price.

5-1-3 Policy on the Executing Agency's Maintenance Control Capability

UEB has experience in operating and maintaining 132KV, 66KV, 33KV and 11KV transmission and distribution networks and is reinforcing these networks through the implementation of the Second Power Project through which UEB is acquiring new skills in regard to monitor and control operation.

In view of such expertise of UEB, the operation and maintenance of the new facilities involving 33KV and 11KV substation operation will be sufficiently conducted by UEB. With the additional OJT provided by Japanese engineers who will be despatched from Japanese contractor for the Project, UEB's operation and maintenance capabilities should improve to meet future requirements.

As the maintenance cost, accounting for some 50% of the total expenditure, is the largest expenditure item in the budget of the Transmission and Distribution Division (see Table 2-3), a reduction of this cost will be the most effective way of improving the financial situation of UEB. Consequently, the main equipment (circuit breakers) to be provided under the Project will be of the maintenance free type to minimize the operation and maintenance cost of such equipment following the completion of the Project. The provision of spare parts for the new facilities and the equipment and materials for Kampala's 11KV distribution network will also contribute to improving the finance of UEB.

5-1-4 Policy on Scope and Level of Facilities, Equipment and Materials

The basic principles regarding the scope and technical level of the facilities, equipment and materials to be provided under the Project are described below taking the conditions given earlier into consideration.

(1) Scope

The selected facilities, equipment and materials for the construction of the Queensway Substation, and the Motor Mart Switching Station, the selected 11KV distribution materials and the selected maintenance vehicles should satisfy the Project objective, i.e., the establishment of a stable power supply for Kampala's economic center (see 4-1), in terms of their types, quantities and specifications.

(2) Technical Level

The specifications of the new equipment for the Queensway Substation and Motor Mart Switching Station should, in principle, satisfy the specifications planned by the Second Power Project although they should out-step the technical levels of the existing facilities to which UEB is accustomed.

The 11KV distribution materials will be used for the rehabilitation of the existing network and, therefore, their specifications must be identical to or compatible with those of the equipment and materials currently in use.

The OJT as part of the Project will aim at upgrading the present operation and maintenance expertise of UEB to the level where preventive maintenance based on appropriate analysis results on the operating and accident data of the new facilities is implemented.

5-1-5 Design Policy on Facility Construction Plan

The following design principles regarding the facility construction plan have been decided in view of the results of the study of site shape, structure of existing buildings and layout of existing equipment and the possible use of the existing equipment for the new facilities and related future plans and also in view of the requirements of the basic design policy.

(1) Common Principles

1) The capacity of the new facilities must satisfy the latest UEB forecast taking the power demand forecast of the Design Report 1989 into consideration.

2) The equipment and systems must be those which will facilitate easy maintenance.

3) An outdoor type switchgear cubicle which will not require a building will be selected to minimize both power cuts and the construction period.

4) The selection of the switchgear cubicle is prompted by the limited space availability.

5) Such industrial standards as IEC, JIS, JEM, JEC, etc., which are commonly used in Japan will be employed as the design and manufacture of the new facilities will be conducted in Japan.

(2) Queensway Substation

1) The site for the new facility will be an empty area of the present premises near Queensway Road and the former bus installation site.

2) The existing dead end tower for the 33KV transmission line, overhead grounding wire and the tower of overhead grounding wire will be used for the Project.

3) Land preparation including banking, construction of site drainage system and construction of an access road to the site to transport the equipment and materials will be completed by UEB prior to the commencement of the work of Japanese side. The required soil bearing capacity after the land preparation by UEB should have required capacity.

4) Temporary 33KV underground cables will be laid between the existing 33KV dead end tower and the existing transformers to secure the location for the new facilities and to prevent electrification and other accidents during the construction period. The temporary cables will be those to be provided under the Project and UEB will conduct the necessary installation work prior to the commencement of the site work of Japanese side

5) Upon completion of the work for the Project, UEB will immediately connect the new 33KV cable to the existing 33KV transmission line and the new 11KV switchgear cubicle to the existing 11KV distribution line.

(3) Motor Mart Switching Station

1) The site for the new Motor Mart Switching Station will be a carpark site which UEB has been renting from the Kampala city council for Project implementation purposes.

2) No existing facility will be used.

3) Land preparation and the construction of site drainage will be completed by UEB prior to the commencement of the site work of Japanese side.

5-2 Study and Examination on Design Criteria

The following design conditions have been adopted for the Project following the examination of various preconditions in the preparation of the Project scale and technical levels.

5-2-1 Climatic and Site Conditions

(1)	Altitude	: approximately 1,300m	
(2)	Ambient Temperature	: maximum 40°C	
		minimum 15°C	
		average 23°C	
(3)	Relative Humidity	: maximum 100%	
(4)	Mean Annual Rainfall	: 1,100mm	
(5)	Seismic Acceleration	: 0.1g (horizontal)	
(6)	Hail	: taken into consideration	
(7)	Dust	: taken into consideration	
(8)	Soil Bearing Capacity	: Queensway Substation	5 tons/m^2 (continuous)
		Motor Mart Switching Station	7 tons/m^2 (continuous)

5-2-2 Power System Conditions

(1)	Transmission Voltage	: 33KV, 3-phase
(2)	Distribution Voltage	: 11KV, 3-phase
(3)	Frequency	: 50Hz
(4)	System Fault Level	: 33KV line 16KA (symmetrical)
		11KV line 20KA (symmetrical)
(5)	Rated Current of Bus Bar	: 33KV line 2,000A
		11KV line 2,000A

5-2-3 Use of Existing Facilities

The following existing facilities will be used as part of the Project.

(1) Queensway Substation

a) Dead end tower for 33KV transmission line

b) Overhead grounding wire and their tower

(2) Motor Mart Switching Station

None of the existing facilities will be used.

5-2-4 Connection Between New Switchgear and Existing Facilities

(1) Queensway Substation

1) 33KV Transmission Line

- The cabling materials to connect the new 33KV cable end and the existing 33KV transmission line will be provided under the Project.
- The work to connect the newly installed 33KV cable end and the existing 33KV overhead transmission line will be conducted by UEB immediately following the completion of the Project using the cabling materials above.

2) 11KV Distribution Line

- The work to connect the existing 11KV distribution line and the newly installed 11KV switchgear cubicle is outside the scope of the Project and will be conducted by UEB immediately following the completion of the Project.

(2) Motor Mart Switching Station

The work to connect the existing 11KV distribution line and the newly installed 11KV switchgear cubicle is outside the scope of the Project and will be conducted by UEB immediately following the completion of the Project.

5-2-5 Standards to be Applied

The following standards will be applied in the design of the Project contents.

(1) International Electrotechnical Commission (IEC)
(2) International Standardization Organization (ISO)
(3) Japanese Industrial Standards (JIS)
(4) Japanese Electrotechnical Commission (JEC)
(5) The Standard of Japan Electrical Manufacturers Association (JEM)
(6) Japan Cable Makers Association (JCS)
(7) Other Relative Japanese Standards

5-3 Basic Plan

5-3-1 Site and Facility Layout Plan

(1) Queensway Substation

As described in 3-1-2, the planned location for new facilities is an empty area near Queensway Road and former 33KV bus line area on the Queensway Substation and the selection of this site is based on the following reasons:

- The building currently housing the 11KV distribution switchgear has no extra space to accommodate the planned switchgear.
- It is necessary for the construction work to be conducted without hindering the operation of the existing facilities to minimize power cuts due to such work.

The following points should be particularly noted in the determination of the equipment layout.

1) The construction work intends to keep the operation of the existing facilities running as much as possible to minimize the negative impact of the work on public life. The locations of the new facilities should, therefore, be far enough away from the locations of the existing transformers and the control panels so that no disturbance is cause to the latter during the installation work.

2) Maintenance space must be provided at both the front and rear of the switchgear cubicle.

3) The present elevation of the ground may not be high enough to avoid flooding during the rainy seasons and, therefore, additional 1.5m banking should be conducted by UEB. The equipment layout should be made simple so that banking work can be conducted with little difficulty. The station transformer and its foundation, the 33KV bus line and all of which are currently located on the planned location for new facilities, should be moved to another location by UEB prior to the commencement of the site work of Japanese side.

(2) Motor Mart Switching Station

As described in 3-1-2, the planned location for new facilities is part of a carpark which UEB has been renting from the Kampala city council ($130m^2$). The following points should be particularly noted in the determination of the equipment layout.

1) Maintenance space must be provided at both the front and rear of the switchgear cubicle.

2) While the site faces both Russel Road and Russel Lane, the layout should provide access to the site from the wider Russel Road.

5-3-2 Facilities Plan

(1) Facility Composition and Common Specifications

As the Queensway Substation and Motor Mart Switching Station are part of the transmission and distribution networks in Kampala, their systems should, in principle, be coordinated with the master distribution network plan prepared by UEB for the Second Power Project.

Some of the specifications (shown in Table 5-1) prepared by UEB, however, do not meet the Japanese standards and IEC. Consequently, these specifications have been modified as shown in Table 5-1.

Table 5-1 Comparison Between Original Specifications Prepared by UEB and Specifications Under the Project

Item	Project	UEB Suggestion	Remarks
a. transformer protection system	differential relay	combination of over-current relays with different characteristics	
b. DC power source for switchgear	DC 110V	DC 30V	Japanese domestic standards
c. distance relay for transmission lines	distance relay for short-circuit protection (without HF interface device)	distance relay equipped with HF interface device	see note below
d. insulation level of power cable	• 33KV system [Eo/E(Em)] : 18/30(36)KV • 11KV system [Eo/E(Em)] : 6/10(12)KV	• 33KV system (Eo/E) : 19/33KV • 11KV system (Eo/E) : 6.35/11KV	IEC standards
e. CT ratio of incoming line at Motor Mart Switching Station	1,200-600/5A	1,200-600-300/5A	necessitated by CT ratio in connection with linkage with Queensway Substation

Note: UEB requested the installation of a HF interface device to the distance relay for the protection of the 33KV transmission lines. The installation of such a device requires the coordination of the distance relay models and their specifications between the 2 linked substations. The substation to be linked to the Queensway Substation has not yet been finalized although the tender process is currently taking place as part of the Second Power Project. As a result, it is impossible to determine the model of the distance relay to be selected. Moreover, the transmission lines can be protected by coordination between the distance relays for short-circuit protection installed at substations. In view of the above difficulty and the availability of an alternative protection measure, it has been decided not to include the HF interface device in the Project.

(2) Facility Plan for Queensway Substation

The basic design for the facility plan for the Queensway Substation will be made based on the items listed in Table 5-2.

Table 5-2 Description of Queensway Substation

(1)33KV Switchgear Cubicle

Item	Q'ty	Specifications
1) 33KV busbar and coupling switchgear	1 set	Outdoor type metal-clad switchgear cubicle
a) Busbar	1 set	Material : Copper plate Rating : 2000A
b) Circuit breaker	1 set	Type : Vacuum, draw-out Rating : 3 poles, 36kV, 1250A, 25KA (Sym)
c) Current transformer for protection & measuring	1 set	Type : Indoor, resin-molded, 2 cores Current rating : Primary 800 - 400A Secondary 5A Burden : 40VA
d) Potential transformer	1 set	Type : Indoor, resin-molded Voltage rating : Primary $33/\sqrt{3}$KV Secondary $110/\sqrt{3}$ V Burden : 100VA
e) Voltmeter	2 sets	with volt selector switch including the values between phases Scale range : 0 to 45KV
f) Ammeter	1 set	with max. demand pointer & change-over switch with 4 position selector switch Scale range : 0 to 800/400A
g) Over current relay with high speed operation (51H)	3 sets	
h) Trip circuit supervision relay	1 set	for indicating on-off position for circuit breaker and alarm indication
i) Test terminal	1 set	
j) Control switches or push buttons for operation of circuit	1 set	
k) Position indicator	1 set	for circuit breaker
l) Annunciator	1 set	with two spare sections
2) 33KV transformer feeder switchgear	2 sets	Outdoor type metal-clad switchgear cubicle
a) Circuit breaker	1 set	Type : Vacuum, draw-out Rating : 3 poles, 36KV, 1250A, 25KA (Sym)
b) Earthing switch	1 set	manual operation
c) Current transformer for protection & measuring	1 set	Type : Indoor, resin-molded, 2 cores Current rating : Primary 800 - 400A Secondary 5A Burden : 40VA

Item	Q'ty	Specifications
d) Current transformer for differential relay (87)	1 set	Type : Indoor, resin-molded Current rating : Primary 800 - 400A Secondary 5A Burden : 40VA
e) Grounding potential transformer	1 set	Type : Indoor, resin-molded Voltage rating : Primary $33/\sqrt{3}$ KV Secondary $110/\sqrt{3}$ V Tritiary 110/3 V Burden : 100VA
f) Over current relay with high speed operation (51H)	3 sets	
g) Over current ground relay (51G)	1 set	
h) Over voltage ground relay (64V)	1 set	
i) Differential relay (87)	3 sets	
j) Trip circuit supervision relay	1 set	for indicating on-off position for circuit breaker and alarm indicator
k) Ammeter	1 set	with maximum demand pointer & change over switch Scale range : 0 to 800/400A
l) Voltmeter	1 set	with volt selector switch 7 positions Scale range : 0 to 45KV
m) Active power meter	1 set	
n) Reactive power meter	1 set	
o) Test terminal	1 set	
p) Control switches & push buttons for operation of circuit	1 set	
q) Position indicator	1 set	for circuit breaker and isolator earthing switch
r) Annunciator	1 set	with two spare sections
s) Cable terminal & treatment material	1 set	
3) 33KV line feeder switchgear	4 sets	Outdoor type metal-clad switchgear cubicle
a) Circuit breaker	1 set	Type : Vacuum, draw-out Rating : 3 poles, 36KV, 630A, 25KA (Sym)
b) Earthing switch	1 set	manual operation
c) Current transformer	1 set	Type : Indoor, resin-molded, 2 cores Current rating : Primary 400 - 200A Secondary 5A Burden : 40VA

Item	Q'ty	Specifications
d) Current transformer (for distance relay)	1 set	Type : Indoor, resin-molded Current rating : Primary 1000 - 500A Secondary 5A Burden : 15VA
e) Captive voltage transformer	1 set	for neon voltage indication
f) Over current relay with high speed operation (51H)	3 sets	
g) Over current ground relay (51G)	1 set	
h) Auto-reclosing relay (79)	1 set	
i) Distance relay (21)	1 set	for short circuit, without HF interface module
j) Ammeter	1 set	with maximum demand pointer and change-over switch Scale range : 0 to 400/200A
k) Kilowatt hour meter	1 set	
l) Test terminal	1 set	
m) Trip circuit supervision relay	1 set	for indicating on-off position for circuit breaker and alarm indicator
n) Control switches & push buttons for operation of circuit	1 set	
o) Position indicator	1 set	for circuit breaker and earthing switch
p) Annunciator	1 set	with two spare sections
q) Cable terminal & treatment material	1 set	
4) 33KV Auxiliary switchgear	1 set	Outdoor type metal-clad switchgear cubicle
a) Potential transformer	1 set	Type : Indoor, resin-molded Voltage rating : Primary $33/\sqrt{3}$ KV Secondary $110/\sqrt{3}$ V Burden : 100VA

(2) 11KV Switchgear Cubicle

Item	Q'ty	Specifications
1) 11KV busbar and coupling section switchgear	1 set	Outdoor type metal-clad switchgear cubicle
a) Busbar	1 set	Material : Copper plate Rating : 2000A
b) Circuit breaker	1 set	Type : Vacuum, draw-out Rating : 3 poles, 12KV, 2000A, 25KA (Sym)
c) Current transformer for protection & measuring	1 set	Type : Indoor, resin-molded, 2 cores Current rating : Primary 1200 - 600A Secondary 5A Burden : 40VA
d) Grounding potential transformer	2 sets	Type : Indoor, resin-molded Voltage rating : Primary $33/\sqrt{3}$KV Secondary $110/\sqrt{3}$ V Tertiary 110/3V
e) Over current relay with high speed operation (51H)	3 sets	
f) Over voltage ground relay (64V)	2 sets	
g) Ammeter	1 set	with max. demand pointer & change-over switch inclusive 4 position selector switches Scale range : 0 to 1200/600A
h) Voltmeter	2 sets	with change-over switch indicating the value between phases Scale range : 0 to 15KV
i) Trip circuit supervision relay	1 set	for indicating on-off position for circuit breaker and alarm indicator
j) Test terminal	1 set	
k) Control switches & push buttons for operation of circuit	1 set	
l) Position indicator	1 set	for circuit breaker
m) Annunciator	1 set	with two spare sections
2) 11KV transformer feeder switchgear	2 sets	Outdoor type metal-clad switchgear cubicle
a) Circuit breaker	1 set	Type : Vacuum, draw-out Rating : 3 poles, 36KV, 2000A, 25KA (Sym)
b) Current transformer for protection & measuring	1 set	Type : Indoor, resin-molded, 2 cores Current rating : Primary 1200 - 600A Secondary 5A Burden : 40VA

Item	Q'ty	Specifications
c) Current transformer for differential relay (87)	1 set	Type : Indoor, resin-molded Current rating : Primary 1200 - 600A Secondary 5A Burden : 40VA
d) Grounding potential transformer	1 set	Type : Indoor, resin-molded Voltage rating : Primary $33/\sqrt{3}$ KV Secondary $110/\sqrt{3}$ V Tritiary 110/3 V Burden : 100VA
e) Over current relay with high speed operation (51H)	3 sets	
f) Over current ground relay (51G)	1 set	
g) Over voltage ground relay (64V)	1 set	
h) Ammeter	1 set	with maximum demand pointer & change over switch Scale range : 0 to 1200/600A
i) Voltmeter	1 set	with volt select switches, 7 positions Scale range : 0 to 15KV
j) Active power meter	1 set	
k) Reactive power meter	1 set	
l) Kilowatt-hour meter	1 set	
j) Trip circuit supervision relay	1 set	for indicating on-off position for circuit breaker and alarm indicator
n) Test terminal	1 set	
o) Control switches & push buttons for operation of circuit	1 set	
p) Position indicator	1 set	for circuit breaker
q) Annunciator	1 set	with two spare sections
3) 11KV line feeder switchgear	12 sets	Outdoor type metal-clad switchgear cubicle
a) Circuit breaker	1 set	Type : Vacuum, draw-out Rating : 3 poles, 12KV, 1250A, 25KA (Sym)
b) Earthing switch	1 set	manual operation
c) Current transformer for protection & measuring	1 set	Type : Indoor, resin-molded, 2 cores Current rating : Primary 800 - 400A Secondary 5A Burden : 40VA
d) Capacitive voltage transformer	1 set	for neon voltage indication

Item	Q'ty	Specifications
e) Over current relay with high speed operation (51H)	3 sets	
f) Over current grounding relay (51G)	1 set	
g) Auto-reclosing relay (79)	1 set	
h) Trip circuit supervision relay	1 set	for indicating on-off position for circuit breaker and alarm indicator
i) Ammeter	1 set	with max. demand pointer & change-over switch Scale range : 0 to 800/400A
j) Active power meter	1 set	
k) Test terminal	1 set	
l) Control switches & push buttons for operation of circuit	1 set	
m) Position indicator	1 set	for circuit breaker and earthing switch
n) Annunciator	1 set	including two spare sections
o) Cable terminal & treatment material	1 set	
4) 11KV station transformer feeder Switchgear	2 sets	Outdoor type metal-clad switchgear cubicle
a) Load breaker switch with HV fuses	1 set	Type : Indoor, manual operation Rating : 3 poles, 12KV, 400A HV Fuse : 10A
b) Station transformer	1 set	Type : Oil-immersed, Indoor type Rating : 3 Phase, 50Hz, 11KV/433 - 250V, 160KVA, Dyn 11
c) Molded case circuit breaker	1 set	Rating : 3 poles, 600V, 400AF x 1 set 3 poles, 600V, small feeders (less than 150AF) x 5 sets
d) Position indicator	1 set	for load break switch
e) Annunciator	1 set	with two spare sections
f) Capacitive voltage transformer	1 set	for neon voltage indication
5) SCADA interface marshalling cubicle	1 set	Outdoor type metal-clad cubicle
6) Battery board	1 set	Outdoor metal-clad cubicle Type : Nickel cadmium alkaline Rating : 60AH, DC 110V

(3) Other Equipment

Item	Q'ty	Specifications
1) 33KV lightning arrester	2 sets	
a) Lightning arrester	1 set	Type : Outdoor Rating : 30KV 10KA, Gapless type
b) Supporting structure	1 set	
2) Power transformer	2 sets	
a) Power transformer	1 set	Type : Outdoor Rating : 33/11KV, 15/20MVA (ONAN/ONAF) 3 phase, 50Hz, Yyo with OLTC of 17 taps (±10%), open type conservator, control panel and L-v / H-v cable duct

Remarks: Lightning arrestor (2 sets, for spare feeder and future Lugogo line) will be supplied under this Project, as the equipment and material Plan.

