

CHAPTER 3 BASIC DESIGN

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3-1 Design Policy

Prior to working out the facility and equipment plans, the following design policies were formulated taking into consideration the natural conditions in Kenya, and the actual condition of the project site and the local construction industry, as well as the objectives of the Project and the present state of the project implementing organization of Kenya.

(1) Design Policy Concerning Local Natural Conditions

In Nairobi City, where the project site is, the temperature ranges from 11°C to 28°C, the humidity from 40 percent to 55 percent, and the average annual rainfall from 750mm to 1,000mm. Although the city is situated at lat. 1°S., it is 1,700 meters above sea level. As a consequence, the city has a favorable climate of low temperature and low humidity. The following design policy concerning local natural conditions was formulated.

1. No rooms other than the special ones, such as the computer room, should be equipped with air conditions.
2. Natural ventilation should be utilized as much as possible, and the indoor temperature should be controlled by opening and closing the windows.
3. In order to prevent the indoor temperature from rising as a result of direct sunshine, the ceilings of the rooms located on the uppermost floor should be provided with a sufficient quantity of heat insulating materials. The buildings should also be arranged from east to west.

(2) Design Policy Concerning the Situation of the Project Site

The project site is situated on hill which has 6 meters undulation. It has no existing facilities, but there are a number of high trees growing on it. In consideration of such site conditions, the following design policy concerning the situation of the project site was formulated.

1. The buildings should be located properly according to differences in ground level so that the project site's present geographical features may be preserved.
2. As many of the existing high trees as possible should be preserved so that they may be incorporated into the landscape plan.

(3) Design Policy Concerning the Actual Condition of the Local Construction Industry

The construction industrial base is well developed in and around Nairobi City. There will be no problem with local procurement of building materials since general building materials are either locally manufactured or imported. On the other hand, however, prices of construction-related goods are on the increase and the exchange rate of the local currency (Kenya shilling) against the U.S. dollar is rising rapidly. As a consequence, construction costs in foreign currencies are on the rise. In view of these facts, the following design policy concerning the actual condition of the local construction industry was formulated.

1. Local traditional construction methods, in which locally made construction materials are used widely, should be included in the architectural plan.

2. In utilizing locally made construction materials, priority should be given to those whose supplies are large enough.
3. Simple frames should be included in the structural plan, and unified building frame cross sections in the architectural plan, so that the construction cost may be minimized.

(4) Design Policy Concerning the Project Implementing Organization's Facility/Equipment Maintenance and Management Capabilities

The Survey of Kenya, which is the organization to implement the Project, is a department responsible for surveying and mapping within the Ministry of Lands and Settlement. When this project is implemented, staff members to take charge of the operation and maintenance of the facilities and equipment procured under the Project will be appointed. In order to facilitate the operation and maintenance, it is necessary to minimize the additional facility/equipment operation and maintenance cost. In trying to minimize the operation and maintenance cost required to implement the Project, careful attention should be paid to the following.

1. As to the facilities, priority should be given to construction materials which are highly durable and which do not soil easily. Also, those which can be procured locally and which are repairable easily should be selected wherever possible.
2. As to the equipment, priority should be given to the types and items of equipment, including those made in third countries, which can be procured, maintained and managed locally.
3. The energy cost should be minimized by making full use of natural lighting and ventilation.

(5) Design Policy Concerning the Scopes and Grades of Facilities and Equipment

The Project is to be implemented to support the implementation of the project-type technical cooperation program which were worked out under "Kenya Institute of Surveying and Mapping Project", started in fiscal 1994. In the technical fields covered by the Project, many innovations are being made and high technologies are being put to practical use one after another. Under such a background, the following design policy concerning the scopes and grades of facilities and equipment was worked out.

1. The facility and equipment plans should be in line with the contents of the training programs (training courses, curriculum, full quotas of trainees) which were formulated under the project-type technical cooperation program and which have already been agreed to by the governments of both countries.
2. As regards the details of the equipment plan, in particular, those types and items of equipment to be procured under the project-type technical cooperation should be clearly distinguished from those to be procured under the Project.
3. Layout and floor plans which are flexible enough to make it possible to extend facilities and change in partition walls should be drawn up.

(6) Design Policy Concerning the Term of Work

Facilities constructed under the Project are to be used for the training of the second-term trainees who are to be enrolled at the institute in January 1997. The project site is situated in Nairobi City, the capital of the country, and therefore it will be easy to transport

procured materials to the project site. In addition, it will be easy to take crime prevention measures and secure accesses since the project site is on the premises of an existing institution. In view of such actual conditions of the project site, the following design policy concerning the term of work was worked out.

1. The period for the construction work and the equipment installation work should be 12 months, and it should not be divided into phases.
2. Most of the buildings should be two-storied ones and constructed using local construction methods so that both the construction work and the equipment installation work may be completed well before the termination of the term of work.

3-2 Study and Examination of Design Criteria

In determining the details of the Project, the size of the Project and the specifications, the following design conditions were examined.

(1) Training Programs

The Project is to be implemented in parallel with other projects implemented under the project-type technical cooperation program, which was started in fiscal 1994. The outline of the training programs drawn up under the project-type technical cooperation program is as shown below. Facilities to be constructed under the Project are to be designed using the details of the training programs as the design conditions.

Table 3-1 Outline of the Training Programs

Course	Subject	Training Period (year)	No. of Class (class/grade)	Full number (person/class)	Total training time (hour)
Diploma Course (Pre-service Course)	Land Survey	3	2	24	2,970
	Cartography	3	1	25	2,970
	Photogrammetry · Remote Sensing	3	1	15	2,970
	Map Reproduction	3	1	15	2,970
Higher Diploma Course (In-service Course)	Land Survey	2.5	1	10	1,430
	Cartography	2.5	1	15	undecided
	Photogrammetry · Remote Sensing	2.5	1	5	undecided
Short Training Course	(undecided)				
(Note) Total registered trainees:		Diploma Course		309	} Total 399
		Higher Diploma Course		90	

(2) Required Facilities

The following facilities are required to implement the training programs worked out under the project-type technical cooperation program.

Table 3-2 Required Facilities

Block	Required Facilities
Training Block	<ul style="list-style-type: none"> • Class rm Bldg. Classrooms (for 25, for 15), Lecturer's rm • Laboratory Bldg. Land surveying lab., Cartography lab., Map reproduction lab., Photo lab., Drawing rm, Computer rm • Lectuer Hall Lecture hall, Stage, Storage • Library Reading rm, Stack rm
Administration Block	<ul style="list-style-type: none"> • Administration Bldg. ... Office, Principal's rm, Experts' rm, Clinic • Others Garage, Pump rm, Electric rm
Hostel Block	<ul style="list-style-type: none"> • Hostel Bed rm (for Male & Female), Superintendent • Canteen Kitchen, Canteen, Storage, Office, Kiosk

(3) Rationales for Deciding the Size of Each Facility

On the basis of the details of the training programs and the staffing plan, it was decided that the total number of trainees should be 400, that of lecturers 67, and that of staff members 130. The size of each of the major rooms was decided on the basis of the contents of the following table.

Table 3-3 Rationale for Deciding the Size of Each Facility

Room	Rationale for Deciding Size	Criterion
Laboratories	The size of each laboratory was decided on the basis of the number of trainees to use it and the equipment arrangement in it.	Equipment arrangement plan
Classrooms	Classrooms were divided into those for classes of 25 and those of 15. The total number of classrooms was calculated on the assumption that they will be shared by trainees taking different courses. According to the training programs, the ratio of lecture hours to the total number of school hours is 80 percent for all the courses and grades, except that the ratio for the diploma courses in the second and third grades is 30 percent. The result of the calculation was: (Number of classrooms for classes of 25 5 Number of classrooms for classes of 15 7	$\text{No. of classrooms} = \frac{(\text{possible annual school hours}) \times (\text{room utilization rate})}{h}$ $= \frac{1,200\text{hours} \times 0.6}{h}$
Lecture hall	The lecture hall is required to accommodate 103 trainees in one grade and 56 lecturers, 160 persons in total. The space for each person will be 1.5m ² on the assumption that movable chairs will be used in the lecture hall. So the total space is: 160 persons × 1.5m ² /person = 240m ²	
Library	The total number of chairs is 20 percent of the total number of trainees, namely 80. The total number of books will be 30,000 to 40,000, including the existing 1,000 volumes.	"Size of Libraries of Vocational Colleges" in the U.S. Architectural Design Standards

Room	Rationale for Deciding Size	Criterion
Hostel	Each room, which is to accommodate 4 trainees, will be equipped with double-decked beds, chairs, desks and lockers. Since the diploma courses are to be offered to 300 trainees from provincial areas, the hostel must accommodate up to 300 trainees, including 60 female trainees.	
Canteen	The total number of persons to take meals at the canteen at a time is estimated at 150, which is one-third of the total number of trainees and lecturers, and the space for each person at 1.2m ² . So the canteen's total floor space is 180m ² . The floor space of the kitchen is estimated at one-third of the canteen's total floor space.	
Instructors' rooms	The instructors' room is a large one, the floor space for each of the 60 instructors is 5.0m ² .	
Office room	The office room to accommodate a clerical staff of 50 is a large one, the floor space for each clerical staff member being 4.0m ² .	

(Note) Data on anthropometric dimensions and work dimensions were those included in the following documents.

- ⊙ [Architectural Graphic Standards] - The American Institute of Architects (AIA)
- ⊙ [Time - Saver Standards for Architectural Design Data] - McGraw-Hill Book Company -
- ⊙ [Architectural Design Data] - Maruzen Co. -
- ⊙ National Plumbing Code

(4) Governing Codes and Standards

The following codes and standards apply to the design of the facilities to be constructed under the Project.

- 1) Architectural plan : ● Kenya Building Code
- 2) Structural Plan : ● Code of Practice for the Design and Construction of Building and Other Structures in relation to Earthquakes
 - BS CP 110, Reinforced Concrete Structural Plan Standards
 - BS, CP 3 Wind Load
 - Reinforced Concrete Calculation Standards (Japan)
- 3) Electrical Plan : ● BS
 - Technical Instruction - MOW
- 4) Mechanical Plan : ● Drainage Standards (Civil engineering section - MOW)
- 5) Other : ● General Specification for Building Works
 - Standard Method of Measurement of Building Works

(5) Other Basic Design Conditions to Note

- Measures against termites:

It is necessary to take measures against termites. Wooden part of roof structures, in particular, are likely to be greatly damaged by termites, causing leaks.

- Measures against lightning:

It is necessary to take sufficient measures against lightning because it thunders often in the areas surrounding the project sites.

- Measures against earthquakes:

It is necessary to work out the basic design of facilities taking into consideration the seismic force specified by the Ministry of Public Works of Kenya.

- Measures against voltage fluctuations:

In and around the project sites, the voltage fluctuates widely ($\pm 20\%$). Computers and other items of precision equipment should be provided with a device to protect against voltage fluctuations. The Substation should also be equipped with AVR.

- Measures against black cotton soil (the kind of soil which is peculiar to Africa and which has a high rate of expansion):

When black cotton soil is found on the project sites, it must all be removed and after that the quality of the ground must be improved in accordance with the instructions of the Ministry of Public Works of Kenya.

3-3 Basic Plan

3-3-1 Site and Layout Plan

The project site, which is situated on the premises of the Survey of Kenya, is divided into two parts with a road in between, one part with an area of about 6ha, which is situated on the western side, near the main gate, and the other part with an area of about 2ha, which is situated on the southern side. The two project sites, therefore, cannot be used as a single site. In the site plan, the planned facilities will be built on the western part, which has a relatively large area, and the southern part will be utilized as an outdoor calibration field for survey equipment. The western part has a 6-meter difference in level and a number of high trees are growing on it. For this reason, in this plan all the planned facilities will be designed compact and will be also laid out properly according to the ground difference in level. As many of the trees as possible will be preserved. Compared with larger facilities, these small scale facilities will be able to secure more natural lighting and ventilation, which will make it possible to reduce the volume of the earth work as part of the construction work. In the layout plan, there will be an outdoor space surrounded by buildings, which will be designed as one of the key facilities of the institute. Buildings which are closely related to each other functionally will be connected with each other with roofed passages. The outline of the site plan is as shown in the following figure.

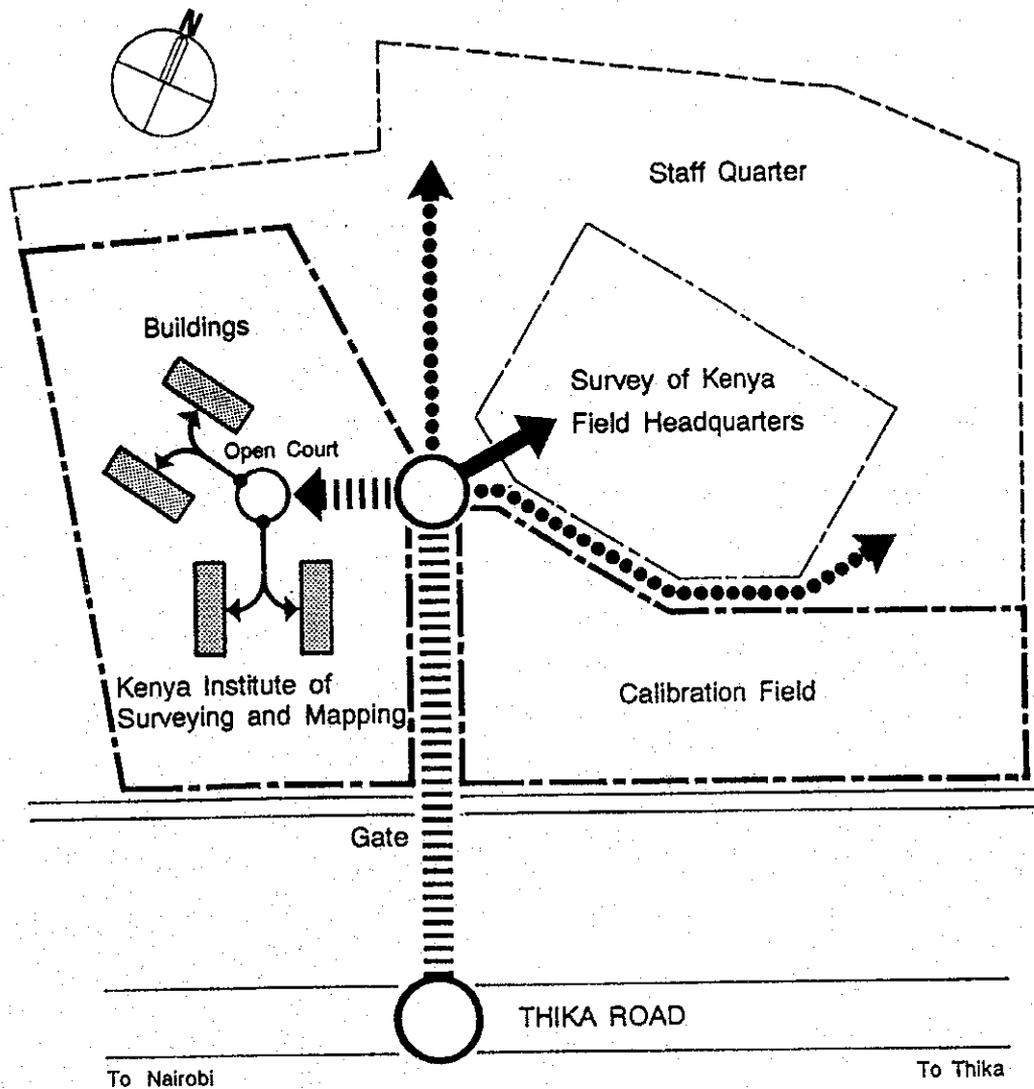


Fig. 3-1 Site Plan

3-3-2 Architectural Design

(1) Floor Plan

The following table shows each of the rooms to be provided under the Project, its function, floor area, and the reason for deciding floor area.

