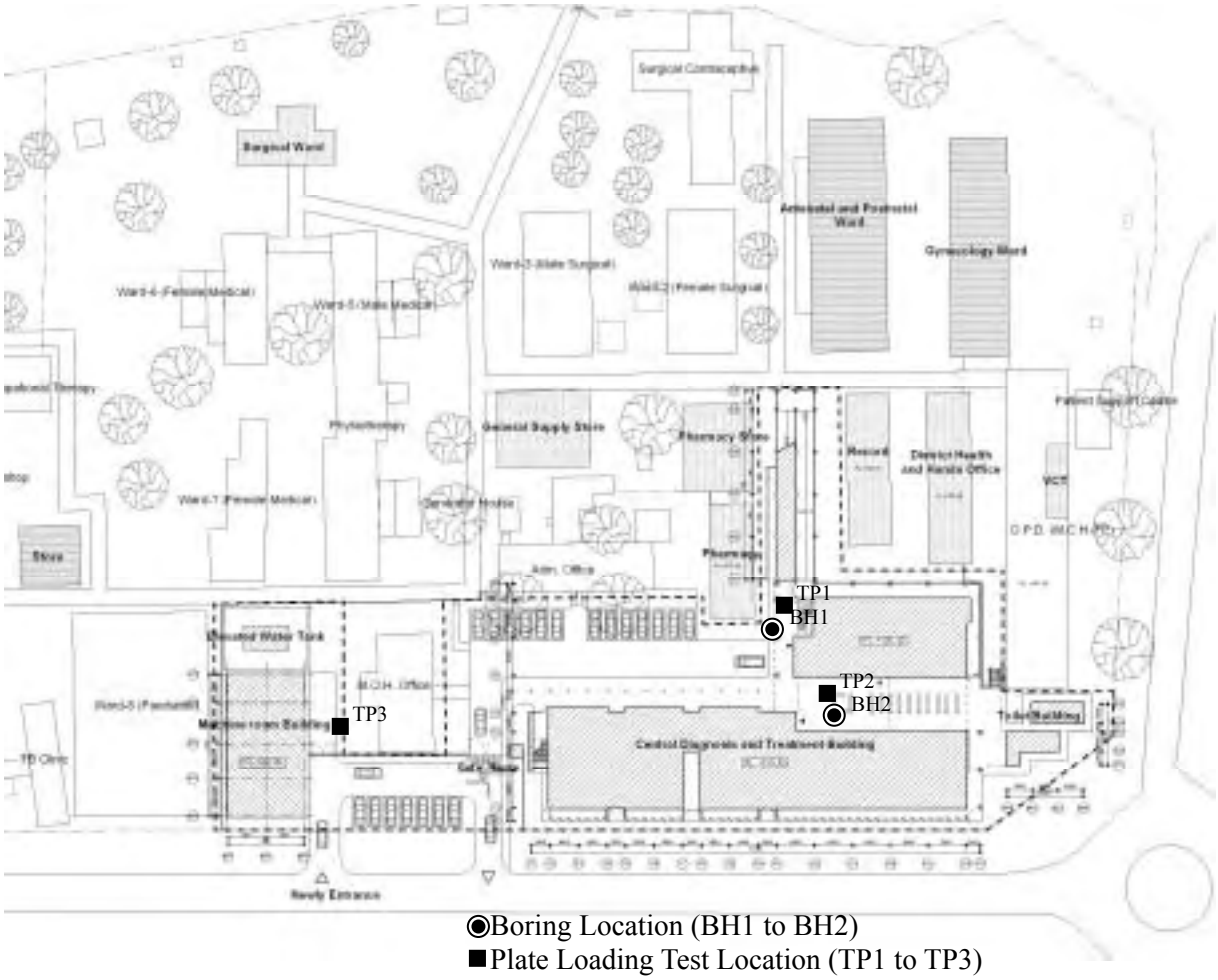
2-2-2-4 Structural Plan

(1) Summary of the geological study results

1) Kisii District Hospital

Boring and plate loading tests were done at points indicated in Figure 2-21 to obtain the depth and bearing strength of the bearing ground necessary for the foundation design. A portion of the results of boring test and the results of plate loading test are shown on Tables 2-35 and 2-36, respectively. The loading plate used for the plate loading test measured 30cm in diameter and the test was done at a depth of 1.5 meters.