(3) Facility Plan for Motor Mart Switching Station

The basic design for the facility plan for the Motor Mart Switching Station will be made based on the items listed in Table 5-3.

Table 5-3 Description of Motor Mart Switching Station

(1)11KV Switchgear Cubicle

Item	Q'ty	Specifications
1) 11KV incoming line feeder switchgear	3 sets	Outdoor type metal-clad switchgear cubicle
a) Circuit breaker	1 set	Type : Vacuum, draw-out Rating : 3 poles, 12KV, 2000A, 25KA (Sym)
b) Earthing switch	1 set	manual operation
c) Current transformer for protection & measuring	1 set	Type : Indoor, resin-molded, 2 cores Current rating : Primary 1200 - 600A Secondary 5A Burden : 40VA
d) Capacitive voltage transformer	1 set	for neon voltage indicator
e) Over current relay with high speed operation (51H)	3 sets	
f) Over current grounding relay (51G)	1 set	
g) Over voltage ground relay (64V)	1 set	
h) Ammeter	1 set	with max. demand pointer & change-over switch Scale range : 0 to 1200/600A
i) Voltmeter	1 set	with volt select switch Scale range : 0 to 15KV
j) Active power indicator	1 set	
k) Kilowatt-hour meter	1 set	
l) Trip circuit supervision relay	1 set	for indicating on-off position for circuit breaker and alarm indication
m) Test terminal	1 set	
n) Control switches & push buttons for operation of circuit	1 set	
o) Position indicator for circuit breaker and earthing switch	1 set	
p) Annunciator	1 set	with two spare sections
q) Cable terminal & treatment material	1 set	

Item	Q'ty	Specifications
2) 11KV outgoing line feeder switchgear	6 sets	Outdoor type metal-clad switchgear cubicle
a) Circuit breaker	1 set	Type : Vacuum, draw-out Rating : 3 poles, 12KV, 1250A, 25KA (Sym)
b) Earthing switch	1 set	
c) Current transformer for protection & measuring	1 set	Type : Indoor, resin-molded, 2 cores Current rating : Primary 600 - 300A Secondary 5A Burden : 40VA
d) Capacitive voltage transformer	1 set	for neon voltage indicator
e) Over current relay with high speed operation (51H)	3 sets	
f) Over current grounding relay (51G)	1 set	
g) Ammeter	1 set	with maximum demand pointer & change-over switch Scale range : 0 to 600/300A
h) Active power indicator	1 set	
i) Kilowatt-hour meter	1 set	
j) Trip circuit supervision relay	1 set	for indicating on-off position for circuit breaker and alarm indication
k) Test terminal	1 set	
l) Control switches & push buttons for operation of circuit	1 set	
m) Position indicator	1 set	for circuit indicator and isolator earthing switch
n) Annunciator	1 set	including two spare sections
3) 11KV coupling section switchgear	2 sets	Outdoor type metal-clad switchgear cubicle
a) 11KV busbar	1 set	Material : Copper plate Current rating : 2000A
b) Circuit breaker	1 set	Type : Vacuum, draw-out Rating : 3 poles, 12KV, 2000A, 25KA (Sym)
c) Grounding potential transformer	1 set	Type : Indoor, resin-molded Voltage rating : Primary $11/\sqrt{3}$KV Secondary $110/\sqrt{3}$ V Tertiary 110/3V Burden : 100VA
4) Station transformer feeder switchgear	1 set	Outdoor type metal-clad switchgear cubicle
a) Load break switch with HV fuses	1 set	Type : Indoor, manual-operation Rating : 3 poles, 12KV, 400A HV Fuse : 40A

Item	Q'ty	Specifications
b) Position indicator	1 set	for load break switch
c) Grounding potential transformer	1 set (3 nos.)	Type : Indoor, resin-molded Voltage rating : Primary $11/\sqrt{3}$KV Secondary $110/\sqrt{3}$ V Tertiary 110/3V Burden : 100VA
d) Molded case circuit breaker	1 set	Rating : 3 poles, 1000AF, 800AT
5) Battery board	1 set	Outdoor metal-clad cubicle Type : Nickel cadmium, Alkaline Rating : 60AH, DC 110V
6) SCADA interface marshaling cubicle	1 set	Outdoor metal-clad cubicle

(2) Other Equipment

Item	Q'ty	Specifications
1) Station transformer	1 set	Type : Outdoor, oil-immersed type with cable duct Rating : 11KV/433-250V, 50Hz, Dynll, 500KVA No-voltage tap changer on H-v side Tap range: ±5% with 2.5 step

(4) Basic Design Drawings

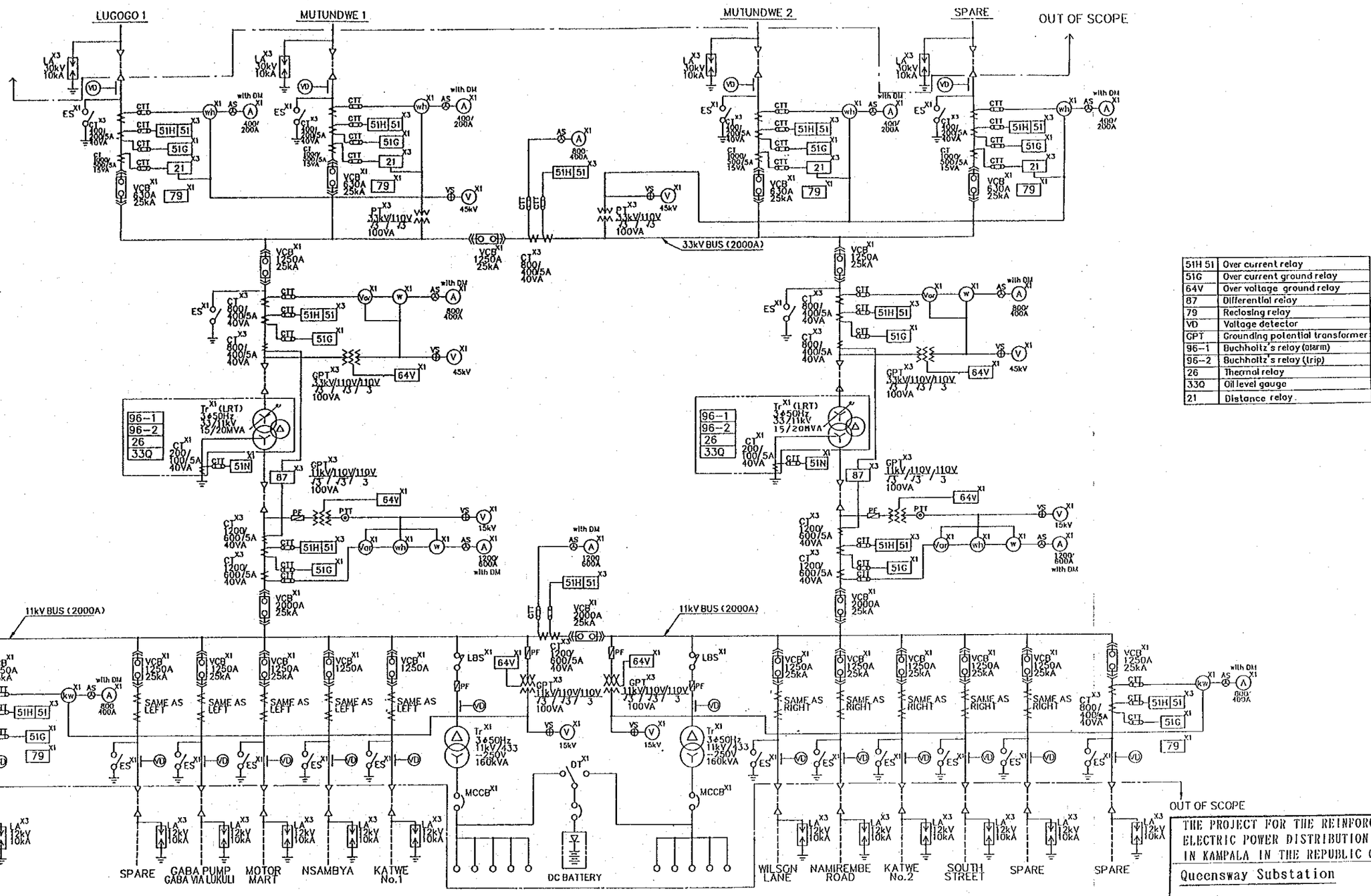
The contents of the basic design of facilities for the Project are shown in the following drawings:

Queensway Substation

UQB-01	Oneline Diagram
UQB-02	Equipment Layout Plan
UQB-03	Outline of 33KV Outdoor Type Switchgear Cubicle
UQB-04	Outline of 11KV Outdoor Type Switchgear Cubicle
UQB-05	Arrangement of Cable Trench and Foundation
UQB-06	Filling Work Plan (to be executed by UEB)

Motor Mart Switching Station

UMB-01	Oneline Diagram
UMB-02	Equipment Layout Plan
UMB-03	Outline of 11KV Outdoor Type Switchgear Cubicle
UMB-04	Arrangement of Cable Trench and Foundation



51H 51	Over current relay
51G	Over current ground relay
64V	Over voltage ground relay
87	Differential relay
79	Reclosing relay
VD	Voltage detector
GPT	Grounding potential transformer
96-1	Buchholtz's relay (alarm)
96-2	Buchholtz's relay (trip)
26	Thermal relay
330	Oil level gauge
21	Distance relay

THE PROJECT FOR THE REINFORCEMENT OF ELECTRIC POWER DISTRIBUTION NETWORK IN KAMPALA IN THE REPUBLIC OF UGANDA

SCALE —

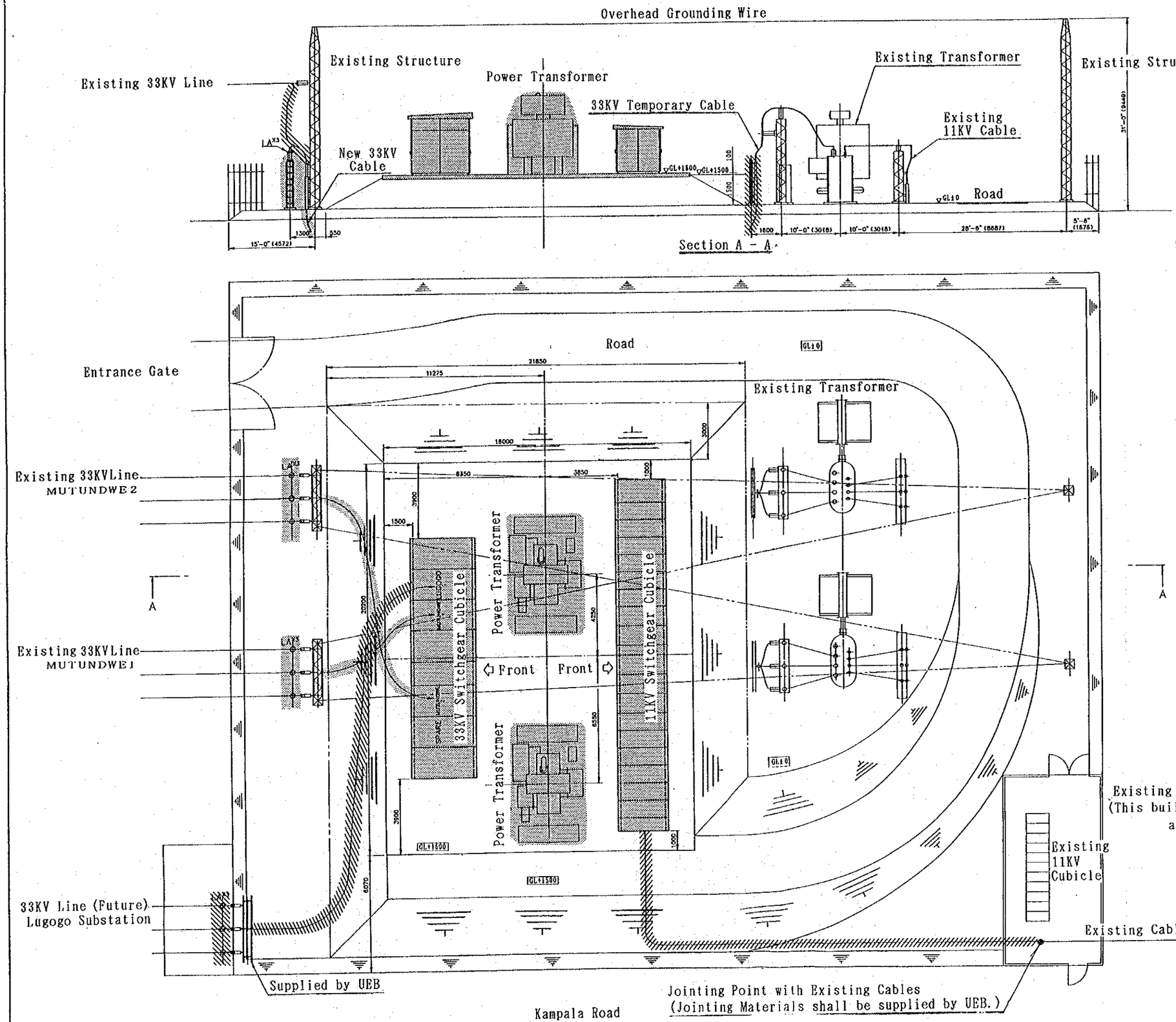
Queensway Substation

DWG NO. UQB-01

Oneline Diagram

DATE	DESIGNED	CHECKED	APPROVED	REVISION

JAPAN INTERNATIONAL COOPERATION AGENCY



Legend :

: Scope of the Project

: Scope of UEB's Work (Materials will be supplied under the Project)

No-mark : Existing Facilities

THE PROJECT FOR THE REINFORCEMENT OF ELECTRIC POWER DISTRIBUTION NETWORK IN KAMPALA IN THE REPUBLIC OF UGANDA	SCALE —
Queensway Substation	DWG NO.
Equipment Layout Plan	UQB-02