Table 3-4 Floor Plan

Room name	No. of rooms	Floor area	Rationale for deciding the size /function of each room
TRAINING BLOCK		total 2,920 m²	
Classroom bldg.			
Classroom (for 15 trainees)	8	36 m ² /room	To be used for the Photogrammetry · Remote Sensing and Map Reproduction diploma courses and the HD courses.
Classroom (for 25 trainees)	5	48 m ² /room	To be used for the Land Surveying and Cartography diploma courses.
Trainees' hall	1	96 m ²	To serve as the entrance hall of the classroom buildings, as well as trainees' rest station and place for mutual communication.
Lecturers' room	1	336 m ²	A large lecturers' room to accommodate about 50 lecturers.
Meeting room	2	36 m ² /room	To be used for lecturers' meetings and short-term seminars.
Laboratory bldg.			
Land Surveying laboratory	1	72 m ²	To be used for training of 24 trainees.
Storage	1	54 m ²	To be used for storing surveying instruments.
Map Reproduction laboratory	1	108 m ²	To be used for training of 15 trainees enrolled at the Map Reproduction
Photography laboratory	1	126 m ²	To be used for training for Map Reproduction.
Cartography laboratory	1	90 m ²	To be used for training of 25 trainees enrolled at Cartography
Drawing room	1	72 m ²	To be used for training in drawing and tracing.
Computer laboratory	1	72 m ²	To be used for training in computerized mapping.
Photogrammetry/Remote Sensing laboratory	1	90 m ²	To be used for training of 15 trainees enrolled at the Photogrammetry
Preparation room	1	36 m ²	There will be a preparatory room for two laboratories.
Lecture hall			
Lecture hall	1	272 m ²	To accommodate 103 trainees/grade and 56 lecturers. (160 × 1.5m ² /person)
Stage	1	64 m ²	To be used for lectures and other events at the lecture hall.
Anteroom	1	24 m ²	To serve as lecturers' anteroom and also as their locker room.
Library			
Reading room	1	108 m ²	A total of 80 chairs
Reading lounge	1	24 m ²	For reading magazines and maps
Stacks	1	72 m ²	No. of books: 30,000 to 40,000
Office room	1	36 m ²	The library will have a manager's room.
Librarians' room	1	9 m ²	To be used for delivery of books and check of the users' entry into and departure from the library.

Room name	No. of rooms	Floor area	Rationale for deciding the size /function of each room
Reception	1	9 m ²	The place for lending and checking.
Storage	1	9 m ²	The place to keep books.
Others		532 m ²	
ADMINISTRATION BLOCK		Total 1,220 m²	
Administration building			
Entrance hall	1	24 m ²	
Office room	1	216 m ²	A large room to accommodate 40 clerical workers
Control room	1	16 m ²	A switchboard, a control board and the like will be installed in the room.
Storage	1	8 m ²	A storage to store office supplies.
Principal's room	1	24 m ²	
Team leader's room	1	24 m ²	The principal's room and the team leader's room will be private rooms and both rooms will have the same floor space.
Secretary's room	1	24 m ²	A room for two secretaries to the principal and to the team leader.
Deputy principal's room	1	16 m ²	A private room
Secretary's room	1	16 m ²	A room for the secretary to the deputy principal
Reception room	1	16 m ²	To be used by the senior managers.
Experts' room	1	72 m ²	A room to serve as the office for 6 to 8 experts
Coordinators' room	1	24 m ²	A room for coordinators
Meeting room	1	24 m ²	A meeting room for the senior managers and experts
Pantry	1	8 m ² /room	To be used for supply of hot water
Clinic	1	48 m ²	The planned institute, which is an educational institution, is required by law to have a clinic.
Garage			
Garage		168 m ²	
Outdoor workers' room	1	36 m ²	To serve as a resting room for outdoor workers
Office room	1	18 m ²	A room for repairmen
Storage	1	18 m ²	A room to store repair tools and supplies
Toilet	2	16 m ² /room	
Outdoor facilities			
Guard house	1	12 m ²	Used for check of visitors' entry and departure
Pump room	1	15 m ²	
Electric room	1	50 m ²	
Others		303 m ²	

Room name	No. of rooms	Floor area	Rationale for deciding the size /function of each room
HOSTEL BLOCK		Total 2,710 m²	
Male trainees' hostel	2 bldg.		
Bed room	60	18 m ² /room	Two bunk beds will be installed in a room (4 trainees/room)
Shower room	6	18 m ² /room	
Toilets	6	18 m ² /room	
Female trainees' hostel			
Bed room	15	18 m ² /room	Two bunk beds will be installed in a room (4 trainees/room)
Shower room	6	18 m ² /room	
Toilets	6	18 m ² /room	
Canteen bldg.			
Canteen	1	144 m ²	A canteen to accommodate 150 persons (150persons×1.0m ² /person)
Kitchen	1	72 m ²	Its floor space will be one-third of the canteen.
Office room	1	9 m ²	For the use of the clerical worker in charge
Cold storage	1	9 m ²	To be used to refrigerate vegetables and fruits.
Storage	1	12 m ²	To be used to store seasonings and the like.
Kiosk	1	16 m ²	A stand will be installed in the canteen in compliance with the local customs.
Others		666 m ²	
Grand total floor area:		6,850 m²	(A 700m² space for the roofed passages not included)

(2) Section Plan

In the cross-sectional plan, sufficient natural ventilation and lighting will be secured, and at the same time steps to prevent direct sunshine and rain from entering the rooms will be taken. The story height for the training block (both the ground and second floors) will be 4.0 meters and that for the hostel block will be 3.0 meters. With these story heights, it will be possible to secure sufficient ceiling heights economically in terms of structural plan. As a safeguard

against heavy rains, the ground floor height will be 0.5 meters from the ground level.

(3) Structural Design

The outline of the facilities to be constructed under the Project and the structural system for them are as described below.

① Outline of Structure

No. of Stories : 2, Partially 3 and 1
Story height : Ground floor; 4.0 meter, 1st floor; 4.0 meters and ground floor; 3.0 meters, 1st floor; 3.0 meters, 2nd floor; 3.0 meters
Basic span : 6.0m×6.0m
Type of structure : Reinforced concrete rigid frame
foundation : Direct foundation

② Design Standards

The structural design is to be developed in accordance with the following local standards or the Japanese standards (when there are no applicable local standards)

- Building Code 1968
- Structural Manual 1973
- Code of Practice for the Design & Construction of Building & other Structures in Relation to Earthquakes 1973
- BS, CP. 110 Design Standards on Concrete Structures

③ Live Load

Office	300 kg/m ²	Storage	600 kg/m ²
Lecture hall	300 kg/m ²	Corridor	400 kg/m ²
Laboratory	400 kg/m ²	Roof	25 kg/m ²

④ Selection of Types of Structure

The following types of structure are selected.

Foundation	: Continuous footing and individual footing
Frame	: Reinforced Concrete Rigid Frame
Floor	: Wire mesh reinforcing concrete on polyethylene sheet
Slab	: Reinforced concrete slab
Wall	: Concrete block, Nairobi stone
Partition	: Concrete block

⑤ Structural Materials

In principle the following structural materials should be used.

- Cement : BS12 Ordinary Portland Cement
- Reinforcing bars: JIS G 3112, SD or BS4461 twisted reinforcing bars

(4) Building Facility Plan

1) Electric System

① Power Receiving Equipment/Substation

A service wire from the electric room to be built on the project site will be connected to an 11kV overhead power cable installed along the road running along the project site via pole erected near the border line of the project site. Electric power received in this way will be changed into low-voltage electric power (415V/240V) by a transformer (320kVA) installed in the electric room and then will be supplied to a low-voltage switchboard. The work to connect the 11kV overhead power

cable to the above-mentioned pole and install a wattmeter (and its accessory) will be carried out by the Government of Kenya.

The power receiving specifications are as follows:

- Received electric power 3Ø 3W 11kV
- Low-voltage electric power 3Ø 4W 415V-240V
- Transformer capacity 500 kVA

To cope with fluctuations in voltage, induction-type automatic voltage regulator (IVR) will be installed. when the range of voltage fluctuation is larger than the regulating range of the IVR, or when there is a lack of phases, the power supply will be cut off in order to protect the equipment installed in the facilities. If certain items of equipment require electric power which is more stable and which is of greater precision, a static automatic voltage regulator will be attached to each of them during the equipment installation work.

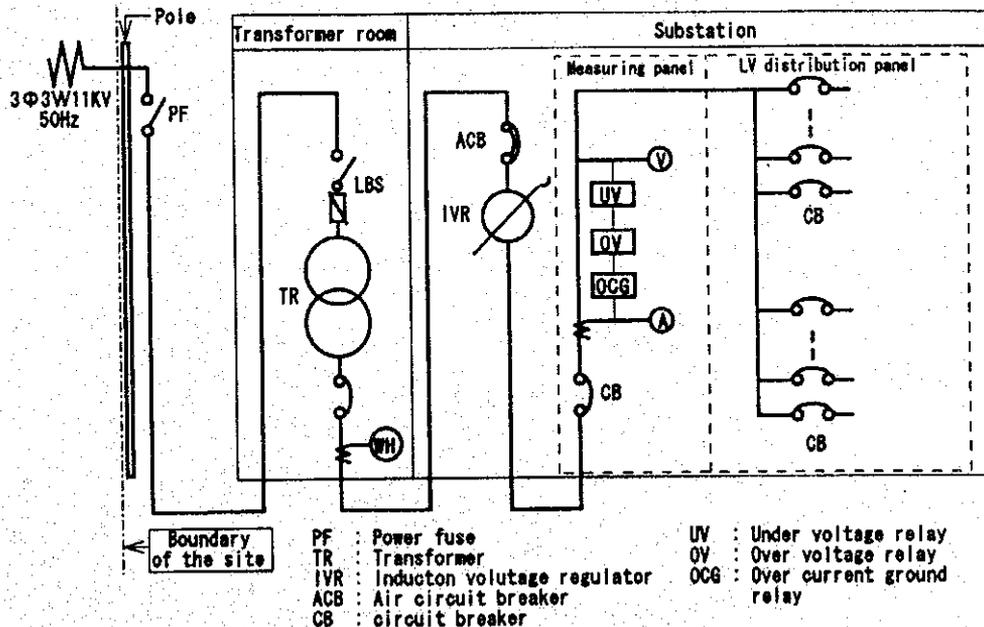


Fig. 3-2 Power Supply System Diagram

② Trunk Line Power Equipment

Electric power will be supplied to the distribution board/power control unit installed in each building from the electric room. The trunk lines from the electric room to the buildings will be laid underground.

The trunk line voltages are as follows:

- Electric power 3Ø 3W 415kV
- Electric lamps, wall sockets 3Ø 4W 415V-240V

An alarm board for monitoring the main items of power equipment will be installed in the control room of the administration building.

③ Electric Lamps and Wall Sockets

a) Lighting Fixtures

Light sources of the lighting fixtures will be mainly fluorescent lamps, and incandescent lamps can be used at places where the architectural design or the purpose of lighting requires the use of such lamps. Switches will be installed in a manner that makes it easy to switch on and off the lighting fixtures and to save energy. The target illuminance for each of the main rooms is as shown in the following table.

Target Illuminance

Room	Target illumination level (lx)
Office	300
Laboratory	400
Library	400
Meeting room	300
Bed room	100~200
Storage	100

b) Wall Sockets

Ordinary wall sockets and those for use with specific items of equipment will be installed in each room. Socket boards will be installed in rooms where many items of equipment are installed.

④ Telephone System

A lead-in wire from the control room of the administration building will be connected to the underground telephone line laid along the road running along the project site. The wiring system within the project site will be the underground wiring system.

In principle, all the extension lines will be housed in pipes. The extension lines from the control room will be connected to extensions via the terminal board installed in each building.

The switch board capacity will be on the order of 8 telephone office lines and 64 extension line.

Telephones will be installed in main private rooms, laboratories and administration rooms.

Under this project, one extension line from the planned facilities will be connected to the existing facilities so that efficient telephone communications may be secured between the planned facilities and the existing ones.

⑤ Public Address System

The main units of a public address system will be installed in the control room so that announcements may be made to a certain building or to all buildings over the public address system.

⑥ Emergency Alarm Equipment

A receiver will be installed in the administration building. A red indicator lamp, an electric bell and a transmitter will be mounted on the top of each fire hydrant case. The starting switch will be mounted inside the case. No detectors will be mounted on the emergency alarm equipment. The receiver will indicate only the place from where the alarm has been transmitted.

⑦ Lightning Arresting Equipment

A lightning rod will be installed on the top of the elevated water tank to protect the buildings against lightning.

⑧ Outdoor Lamps

Outdoor lamps will be installed around the buildings and along the access road.

2) Plumbing Systems

① Water Supply System

A 225Ø (9-inch) water main is laid along the THIKA road. At present, a 100Ø (4-inch) water pipe from the Survey of Kenya is connected to the water main to supply city water to its facilities. The problem is that the water supply is not large enough. The Survey of Kenya, therefore, plans to replace the present water pipe with a 150Ø (6-inch) so that the water supply will become large enough to cover the planned facilities.

Regarding the water supply to the planned facilities, the new water pipe is to be connected to a 100Ø water pipe via the water meter and then is to be sent to a steel-panel water receiving tank with a

capacity of 68m³. City water stored in this water tank is to be pumped up into an elevated steel-panel water tank with a capacity 7m³, from which water will be supplied to the planned facilities.

② Hot Water Supply System

In principle, the hot water supply system will be a decentralized one. At the canteen's kitchen, hot water is to be supplied from a gas water heater. At all the other facilities (the hot water rooms and the automatic processing laboratory), hot water is to be supplied from electric water heaters.

③ Sewerage System

Sewage and ordinary waste water are to be discharged separately indoors and they are to join outdoors. Sewage from the toilets installed on the ground floor is to be discharged into individual sewage pits through sewage pipes. Waste water from the kitchen is to be discharged after oil contained in it has been removed with a grease trap.