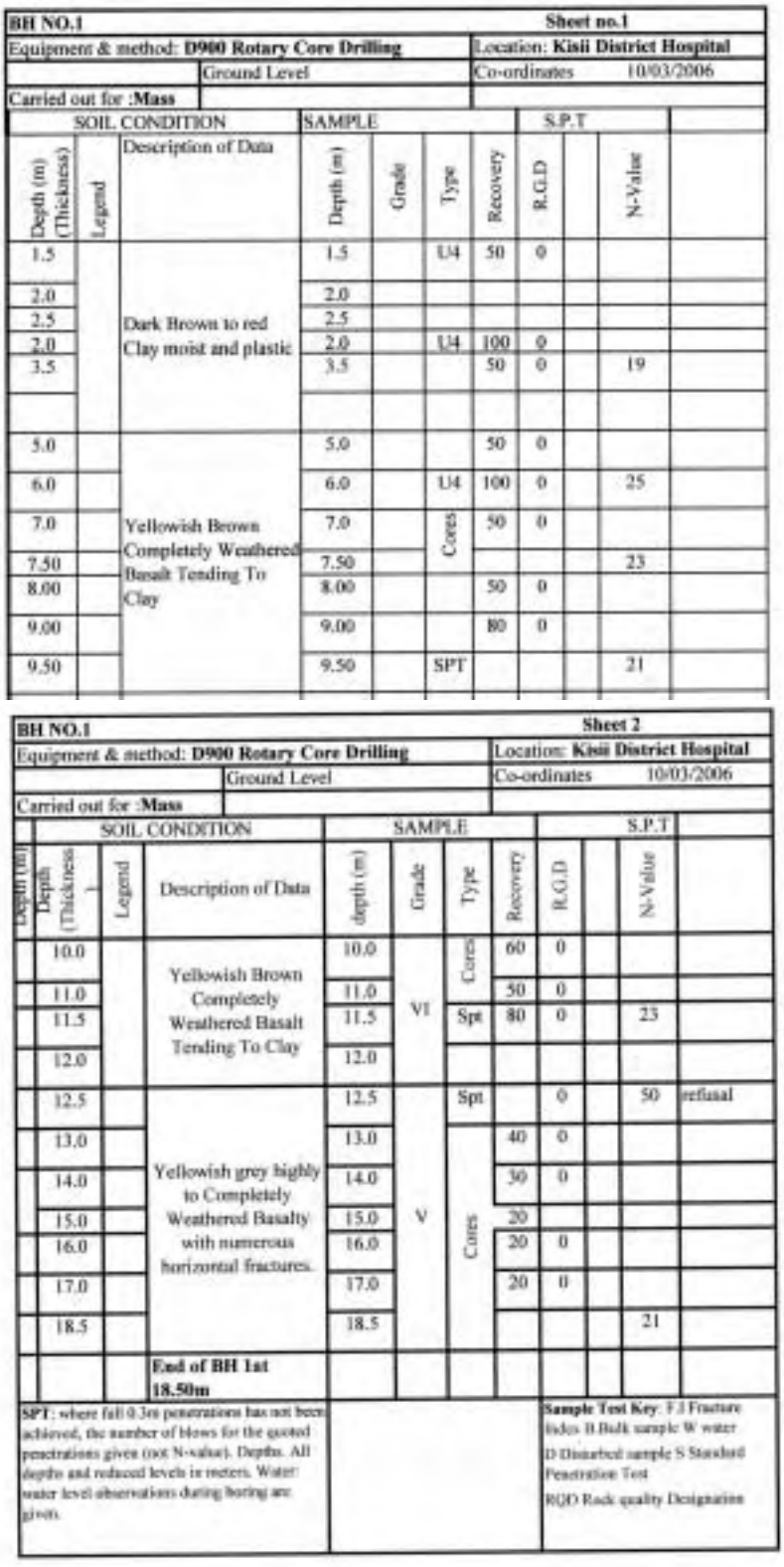
The boring test results indicate that a cohesive soil (weathered basalt) layer lies to a depth of about GL-20m, indicating an N value of 19 to 50. The results of plate loading test indicate that subsidence at the maximum load (500 kN/m^2) was 12.5mm, and from this the ultimate bearing capacity is considered to be 500 kN/m^2. Therefore, the long-term load bearing strength may be expected to one third of it, or 160 kN/m^2. On the other hand, the result of the tri-axial compression test done on the same layer gave an angle of internal friction of φ= 10, a cohesion of c = 27. With these values the long-term load bearing strength turns out to be 70 to 80 kN/m^2 according to the "Foundation Design Guideline" of the Architectural Institute of Japan. Given such study results, the design long-term load bearing strength is set at 70 kN/m^2. This cohesive soil tends to collapse if it absorbs water; therefore, it is necessary to take a measure to prevent water from permeating to the ground beneath the foundation.