DATE	DESIGNED	CHECKED	APPROVED	REVISION

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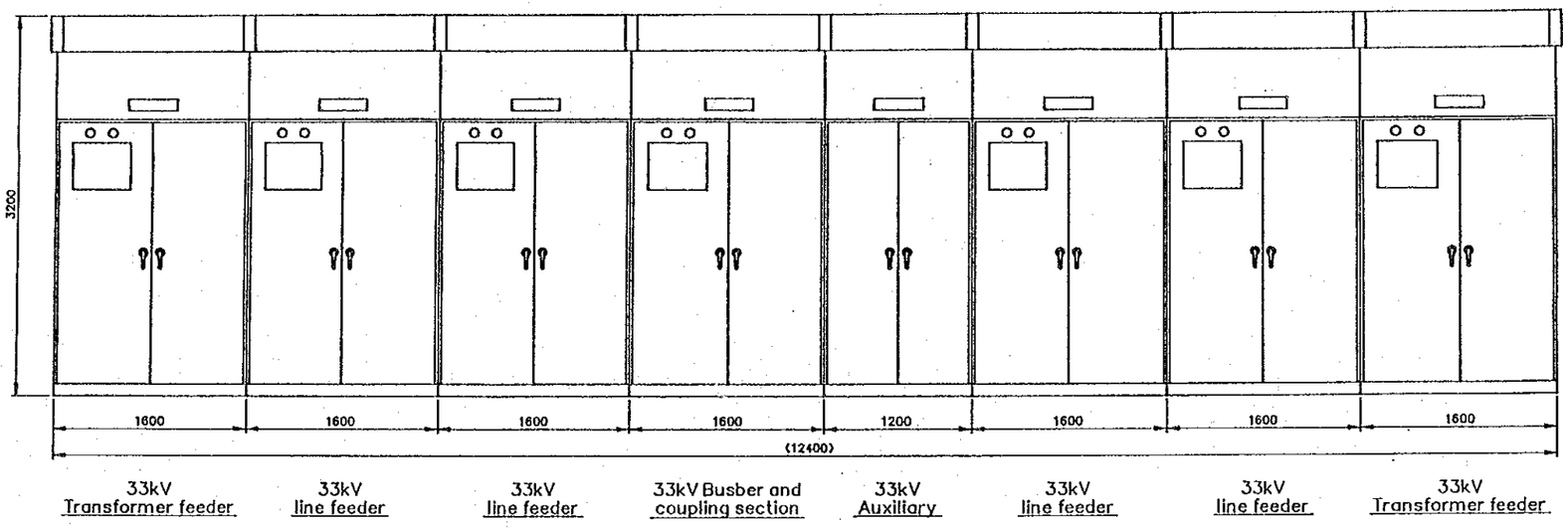
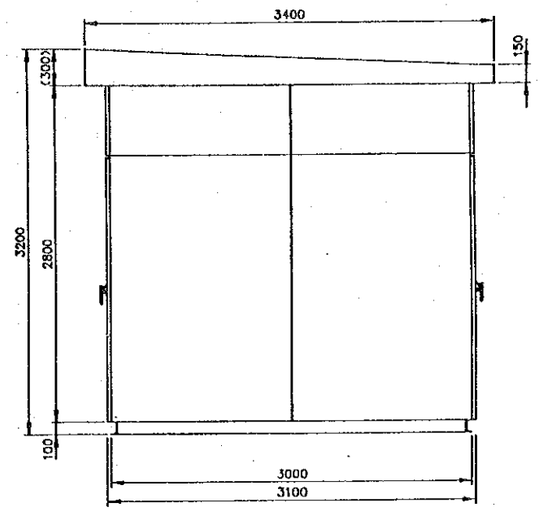
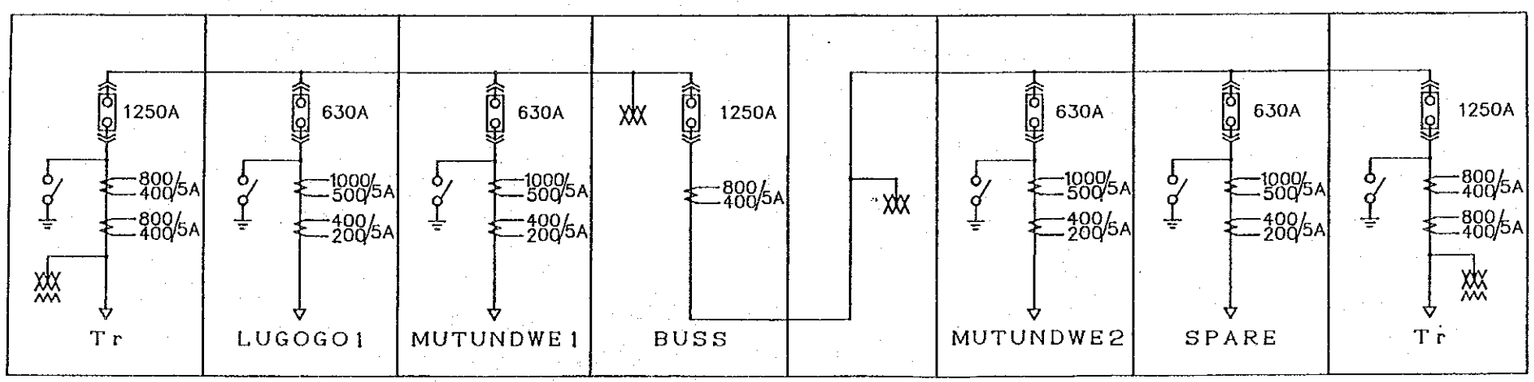
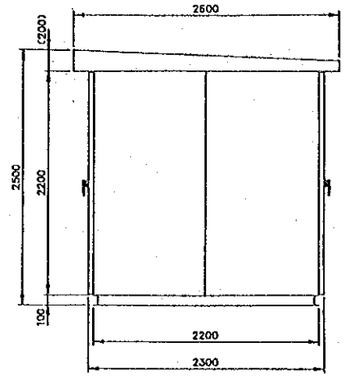
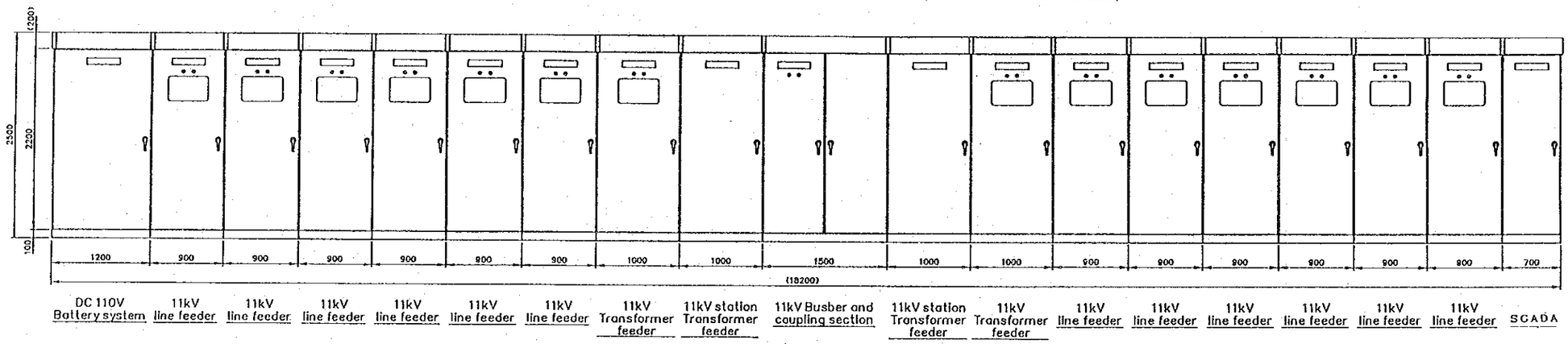


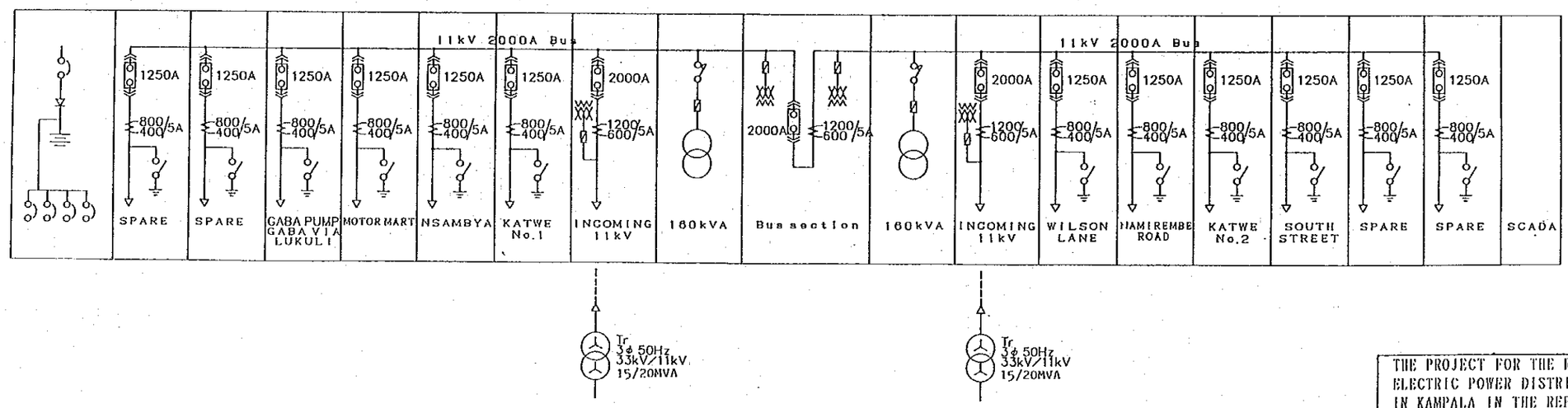




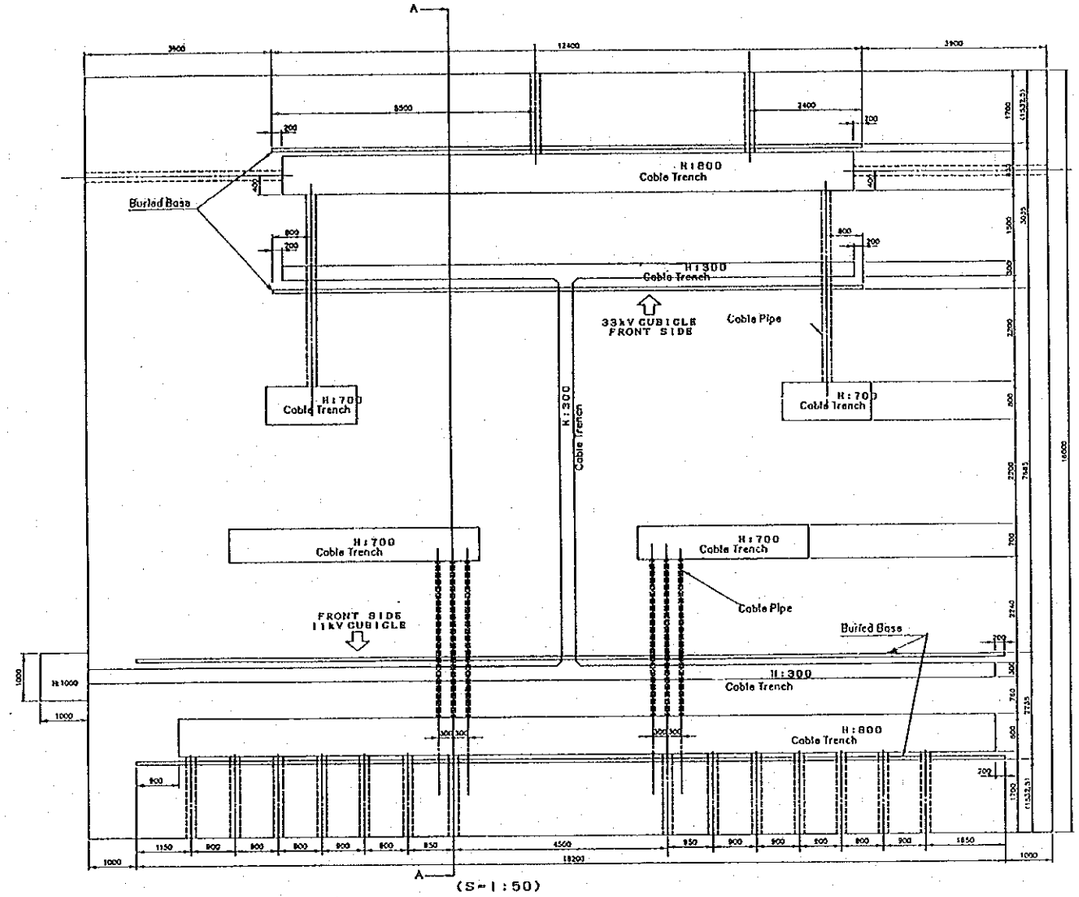
THE PROJECT FOR THE REINFORCEMENT OF ELECTRIC POWER DISTRIBUTION NETWORK IN KAMPALA IN THE REPUBLIC OF UGANDA				SCALE —
Queensway Substation Outline of 33KV Outdoor Type Swithgear Cubicle				DWG NO. UQB-03
DATE	DESIGNED	CHECKED	APPROVED	REVISION
JAPAN INTERNATIONAL COOPERATION AGENCY				







THE PROJECT FOR THE REINFORCEMENT OF ELECTRIC POWER DISTRIBUTION NETWORK IN KAMPALA IN THE REPUBLIC OF UGANDA				SCALE —
Queensway Substation Outline of 11KV Outdoor Type Switchgear Cubicle				DWG NO. UQB-04
DATE	DESIGNED	CHECKED	APPROVED	REVISION
JAPAN INTERNATIONAL COOPERATION AGENCY				



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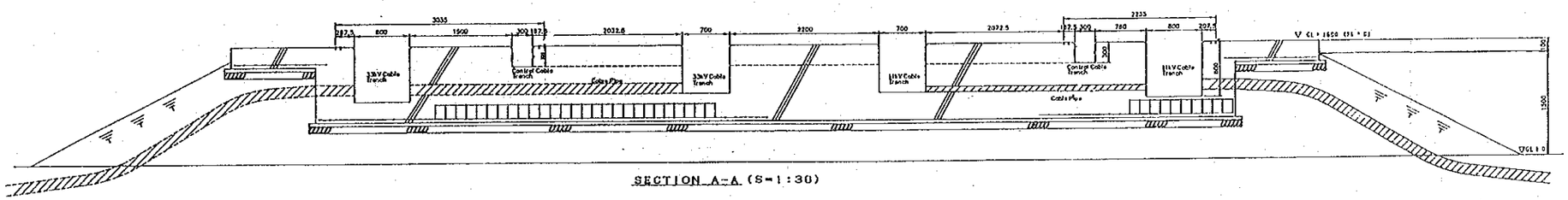
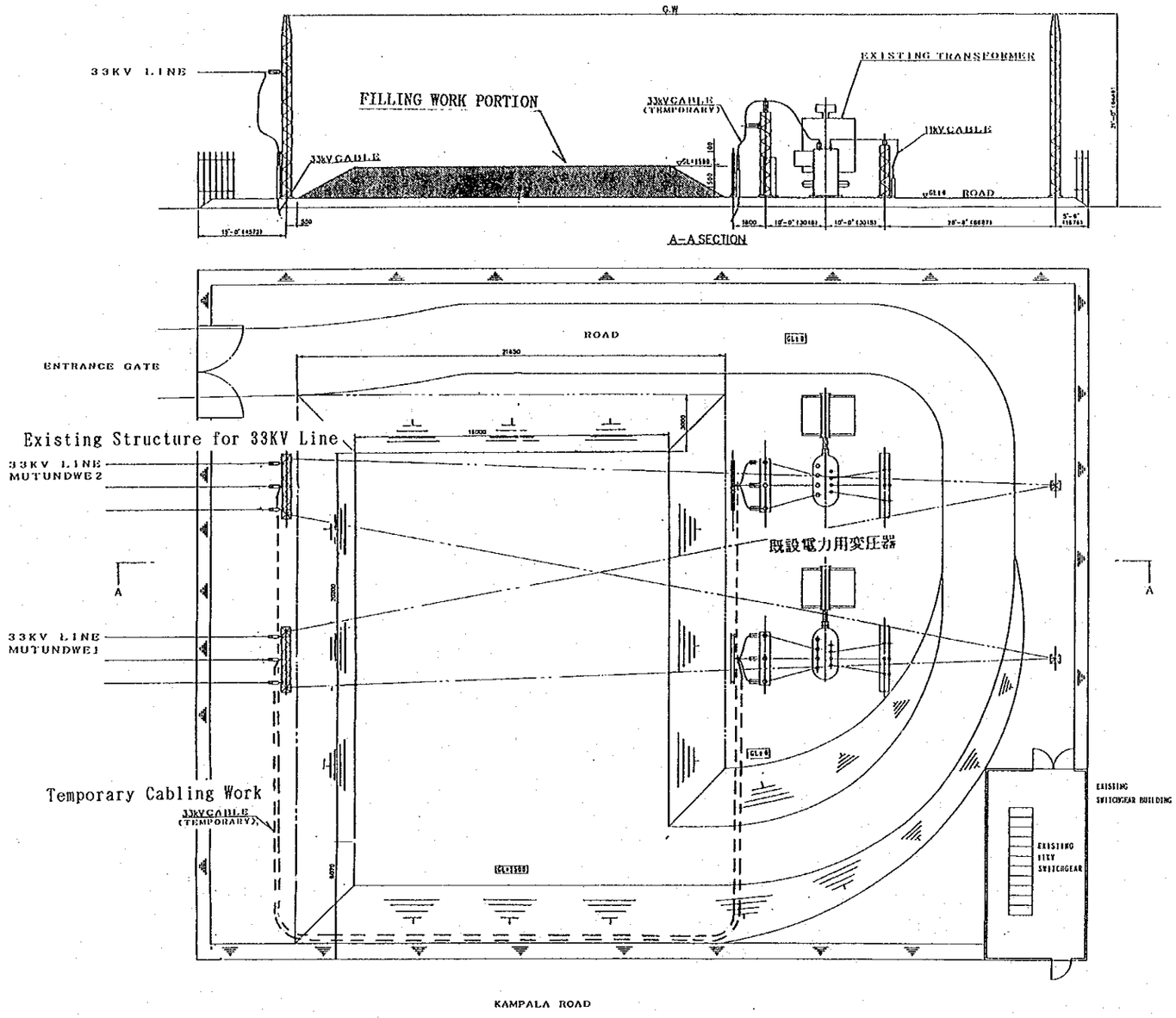


SECTION A-A (S=1:30)

THE PROJECT FOR THE REINFORCEMENT OF ELECTRIC POWER DISTRIBUTION NETWORK IN KAMPALA IN THE REPUBLIC OF UGANDA				SCALE —
Queensway Substation Arrangement of Cable Trench and Foundation				DWG NO. UQB-05
DATE	DESIGNED	CHECKED	APPROVED	REVISION
JAPAN INTERNATIONAL COOPERATION AGENCY				



SPECIFICATION FOR FILLING WORK (TO BE EXECUTED BY UGANDAN SIDE)

1. Scope of Filing Work

   The scope of filling work shall be as shown in this drawing.
   The filling work shall be completed before commencement of the site work for Japanese contractor for the Project.
   This work shall include the temporary cabling work between the existing gantry structure for 33KV transmission lines and the power transformers, the replacement work for the existing facilities, etc.

2. Curing of Existing Ground

   The existing ground shall be cut off up to the level where stable stratum having enough bearing capacity for loads from facilities to be constructed is obtained.

3. Unsuitable Soil in Existing Ground

   When there exist some soils unsuitable for foundations such as black cotton soil in the existing ground, such soils shall be removed completely to confirm stabilized stratum.

4. Filling Materials

   Filling materials shall be borrowed well-graded sandy soil free from vegetable, organic material, trash, mud, rock or stones of over 15cm diameter or other harmful materials.