Developing and fixing solutions from the automatic processor are to be collected in the Photography laboratory and then are to be made to evaporate in the evaporation tank. Waste water from the laboratories are to be discharged after being neutralized. All drainpipes are to be connected to the waste water pit located in the existing boarding facility for staff members.

④ Fire Extinguishing Equipment

A fire hydrant pump will be installed in the outdoor pump room, and hose reel type indoor fire extinguishing equipment will be installed in each building. A fire extinguishing water tank with a capacity of

15m³ is to be installed below the pump room.

The pump will be the engine motor-driven type. The water receiving tank will be equipped with a water collecting port so that the water stored in it may be used for fire fighting.

⑥ Sanitary Equipment

Sanitary equipment will be installed at each appointed place within the project site.

⑦ Kitchen Equipment

Kitchen equipment suited for local eating habits will be installed.

⑧ LP Gas Equipment

An LP gas tank with a capacity of 3m³ will be installed outdoors to supply LP gas to the planned facilities.

⑨ Incinerator

A natural ventilation type incinerator will be installed.

3) Air Conditioning system

① Air Conditioners

The project site is 1,700 meters above sea level. It has a favorable climate, the average highest temperature being 25.4°C, the average lowest temperature 12.3°, and the average relative humidity 48% (1959-80 statistics). In view of such natural conditions, air conditioners will not be installed in ordinary rooms. On the other hand, air conditioners will be installed in the following rooms where heat is likely to be generated in the course of operation of the equipment.

Rooms where air conditioners will be installed:

- Photographic laboratory
- Computer laboratory
- Photogrammetric/remote sensing laboratory
- Cartographic laboratory
- Land Survey laboratory

All the air conditioners will be air-cooled split type air conditioners.

② Ventilating Equipment

In principle, ordinary rooms are to be ventilated by means of natural ventilation. Those rooms where bad smells and heat are likely to be generated will be ventilated by means of ventilators. Exhaust air from the automatic processor is to be discharged forcibly by means of a ventilator provided with a hood.

(5) Building Materials Plan

Building materials to be used in the construction of the planned facilities should be those which are suited for local climate and construction methods and which meet the performance requirements under the Project. They should also be highly durable and easy to maintain and manage.

① Main Structural Materials

Component	Material	Remarks
Foundation, column, beam, floor	Reinforced concrete	Commonly used in the country with satisfactory results

② Exterior Finishing Materials

Component	Materials	Remarks
Roof	Cement roof tile	Commonly used in the country. Quality control of articles stored below the roofs is necessary.
Walls	Nairobi stones	Commonly used in the country. Maintenance-free and therefore best as wall materials.
Doors and Windows	Aluminum sash, Steel doors	High-precision doors and windows should be installed to protect precision equipment. Steel grill will be attached to windows.

③ Interior Finishing Materials

Room	Floor	Wall	Ceiling	Remarks
Laboratory	Terrazzo	Paint finish	Inorganic acoustic board/perlite spraying	Excels durability and economy.
Office	Terrazzo	Paint finish	Inorganic acoustic board	Excels in durability and economy.
Lecture hall	Terrazzo	Paint finish	Calcium silicate board VP	Excels in durability and economy.
Kitchen, Pantry	Terrazzo	Paint finish	Calcium silicate board VP	Excels in durability.
Toilet	Tile	Tile	Calcium silicate board VP	Excels in durability and water resistance.
Exterior corridor	Terrazzo	Spray tile	Calcium silicate board VP	

3-3-3 Equipment Plan

In equipment plan, the following basic guidelines were formulated through discussions with the Government of Kenya, in due consideration of the purposes of planned training.

- 1) To selected items which will smoothen future operations on the basis of the result of survey of the present state of the existing equipment.

2) The items which are introduced for the Project should satisfy the following conditions.

1. To require installation, including floor foundation work

Printing press, Calibration system, etc.

2. To be relatively expensive

Analytical plotter, GPS equipment, CAC equipment, etc.

3. To be needed in a large quantity

Lecture tables and chairs, Bunk beds, Dormitory desks and chairs, etc.

3) To give sufficient consideration on consistency with the existing equipment in selecting the equipment grades and types

4) To select models and types which can be locally maintained to the utmost especially for the computer related equipment.

Kenyan side first planned to organize five trainees to a group, for the purpose of training and practical learning. It was concluded, however, that smaller number of trainees in a group would be more effective, in view of difference of trainees' experience and characteristics of different courses. The necessary numbers of the equipment, therefore, was determined to organize four trainees to a group, as a general rule.

The following list shows the outline of the basic equipment plan.

No.	Equipment	Q'ty
1. General Use equipment		
A-1	Conference table	2 units
A-2	Lecture table (A)	133 units
A-3	Lecture table (B)	245 units
A-4	Conference chair	160 units
A-5	Lecture chair (A)	180 units
A-6	Lecture chair (B)	245 units
A-7	Dining table (W900×D900×H700mm)	38 units
A-8	Dining chair	150 units
A-9	Bunk bed (W2,000×D900×H1,500mm, for 2 persons)	150 units
A-10	Dormitory desks (W900×D700×H750mm)	300 units
A-11	Dormitory chair (without arm rest)	300 units
A-12	Locker (W450×D450×H1,800mm)	300 units
2. Land Survey equipment		
B-1	GPS equipment	1 set
	• Receiver (for two waves)	(3)
	• Personal computer (laptop type)	(3)
	• Software	(1)
B-2	Theodolite (T2 equivalent, compatible to EDM)	4 units
B-3	EDM equipment	1 set
	• Middle range	(6)
	• Long range	(1)
B-4	Level	1 set
	• Automatic level	(12)
	• Precise tilting level	(2)
	• Precise automatic level	(2)
B-5	Calibration system (optical)	1 set
B-6	Equipment for physics laboratory (optical, electrical, electronic)	1 set
B-7	Software for survey calculation	1 set
B-8	Maintenance parts for existing equipment	1 set
3. Cartographic equipment		
C-1	Planimeter	1 set
	• Digital planimeter	(10)
	• Mechanical planimeter	(5)
C-2	CAC equipment (for training purpose, with software, UPS, etc.)	1 set

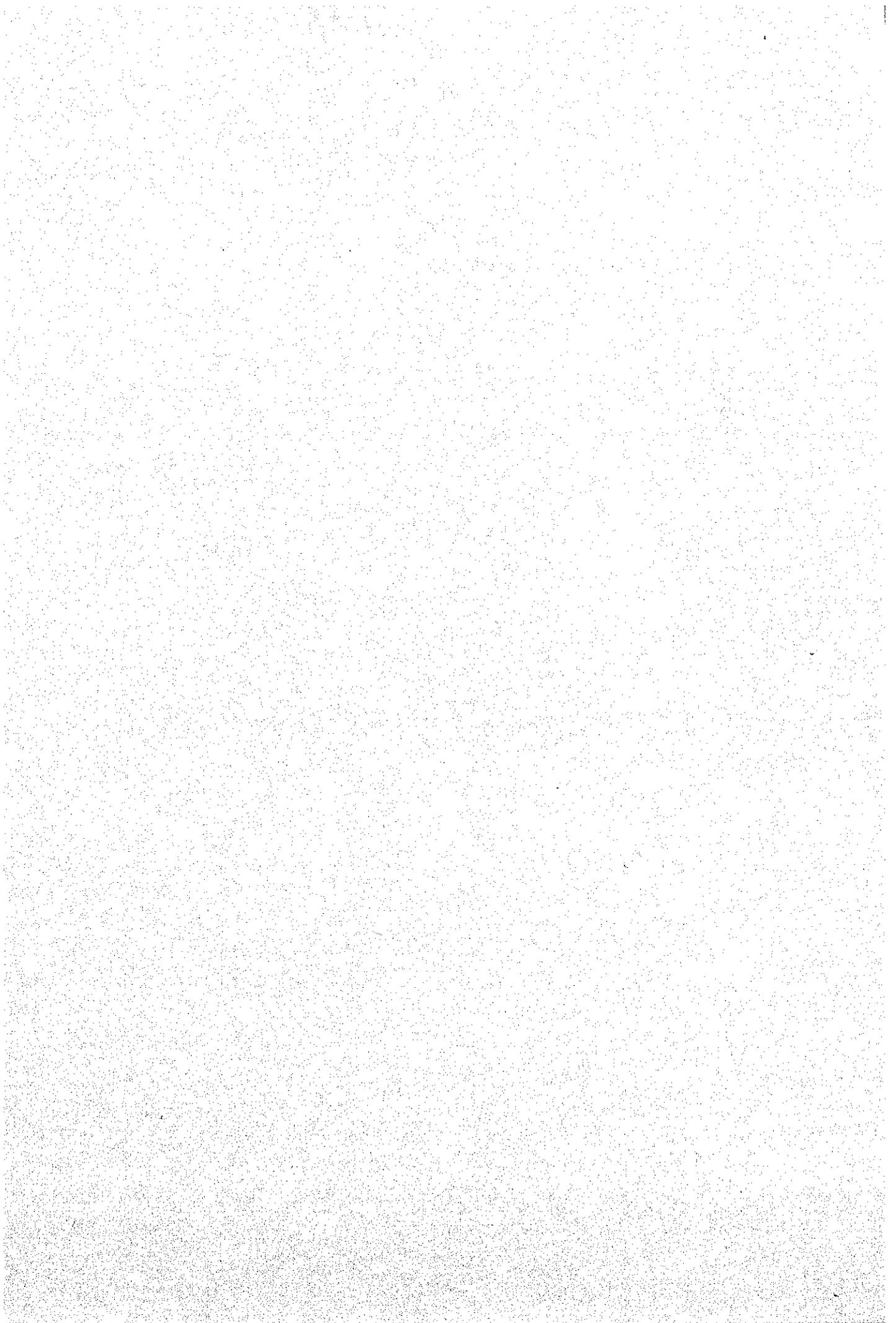
No.	Equipment	Qty
C-3	Stereo zoom transferscope	2 units
C-4	Light table	15 units
C-5	Light table with scales	10 units
4. Photogrammetric and Remote Sensing equipment		
D-1	Analytical plotter (for training purpose)	2 units
D-2	Digital image scanner	1 unit
D-3	Aerial camera simulator	1 set
D-4	Point pricking machine	1 unit
D-5	Mirror stereoscope	4 units
D-6	Software for image analysis	1 set
D-7	Software for aerial triangulation	1 set
D-8	Maintenance parts for existing equipment	1 set
5. Map Reproduction equipment		
E-1	Guillotine and trimmers (programmable, maintenance parts)	1 set
E-2	Proofing press	1 unit
E-3	Proofing equipment (cromaline)	1 set
E-4	Contact printing frame (for cromaline and presensitized plate)	2 sets
E-5	Rectifier (maintenance parts)	1 set
E-6	Printing ink testing machine	1 set
E-7	Printing press (for A2 size).	1 unit
E-8	Colour scanner	1 unit
E-9	Folding machine (maintenance parts)	1 set
E-10	Desktop publishing system (with accessories)	1 set
E-11	Process camera (small size, with controller)	1 unit
E-12	Contact printing machine (for Photography)	1 unit
E-13	Film processor (A2 size)	1 unit
E-14	Plate processor (for presensitized plate)	1 unit
E-15	Rapid access and diffusion transfer system	1 unit
E-16	Equipment for applying light sensitive coating	1 unit
E-17	Light table (large size)	8 units
E-18	Process camera (Large size, maintenance parts)	1 set
6. Library equipment		
F-1	Magazine storage rack (24 sections)	10 units
F-2	Reading table (for 6 persons)	14 units

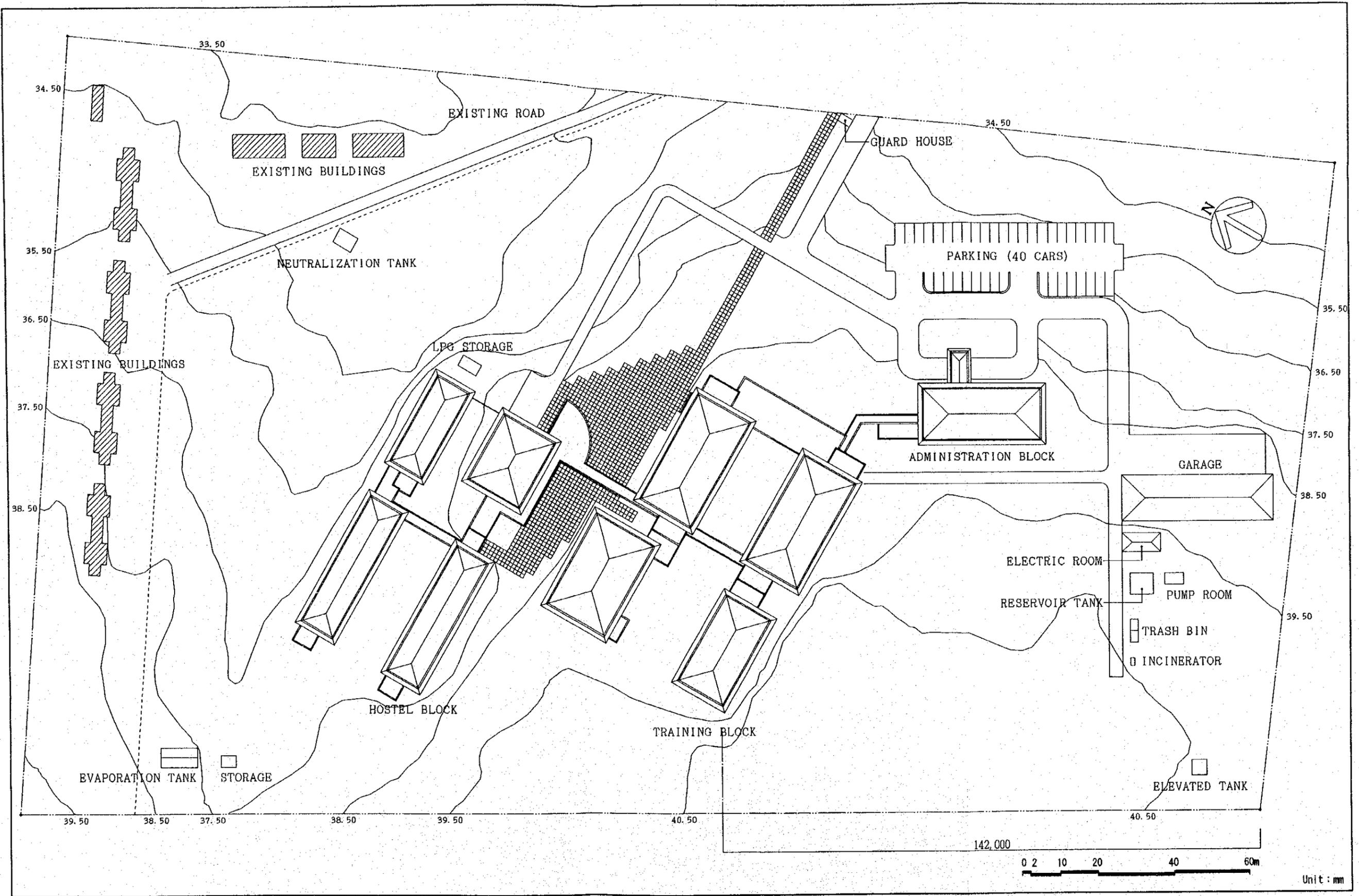
No.	Equipment	Q'ty
F-3	Reading chair	84 units
F-4	Map filing cabinet	2 units
F-5	Monograph card catalogue duplicating machine	1 unit
F-6	Unit shelves	60 units
F-7	Book binding equipment (binding machine, guillotine, table, etc.)	1 set
7. Computer laboratory equipment		
G-1	Personal computer (desktop type, with printer, software, UPS, table, etc.)	25 sets
8. Vehicle for field training		
H-1	Minibus (for 30 passengers)	2 units
H-2	Minibus (for 20 passengers)	1 unit
H-3	4WD wagon (for 9 passengers, tropical standard)	5 units
H-4	Pickup truck (Capacity: 1 ton)	1 unit
H-5	Pickup truck (Capacity: 3 ton)	1 unit

Note: The number in () shows breakdown quantity of each item.