◉Boring Location (BH1 to BH2)
■Plate Loading Test Location (TP1 to TP3)

Figure 2-21 Location of Ground Examination in the Premises of the Kisii District Hospital

Table 2-35 Boring Data (BH NO. 1) of the Kisii District Hospital



BH NO.1 — Sheet no.1

Equipment & method: **D900 Rotary Core Drilling** — Location: **Kisii District Hospital**

Ground Level — Co-ordinates 10/03/2006

Carried out for :**Mass**

SOIL CONDITION			SAMPLE				S.P.T		
Depth (m) (Thickness)	Legend	Description of Data	Depth (m)	Grade	Type	Recovery	R.G.D		N-Value
1.5		Dark Brown to red Clay moist and plastic	1.5		U4	50	0		
2.0			2.0						
2.5			2.5						
2.0			2.0		U4	100	0		
3.5			3.5			50	0		19
5.0		Yellowish Brown Completely Weathered Basalt Tending To Clay	5.0			50	0		
6.0			6.0		U4	100	0		25
7.0			7.0		Cores	50	0		
7.50			7.50						23
8.00			8.00			50	0		
9.00			9.00			80	0		
9.50			9.50		SPT				21

BH NO.1 — Sheet 2

Equipment & method: **D900 Rotary Core Drilling** — Location: **Kisii District Hospital**

Ground Level — Co-ordinates 10/03/2006

Carried out for :**Mass**

Depth (m)	SOIL CONDITION			SAMPLE				S.P.T		
	Depth (Thickness)	Legend	Description of Data	depth (m)	Grade	Type	Recovery	R.G.D	N-Value	
	10.0		Yellowish Brown Completely Weathered Basalt Tending To Clay	10.0	VI	Cores	60	0		
	11.0			11.0			50	0		
	11.5			11.5		Spt	80	0	23	
	12.0			12.0						
	12.5		Yellowish grey highly to Completely Weathered Basalty with numerous horizontal fractures.	12.5	V	Spt		0	50	refusal
	13.0			13.0		Cores	40	0		
	14.0			14.0			30	0		
	15.0			15.0			20			
	16.0			16.0			20	0		
	17.0			17.0			20	0		
	18.5			18.5					21	
			End of BH 1st 18.50m							

SPT: where full 0.3m penetrations has not been achieved, the number of blows for the quoted penetrations given (not N-value). Depths. All depths and reduced levels in meters. Water: water level observations during boring are given.

Sample Test Key: F.I Fracture Index B Bulk sample W water D Disturbed sample S Standard Penetration Test RQD Rock quality Designation

Table 2-36 Result of Plate Loading Test at the Kisii District Hospital

Load location	Compressive stress (kN/m^2)	Subsidence (mm)
TP NO. 1	500	12.52
TP NO. 2	500	8.06
TP NO. 3	500	7.82

2) Kericho District Hospital

The plate loading test alone was done at locations indicated in Figure 2-22, of which the results of test are shown in Table 2-37. The method for the plate loading test was the same as that for the Kisii District Hospital.

The results of plate loading test indicate that subsidence at the maximum load (500 kN/m^2) was 25.9mm, and from this the ultimate bearing capacity is considered to be 500 kN/m^2. Therefore, the long-term load bearing strength should be one third of this value, or 160 kN/m^2. However, for the sake of safety, the design long-term load bearing strength is set at 70 kN/m^2, as is the case with the Kisii District Hospital. The bearing ground is a cohesive soil which tends to collapse if it absorbs water; therefore, it is necessary to take a measure to prevent water from permeating to the ground beneath the foundation, as is the case with the Kisii District Hospital.