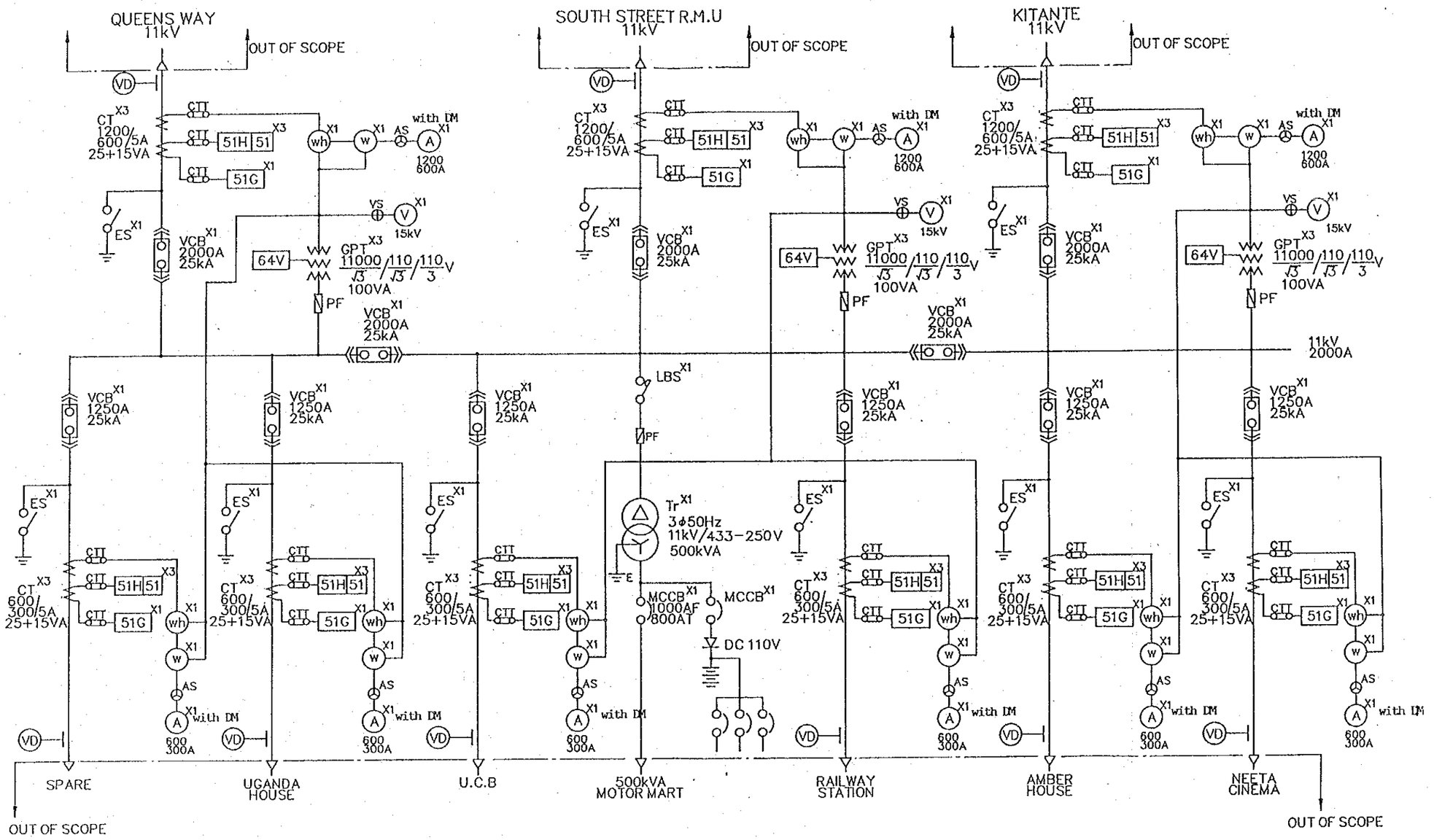
5. Compaction of Filling

   Filling materials shall be placed in even layers of a depth not greater than 30cm.
   Each layer shall be compacted, by power driven rollers of not less than 10tons or other equivalent machine, to at least 95% of maximum dry density at optimum moisture content.

6. Test of the Work

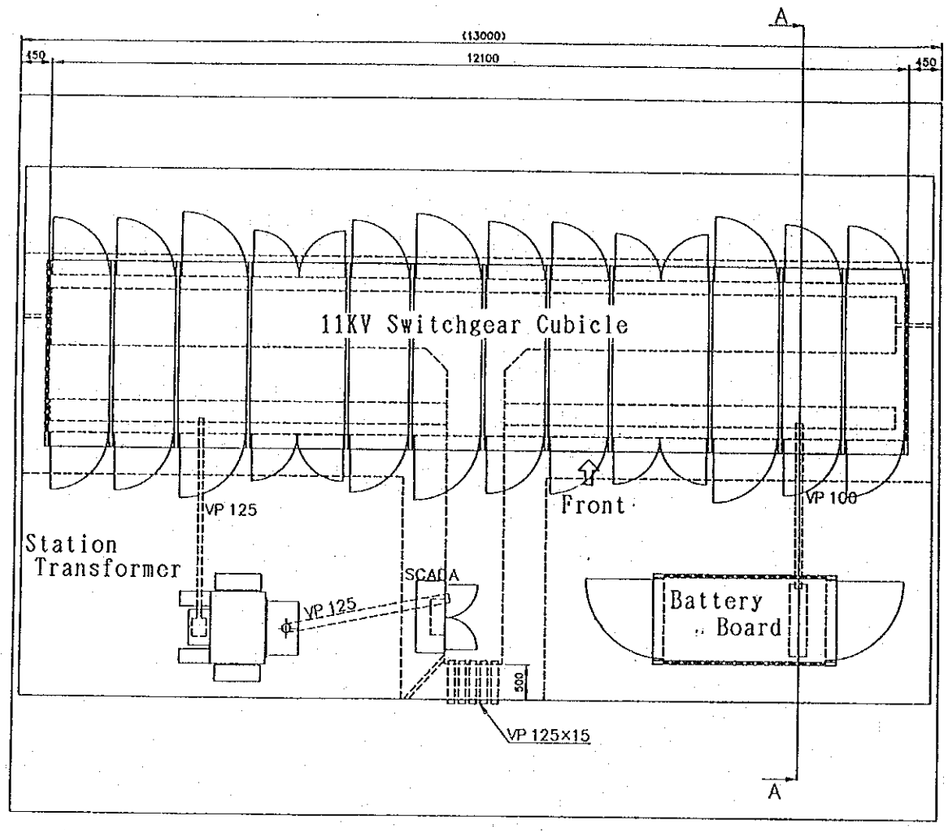
   In-situ density tests during the course of filling shall be executed.
   The test records shall be preserved and be submitted to Japanese consultant.

THE PROJECT FOR THE REINFORCEMENT OF ELECTRIC POWER DISTRIBUTION NETWORK IN KAMPALA IN THE REPUBLIC OF UGANDA				SCALE —
Queensway Substation				DWG NO. UQB-06
Filling Work Plan (TO BE EXECUTED BY UGANDAN SIDE)				
DATE	DESIGNED	CHECKED	APPROVED	REVISION
JAPAN INTERNATIONAL COOPERATION AGENCY				



51H 51	Over current relay
51G	Over current ground relay
64V	Over voltage ground relay

THE PROJECT FOR THE REINFORCEMENT OF ELECTRIC POWER DISTRIBUTION NETWORK IN KAMPALA IN THE REPUBLIC OF UGANDA				SCALE ---
Motor Mart Switching Station Oneline Diagram				DWG NO. UNB-01
DATE	DESIGNED	CHECKED	APPROVED	REVISION
JAPAN INTERNATIONAL COOPERATION AGENCY				



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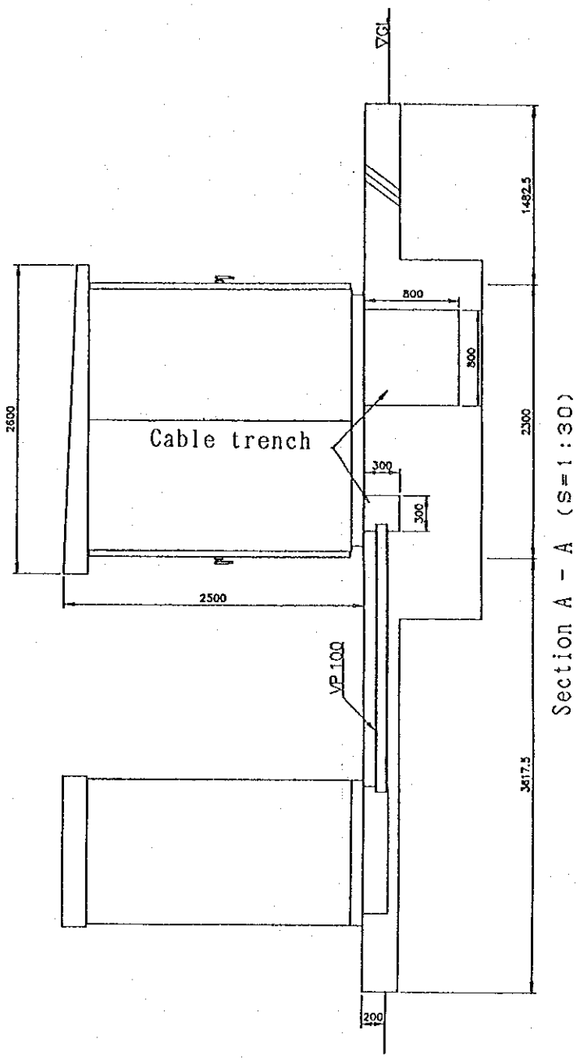
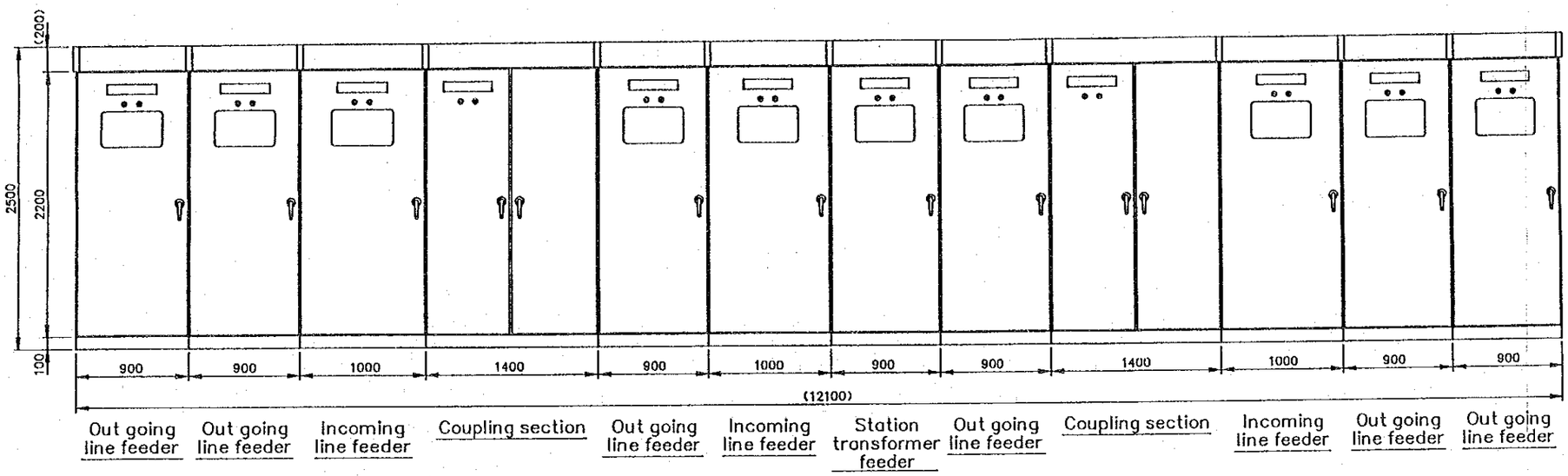
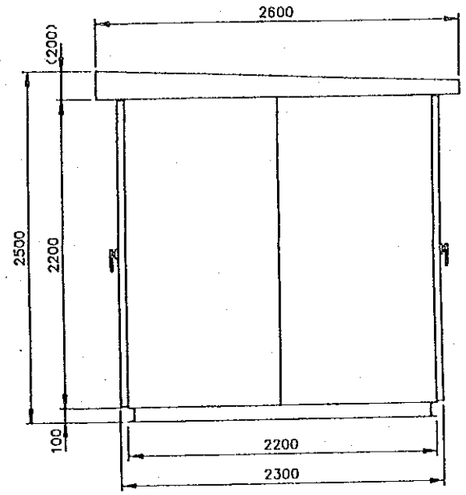
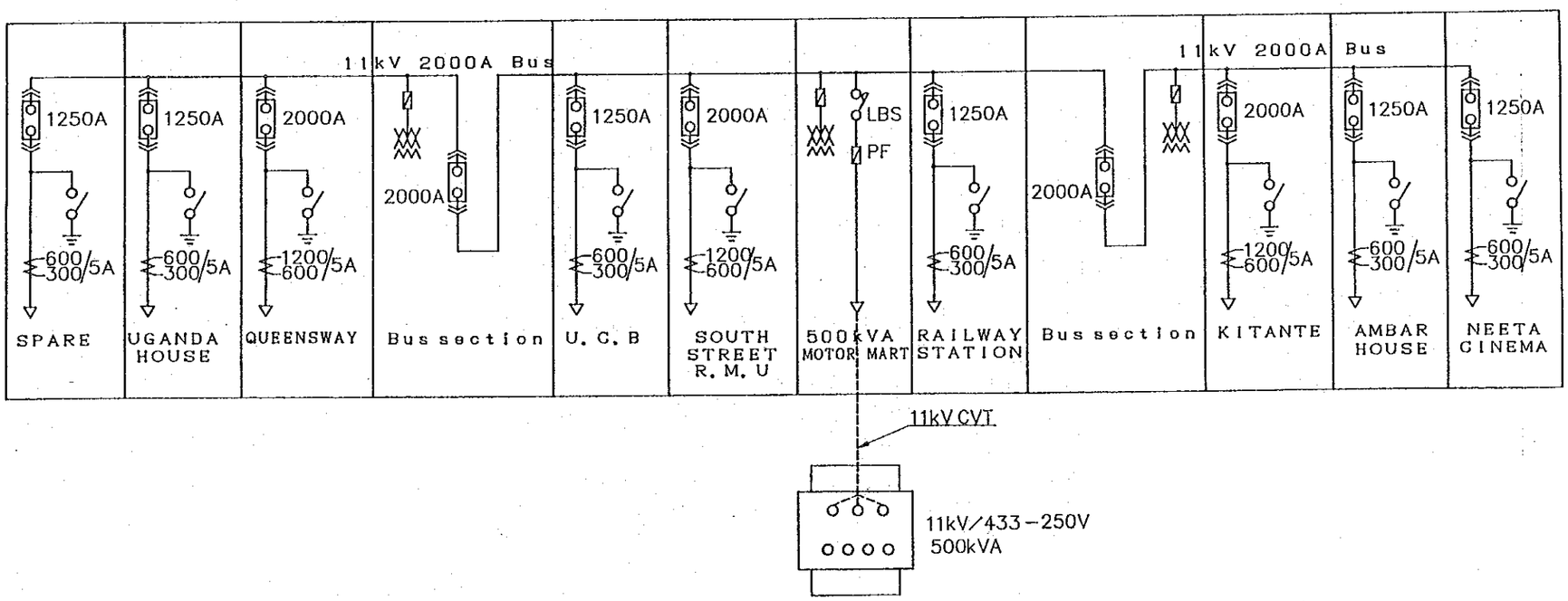


Section A - A (S=1:30)

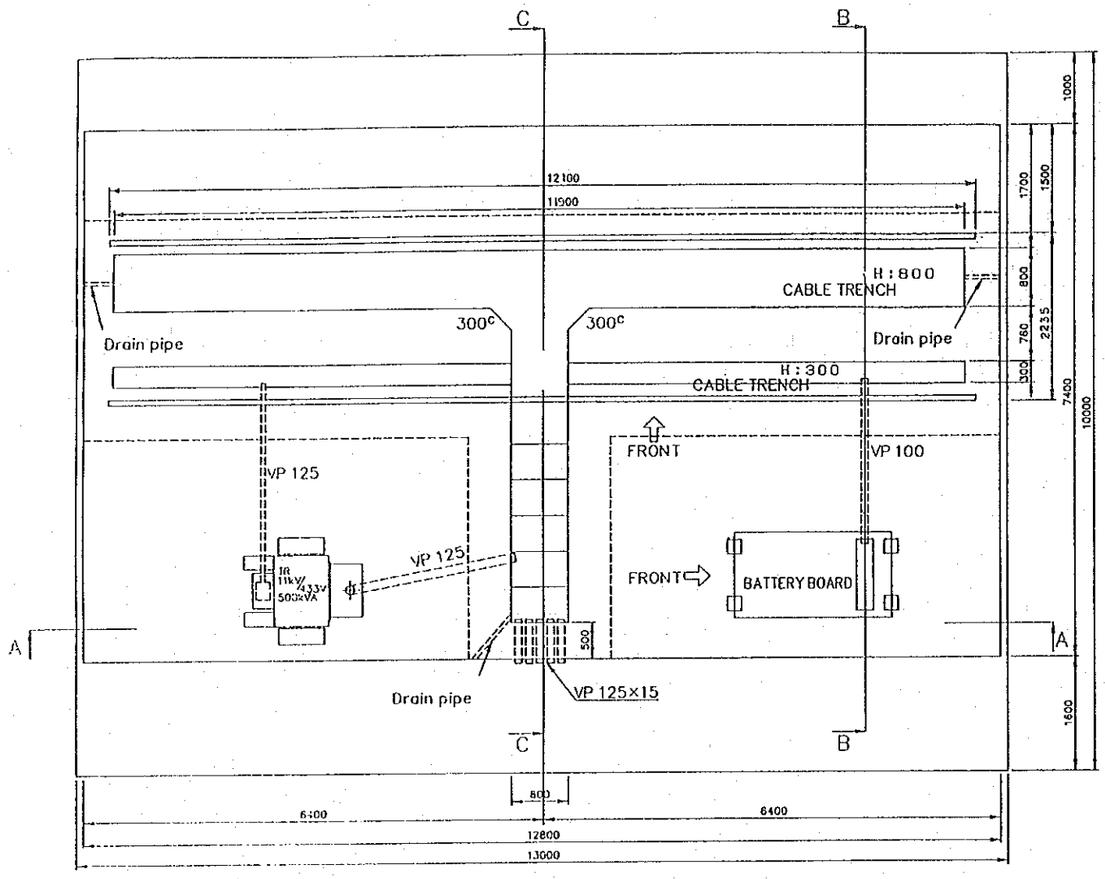
THE PROJECT FOR THE REINFORCEMENT OF ELECTRIC POWER DISTRIBUTION NETWORK IN KAMPALA IN THE REPUBLIC OF UGANDA				SCALE —
Motor Mart Switching Station Equipment Layout Plan				DWG NO. UHB-02
DATE	DESIGNED	CHECKED	APPROVED	REVISION
JAPAN INTERNATIONAL COOPERATION AGENCY				