3-3-4 Basic Design Drawings

1. Site Plan
2. Ground Floor Plan, Training Block
3. First Floor Plan, Training Block
4. Elevation, Training Block
5. Elevation, Training Block
6. Section, Training Block
7. Ground Floor Plan, Hostel Block
8. First & Second Floor Plan, Hostel Block
9. Elevation, Hostel Block
10. Section, Hostel Block
11. Plan, Administration Block
12. Elevation & Section, Administration Block
13. Auxiliary Buildings



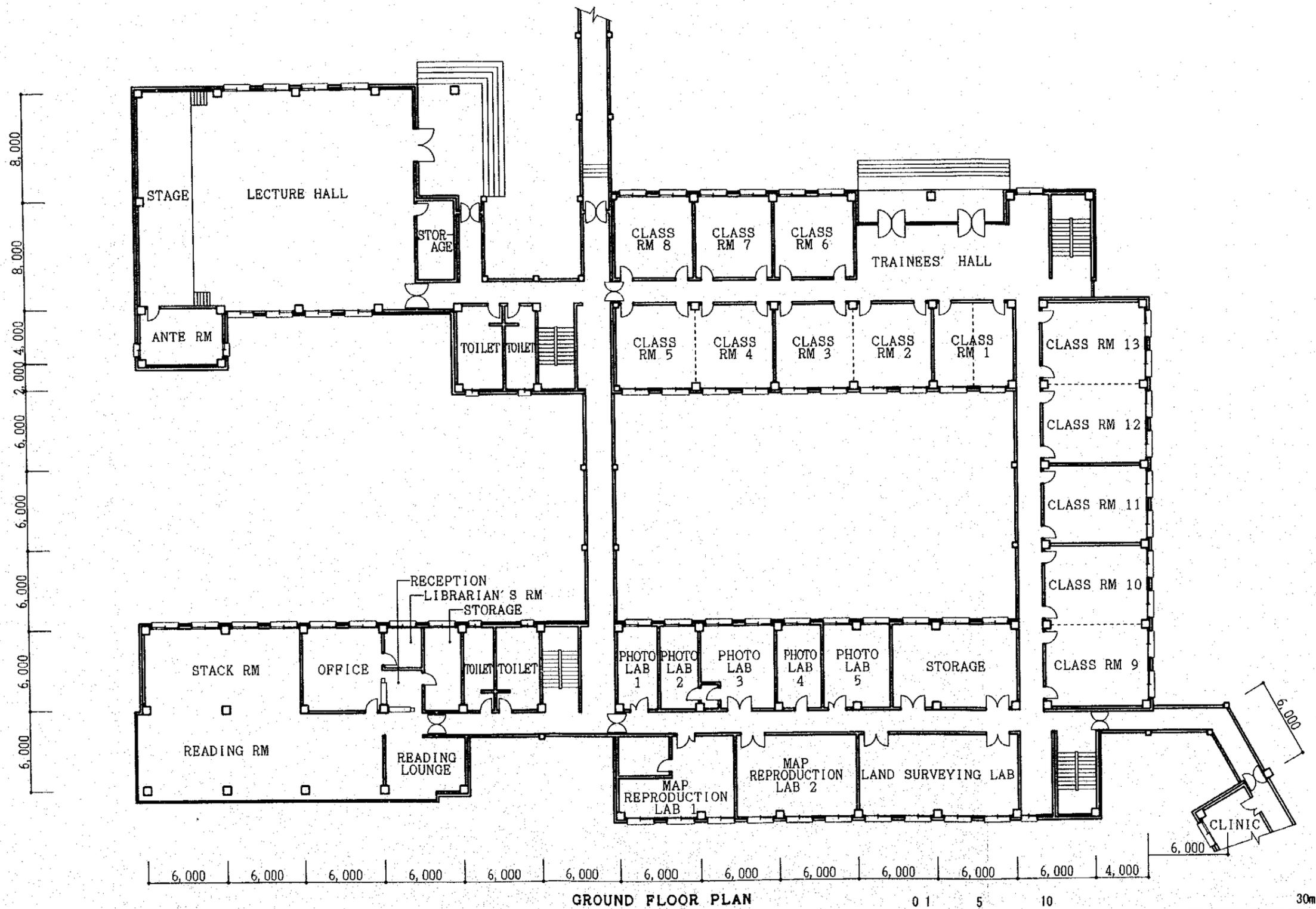


THE PROJECT FOR THE ESTABLISHMENT OF THE KENYA
INSTITUTE OF SURVEYING AND MAPPING

SITE PLAN S=1:900

107

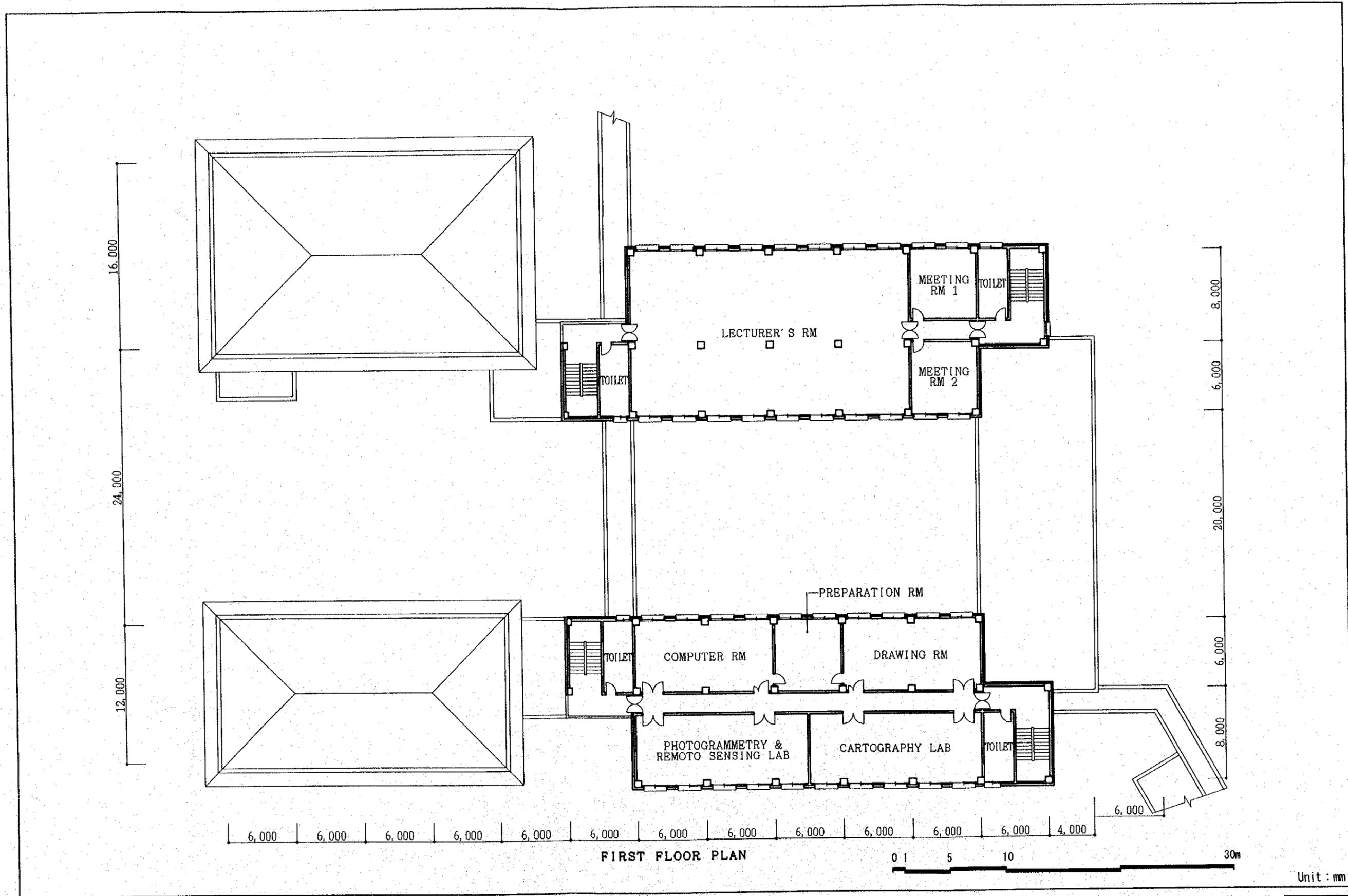
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GROUND FLOOR PLAN

0 1 5 10 30m

Unit: mm



Unit : mm

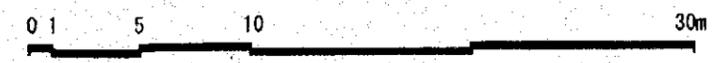
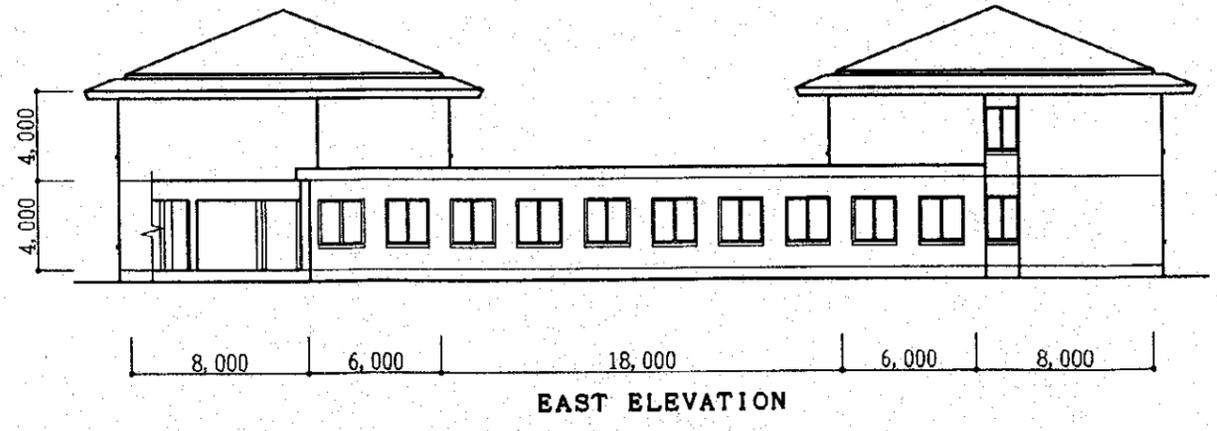
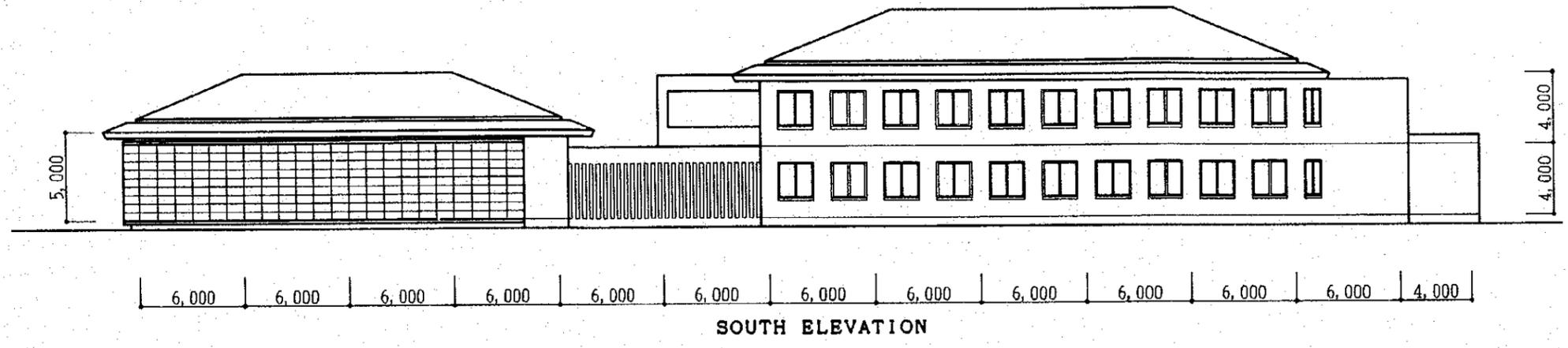
THE PROJECT FOR THE ESTABLISHMENT OF THE KENYA
INSTITUTE OF SURVEYING AND MAPPING