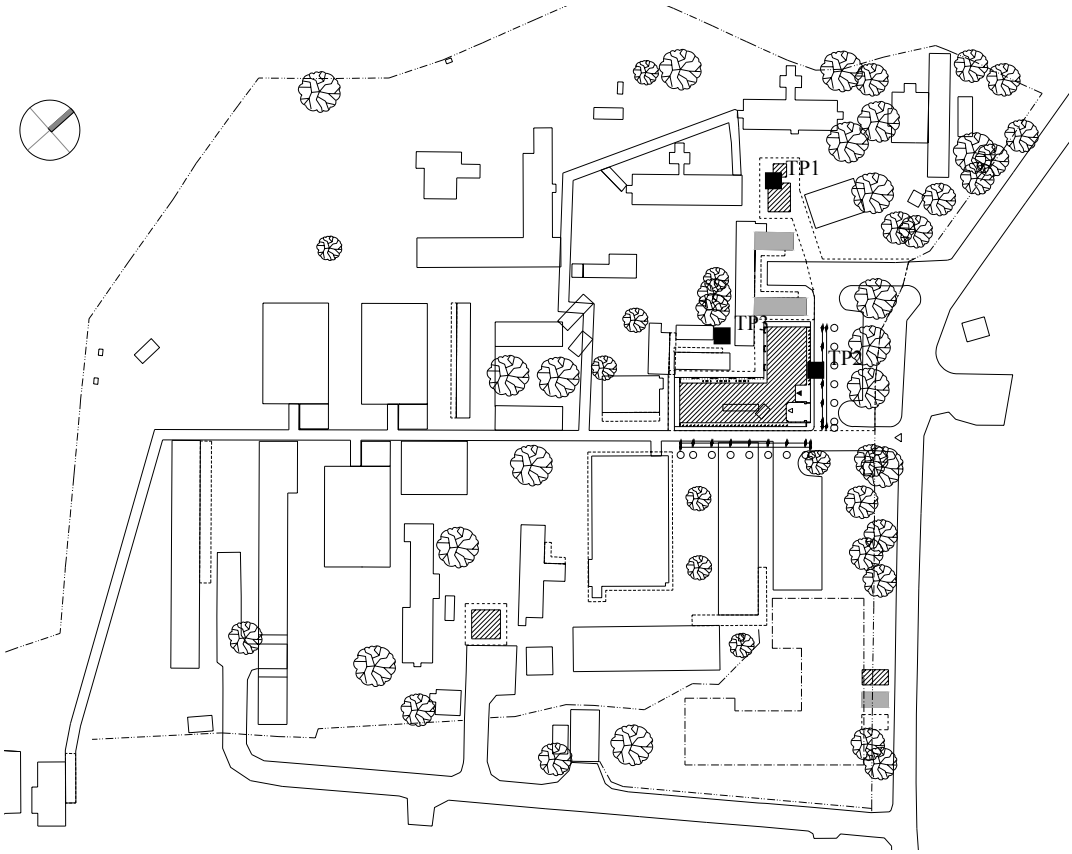


Figure 2-22 Location of Ground Examination in the Premises of the Kericho District Hospital

Table 2-37 Result of Plate Loading Test at the Kericho District Hospital

Load location	Compressive stress (kN/m^2)	Subsidence (mm)
TP NO. 1	500	11.6
TP NO. 2	500	25.9
TP NO. 3	500	7.23

(2) Foundation plan

1) Kisii District Hospital

The Outpatient Department Building is a two-storied reinforced concrete building and therefore adopts the spread foundation. Of the spread foundations, the mat foundation is adopted. This is because the building needs pits over a wide area for reason of its uses, and the contact pressure should not exceed the allowable bearing strength, and the long-term contact pressure is kept lower than 70kN/m^2. Such ancillary buildings as Machine Building do not need pits in principle and the continuous footings foundations, one type of the spread foundation, will be adopted.

2) Kericho District Hospital

The planned Casualty is a one-storied reinforced concrete building. For the reasons same as the Kisii District Hospital, the mat foundation is adopted, and the long-term contact pressure is kept lower than 70kN/m^2. Such buildings as Machine Building adopt the continuous footing foundation, and will have a berm surrounding the buildings.

(3) Structural plan

1) Kisii District Hospital

The planned facility is a two-storied building, with a basic span of 6.0m × 6.0m. The structure will be the pure reinforced concrete rigid frame structure commonly used in Kenya. Such ancillary buildings as Machine Building will be of the same structure.

2) Kericho District Hospital

The Casualty will be a one-storied building. The span module and structure type will be the same as those of the Kisii District Hospital.