THE PROJECT FOR THE REINFORCEMENT OF ELECTRIC POWER DISTRIBUTION NETWORK IN KAMPALA IN THE REPUBLIC OF UGANDA				SCALE ---
Motor Mart Switching Station Outline of 11KV Outdoor Type Switchgear Cubicle				DWG NO. UMB-03
DATE	DESIGNED	CHECKED	APPROVED	REVISION
JAPAN INTERNATIONAL COOPERATION AGENCY				



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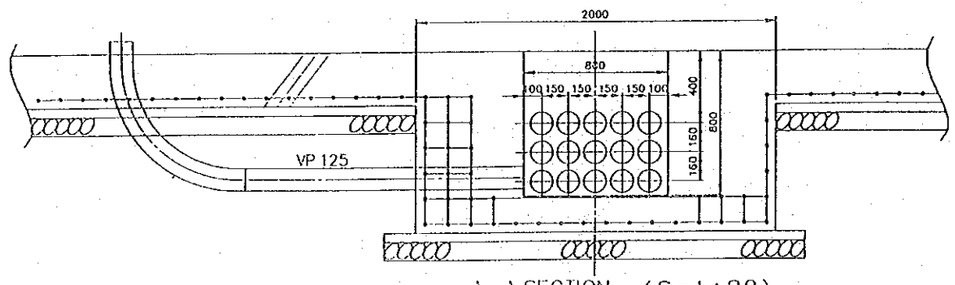
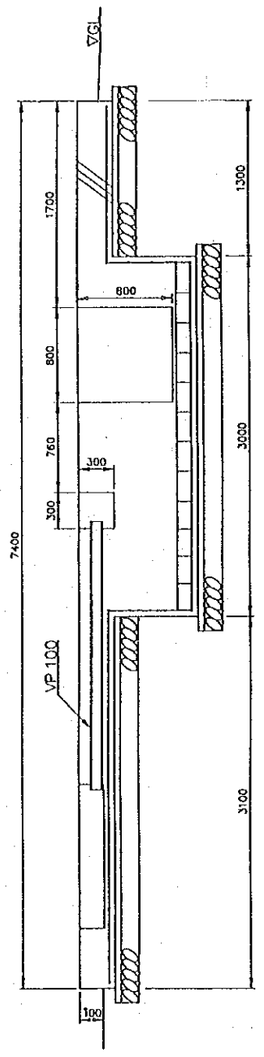
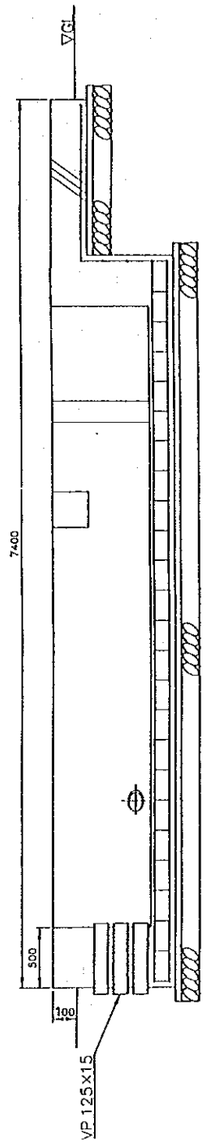


A-A SECTION (S=1:20)



B-B SECTION (S=1:30)



C-C SECTION (S=1:30)

THE PROJECT FOR THE REINFORCEMENT OF ELECTRIC POWER DISTRIBUTION NETWORK IN KAMPALA IN THE REPUBLIC OF UGANDA				SCALE —
Motor Mart Switching Station Arrangement of Cable Tranch and Foundation				DWG NO. UMB-04
DATE	DESIGNED	CHECKED	APPROVED	REVISION
JAPAN INTERNATIONAL COOPERATION AGENCY				

5-3-3 Equipment and Materials Procurement Plan

(1) 11KV Distribution Materials

The items, specifications and quantities to be procured for the 11KV distribution materials based on the study results (see 4-2-5) and the design policy (see 5-1) are shown in Table 5-4.

Table 5-4 11KV Distribution Materials to be Procured under the Project

No.	Item	Category	Unit	Procurement Quantity		
				Phase I	Phase II	Total
1	JPU Fuse 80A	maintenance & protection materials	piece	3,000	0	3,000
2	JPU Fuse 160A	maintenance & protection materials	piece	3,000	0	3,000
3	JPU Fuse 315A	maintenance & protection materials	piece	3,000	0	3,000
4	JPU Fuse 400A	maintenance & protection materials	piece	3,000	0	3,000
5	HRC Fuse 80A	maintenance & protection materials	piece	3,000	0	3,000
6	Interior cut out 150A	maintenance & protection materials	piece	150	0	150
7	Interior cut out 300A	maintenance & protection materials	piece	150	0	150
8	60/80A SP house service cut outs	maintenance & protection materials	set	1,500	0	1,500
9	Elements slow Burning 5A	maintenance & protection materials	piece	180	0	180
10	Elements slow Burning 15A	maintenance & protection materials	piece	360	0	360
11	Elements slow Burning 25A	maintenance & protection materials	piece	360	0	360
12	70mm² 11KV 3C XLPE CU cable	maintenance & protection materials	m	300	0	300
13	Cork sheet 1.2m x 1.2m x 3mm	maintenance & protection materials	piece	30	0	30
14	Cork sheet 1.2m x 1.2m x 6.4mm	maintenance & protection materials	piece	30	0	30
15	Cork sheet 1.2m x 1.2m x 1.6mm	maintenance & protection materials	piece	30	0	30
16	Manila ropes 24mm (88KG) in coils	construction materials	coil	0	0	0
17	Manila ropes 15mm (42KG) in coils	construction materials	coil	0	0	0
18	Manila ropes 12mm (23KG) in coils	construction materials	coil	0	0	0
19	Preformed PT make off for 7/8 SWG stay wire	construction materials	piece	0	0	0
20	Preformed PT make off for 7/12 SWG stay wire	construction materials	piece	0	0	0
21	Preformed wrap guy grips for 7/8 SWG stay wire	construction materials	piece	0	0	0
22	Preformed wrap guy grips for 7/12 SWG stay wire	construction materials	piece	0	0	0
23	Turn Buckles 10" x 5/8" eye each end	construction materials	piece	0	0	0
24	Turn Buckles 10" x 3/4" eye each end	construction materials	piece	0	0	0
25	Silica gel in 25KG pack	maintenance & protection materials	piece	15	0	15
26	25KVA single phase 11KV/250V transformer	distribution equipment	set	45	105	150
27	50KVA three phase 11KV/433V transformer	distribution equipment	set	30	70	100
28	100KVA three phase 11KV/433V transformer	distribution equipment	set	15	35	50
29	315KVA three phase 33KV/433V transformer	distribution equipment	set	0	5	5
30	Surge arrestor 11KV	distribution equipment	set	360	840	1,200
31	Surge arrestor 33KV	distribution equipment	set	0	900	900
32	Autorecloser 11KV	distribution equipment	set	0	9	9
33	JPU Fuse 100A	maintenance & protection materials	piece	0	3,000	3,000
34	JPU Fuse 200A	maintenance & protection materials	piece	0	3,000	3,000
35	JPU Fuse 250A	maintenance & protection materials	piece	0	3,000	3,000

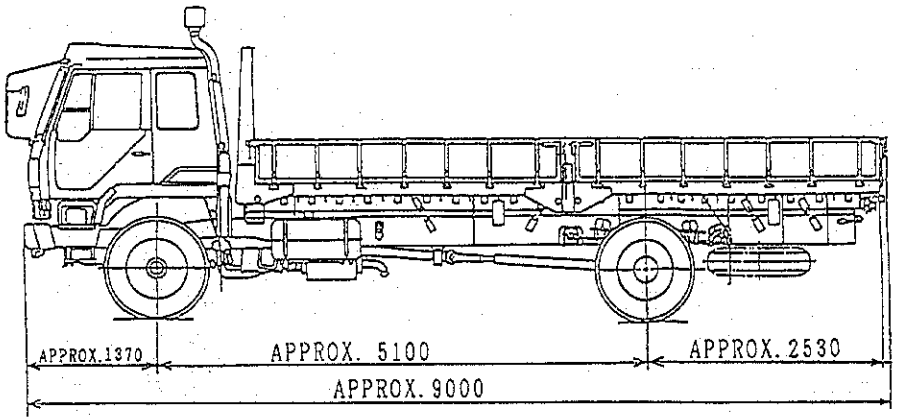
(2) Maintenance Vehicles

In accordance with the study results of the requested equipment and materials, etc. (see 4-2-5), the maintenance vehicles shown in Table 5-5 will be procured under the Project. The subject vehicles are illustrated in Fig. 5-1.

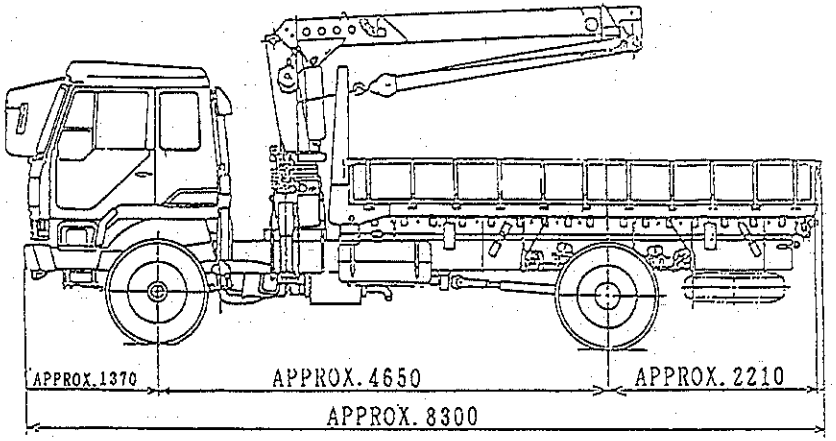
Table 5-5 Maintenance Vehicles to be Procured under the Project

Item	Specifications	Procurement Quantity		
		Phase I	Phase II	Total
Lorry*	diesel engine loading capacity: 7 tons spatial capacity: 4.5m^3	2	5	7
4 wheel drive	diesel engine (around 2,500cc) 9 seats	4	4	8
Self-loading lorry	diesel engine loading capacity: 10 tons max. lifting weight: 3 tons	2	0	2
Street lighting lorry	diesel engine boom length: about 10m with work platform	1	0	1
Spare parts	2 years' supply	1	1	

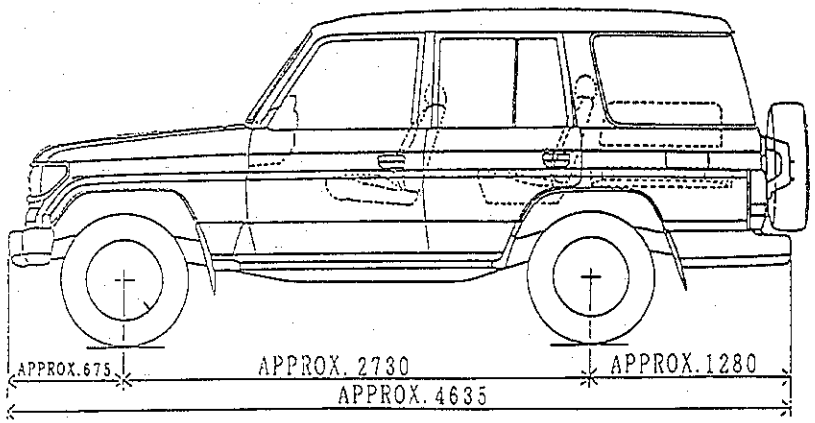
* UEB requested the installation of a power winch to each lorry for the installation of pole mounted transformers and poles. In view of the facts that the standard Japanese lorry does not have an appropriate body structure to support such a winch and that the use of the crane of the self-loading lorry for such work is safer than the use of a winch, it has been decided that a winch will not be provided under the Project.



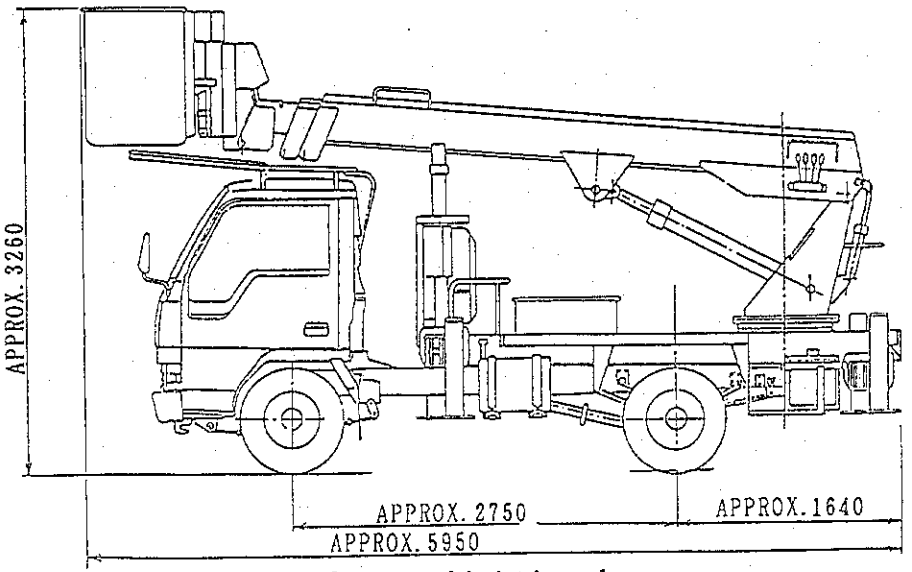
Lorry



Self loading lorry



4 Wheel drive vehicle



Street lighting lorry

Fig. 5-1 Outline of Vehicles for the Project

(3) Auxiliary Equipment and Materials Related to the Stations

In accordance with the study results of the requested facilities (see 4-2-5 (1)) and the contents of the facility plan (see 5-3-2), the equipment and materials related to the stations which are listed in Table 5-6 will be procured under the Project.

Table 5-6 Auxiliary Equipment and Materials related to the Stations to be Procured under the Project

Item	Quantity		
	Phase I	Phase II	Total
1. 11KV underground distribution cable for section between Queensway Substation and Motor Mart Switching Station (11KV armoured cable 3 cores, 185mm^2)	-	5km	5km
2. 33KV underground transmission cable for connection between Queensway Substation and Lugogo Substation (33KV armoured cable 3 cores, 185mm^2)	-	500m	500m
3. 11KV distribution cable to connect existing 11KV line to new 11KV switchgear cubicle (11KV armoured cable 3 cores, 70mm^2)	400m	-	400m
4. 33KV outdoor type surge arrestors for 33KV line to Lugogo Substation (future plan in Queensway Substation) and for reserve circuit (30KV, 10KA, gapless type)	2 sets	-	2 sets
5. 2 years' supply of spare parts for new substation facilities	1 set	-	1 set

5-4 Implementation Plan

5-4-1 Implementation Method

The Project will be implemented within the framework of Japan's grant aid. Prior to implementation, the Project must be approved by both governments and the Exchange of Notes (E/N) will be concluded. Following the conclusion of E//N, the Government of Uganda will make a contract with a Japanese consulting firm to conduct the detailed design work. Upon completion of the detailed design documents, a Japanese contractor selected through a tender procedure supervised by both the consultant and the Government of Uganda will commence the construction of the facilities and the procurement of the equipment and materials. Particular attention must be paid to the following in the implementation of the Project.

(1) Execution Agency

UEB which is responsible for all services in the power sector in Uganda will be responsible for the implementation of the Project (see 2-2-1). At UEB, the Development, Distribution and Administration Divisions will be directly responsible for the smooth progress of project implementation under the leadership of the Deputy Managing Director in charge of technical aspects. The Government of Uganda is required to appoint a full-time official to coordinate project implementation by maintaining close contact and consulting with the Japanese consultant and contractor.

(2) Consultant

For the construction of the facilities and the procurement of the equipment and materials under the Project, the Japanese consulting firm will conclude a consultancy agreement with the Government of Uganda, conduct the detailed design for the construction and procurement and conduct the supervision and control of the construction work. The consulting firm will also prepare the tender documents and conduct the tender procedure on behalf of the Government of Uganda.

(3) Contractor

In accordance with Japan's grant aid, the Japanese contractor to be selected by public tender will construct the facilities and procure the necessary equipment and materials. It is also considered necessary for the contractor to provide such after-service as the supply of spare parts and the repair of broken-down equipment even after the completion of the construction work. Therefore, the contractor should give due consideration to communications with and coordination between the Ugandan side and the Japanese counterpart following the completion of the construction work.

(4) Necessity for Dispatch of Engineers

The construction work under the Project requires engineers well experienced in the configuration and functions of the facilities for the Project. The manufacturer of the substation facilities in Japan will be required to dispatch engineers well experienced in construction and other aspects of the required work to Uganda in view of the difficulty of securing such engineers in Uganda.

(5) Specific Points to Note for Construction Work

The following points must be noted for the construction of the subject substation facilities taking the facts that the work will be conducted alongside the operating

substation and the Project's classification as an official grant aid cooperation project into consideration.

1) Particular care is required for packaging and the transportation time as the main equipment and materials for the Project will be taken to the sites by long land transportation (some 1,100km) from Kilindini Port.

2) The construction method and machinery to be used should be carefully selected to avoid accidental damage to the existing facilities.

3) The temporary facilities and stockyard required for the construction work should be located so as not to damage the existing facilities.

4) The construction schedule must be coordinated with the schedules of the work to be conducted by the Ugandan side through prior consultations with UEB and must be adhered to.

5) All the work at the Queensway Substation and Motor Mart Switching Station must be smoothly conducted to minimize the installation work period and to adhere to the planned implementation schedule.