TRAINING BLOCK

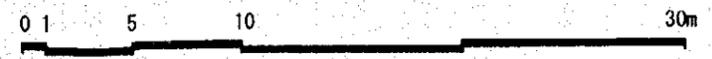
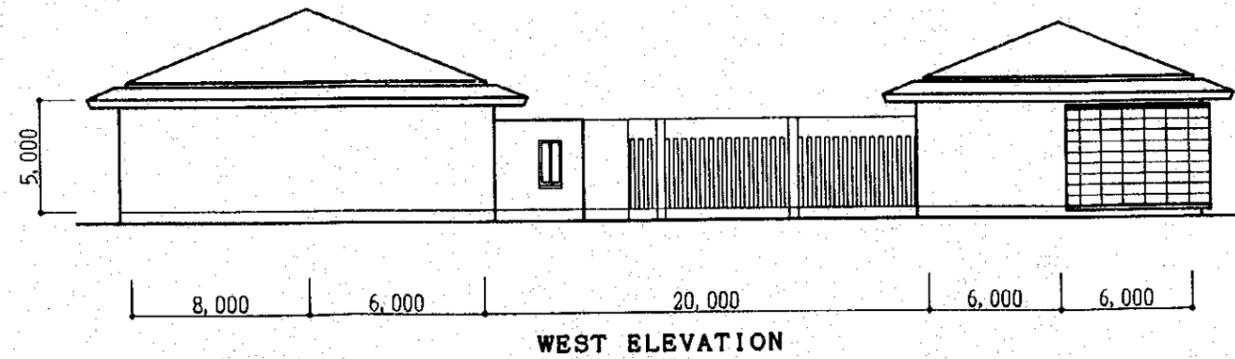
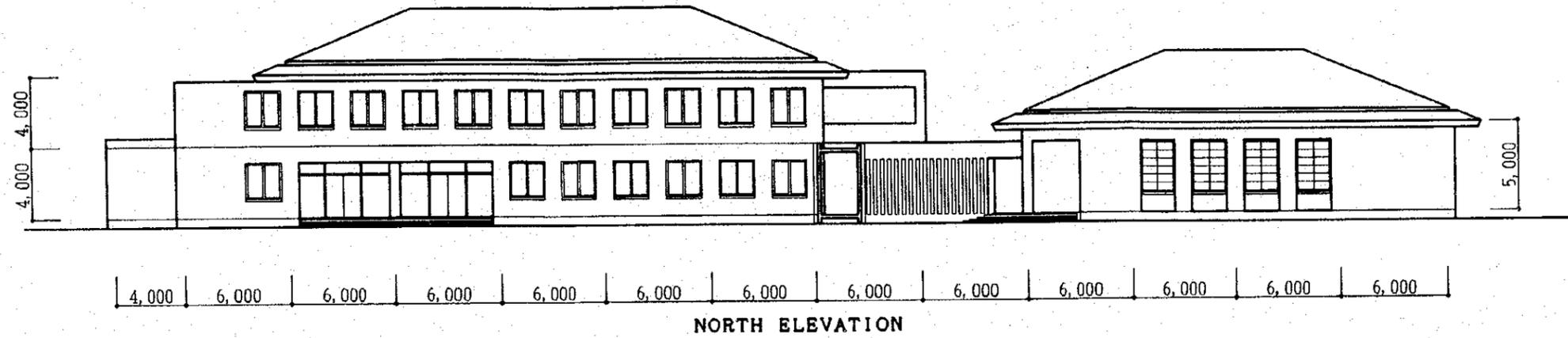
FIRST FLOOR PLAN

S=1:300

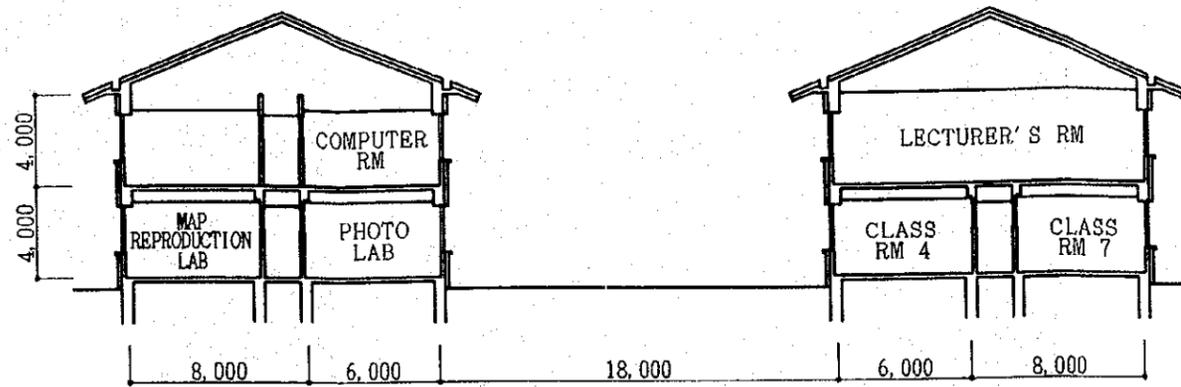
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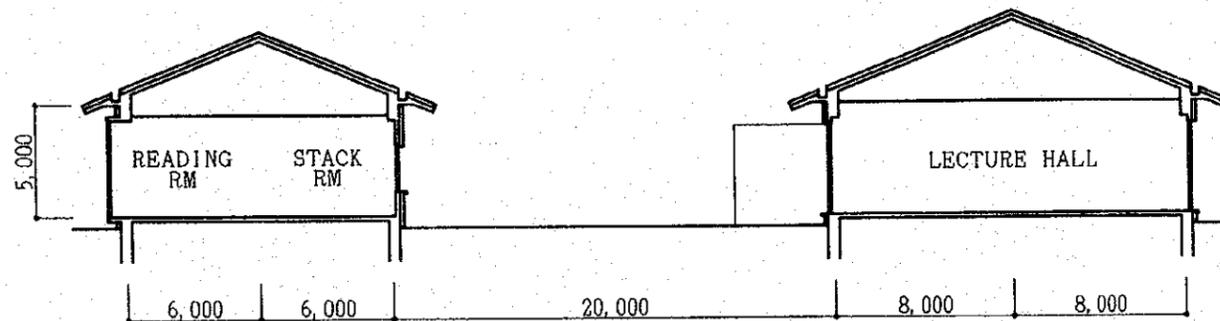
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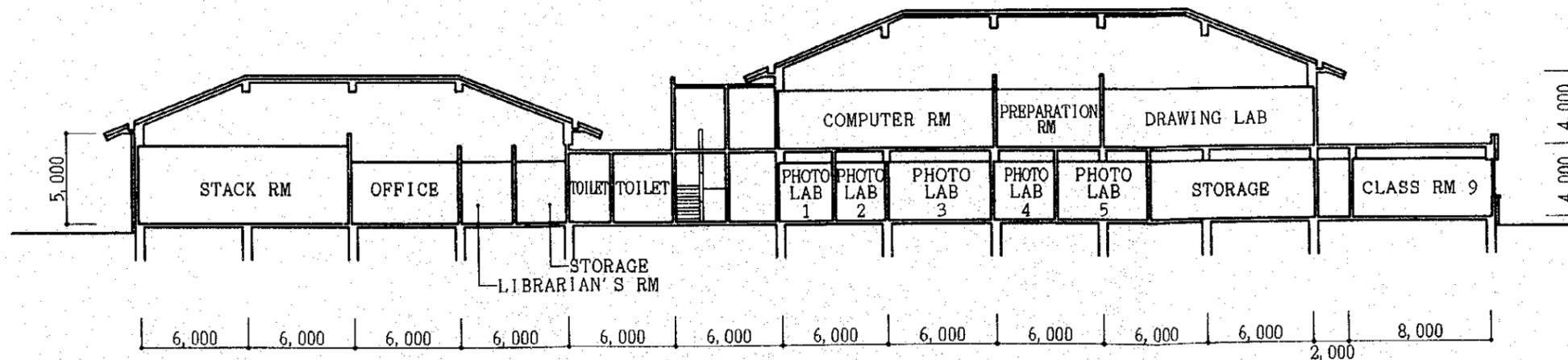
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SECTION



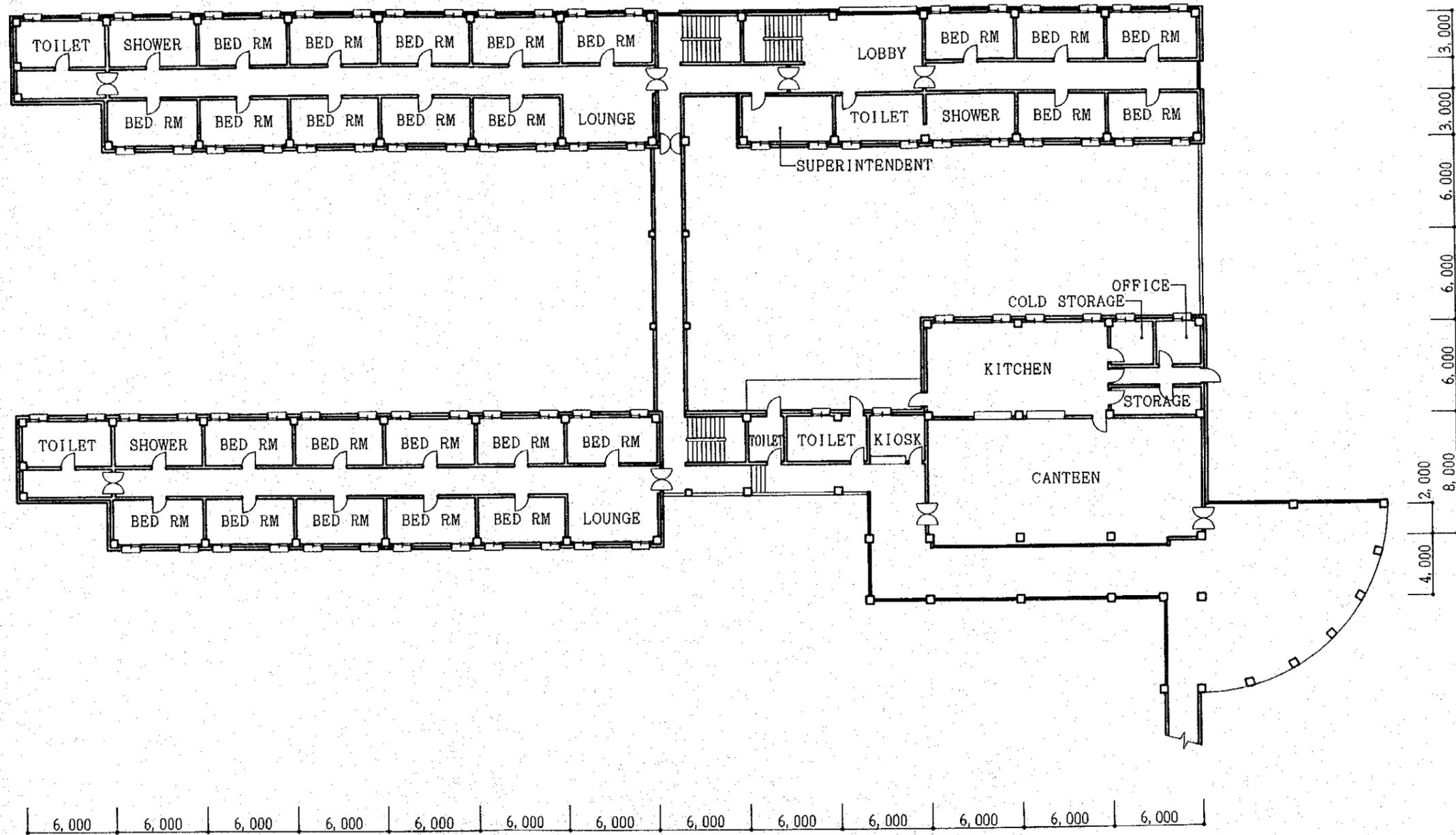
SECTION



SECTION



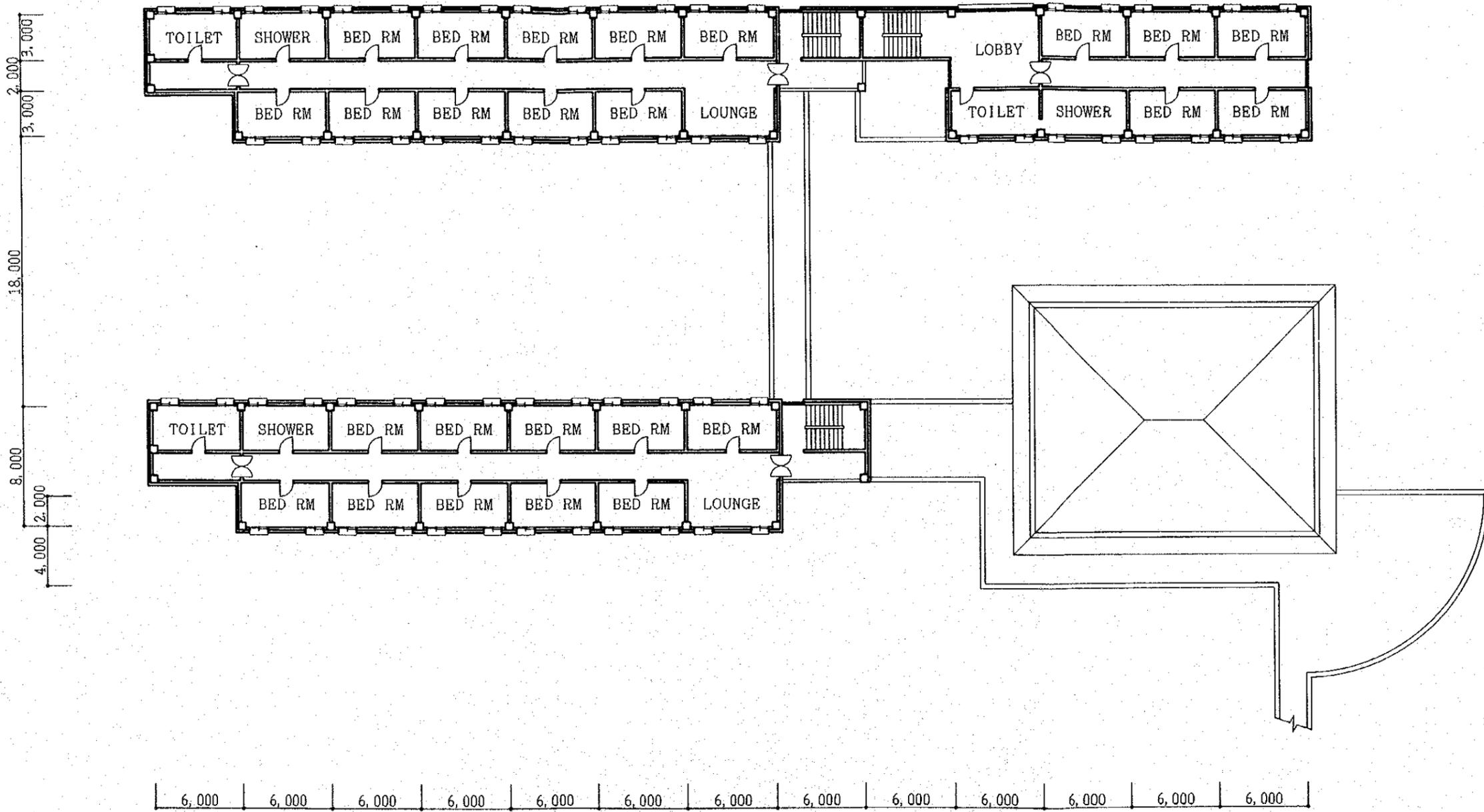
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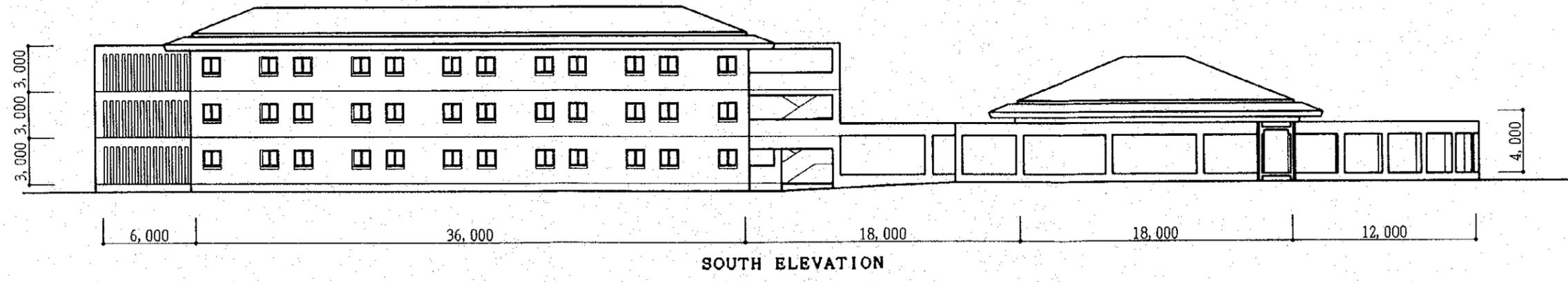
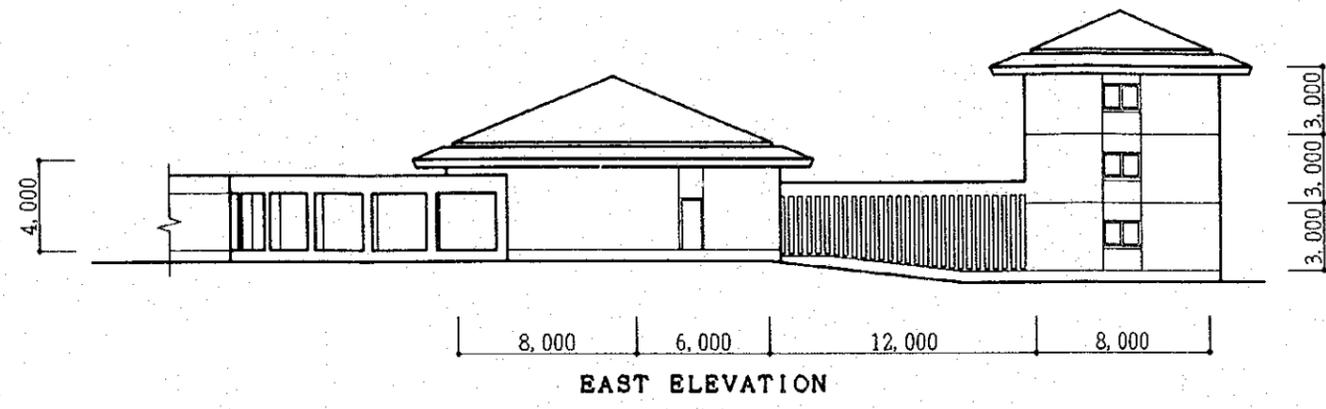
GROUND FLOOR PLAN