(4) Policy for the structural design

The structural design will be done in conformity mainly with the Building Code Republic of Kenya, and also with the earthquake resisting design standard, the General Specification for Building Works Republic of Kenya, and also referring to the BS Standards. As found necessary, the design standards of Japan will be referred to. Given below is a list of major codes and standards to which the design will conform.

a. the Building Code Republic of Kenya
   Building Code Republic of Kenya (1968)
b. Earthquake resisting design standard: earthquake resisting design code of Kenya
   Code of Practice for the Design & Construction of Buildings & Other Structures in relation to Earthquakes (1973)
c. General specification for construction works: the General Specification for Building Works Republic of Kenya
   General Specification for Building Works, Republic of Kenya (1976)
d. Load conditions according to the BS Standards
e. BS standard for reinforced concrete structures
f. Various standards of the Architectural Institute of Japan

(5) Load and external force

1) Dead load

The dead load is calculated from the weights of structural materials, exterior surfacing materials, pipes and ducts fixed to the building.

2) Live load

As live loads for the design, the numbers indicated in the Building Code Republic of Kenya will be used. Other than that, the design conditions should not fall short of the numbers corrected by the load conditions of the BS Standards, and will be set to meet the actual conditions of use. The live loads of major rooms are shown below.

Table 2-38 Live Loads of Major Rooms

Room	Live load (N/m^2)	Note
Various wards, wash rooms, toilets	2,000	Kenyan code
Radiography room, theatre	2,000	BS Standards
Office, laboratory, treatment room	2,500	Kenyan code
Corridor, stairway	4,000	BS Standards
Balcony	4,000	BS Standards
Conference room	5,000	Kenyan code
Runway, parking lots	7,500	Kenyan code
Machine room (including machine weight)	7,500	BS Standards (excepting heavy machines which are separately treated)
Storage room	10,000	Kenyan code
Flat roof	1,500	BS Standards (0° □ gradient □ 10°)
Sloped roof	250	BS Standards (10° < gradient □ 30°)

3) Wind load

The Building Code Republic of Kenya calls for application of the BS Standards for wind loads. However, the reference wind speed is not specified for the project area. The past records do not indicate damages by cyclones in Kisii and Kericho Districts; therefore, the design will use the minimum value of the BS Standards, or 38m/s. The wind load is given by the equations below, and the calculation gave the design wind speeds of 38m/s and 40m/s, respectively for Kisii District and Kericho District.

$V_s = V \cdot S_1 \cdot S_2 \cdot S_3$
$F = C_f \cdot q \cdot A_c$
$q = 0.613 \cdot V_s^2$
Where,

Vs: design wind speed (m/s)
V: reference wind speed (=38m/s)
S_1: topographic factor (=1.1)
S_2: coefficient determined by the ground roughness and the scale of building
(Kisii District: ground roughness (1); building scale, Class C, then the coefficient = 0.90) (Kericho District: ground roughness (1), building scale, Class B, then the coefficient = 0.95)
S_3: statistical factor (= 1.0)
F: wind force (N)
Cf: coefficient of wind force
q: design wind pressure (N/m^2)

4) Seismic load

The design will conform to the Code of Practice for the Design & Construction of Buildings & Other Structures in relation to Earthquakes (1973). The code does not require consideration of seismic load for low-rise buildings or rigid frame structure in Kisii and Kericho Districts. Accordingly, the reinforced concrete earthquake resisting wall is not planned.

(6) Materials to be used and their strength

Structural members will be basically domestic products of Kenya. However, the following specifications are planned considering supply capacity, quality and workability of domestic product.

1) Concrete

Type: plain concrete
Strength: Fo = 25 N/mm^2
Aggregate: The coarse aggregate should be crushed stones, and the fine aggregate should be river sands, pit sands and fine sands, and should conform to the BS882.

2) Reinforcing bar

High Yield Steel Bar：D6, D10, D12, D16, D20, D25

2-2-2-5 Mechanical and Electrical Systems

(1) Electric facility plan

1) Kisii District Hospital

① Electric power supply system

Electric power is supplied from the Kenya Power and Lighting Company (KPLC) via the high-voltage transformer (11kV-415V/240V) to the southwest of the hospital to the electric room of the Machine Building at the southwest of the site in 3 phase 3 wire (415V / 240V 1 circuit). This project is expected to need about 400 kVA (100VA/m^2 × 4,100m^2 = about 400 kVA) for the new facilities and 100 kVA for the existing facilities. Installation of the primary circuit to the electric room will be the Kenyan side portion of the work; the Japanese side will install necessary transformers, trunk cables, switchboards, main breaker boards for receiving and distribution ahead of the main power panel, and cables to the existing panel.