5-4-2 Conditions of Local Construction Industry

(1) Construction Industry in Uganda

1) Engineers and workers capable of conducting the foundation and other work can be employed locally.

2) Engineers capable of conducting the installation and adjustment, etc., of the anticipated substation facilities for the Project cannot be employed locally.

3) Except for some special items, it is believed that the construction machinery and general tools can be supplied locally.

4) The use of Kilindini Port in Kenya for the unloading of the equipment and materials is advisable in view of the fact that it is Kenya's largest unloading port. With the large unloading facilities available at the Port, no difficulties are anticipated in handling the cargo for the Project.

5) In regard to the inland transportation of some 1,100km from Kilindini Port to the Project sites, the road is in generally good condition except for some short sections. This is currently the main route for the supply of goods to Uganda and is perfectly usable with some care taken in driving.

(2) Points to Note for Construction Work

1) Kampala has 2 rainy seasons, i.e., from March to May and from September to November, during which the monthly rainfall tends to exceed 100mm, indicating that particular attention should be paid to the installation of heavy equipment.

2) The installation of the substation facilities should immediately follow the completion of the land preparation and foundation work.

3) The construction schedule at the Queensway Substation must be coordinated with the land preparation work to be conducted by UEB and the foundation work (concrete placing) to be conducted by the contractor.

4) As the planned site for the new Motor Mart Switching Station faces 2 busy roads, particular care should be taken to avoiding any injury to any third party due to the construction work on the site.

5-4-3 Work Supervision Plan

In accordance with the general policy of Japan's grant aid and the main objectives of the basic design, the consultant will organize a consistent project team to conduct the detailed design and supervisory work for the smooth implementation of all the work. At the supervisory stage, the consultant will dispatch technically qualified field supervisory personnel to the sites for liaison and the provision of guidance on the execution of the work. The field supervisory personnel will be dispatched in accordance with the following schedule.

First Half (approx. 1.5 months) : 1 civil engineer (supervision of foundation work for main equipment)

Second Half (approx. 2 months) : 1 electrical engineer (supervision of equipment installation work)

In addition, it will be necessary for the consultant to dispatch engineers, each of which is responsible for a particular field of design, for a short period of time as required in accordance with the progress of the work to supervise work implementation and to conduct inspections.

(1) Basic Principles for Supervision of Construction Work

The consultant is required to conduct appropriate supervision throughout the work period in view of the safe execution of the construction work and meeting all the requirements within the set construction period on the basis of the following principles.

1) Management of Work Progress

a) The manufacture and delivery of the equipment and materials and work progress will be controlled by continual checks on the work progress against the original plan.

b) The schedule for each type of work will be controlled on a monthly, weekly and daily basis and guidance will be provided to the contractor to meet the agreed work schedule.

2) Quality Control

a) The quality of the equipment and materials will be controlled by checking them against the specifications given in the detailed design documents.

b) Accuracy inspections, construction method inspections and various performance tests regarding installation, piping, wiring and connection work, etc., undertaken on the sites will be conducted.

3) Safety Control

a) Guidance will be provided to the contractor in view of raising the consciousness of all workers, down to those at the lowest level, of the need to prevent accidents while foreman class workers will be trained to foresee any dangers involved in the work.

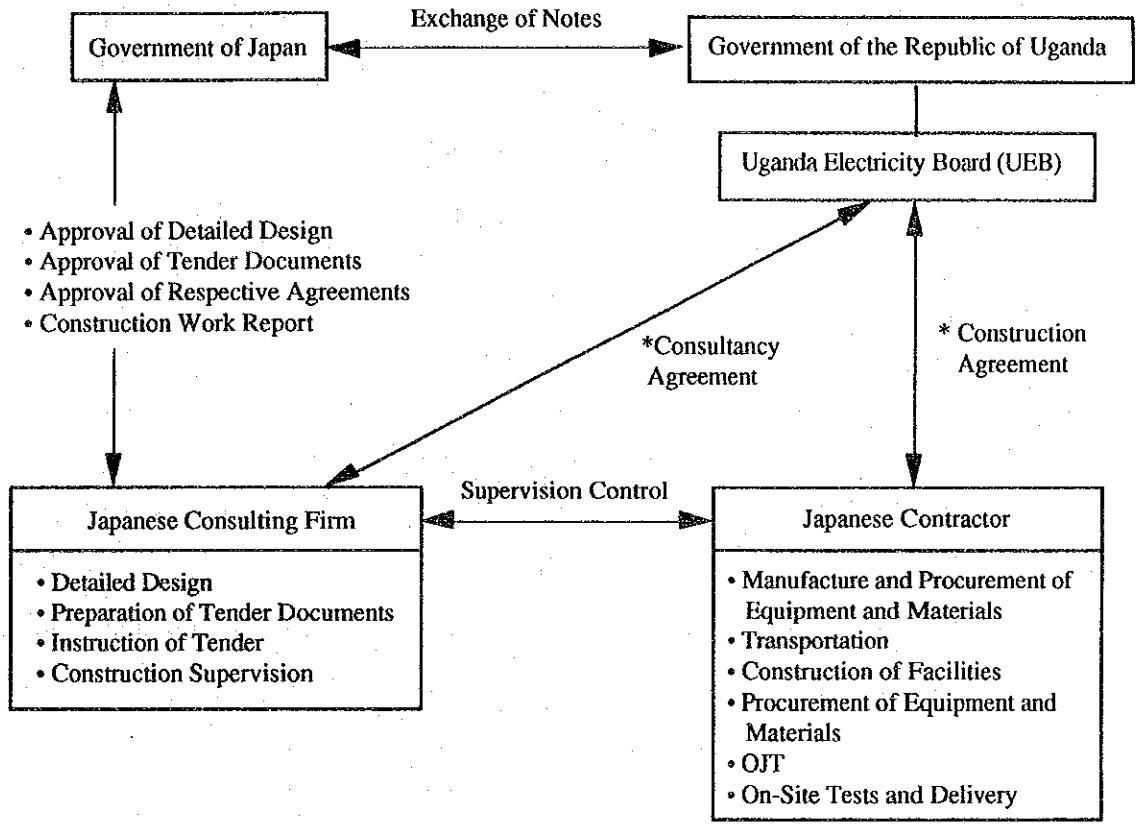
b) Continual checks of the operation of the existing facilities will be ensured to avoid electrification accidents.

c) Every effort will be made to prevent accidents by continual checks of the conditions of the construction machinery, including lorry-loaded cranes.

d) When transport vehicles and construction machinery, etc., travel on the construction sites, slow driving will be strictly adhered to and every precaution taken to prevent traffic accidents which could cause injury and/or damage to the existing facilities.

(2) General Relationships During Supervisory Control

The following figure shows the general relationships of the work supervision system and related organizations during the supervision period.



* Both the consultancy and construciton agreements are subject to verification by the Government of Japan.

Fig. 5-2 Processes of Project Implementation

(3) Work Supervisors

In order for the contractor complete the construction of the facilities conforming to the specifications given in the detailed design documents within the set construction period, work supervisors with the ability to smoothly manage joint work with local contractors and to provide adequate technical guidance to such local contractors are required. In addition, it is desirable that these supervisors have experience in similar projects in order to guarantee a high work quality.

Based on the scale and contents of the facilities to be constructed under the Project, the contractor stationed at the sites may require the following full-time supervisors:

Site Manager	: 1 (to supervise the entire work and to execute administration)
Electrical Supervisor	: 3 (to supervise the installation of electrical equipment and work progress)

Civil Engineering Supervisor : 1 (to supervise the civil engineering work, including foundation work, and work progress)

5-4-4 Procurement Plan

(1) Sources of Equipment and Materials

The equipment and materials for both construction and Project procurement purposes will be supplied from Japan or a third country with the exception of aggregate for concrete in view of the local unavailability of such equipment and materials. While Uganda imports some of these items, the existing import arrangements cannot be relied upon in view of difficulties in meeting the delivery or quality requirements for the Project.

As a result of a comparative study on industrial standards, specifications, quality, production, supply stability, lead time and prices, the equipment and materials for the Project will be procured from the sources listed in Table 5-7 below.

Table 5-7 Sources of Equipment and Materials

Source	Equipment and Materials	Remarks
Uganda	sand, gravel, rubble, cement, fuel oil	
Third Countries	11KV distribution materials (except distribution transformers and cables)	required to conform to BS as all existing equipment and systems are made to BS except distribution transformers and cables where IEC standards were used
Japan	• 33KV outdoor type switchgear cubicle • 11KV outdoor type switchgear cubicle • power transformers • battery board • conduit pipes and cables • steel materials • paint • special tools for substation use • spare parts • maintenance vehicles • distribution transformers	

(2) Transportation Method

Adequate packaging must be provided for cargo to withstand the transportation conditions in terms of the port conditions in Kenya, long land transportation distance, total transportation period and Project sites. Trailers, etc., will be used for the some 1,100km land transportation of the cargo from the unloading port in Kenya to the Project sites.

5-4-5 Implementation Processes

(1) Outline

In the event of the Project being implemented as a Japan's grant aid, the facilities will be constructed and the equipment and materials procured in the following 3 stages following the conclusion of the Exchange of Notes (E/N) by the 2 governments: ① preparation of detailed design documents, ② tender and agreement on construction work and ③ execution of construction work. These processes are illustrated in Fig. 5-3.

1) Detailed Design Work

Following the conclusion of the E/N, the Japanese consultant will immediately conclude a consultancy agreement with the Government of Uganda and commence the detailed design work.

Based on the confirmed results of the basic and detailed design surveys, the consultant will prepare the tender documents, including the tender specifications and detailed design drawings. The consultant will hold thorough discussions with the responsible organizations in Uganda at both the initial and final stages of the detailed design and proceed with the tender process upon receipt of approval of the prepared documents and drawings, etc., by the Ugandan side. The required time for the above detailed design work will be 3 months for Phase I construction work and 2 months for Phase II construction work.

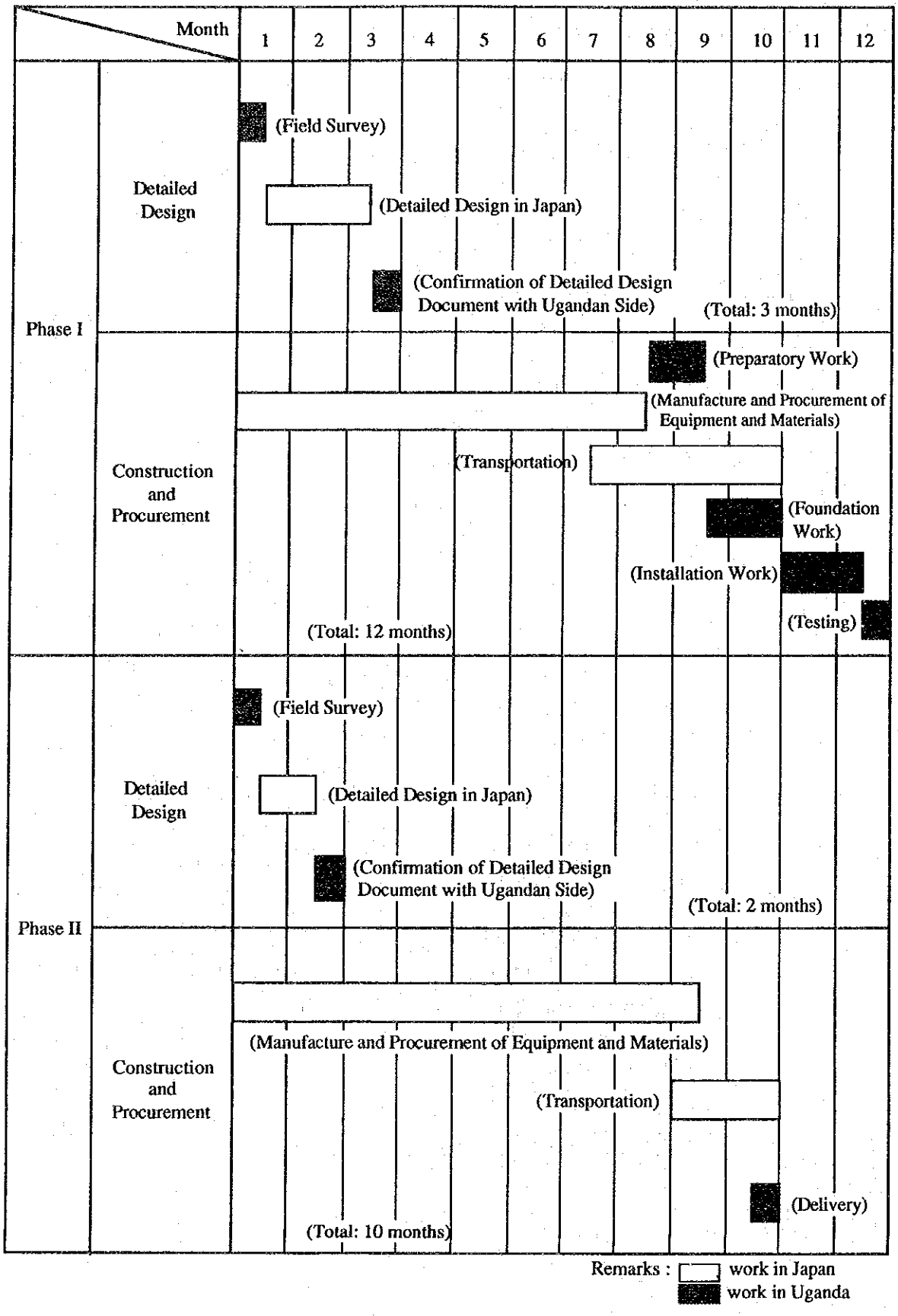


Fig. 5-3 Project Implementation Schedule

2) Awarding of Contract

Acting for the Ugandan side, the consultant will announce the tender, accept applications, evaluate the tenderers in terms of the necessary qualifications, hold briefings on the tender and distribute the tender documents. After allowing a certain period of time for the preparation of the tenders, the consultant will then accept the tenders, promptly examine them and assist in the quick conclusion of a construction agreement between the Government of Uganda and a Japanese contractor.

The tender of the applicants will be opened in the presence of all the parties concerned. The applicant with the lowest price will be selected as the successful bidder if the contents of the tender are found to be appropriate and will conclude a construction agreement with the Government of Uganda.

The period from the commencement of the tender process to the conclusion of the contract is expected to be 2 months for both phases.

3) Construction Work and Procurement of Equipment and Materials

Following the signing of the construction agreement, the contractor will commence work upon verification by the Government of Japan. Judging from the scale of the Project and the contents of the facilities and if the preparatory work for which the Uganda side is responsible is smoothly conducted, the construction work and procurement of equipment and materials are expected to be completed in 12 months for Phase I and 10 months for Phase II.

The consultant will hold discussions with the contractor prior to the commencement of the work, provide guidance and instructions to the contractor on the transportation of the equipment and materials to the sites, construction methods and construction schedule, conduct process and quality control and ensure that all the work is completed within the period set forth in the E/N.

5-4-6 Scope of Works

(1) Work Assignment

The Governments of Japan and Uganda will undertake the following work to complete the Project.

1) Work to be Undertaken by Government of Japan

a) To undertake construction of new facilities for the Queensway Substation.

b) To undertake construction of the new Motor Mart Switching Station.

c) To procure of the 11KV distribution materials.

d) To procure of maintenance vehicles.

2) Work to be Undertaken by Government of Uganda

a) To provide cleared, embanked and leveled land for the Project prior to the commencement of the construction of the Japanese side.

b) To provide the land for temporary site office, warehouse and stock yard in the sites during the implementation period.

c) To ensure speedy unloading, tax exemption, custom clearance of the goods for the Project at the port and/or airport of disembarkation.

d) To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contracts such facilities as may be necessary for their entry into the Republic of Uganda and stay therein for the performance of their work.

e) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the Republic of Uganda with respect to the supply of the products and services under the verified contracts.

f) To bear commissions to a Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

g) To bear all the expenses, other than those to be borne by the Grant Aid necessary for the execution of the Project.

h) To provide proper arrangements for the construction, such as water supply, electricity, drainage, etc., if necessary.

i) To assign exclusive-counterpart engineers/technicians to the Project in order to transfer the operation and maintenance technique for the Project and to witness and conform construction when inspection are carried out.

j) To take necessary measures and responsibility for the stoppage of electricity during a construction period when it is necessary.

k) To construct and connect the cables for incoming and outgoing feeders for Queensway Substation and Motor Mart Switching Station.

l) To construct the temporary 33KV cables between the existing 33KV transmission lines and the existing 33/11KV power transformers prior to the commencement of the construction of Japanese side.

m) To dismantle and remove the existing equipment and facilities not to be used for the Project in Queensway Substation and Motor Mart Switching Station.

n) To provide a bench mark at the sites.

o) To provide site drainage system and other facilities including outdoor lighting system, fire fighting system, telecommunication system, etc., at the sites if necessary.

p) To provide necessary data and information for the detailed design of the Project.

q) To take necessary measures to expedite the approval for executions of the Project by the Government of Uganda.

r) To control traffic during the inland transportation of the facilities of the Project, if necessary.

s) To provide the disposal places of the surplus soil during the construction period.

t) To secure the approval for access to public and private land for the Project.

u) To secure the approval for protection works for the existing facilities, if necessary.

v) To provide relay tap setting work regarding the transmission lines and study of the transmission network including relay protection coordination, short circuit calculation, etc.

(2) Cost to be Borne by Government of Uganda

Total Cost Estimate (see Appendix 9) 5.41 million shs (about 1.23 million yen)

Phase I:

1) Relocation cost of station transformer and bus line	2.45 M shs
2) Land preparation cost	2.02 M shs
3) Line connection cost to existing networks	0.28 M shs
4) Cost of temporary cabling work between existing transformers and 33KV transmission line	0.21 M shs
5) OJT trainee	0.45 M shs
Phase I total shs	5.41 M shs

Phase II: none

In addition, the following expenses will be incurred.

1) Commission for banking arrangements : 0.01% of E/N value

2) Advising commission of authorization : approx. 3,000 yen for each issue of A/P to pay (A/P)

Estimate Conditions

1) Estimate Time : March, 1991

2) Exchange Rate : 1 US$ = 583.18 shs (Rate as of February 1991)

1 US $ = 133.79 Yen (Average TTS rate from September 1990 to March 1991)

3) Construction Period : The Project shall be executed by two phases as shown in Fig. 5-3.