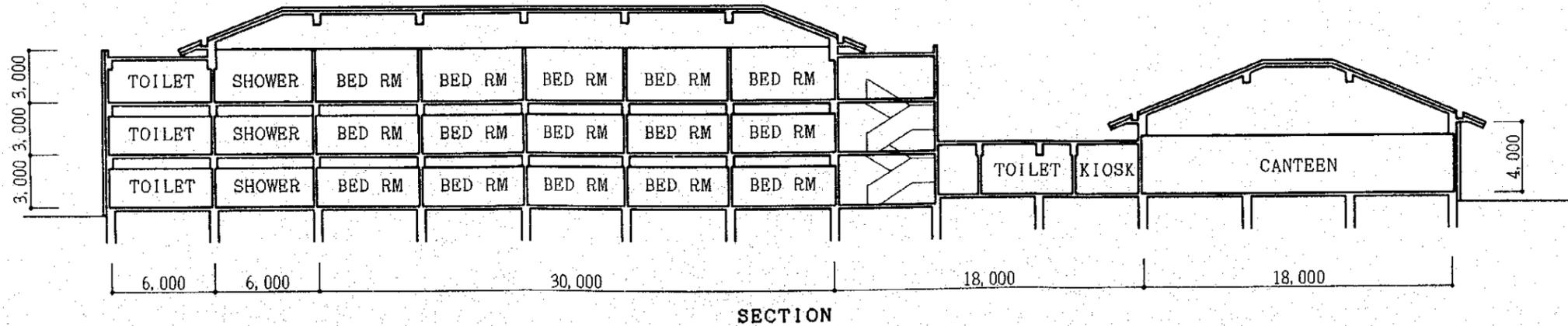
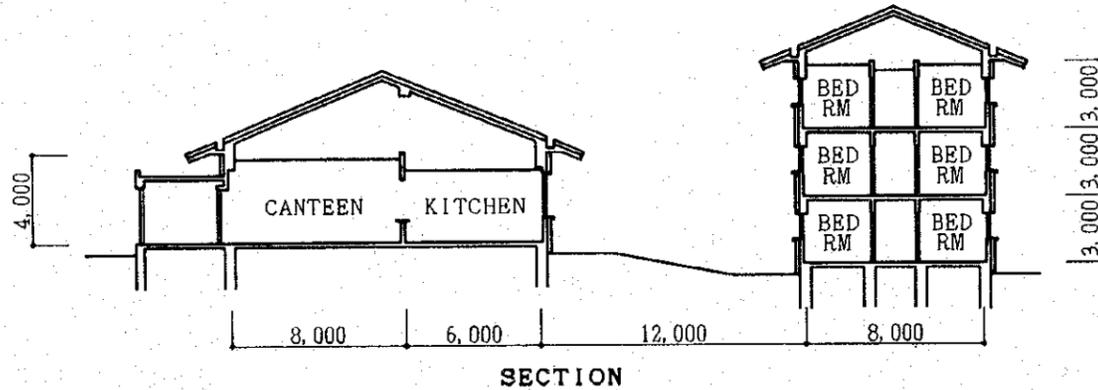
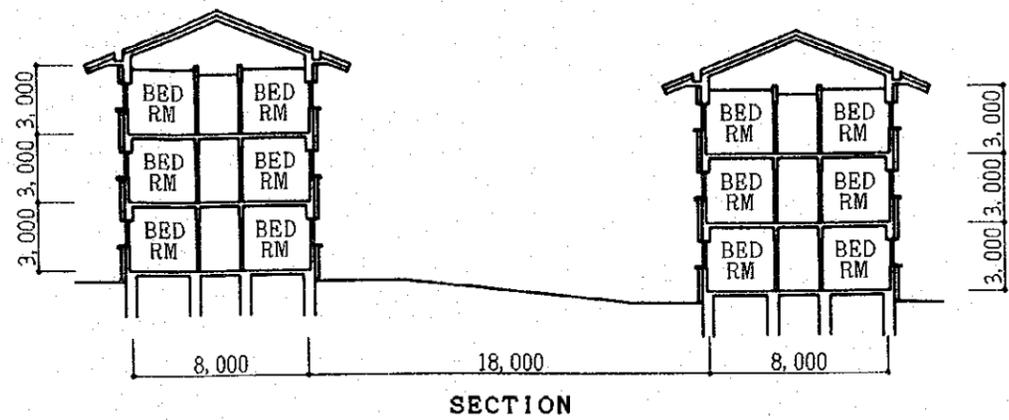
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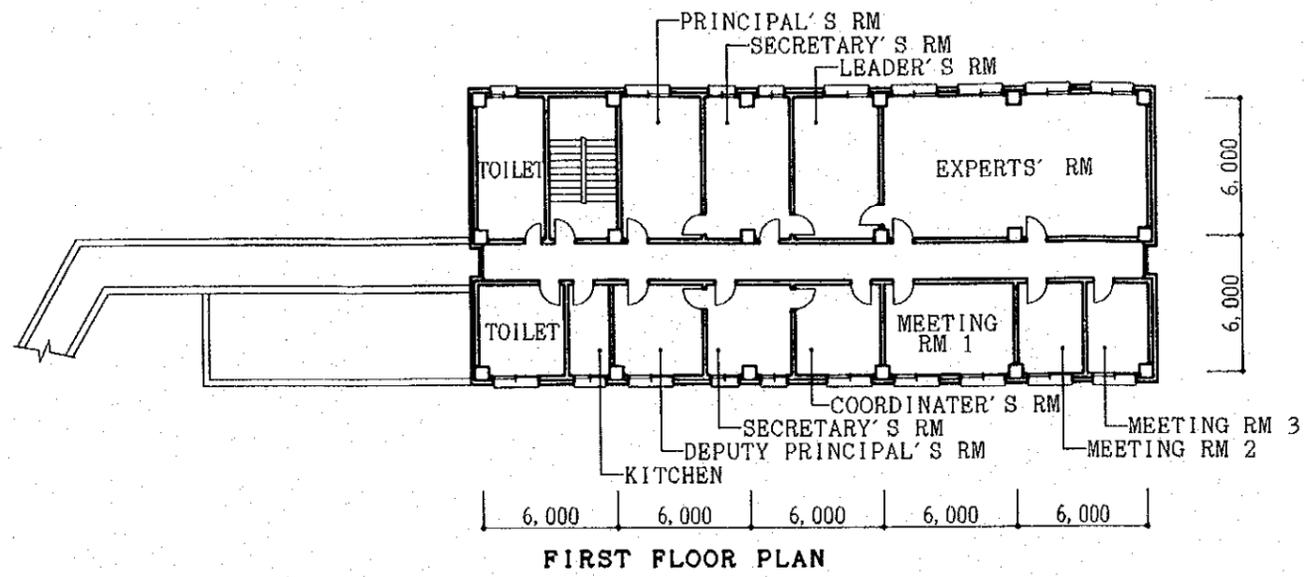
FIRST AND SECOND FLOOR PLAN



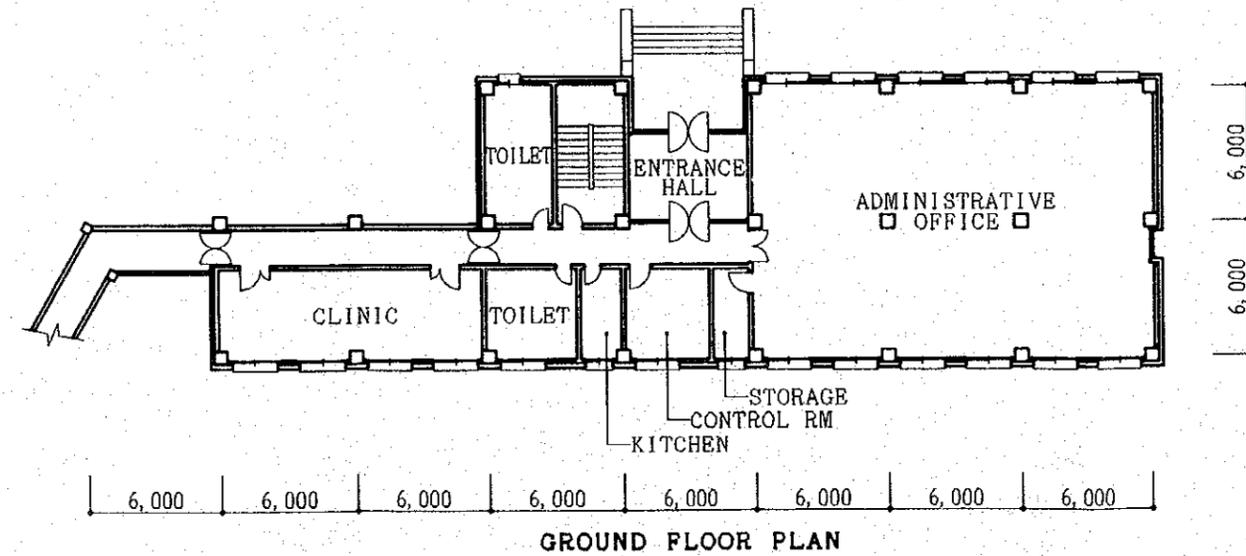
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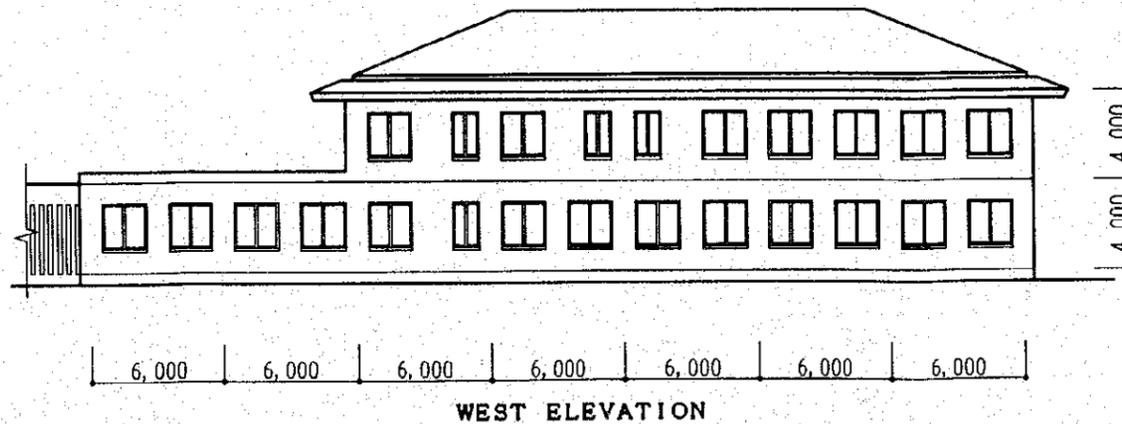
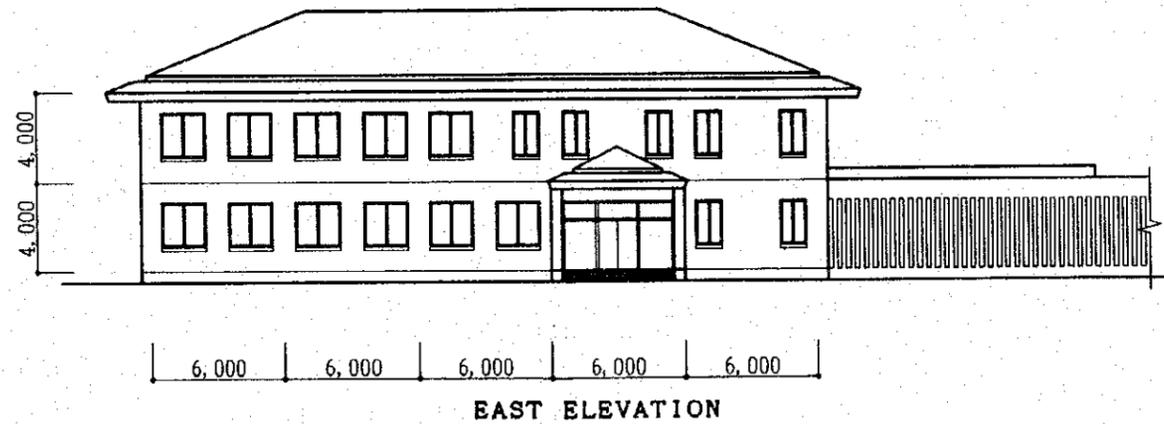
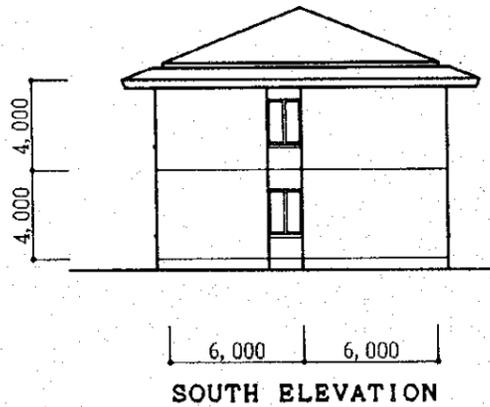
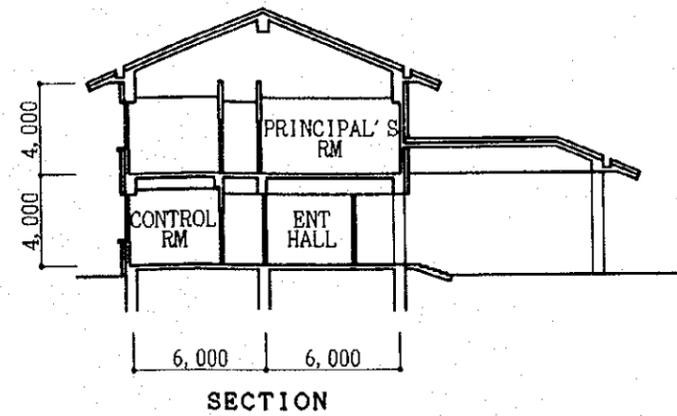
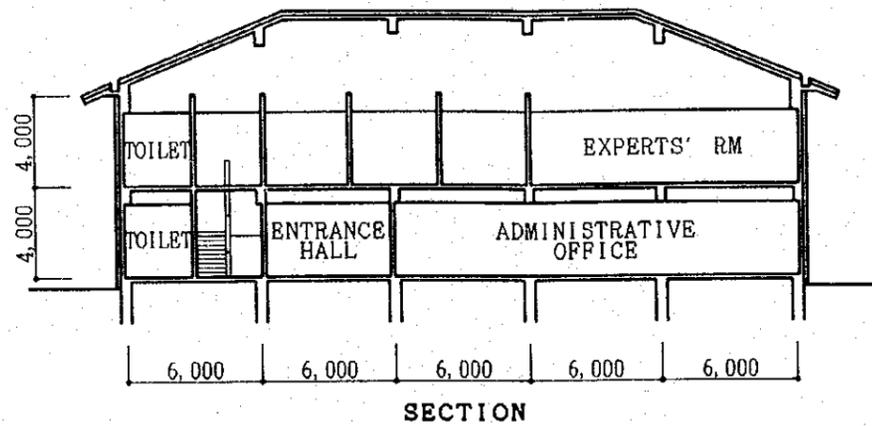
FIRST FLOOR PLAN