The present utility electric power supply is short of the Kisii City's entire demand. Consequently, power failure occurs several times a day. (Power failures normally last 20 minutes to 1 hour, but can last longer than 12 hours.)

A diesel-driven power generator will be installed as an emergency generator to maintain the minimum required function of the facilities. Of all medical facilities and equipment, the backup capacity that has to be supplied by this generator is about 160kW. With air conditioners for theatre, etc., and lighting added to this requirement, the total emergency power requirement is estimated at 250kVA. Regarding the existing facilities, an emergency power generator is already installed; therefore, a generator is not included in the scope of this project.

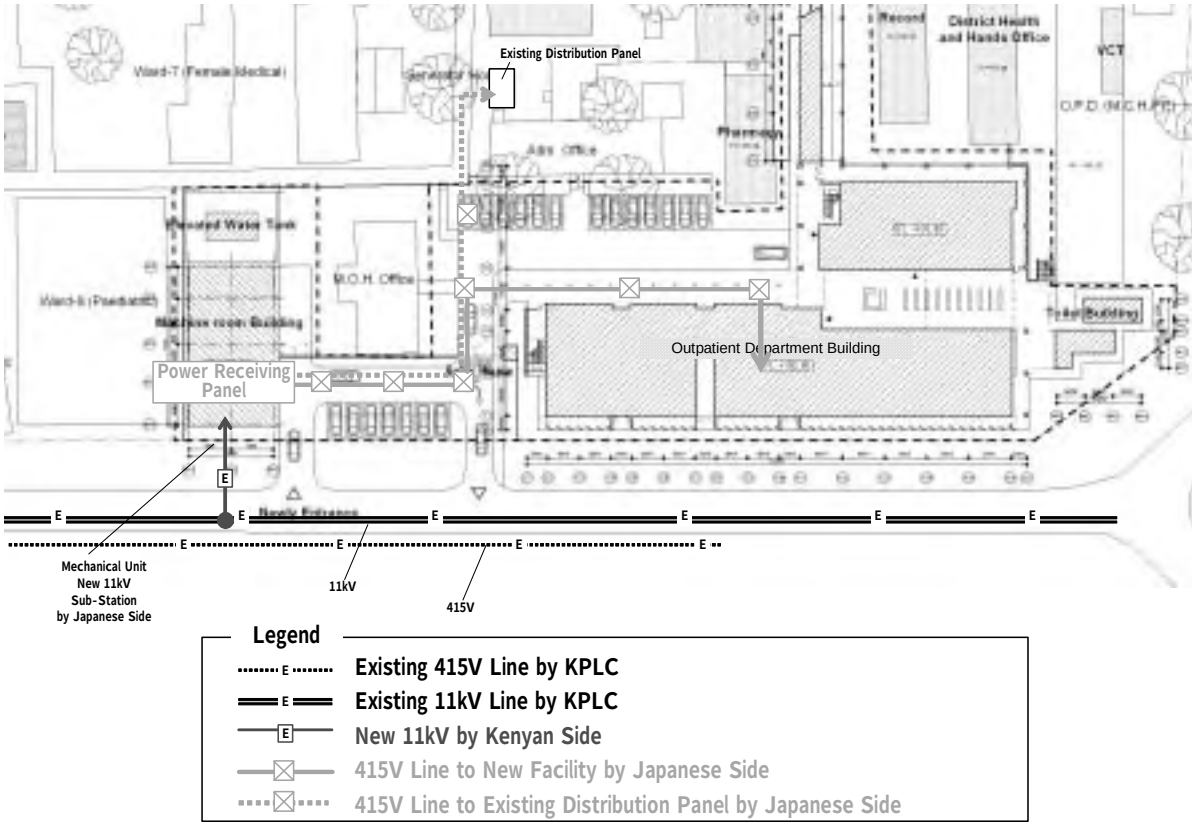


Figure 2-23 Cable Route for Receiving Electric Power (Kisii District Hospital)