4) Others : The Project shall be executed under the regulation of Japan's grant aid.

CHAPTER 6 PROJECT EFFECTS AND CONCLUSIONS

CHAPTER 6 PROJECT EFFECTS AND CONCLUSIONS

6-1 Project Effects

Following its completion, the Project is expected to have the following direct and indirect effects.

6-1-1 Direct Effects

The Project is expected to have the direct effects of providing a stable power supply through the construction of new substations and the installation of new distribution equipment, including distribution transformers, and increasing revenue.

The expected direct effects are summarized in Table 6-1. The effects of Phase I will be the provision of a stable power supply through the new facilities at the Queensway Substation and Motor Mart Switching Station, including the renewal of power transformers, and the generation of new revenue through power supply from the rehabilitated stations to the amount of some 250 million shs in the first year.

The direct effect of Phase II will be increased revenue through the installation of distribution transformers to be procured as part of Phase II. Since the provision of these distribution transformers means the reinforcement of the existing distribution network (increased transformer capacity), the revenue increase will be some 59 million shs which are equivalent to the increased transformer capacity (total : approximately 11MVA).

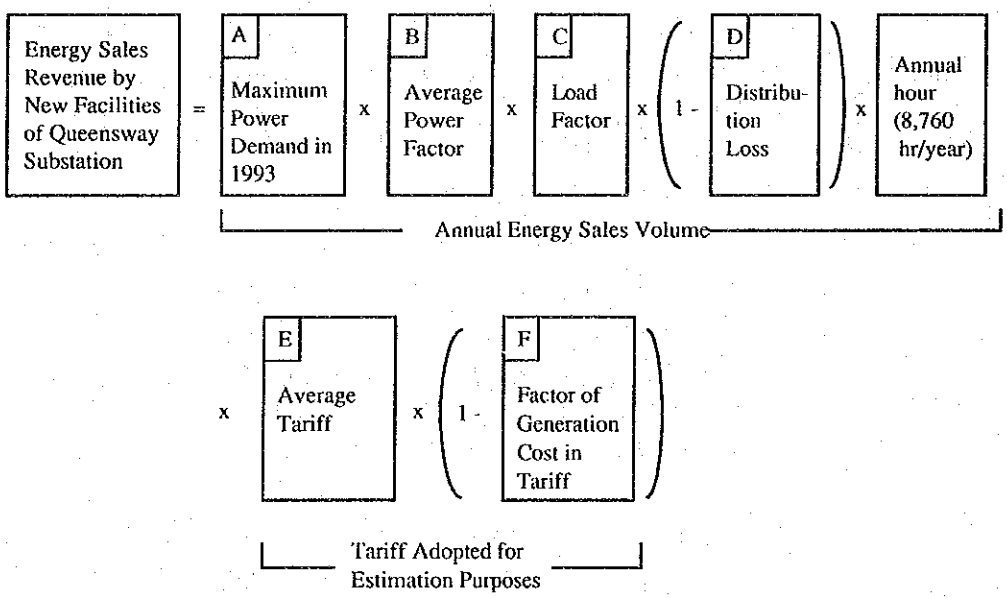
Table 6-1 Direct Effects of the Project

Item	Effects After Project Completion (1993)	
	Phase I	Phase II
Energy sales revenue due to new facilities of Queensway Substation	approx. 250 million shs [see precondition (2)]	—
Increased revenue due to installation of distribution transformers	— [see precondition (3)]	approx. 59 million shs [see precondition (4)]
Number of consumers (service population)	43,200 households (approx. 259,000 persons) [see preconditions (5)]	144,000 households (approx. 864,000 persons) [see precondition (6)]

Preconditions for Table 6-1:

(1) The subject year for the assessment of the effects is 1993 prior to the completion of the rehabilitation and new facility construction work at the Lugogo, Mutundwe, Gaba, Kireka and Port Bell Substations under the Second Power Project.

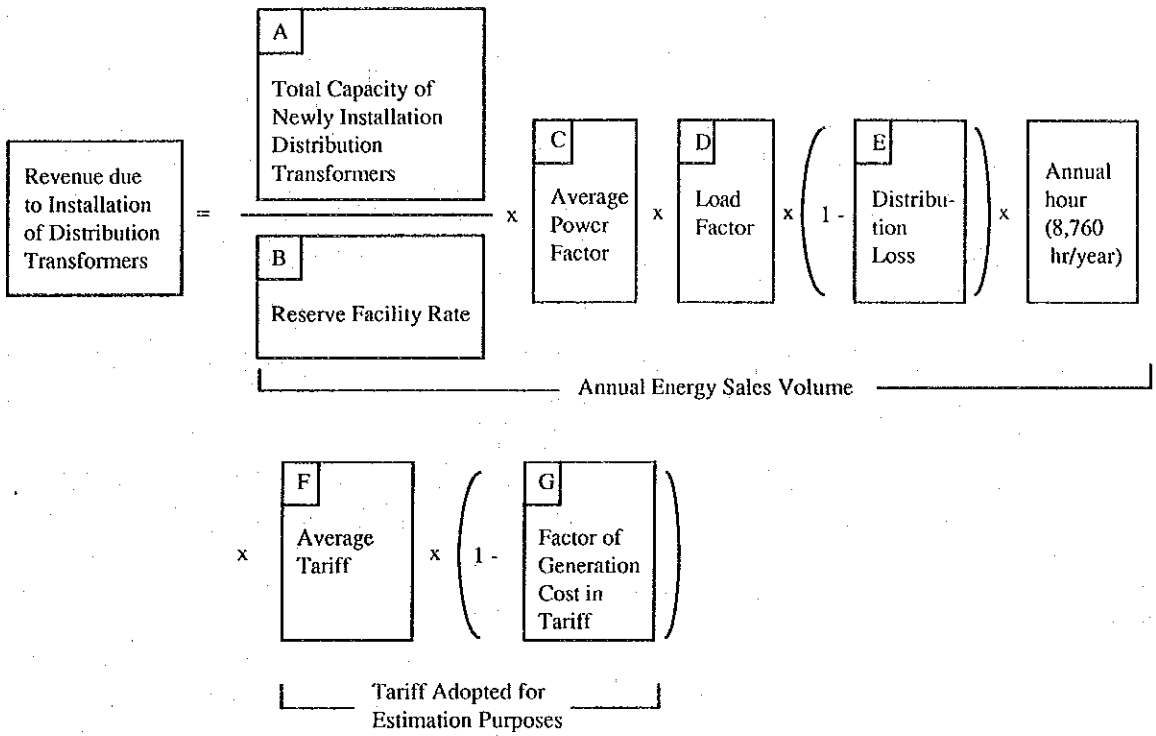
(2) The revenue for the first year following the completion of Phase I due to the construction of the new facilities is estimated as follows:



A : 31.9MVA based on the Design Report 1989
B : 0.9 based on the Design Report 1989
C : 0.24 based on the Design Report 1989
D : 0.1 (assumption)
E : 9 shs/KWh based on Table 3-4 - Tariff as of 1991
F : 0.5 (assumption)

(3) The energy sales revenue due to the installation of the distribution transformers in Phase I is not considered in the relevant revenue in (2) above. Because, the service area covered by the new power transformers at the Queensway Substation includes those areas where the new distribution transformers will be installed.

(4) The revenue due to the installation of the distribution transformers in Phase II is estimated as follows:



A : The total distribution transformer capacity to be procured in Phase II will be 11.2MVA.

B : 1.5 (Assumption)

C : 0.9 based on the Design Report 1989

D : 0.24 based on the Design Report 1989.

E : 0.1 (Assumption)

F : 9 shs/KWh based on Table 3-4 - Tariff as of 1991

G : 0.5 (Assumption)

(5) The number of consumers (service population) for Phase I is assumed to be 30% of the total households in Kampala (144,000) based on the relative ratio of the maximum power demand for the Queensway Substation (including the Motor Mart Switching Station) vis-a-vis the maximum power demand for entire Kampala.

(6) The estimated population in Kampala in 1993 is used as the total number of consumers (service population) for the Phase II period as a sufficient number of

(7) The basis for calculating the population is an average number of people per family of 6 and an annual population growth rate of some 5% as suggested in the Design Report 1989.

6-1-2 Indirect Effects

The following indirect effects are expected as a result of the implementation of the Project.

(1) Power Supply

1) With the construction of the new facilities and the procurement of equipment and materials for the 11KV distribution network, the Second and Third Power Projects which form part of the plan to provide Kampala with a stable power supply will be greatly assisted in meeting their objectives.

2) The acquisition of the new maintenance vehicles will provide the necessary mobility for the appropriate maintenance of the distribution network.

3) The transfer of technology relating to the operation and maintenance will upgrade the technical level of UEB engineers, establish a reliable power supply and improve efficiency and self-reliance in maintenance work.

(2) Public Life

1) The stable supply of electricity will stabilize public life, vitalize commercial and industrial activities and assist the smooth running of such public facilities as general post office, banks, etc.

2) The general security of public life will be improved as lighting becomes readily available due to a constant power supply.

(3) Socioeconomy

1) The stable power supply service which is one of the most important elements of the social infrastructure will reduce the excessive dependence on emergency power generation units (diesel generators), reducing production costs and thus revitalizing economic activities.

2) The reliable power supply will promote economic activities in general.

3) The rehabilitation of the existing transmission and distribution networks which is the main target for the energy sector in the Rehabilitation and Development Plan (1988/89 ~ 1991/92) will be promoted.

3) The rehabilitation of the existing transmission and distribution networks which is the main target for the energy sector in the Rehabilitation and Development Plan (1988/89 ~ 1991/92) will be promoted.

(4) Environment

A reliable power supply will reduce the use of such natural resources as charcoal and firewood which are currently used as alternative energy sources of electricity, thus contributing to environmental conservation.

6-2 Suitability of Project Contents

6-2-1 Technical Aspects

The scale of the planned substation facilities under the Project corresponds to the scale of the facilities anticipated in the Second Power Project. The construction plan for the Project is designed to minimize adverse effects on public life by adopting the use of the existing facilities and the short construction period required will reduce the length of possible power cuts due to the work. In view of such design and arrangements, the construction plan is deemed suitable from the technical point of view.

6-2-2 Financial Aspects

The construction of the new substations and the installation of the distribution transformers are expected to result in additional revenue to improve the financial situation of UEB (see Table 6-1). As the operation and maintenance of the new facilities can be sufficiently conducted by UEB's present staff, no recruitment of additional personnel is required by UEB. Moreover, UEB is planning to introduce phased tariff increases based on its review of the present tariff system in order to improve its financial situation. In view of such additional revenue in the future, the construction of the new substations and the installation of the new distribution transformers, etc., will not pose any financial difficulty in the future.

6-2-3 Maintenance Aspects

The OJT to be provided as part of the Project will equip the Ugandan engineers with sufficient skills to maintain not only the new substation facilities but also other substation facilities.

In short, the Project contents appear suitable from all the technical, financial and maintenance aspects.

6-3 Conclusions

The general power supply in Kampala suffers from frequent power cuts due to breakdowns of the facilities caused by general deterioration and the shortage of spare parts as described in 3-4.

Although the Government of Uganda has made strenuous efforts to establish an efficient power service, it has found it difficult to provide adequate maintenance due to difficulties in securing spare parts for the outdated facilities and in the procurement of the necessary maintenance supplies given the low level of foreign reserves. Consequently, the electricity supply in the Kampala metropolitan area has been very unstable for some time which has had a negative impact on public life, including the operation of public facilities and industrial activities.

To remedy the situation, the Government of Uganda has prepared the Second and Third Power Projects and is currently implementing the former to urgently improve the power supply. The Project is considered to assist the these Power Projects and the implementation of the Project which aims at the construction of new substation facilities is expected to greatly contribute to the achievement of the stable operation of public facilities and the upgrading of public life in general in Kampala. The Project contents are judged to be optimal from the technical specifications and capacity of facilities, financial for personnel cost and others, and maintenance viewpoints to achieve the Project objective and equipment specifications are in harmony with those of the Second Power Project. The fact that the new facilities to be constructed or procured under the Project will not require any extra maintenance staff by UEB also contributes to the above judgement.

As already discussed in 2-3-1, the Project will assist the achievement of such objectives of the Rehabilitation and Development Plan (1988/89 ~ 1991/92) as the rehabilitation of public facilities in general and the urgent improvement of the energy situation in particular.

The benefits of the Project to public life as well as economic and industrial activities in Kampala will be tremendous given the fact that the Queensway Substation and Motor Mart Switching Station where the new facilities will be installed are directly responsible for the supply of power to the economic center in the Kampala metropolitan area.

The above considerations suggest that the Project's implementation as a Japan's grant aid is highly significant and that the Project satisfies all the requirements for qualification as such a project.

6-4 Recommendations

It is recommended that the Ugandan side takes the following measures to maintain the appropriate operation of the new facilities over a long period of time, as the Project plays an important part in improving to power supply system in Uganda to secure a stable power supply.

(1) The Ugandan side should review the overall operation plan for the transmission and distribution networks, including the new facilities to be installed under the Project, and should assist with the establishment of a highly reliable power supply system by the preparation of a concrete operation and maintenance plan for the new facilities.

(2) The Ugandan side should nominate engineers to be responsible for the maintenance of the new facilities to achieve the effective implementation and successful completion of the Project and these engineers should undergo the OJT to be provided under the Project.

(3) The Ugandan engineers selected to undergo the OJT should learn the operation and maintenance techniques from the Japanese engineers of the contractor and should continue to improve their technical expertise on their own initiative following the completion of the Project.

(4) The Ugandan engineers selected to undergo the OJT should transfer their newly acquired knowledge and techniques on operation and maintenance to their colleagues who do not undergo such OJT in order to improve the general technical level of Ugandan engineers.

APPENDIX 1 BASIC DESIGN STUDY TEAM

List of Study Team Members (Basic Design Study)

Name	Assignment	Position
Yusuke Kitamura	Team Leader	Deputy Director, First Training Division, Training Affairs Department, JICA
Tadao Okabe	Power Planner	Yachiyo Engineering Co., Ltd.
Masatsugu Komiya	Substation Facility Planner	Yachiyo Engineering Co., Ltd.
Kenji Miwa	Power Distribution Facility Planner	Yachiyo Engineering Co., Ltd.

List of Study Team Members (Draft Final Reporting Team)

Name	Assignment	Position
Yutaka Hosono	Team Leader	Manageing Director, Grant Aid Study and Design Department, JICA
Tadao Okabe	Power Planner	Yachiyo Engineering Co., Ltd.
Masatsugu Komiya	Substation Facility Planner	Yachiyo Engineering Co., Ltd.

APPENDIX 2 FIELD SURVEY SCHEDULE

1. Field Survey Schedule (Basic Design Study)

No.	Date	Day of the week	Weather	Place of stay	Schedule	Detail of Study Items
1	Jan. 28	Mon.	Fine	Frankfurt	Lv. Narita at 14:05 on LH 711 Ar. Frankfurt at 18:00	Departure of Basic Design Study Team from Tokyo
2	" 29	Tue.	Fine	in air-plane	Lv. Frankfurt at 19:45 on LH 580	
3	" 30	Wed.	Fine	Nairobi	Arrival in Nairobi at 05:45.	Courtesy visit to Embassy of Japan and JICA Office in Kenya
4	" 31	Thu.	Fine	Nairobi		Acquisition of entry visa for Uganda. Meeting at JICA Office
5	Feb. 1	Fri.	Fine	Kampala	Lv. Nairobi at 18:00 on KQ 412 Ar. Entebbe at 19:00	
6	" 2	Sat.	Fine	Kampala		Preparation of field survey (observation of Kampala and visits to Substations in Kampala)
7	" 3	Sun.	Fine	Kampala		Internal meeting of the Study Team
8	" 4	Mon.	Fine	Kampala		Visit to Ministry of Energy (MOE) and UEB. Briefing of Inception Report, grant aid system and questionnaire to UEB
9	" 5	Tue.	Fine	Kampala		Site survey at Queensway Substation (QWS) and Motor Mart Switching Station (MMS). Meeting with UEB on Inception Report and questionnaire
10	" 6	Wed.	Fine	Kampala		Meeting with UEB. Collection of Data and Information
11	" 7	Thu.	Light rain	Kampala		Meeting with UEB. Collection of data and information
12	" 8	Fri.	Fine	Kampala		Meeting with UEB. Site survey at Lugogo Substation (LGS)
13	" 9	Sat.	Fine	Kampala		Arrival of Team Leader Mr. Kitamura in Uganda. Internal meeting of the Study Team.
14	Feb. 10	Sun.	Fine	Kampala		Internal meeting of the Study Team. Site survey at QWS and MMS.
15	" 11	Mon.	Fine	Kampala		Preparation of draft Minutes of Discussions (M/D). Meeting with UEB on draft M/D
16	" 12	Tue.	Fine	Kampala		Meeting with UEB on draft M/D. Site survey at Owen Falls Power Station

No.	Date	Day of the week	Weather	Place of stay	Schedule	Detail of Study Items
17	" 13	Wed.	Light rain	Kampala		Meeting with UEB. Courtesy visit to World Bank Office. Signing of M/D. Collection of data and information. Departure of Team Leader Mr. Kitamura from Uganda
18	" 14	Thu.	Fine	Kampala		Meeting with UEB. Collection of data and information
19	" 15	Fri.	Fine	Kampala		Meeting with UEB. Collection of data and information
20	" 16	Sat.	Fine	Kampala		Preparation of field report
21	" 17	Sun.	Fine	Kampala		Preparation of field report
22	" 18	Mon.	Fine	Kampala		Meeting with UEB. Visit to and meeting at Kampala Municipal Office. Collection of data and information
23	" 19	Tue.	Fine	Kampala		Preparation of field report
24	" 20	Wed.	Fine	Kampala		Preparation of field report
25	" 21	Thu.	Fine	Kampala		Preparation of field report
26	" 22	Fri.	Fine	Kampala		Meeting with UEB
27	" 23	Sat.	Fine	Kampala		Preparation of field report
28	" 24	Sun.	Fine	Kampala		Preparation of field report
29	" 25	Mon.	Fine	Kampala		Meeting with UEB and preparation of field report
30	" 26	Tue.	Fine	Kampala		Submittance of and discussions on field report with UEB
31	Feb. 27	Wed.	Fine	Kampala		Discussion on field report with UEB
32	" 28	Thu.	Fine	Kampala		Approval on field report by UEB. Courtesy visit to various Ugandan organizations related to the Project
33	Mar. 1	Fri.	Fine	Frankfurt	Lv. Entebbe at 09:30 on ET 850 Ar. Addis Abbaba at 11:15. Lv. Addis Abbaba at 12:15 on ET 750 Ar. Frankfurt at 17:45	Departure of Basic Design Study Team from Entebbe
34	" 2	Sat.	Fine	in air-plane	Lv. Frankfurt at 18:50 on LH 710	
35	" 3	Sun.	Fine		Ar. Narita at 12:00	Arrival of Basic Design Study Team at Narita