GROUND FLOOR PLAN

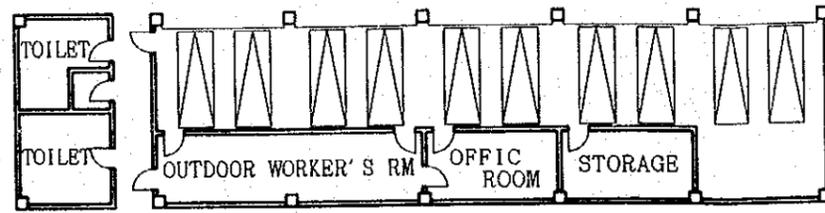


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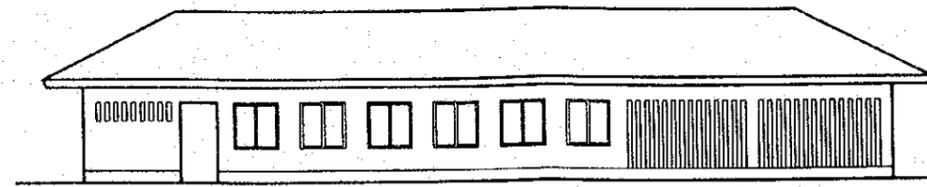


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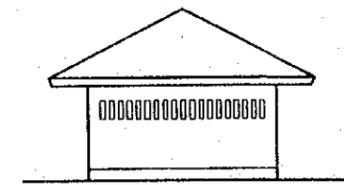
GARAGE



PLAN

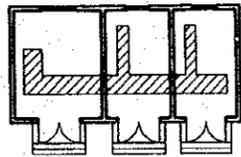


WEST ELEVATION

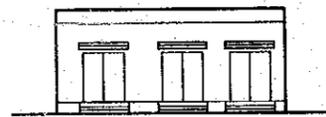


NORTH ELEVATION

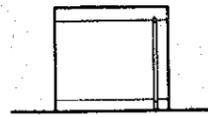
ELECTRIC ROOM



PLAN

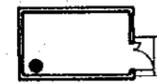


WEST ELEVATION

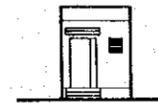


NORTH ELEVATION

PUMP ROOM

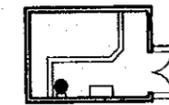


PLAN

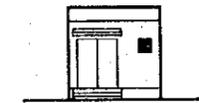


ELEVATION

NEUTRALIZATION

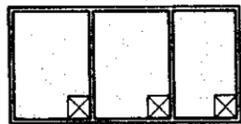


PLAN



ELEVATION

EVAPORATION TANK

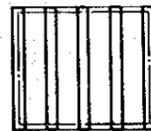


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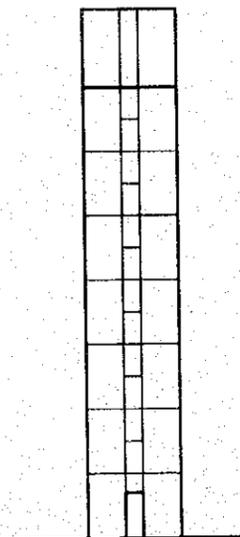


ELEVATION

RESERVOIR TANK



PLAN



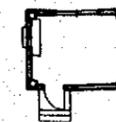
ELEVATION

INCINERATOR

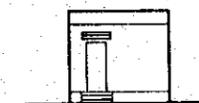


PLAN

GUARD HOUSE



PLAN



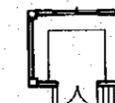
ELEVATION

TRASH BIN

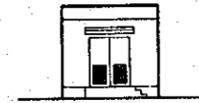


PLAN

STORAGE

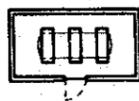


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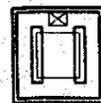
ELEVATION

LPG STORAGE



PLAN

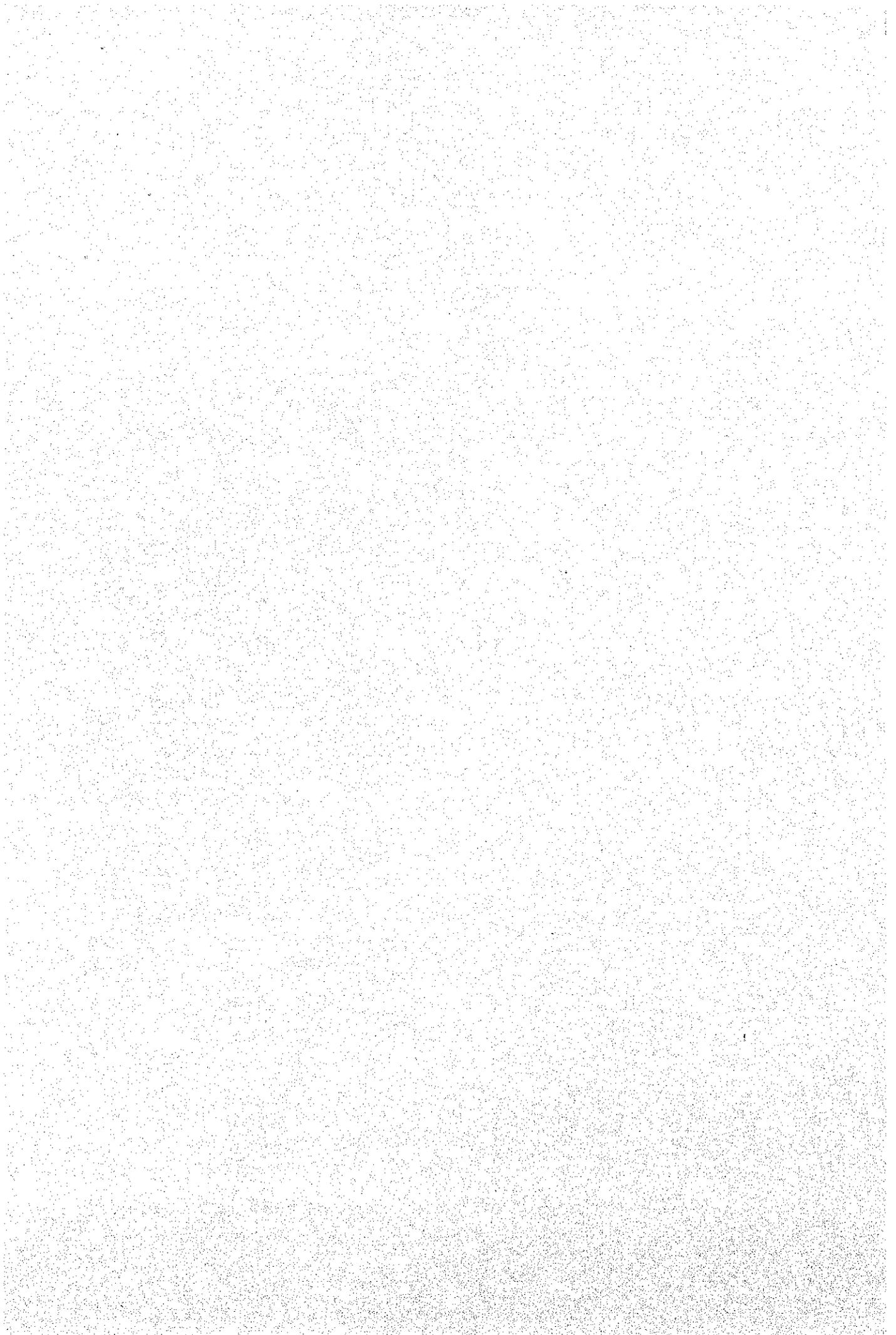
ELEVATED TANK



PLAN



Unit : mm



3-4 Implementation Plan

3-4-1 Construction Condition

(1) Term of Work and Contracting System

The Project is to be implemented under the Government of Japan's grant aid cooperation after the signing of an Exchange of Notes by the governments of both countries, subject to the Government of Japan's approval for it at a Cabinet meeting. Main facilities to be constructed under the Project are a two-story building in the Training Block (with an area of 2,920m²), a two-story building in the Administration Block (with an area of 1,220m²), and a three-story building in the Hostel Block (with an area of 2,710m²). Judging from the actual situation of the project site and the present conditions of procurement of building materials in Kenya, there will be no need to divide the construction period into phases. It will be possible to complete both the construction work and the equipment installation work within 12 months, or within a single fiscal year. In this case, it will be possible to start the planned institute's training programs from January, 1997, for the second intake of trainees to receive training under the Government of Japan's project-type technical cooperation program.

Judging from the size of the cost of both the construction work and equipment work, and the relations between both works, it will be appropriate to contract the construction work and the equipment work separately. Contractors are to be selected by conditional public tender in Japan.

(2) The Government of Kenya's System for the Implementation of the Project

The Project is to be implemented by the Survey of Kenya, a department in the Ministry of Lands and Settlement of Kenya. The Director of the Survey of Kenya will be a party representing the Kenyan side to the consultant agreement, the construction contracts, the banking arrangement and other arrangements concerning the implementation of the Project.

The External Resources Department of the Ministry of Finance of Kenya, will be the Kenyan organization to take charge of grant aid cooperation and will be responsible for carrying out activities concerning grant aid cooperation arrangements, as well as for approving the above-mentioned agreements and contracts.

Regarding technical matters such as the contents of the facility plan and the method of execution, the Survey of Kenya is required to ask the Ministry of Public Works and Housing for guidance and advice in accordance with the Office of President of Kenya's notification.

(3) Execution System

1) Consultant

After the signing of the Exchange of Notes on grant aid cooperation for the Project, the Survey of Kenya is to conclude a design and supervision agreement with the selected Japanese consultant and have such agreement verified by the Government of Japan. The consultant is to prepare detail design drawings based on the contents of the basic design study report and then carry out tender and construction supervision. In the case of the Project, it is necessary to reduce the design period so that training in the new facilities may be started in January 1997. It

will be difficult, therefore, to utilize the services of a local consultant in preparing design drawings.

2) Contractors

Contractors for both the construction work and the equipment work are to be selected from among qualified Japanese companies by public tender. In principle, the Survey of Kenya is to conclude both construction contract and equipment contract with the successful tenderers based on the results of public tender under the verification on such contracts by the Government of Japan.

The selected Japanese contractors will utilize local subcontractors, and also they need to dispatch Japanese engineers to the project site for the installation, test runs and adjustment of certain fields of construction and equipment works.

3-4-2 Implementation Method

(1) Situation of the Construction Industry in Kenya

1) Ministry of Public Works and Housing

The Project is ranked as a large-scale construction work for which a public organization places an order in Kenya. In the case of a large-scale construction work, the Ministry of Public Works and Housing of Kenya is required, in accordance with the president's notification, to cooperate with an executing organization that places an order for construction work concerning technical matters in the field of construction. The Ministry of Public Works and Housing issues various permits and conducts design and supervising activities. As such, the Ministry has technical departments of architecture, structure,

electrical engineering, mechanical engineering and quantity surveying. In carrying out this construction work, it is necessary to consult with, and obtain the approval of, the chief architect of the Ministry of Public Works and Housing at each of the stages of detail design, tendering and supervision of construction work.

2) Local Consultants

There are many consultant firms active in the center of Nairobi City. Few of them are general consultant firms capable of covering such technical fields as structural design, electrical engineering and other building facilities engineering. But most of the consultant firms are consisting mainly of architects, and these local consultant firms are actually conducting design work for a construction project with other engineering firms in specific technical fields. Although many of these local consultant firms' staff members were educated abroad, notably in Britain, and are highly competent in preparation of design drawings that comply with the British standards, they seem not so reliable in terms of adjustment of design work in relation to other related engineering fields in limited design periods.

3) Local Construction Firms

In Kenya, there are private construction firms of various sizes, and they can accept orders for various types of construction works, from big construction projects by foreign-owned companies to housing projects. There is no problem with the quantities of construction machines owned by them and their ability to procure locally made building materials. But there is a shortage of construction workers skilled in specific construction fields, which raises a question about local construction firms' process control capabilities. The

construction work under the Project is to be subcontracted to local construction firms. In this case, the Japanese contractor is to place an order for the most part (classified by type and size) of the construction work with a group of local construction firms. To ensure process control, it will be necessary to have Japanese construction engineers, skilled in specific technical fields, dispatched to the project site.