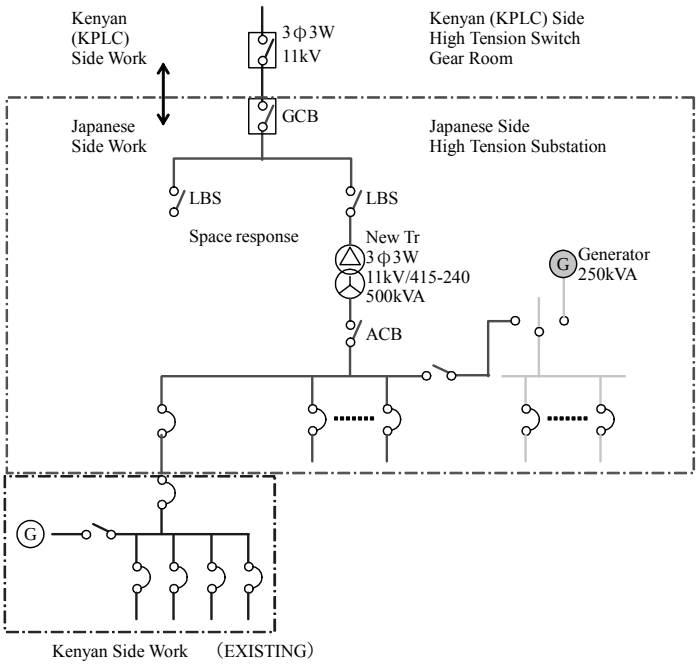


Figure 2-24 Power Receiving Conceptual Drawing (Kisii District Hospital)

2) Kericho District Hospital

① Electric power supply system

To receive electric power, first the high-voltage transformer of the Kenya Power and Lighting Company (KPLC) close to the back entrance on the southwest side of the Kericho District Hospital is expanded from 200kVA to 300kVA, and electric power is fed at low voltage to the Machine Building (electric room) to be constructed in the site, in 3 phase 3 wire (415V 1 circuit). The project is expected to need about 50kVA (100 VA/m^2 × 500m^2 = about 50kVA) for the new facilities and 100kVA for the existing facilities. The modification of the primary low-voltage circuit will be Kenyan side portion of the work; the Japanese side will provide low-voltage switchboards necessary for the Kenyan side and the main power source to the existing facilities.

The study team requested the Kenyan side to study the electric power supply system to the new building constructed by Walter Reed of the United State, the details of which the study team was unable to confirm during the field survey. There is a possibility of the Kenyan side (KPLC side) installing a high-voltage transformer room in the site.

Power failure now occurs five to six times a month which normally last two to three hours. To maintain the minimum functions of the facilities, a diesel-driven emergency power generator will be installed. Backup power required by the medical facilities and equipment to be procured by this project will be about 30kW. The total requirement is estimated at 50kVA, with the demands of the air conditioners of the theatre and lighting added.