2. Schedule of Draft Final Reporting Team

No.	Date	Day of the week	Weather	Place of stay	Schedule	Detail of Study Items
1	May 28	Tue.	Fine	in air-plane	Lv. Narita at 12:55 on LH 711 Ar. Frankfurt at 17:50 Lv. Frankfult at 23:15 on LH574	Departure of Consultant Team from Tokyo
2	" 29	Wed.	Fine	Nairobi	Lv. Nairobi at 08:20	Meeting with JICA Office in Kenya Departure of Mr. Hosono, Team Leader from Tokyo
3	" 30	Thu.	Fine	Nairobi		Acquisition of entry visa for Uganda Courtesy visit to Embassy of Japan
4	" 31	Fri.	Fine	Kampala	Lv. Nairobi at 14:15 on KQ 412 Ar. Entebbe at 15:15	Consultant team arrivals at Entebbe Internal meeting of the team
5	June 1	Sat.	Fine	Kampala		Briefing of Draft Report to UEB
6	" 2	Sun.	Fine	Kampala		Internal meeting of the team
7	" 3	Mon.	Light rain	Kampala		Briefing of Draft Report to UEB Discussion of M/D (Draft) to UEB
8	" 4	Tue.	Fine	Kampala		Mr. Hosono, Team Leader and Mr. Sakai of JICA Office in Kenya arrive at Entebbe. Explanation of Japan's grant aid Discussion of M/D (Draft) with UEB
9	" 5	Wed.	Fine	Kampala		Explanation of Japan's Grant Aid and confirmation of M/D (Draft) with UEB. Site survey to Qweensway S/S, Motor Mart S/S and substation in Kampala. Signing of M/D. Visiting to Japan's grant aid project. (Makeree Univ. construction site) Courtesy call to Minister of Energy and Minister of Planning and Economy Development.
10	" 6	Thu.	Fine	Kampala		Visiting to Owen Falls power station

No.	Date	Day of the week	Weather	Place of stay	Schedule	Detail of Study Items
11	" 7	Fri.	Light rain	in air-plane	Lv. Entebbe at 16:15 on KQ413 Ar. Nairobi at 17:15 Lv. Nairobi at 23:40 on BA054	Mr. Hosono, Team Leader, departures from Entebbe by QZ611 Mr. Sakai of JICA/Nairobi and Consultant team leave from Entebbe by KQ413
12	" 8	Sat.	Fine	London	Ar. London at 06:25	
13	" 9	Sun.	Fine	in air-plane	Lv. London at 15:30 on BA007	
14	" 10	Mon.	Cloudy	Tokyo	Ar. Narita at 11:20	Consultant team arrives at Tokyo

APPENDIX 3 LIST OF INTERVIEWEES

List of Interviewees

Place of Work and Name	Position
Embassy of Japan in Kenya:	
Mr. Ichiro Nagame	First Secretary
Mr. Takenari Okubo	First Secretary
Mr. Yasuo Imashiro	Second Secretary and Vice Consul
JICA Kenya Office:	
Mr. Kenji Kumagishi	Resident Representative
Mr. Yoshiyuki Takahashi	Assistant Resident Representative
Mr. Katsuichiro Sakai	Assistant Resident Representative
Mr. Masahiko Suzuki	Development Specialist
Mr. Yasushi Odani	Administrative Officer
Ministry of Planning and Economic Development:	
Hon. Mayanja Nkangi	Minister of Planning and Economic Development
Mr. D.S. Nsubuga	Economist OECD Section
Ministry of Energy (MOE):	
Hon. R. H. Kaijuka	Minister of Energy
Hon. Ruhakana Rugunda	Acting Minister
Hon. Bachu	Deputy Minister of Energy
Mr. Ben Daramadri	Permanent Secretary
Miss Kaisho Rhoda	Under Secretary
Uganda Electricity Board (UEB):	
Mr. A.R. Rutta	Managing Director
Mr. E.S.N. Bwanika	Deputy Managing Director
Mr. C. Kabagambe	Board Secretary
Mr. E.B.Nzabanita	Chief Development Manager
Mr. Y.B.K. Mpagi	Project Coordinator
Mr. G.S. Kagolobya	Chief Distribution Manager
Mr. Simon G. D'Ujanga	Chief Operation Manager
Mr. Chris Eyahura	Chief Accountant
Mr. Cherles Rwemereza	Chief Commercial and Consumer Services Manager
Mr. A. Rutebemberwa	Chief Finance Manager
Mr. K. Karekaho	Deputy Chief Development Manager

Place of Work and Name	Position
Mr. Kasendwa	Principal Civil Engineer
Mr. H. Senyondwa	Ag. Principal Planning Engineer
Mr. Henry Lwetabe	Finance Manager (Corporate)
Mr. Fred Masozera	Personnel Manager
Mr. W.K. Kiryahika	District Engineer (Kampala)
Mr. F.K. Oidu	District Engineer (Overhead Line)
Mr. Robert Kisubi	Senior Training Officer
Mr. A. Sam Sembatya	Assist. Plan & Equip. Supervisor
Mr. E.M. Kaggwa	Construction Engineer
Mrs. Catherine Senyodwa	Assistant Protection Engineer
Mr. Wagugwe Wj.	Assistant Project Accountant
UEB (Lugogo):	
Mr. Luzira E.B.	Depot Manager of the Station
Mr. D. Mukasa	Superintendent (Communication Workshop)
Mr. Abdallah Galabuzi	Superintendent (Mechanical Workshop)
Mr. James Kusemererwa	Superintendent (Store)
Mr. Geresone Nalunda	Assistant of Superintendent (Store)
Mr. Ndagga Kyeynne	Foreman (Electrical Workshop)
Mr. Caesar Okumu	Transport Manager
UEB (Owen Falls Power Station):	
Mr. Kagga	Acting Chief Generator Manager
Kampala City Council:	
Mr. Barugahare Jonn	Chief Town Planner
The World Bank:	
Mr. Seung H. Choi	Resident Representative in Uganda
Geological Survey and Mines Department:	
Mr. David Hadato	Principal Geologist
Department of Meteorology:	
Mr. S.A.K. Magezi	Assistant Director

Place of Work and Name	Position
Ministry of Works Central Materials Laboratory:	
Mr. L. Lutaaya	Chief Materials Engineer
Water Development Department:	
Mr. Patric Kahangire	Assistant Commissioner

APPENDIX 4 MINUTES OF DISCUSSIONS

MINUTES OF DISCUSSIONS
ON
THE PROJECT FOR
THE REINFORCEMENT OF ELECTRIC POWER DISTRIBUTION NETWORK
IN KAMPALA
IN
THE REPUBLIC OF UGANDA

In response to the request of the Government of the Republic of Uganda, and based on the results of the preliminary study for the Project of the Reinforcement of Electric Power Distribution Network in Kampala (hereinafter referred to as "the Project") Japan International Cooperation Agency (JICA) decided to implement a basic design study and sent the study team headed by Mr. Yusuke Kitamura to the Republic of Uganda from 1st February to 1st March, 1991.

The team had a series of discussions with the authorities concerned of the Government of the Republic of Uganda and conducted a field survey in the Project sites.

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

The team will proceed to the works and prepare the Basic Design Study Report.

12th February, 1991

E.S.N. Bwanika
Acting Managing Director
Uganda Electricity Board

Yusuke Kitamura
Leader
Basic Design Study Team
Japan International Cooperation Agency

ATTACHMENT

1. Objective

The objective of the Project is to rehabilitate the Kampala Electricity Distribution System in order to supply adequate and reliable power at all times to several important areas throughout the national capital, thus contributing to revitalization of all various industrial, commercial and social activities around and within the city.

2. Project Site

The Project sites are located at Queens Way substation and Motor Mart switching station in Kampala as shown in Annex-1.

3. Responsible Organization

Uganda Electricity Board (UEB) is responsible for the administration and execution of the Project.

4. The Project Components

The following items were requested by the Government of Uganda for implementation of the Project.

(1) Re-construction of 33 kV and 11 kV switchgear for Queens Way substation

(2) Re-construction of 11 kV switchgear for Motor Mart switching station.

(3) Procurement of 11 kV/LV distribution materials for the Project.

(4) Procurement of Motor Vehicles for the Project.

5. Grant Aid System Extended by the Government of Japan

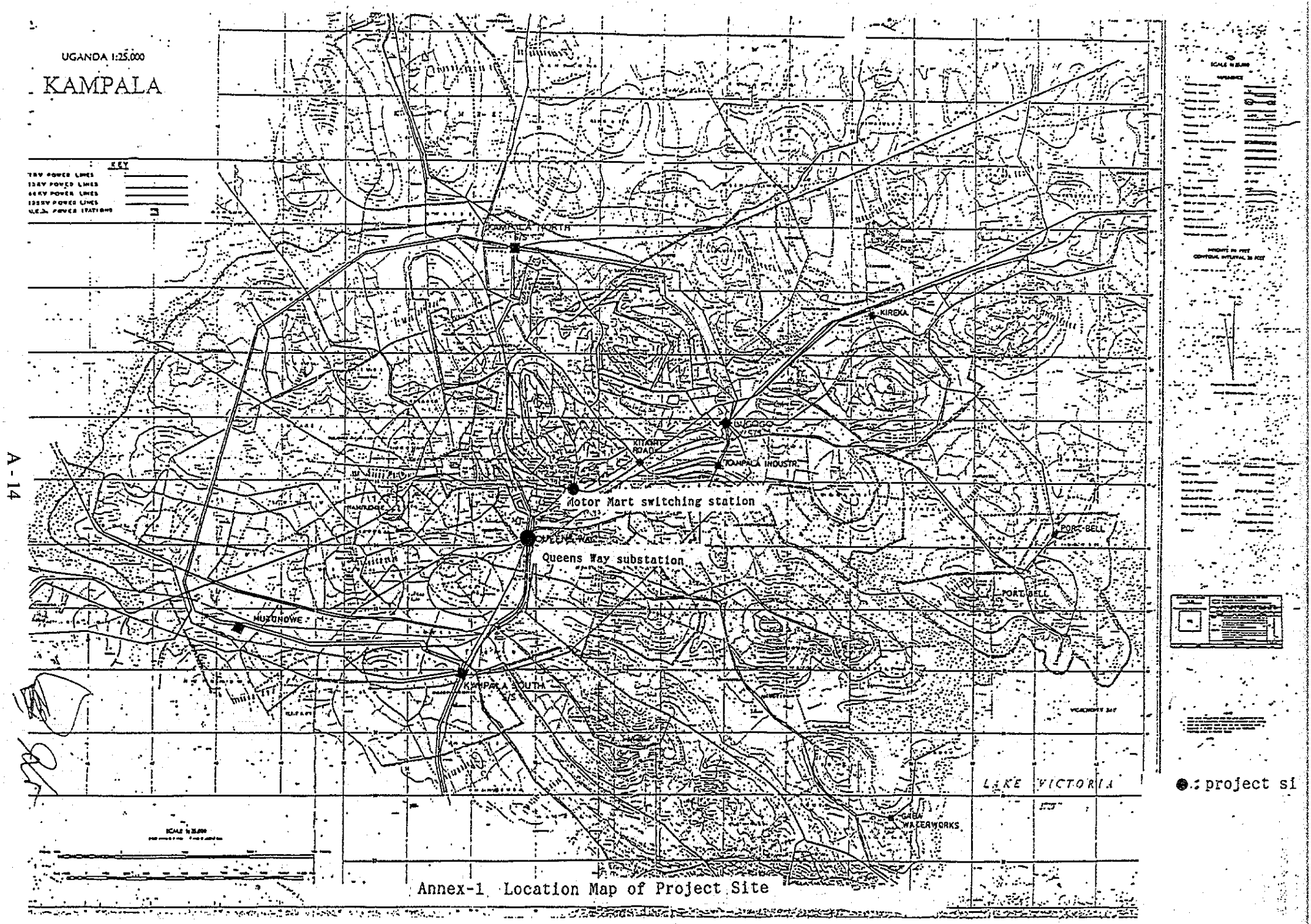
(1) The Government of Uganda has understood the system of Japan's Grant Aid explained by the team.

(2) The Government of Uganda will take the necessary measures described in Annex II for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

6. Schedule of the Study

(1) JICA will prepare a final draft report in English and dispatch a mission to the Republic of Uganda in order to explain its contents by the beginning of May, 1991 latest and thereafter present the report to the Japanese Cabinet for approval.

(2) In case that the contents of the report are accepted in principle by the Government of Uganda, JICA will complete a final report and send it to Uganda by the end of July, 1991.



Annex-1 Location Map of Project Site

ANNEX-2 UNDERTAKINGS BY THE GOVERNMENT OF THE REPUBLIC OF UGANDA

(1) To provide cleared, embanked and leveled land for the Project.

(2) To provide the land for temporary site office, warehouse and stock yard during the implementation period.

(3) To ensure speedy unloading, tax exemption, custom clearance of the goods for the Project at the port and/or airport of disembarkation.

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

(5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the Republic of Uganda with respect to the supply of the products and services under the verified contracts.

(6) To bear commissions to a Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

(7) To bear all the expenses, other than those to be borne by the Grant Aid necessary for the execution of the Project.

(8) To provide proper arrangements for the construction, such as water supply, electricity, drainage, etc., if necessary.

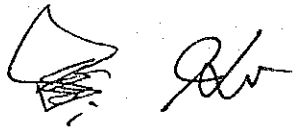
(9) To assign exclusive-counterpart engineers/technicians to the Project in order to transfer the operation and maintenance technique for the Project.

(10) To take necessary measures and responsibility for the stoppage of electricity during a construction period when it is necessary.

(11) To supply and construct the cables for incoming and outgoing feeders outside the scope of Japan's Grant Aid for Queens Way substation and Motor Mart switching station.

(12) To repair the existing transformers of Queens Way substation which shall be used for the Project in order to ensure the proper operation .

(13) To dismantle and remove the existing equipment and facilities not to be used for the Project in Queens Way substation and Motor Mart switching station.



MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY ON THE PROJECT FOR THE REINFORCEMENT OF ELECTRIC POWER DISTRIBUTION NETWORK IN KAMPALA IN THE REPUBLIC OF UGANDA

(CONSULTATION ON DRAFT REPORT)

In February 1991, Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team on the Project for the Reinforcement of Electric Power Distribution Network in Kampala (hereinafter referred to as "the Project") to the Republic of Uganda, and has prepared the draft report of the basic design study through examining the results of the study in Japan.

In order to explain the components of the draft report to the Government of Uganda as well as to consult with Ugandan side on the contents of the report, JICA sent to Uganda a study team, which is headed by Mr. Yutaka Hosono, Managing Director of Grant Aid Study and Design Department, JICA.

The team commenced its study in Uganda from May 31, 1991 and will terminate it on June 7, 1991.

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

Kampala, June 5, 1991

Mr. Yutaka Hosono
Leader
Draft Report Explanation Team
Japan International Cooperation Agency

Mr. A.R. Rutta
Managing Director
Uganda Electricity Board

ATTACHMENT

1. Components of Draft Report

The Government of Uganda has agreed and accepted in principle the components of the draft report prepared by the team.

2. Japan's Grant Aid system

(1) The Government of Uganda has understood the system of Japan's Grant Aid including further schedule of the study explained by the team.

(2) The Government of Uganda will take the necessary measures, described in Annex, for smooth implementation of the Project on condition that the grant aid by the Government of Japan is extended to the Project.

3. Further schedule of the study

The team will make the final report in accordance with the confirmed items, and send it to the Government of Uganda around August 1991.

4. Operation and maintenance for the facilities

The Government of Uganda stressed that it will allocate necessary budget for the works including operation and maintenance of the facilities to be constructed under the Project.

The Government of Uganda also confirmed that the 11KV distribution materials to be procured under the Project will be utilized properly.

ANNEX: Necessary measures to be taken by the Government of Uganda in case Japan's Grant Aid is extended.

(1) To provide cleared, embanked and leveled land for the Project prior to the commencement of the construction of the Japanese side.

(2) To provide the land for temporary site office, warehouse and stock yard in the sites during the implementation period.

(3) To ensure speedy unloading, tax exemption, custom clearance of the goods for the Project at the port and/or airport of disembarkation.

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

(5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the Republic of Uganda with respect to the supply of the products and services under the verified contracts.

(6) To bear commissions to a Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

(7) To bear all the expenses, other than those to be borne by the Grant Aid necessary for the execution of the Project.

(8) To provide proper arrangements for the construction, such as water supply, electricity, drainage, etc., if necessary.

(9) To assign exclusive-counterpart engineers/technicians to the Project in order to transfer the operation and maintenance technique for the Project and to witness and conform construction when inspection are carried out.

(10) To take necessary measures and responsibility for the stoppage of electricity during a construction period when it is necessary.

(11) To construct and connect the cables for incoming and outgoing feeders for Queensway substation and Motor Mart switching station.

(12) To construct the temporary 33KV cables between the existing 33KV transmission lines and the existing 33/11KV power transformers prior to the commencement of the construction of Japanese side.

(13) To dismantle and remove the existing equipment and facilities not to be used for the Project in Queensway substation and Motor Mart switching station.

(14) To provide a bench mark at the sites.

(15) To provide drainage system and other facilities including outdoor lighting system, fire fighting system, telecommunication system, etc., at the sites if necessary.

(16) To provide necessary data and information for the detailed design of the Project.

(17) To take necessary measures to expedite the approval for executions of the Project by the Government of Uganda.

(18) To control traffic during the inland transportation of the facilities of the Project, if necessary.

(19) To provide the disposal places of the surplus soil during the construction period.

(20) To secure the approval for access to public and private land for the Project, if necessary.

(21) To secure the approval for protection works for the existing facilities, if necessary.

(22) To provide relay tap setting work regarding the transmission lines and study of the transmission network including relay protection coordination, short circuit calculation, etc.