4) Locally available construction materials

In Kenya, general construction materials are either manufactured locally or imported. Therefore, in principle, it is possible to procure them locally. However, some of them are of poor quality and are supplied in limited quantities. It should also be noted that choices of types, patterns and colors are limited for certain products. In case prompt delivery of necessary quantities of products of high quality is required, it will be inevitable to procure them from Japan or third countries as occasion demands.

5) Exemption from Taxation

Japanese corporations to be concerned with the implementation of the Project, such as the Japanese consultant and contractors, are to be exempted from all taxes imposed under the Kenyan laws. In Kenya, however, new taxation-related systems and taxation procedures have been introduced or are being introduced, and confusion is arising as to how to apply them. For example, under the "pre-shipment inspection charge", equivalent to 2 percent of the F.O.B. price, is applicable to any imported good whose F.O.B. price, is US\$500 or more and inspection charges are collected from exporters of these goods. But it is not clear whether or not the inspection charge is applicable to goods imported into Kenya for use in grant aid cooperation projects. There

is a strong possibility that new taxation-related systems will be introduced in Kenya in the future, and therefore it will be necessary to watch closely new taxation in the country.

(2) Points to Note in Executing the Construction Work

Judging from the present state of the project site and the actual situation of the local construction industry, there is a need to note the following points in executing the construction work.

1. Trees growing in the project site are to be removed by the Kenyan side at its expense, if it is in the way of the construction work. But every effort should be made to leave those trees in the project site unremoved, from the standpoint of environmental protection.
2. The construction work under the Project is to be implemented on the premises of the Survey of Kenya, and therefore the Survey of Kenya's existing facilities are to continue to perform their present functions throughout the period of the construction work. For this reason, there is a need to take sufficient safety and crime prevention measures in carrying out the construction work so that the effects of the construction work on the existing facilities may be minimized.
3. The Government of Kenya is required to execute the electric supply, water supply and sewerage work outside the project site without delay. In the case of the sewerage work, in particular, it will be necessary to have detailed prior consultations with a public organization whose facilities are located close to the project site because the planned sewerage pipe is to pass through the premises of the public organization.

4. The Government of Kenya is required to follow tax exemption and customs clearance procedures for imported building materials. It will also be necessary to secure fiscal resources thorough understanding of local laws and regulations concerning customs clearance.

3-4-3 Construction and Supervisory Plan

In accordance with the procures of Japan's grant aid program, the Japanese consultant firm will conclude a consultant agreement with the implementing organization of the Government of Kenya. After concluding the agreement, the consultant will work out detailed design documents and supervise the construction work in compliance with the provisions of the consultant agreement. Construction supervision is aimed at ensuring that the construction work will be carried out in accordance with the design documents, and at providing direction, technical advise and coordination throughout the term of services from a fair point of view for the proper implementation and quality control of the construction work. The construction supervision service includes the followings.

1. Assistance in tendering

The consultant shall prepare the documents necessary for tendering the construction work and the equipment procurement/installation work, and assist the client in carrying out tasks such as the public announcement of invitation to tender, acceptance of applications, prequalification, distribution of documents to the tenderers, acceptance of tender, evaluation of the tender results. And the consultant also advise the client on concluding the contract.

2. Direction, advice and coordination to the contractor

The consultant shall examine the construction schedule, construction plan, the building materials procurement plan and the equipment procurement/installation plan, and shall give the direction, advice and coordination to the contractors.

3. Examination and approval of shop drawings and manufacturing drawings

The consultant shall examine and approve the shop drawings, manufacturing drawings and other relevant documents submitted by the contractors.

4. Confirmation and approval of building materials and equipment

The consultant shall confirm the consistency with the contract documents of the building materials and equipment which the contractors propose to procure, and shall approve their adoption.

5. Plant inspection

The consultant shall inspect the building materials and equipment at the manufacturers' factories to ensure their quality and performance.

6. Reporting on progress of the construction work

The consultant shall grasp the actual conditions of the construction site and progress, and report them to both Governments.

7. Completion inspection and test operations

The consultant shall inspect the completed facilities and the installed equipment, and make a test run of each piece of equipment, in order to ascertain that all the works of facilities and equipment are completed in compliance with the provisions of the contract

documents, and shall submit the Inspection Certificate to the Kenyan side.

8. Training in operation of the equipment

Some equipment installed under the Project will require considerable operating skills as well as good knowledge of their maintenance. For this reason, it will be necessary to have the Kenyan engineers in charge receive on-site trainings in proper equipment operation and troubleshooting techniques during the installation/adjustment/test-run period. The consultant shall give direction and advice concerning the training programme.

Judging from the scale of the Project, it is advisable that, in carrying out the aforementioned tasks, the consultant shall dispatch an architect/engineer to Kenya throughout the term of works. The consultant shall also dispatch necessary engineers to the site at relevant occasions for inspection, direction and coordination, and at the same time establish a communication and backup system to assign necessary engineers in Japan. The consultant shall report the progress of the works, payment procedures, completion of the construction of the facilities and installation of the equipment, and any other relevant matters to the competent agencies of the Japanese Government.

3-4-4 Material Procurement Plan

(1) Material Procurement Criteria

The following shall be noted for procurement of materials necessary for the Project.

1) Local procurement

To facilitate the repair and maintenance after completion of the Project, materials used for the construction of the facilities should be primarily procured locally. In this case, before placing an order to local manufacturers or suppliers, current supply must be thoroughly examined in order to evade delay in the construction work due to shortfalls in supply of these materials.

2) Imported materials

Those materials which are considered poor in quality or in short supply should be imported from Japan or third countries. In this case, the contractor will be required to keep in close contact with the Kenyan officials of the implementing organization of the Project concerning their importation and customs clearance, and to ensure that all the necessary procedures are followed without delay.

3) Unit prices of materials

The unit price for the importation of material (including the packing, transportation and insurance costs) should be compared with that for its local procurement. When the unit price for its local procurement is judged to be lower than or nearly equal to that for its importation, the local products shall be given priority.

(2) Material Procurement Plan

The main materials procurement plan for the construction work will be as follows.

Table 3-5 Materials Procurement

Works	Material	Procurement			Remarks
		Local	Japan	Others	
Architectural Work	Cement	○			Unstable in supply but including imported cement, possible to procure locally.
	Sand	○			River sand available
	Gravel	○			Crushed stones available
	Reinforcing bar	○			Good in quality and supply quantity
	Form (Plywood)	○			Available locally
	Nairobi stone	○			For partition wall
	Concrete block	○			For partition wall
	Terrazzo tile	○			For floor finishing, not many varieties
	Ceramic tile	○			Produced locally, not many varieties
	Glass	○			Produced locally
	Roof tile (Cement Roof tile)	○			Commonly used for roof material
	Timber			○	Short supply, also poor in quality
	Calcium silicate board	○			Imported ones available locally
	Doors & Windows (Metal)			○	Poor quantity and short supply
	Doors & Windows (Wood)	○			Available locally
Hardware			○	Not produced locally	
Paint	○			Easy maintenance	
Mechanical Work Sanitary Work	Pump		○		Bad quality
	Fan		○		Not produced locally
	Air-conditioner			○	Imported ones available through local agent
	Apparatus for septic and neutralization tank		○		Not produced locally
	Water treatment apparatus		○		Not produced locally
	Sanitary fittings	○			Imported ones available but joints poor quality
	PVC pipe	* ○	○		No joints available, *Use only for outdoor piping
Galvanized steel pipe	○			Imported ones available but its joints poor quality	
Electrical Work	Distribution panel		○		Not produced locally
	Lighting fixtures			○	Bad quality, small variety
	Telephone exchange	○			Available locally
	Paging system		○		Not produced locally
	Fire alarm system		○		Not produced locally
	Wiring pipe	○			Available locally
	Wire	○			Available locally

(3) Equipment Procurement Plan

The survey equipment which will be used in the Project shall be procured in accordance with the following table.

Table 3-6 Equipment Procurement Plan

Training course	Equipment	Country			Remarks
		Local	Japan	Others	
General use	Table, chair, beds, etc.	○			Manufactured locally.
Land survey	GPS equipment		○		Not manufactured locally.
	Theodolite		○		Not manufactured locally.
	EDM equipment		○		Not manufactured locally.
	Level		○		Not manufactured locally.
	Calibration system		○		Due to the quality.
	Equipment for physic laboratory		○		Due to the quality.
Cartography	Planimeter		○		Not manufactured locally.
	CAC equipment		○		Not manufactured locally.
	Stereo zoom transferscope		○		Not manufactured locally.
	Light table		○		Not manufactured locally.
Photogrammetry and Remote Sensing	Analytical plotter		○		Kenya side are used to it.
	Image scanner		○		Not manufactured locally.
	Aerial camera simulator	○			Can be procured locally.
	Point pricking machine		○		Kenya side is used to it.
	Mirror stereoscope		○		Existing equipment are imported.
	Software for image analysis		○		Not manufactured locally.
Map Reproduction	Proofing equipment	○			Can be procured locally.
	Printing press	○			Can be procured locally.
	Desktop publishing system	○			Can be procured locally.
	Process camera	○			Can be procured locally.
	Film processor	○			Can be procured locally.
	Plate processor	○			Can be procured locally.
	Light table	○			Can be procured locally.
	Equipment for applying light sensitive coating	○			Can be procured locally.
Library	Reading table & chairs	○			Not manufactured locally.
	Monograph card catalogue duplicating machine		○		Can not be procured locally.
	Unit shelves	○			Manufactured locally.
	Binding equipment		○		Can not be procured locally.
Computer Equipment	Desktop computer	○			There is a agency.
	Printer	○			There is a agency.
Vehicles	Minibus	○			Assembled locally.
	4WD wagon	○			Assembled locally.
	Pickup truck	○			Assembled locally.

3-4-5 Implementation Schedule

When the Exchange of Notes concerning the implementation of the Project is concluded between the Government of Japan and the Government of Kenya, the construction and equipment work will be implemented with the following procedures.

1. Detail design

The consultant shall prepare the design documents such as detailed design drawings, specifications and tender documents based on the contents of the basic design study report after the conclusion of the consultant agreement. The consultant shall also obtain approval on the above-mentioned documents from the Kenyan side after consultation with them. The time required for completing the procedure is estimated at three months.

2. Tendering

The contractors to take charge of the construction work and the equipment work will be selected separately by tender. The tender work includes tender announcement, prequalification, acceptance of tenders, evaluation of the tenders, designation of the contractors and conclusion of the contracts. The time required for completing this procedure is estimated at about one and a half months.

3. Construction work and equipment work

Judging from the contents and scale of the work and the actual situation of the local construction industry, it will take 12 months to complete the entire project, including the equipment work, provided

the procurement of building materials and the customs clearance of imported articles proceed smoothly.

The overall implementation schedule from the conclusion of the Exchange of Notes to the completion of the project by considering the above-mentioned factors is as shown in table 3-7.

Table 3-7 Implementation Schedule

Month	1	2	3	4	5	6	7	8	9	10	11	12	
Detail Design	■ (Detail Design)			■ (in Kenya)		■ (Tender)		■ (in Kenya)					
	(Total 4.5 months)												
Construction Work	■ (Preparation)	■ (Earth Work)		■ (Concrete Work)					■ (Finishing Work)				
	(Total 12.0 months)												
Equipment Procurement & Installation work	■ (Preparation)	■ (Manufacturing/Procurement)						■ (Transport)		■ (Installation/Adjustment)			■ (Training)
	(Total 12.0 months)												

3-4-6 Scope of Work

(1) Scope of Work

The Project is to be implemented through close cooperation between the Government of Japan and the Government of Kenya within the framework of grant aid from the Government of Japan. It is reasonable for the Governments of the two countries to undertake scope of works as shown follows.

1) The work to be done by the Government of Japan

1. Facilities

- Construction of the buildings described in this basic design study report
- Electrical, mechanical and sanitary installations

2. Equipment

- Equipment procurement work
- Equipment installation work

3. Infrastructure

- Substation
- Water supply and drainage work within the premises
- Telephone exchange system

4. Outdoor structures

- Roads and parking lots within the premises
- Septic tanks
- Outdoor lighting

5. Other work related to the above work

- Transportation of equipment and materials from Japan to Kenya

- Inland transportation of imported equipment and materials from ports of disembarkation to the project site

2) The work to be done by the Government of Kenya

1. Site and outdoor structures

- Securing the site for the project
- Removing existing structures, trees and so on from the project site and reclamation of site
- Construction of access roads to the project site
- Construction of exterior structures including fence, gate and a regulatory pond etc.
- Exterior works such as planting

2. Infrastructure

- Supply of electricity up to the site
- Installation of telephone line up to the MDF
- Water supply up to the reservoir of the proposed building and connection of the sewerage line to the main at the building.

3. Preparatory work

- Provision of sites for temporary construction site office, workshops and material storage places
- Installation of temporary electricity supply and telephone lines

4. Fixtures and furniture

- Fixtures, curtains, furniture, etc. other than those supplied by the Government of Japan

5. Procedural work and its expenses borne by the Kenyan side

- Banking arrangement expenses
- Tax exemption procedure expenses

- Prompt action related to customs clearance and inland transportation
- Necessary measures for exempting the Japanese nationals engaged in the implementation of the Project from customs duties, domestic taxes and other fiscal levies in accordance with the verified agreement
- Arrangement to expedite the acquisition of visas, customs clearance, and any other formalities that may be necessary for the entry of Japanese nationals engaged in the implementation of the project
- Maintenance and management expenses for ensuring that the facilities constructed and the equipment installed are operated properly and effectively
- Expenses for the construction-related procedures

(2) Estimated costs to be borne by the Government of Kenya

- | | |
|---|-----------------|
| 1. Electric power supply | 400,000 Kshs |
| (installation of power line with 2 poles) | |
| 2. Telephone trunk line | 50,000 Kshs |
| (branch fee at hand-hole) | |
| 3. Water supply | 950,000 Kshs |
| (change of water supply line to 150Ø, 100m length) | |
| 4. Sewerage | 2,65,000 Kshs |
| (connect 250Ø pipe to 400Ø main, 200m length,
with deposit to Nairobi City Council)) | |
| 5. Removal of existing trees and site reclamation ... | 1,200,000 Kshs |
| 6. Purchase of Equipment | 15,000,000 Kshs |
| (not specified, but reserved in the budget of 95/96~97/98) | |
| 7. Fittings and furniture | 1,800,000 Kshs |
| (desks & chairs, 80 sets) | |

8. Curtain	750,000 Kshs
(200 windows)	
9. Construction of Access Road	1,500,000 Kshs
(from THIKA road to the gate)	
10. Fencing & Planting	1,800,000 Kshs
(fencing 300m by planting and wire-net)	
11. Others	500,000 Kshs
<hr/>	
	26,600,000 Kshs

It will be necessary to include in the total costs the following as part of the expenses to cover fees and commission.

- Banking arrangement for each contract.
- Bank commission of each payment to the Consultant and Contractors

It is desirable that the Government of Kenya prepare the budget for the Project and conduct the construction with proper timing so that the entire project can be implemented smoothly.