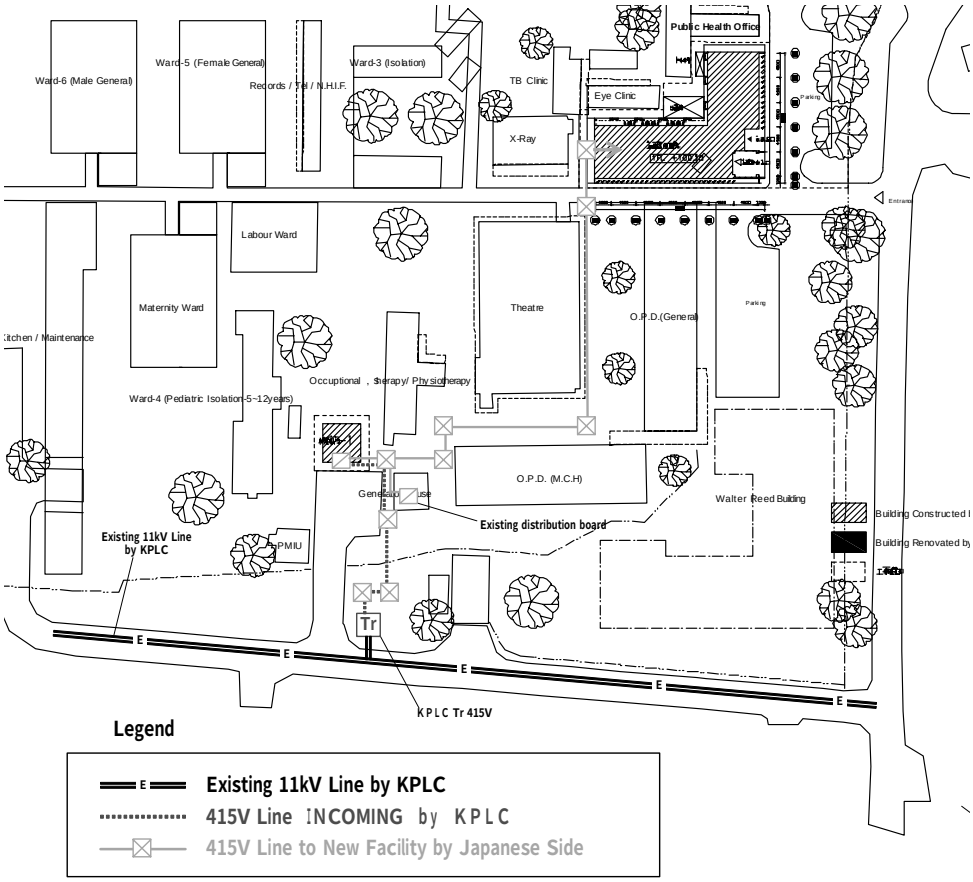


Figure 2-25 Cable Route for Receiving Electric Power (Kericho District Hospital)

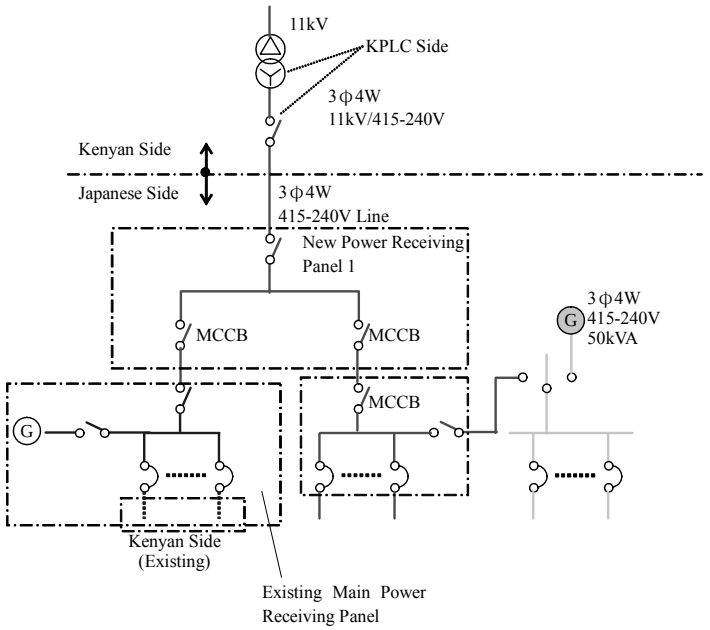


Figure 2-26 Power Receiving Conceptual Drawing (Kericho District Hospital)

3) Planning of electric facilities and equipment common to both hospitals

① Electric power supply, power generator

The distribution system will follow the standard distribution scheme of Kenya, namely, a circuit of four cables at 415V/240v in 3 phases. The result of field survey indicates that there are voltage fluctuations of ±10% of the commercial utility electric power.

Therefore, AVRs will be installed where necessary each equipment which are susceptible to voltage fluctuation.

The emergency generators are of package type. The fuel is fed through a service tank. Appropriate sound insulation, noise and vibration prevention facilities will be provided in consideration of the surrounding environments.

② Power outlet for lighting

The design illuminance is set at about 60 to 70 percent of the JIS standards in consideration of the present state of Kenya. The light sources will mainly be fluorescent lamps of high illumination efficiency commonly used in Kenya. Switching zones will be finely divided to reduce running cost.

The wall power outlet will basically be for three square prongs with a grounding terminal, two parallel flat blades type plugs commonly used in Kenya, and their specifications will be decided considering the types of power source, capacity, connecting method of the facility and equipment used for the subject outlet. In case the existing facilities need to be modified, such works are the portions of the Kenyan side.

③ Lightning arrester, grounding device

To protect the facilities from lightning, a lightning rod and roof conductors will be installed. Medical facilities and equipment, electrical facilities, communication facilities will be equipped with a grounding device as indicated by their specifications.

④ Telephone system

The telephone cables are drawn to the existing MDFs (main distribution frame) of the PABXs (private automatic branch exchange) in the telephone exchange rooms. Assuming that the number of required lines for this project, including the future plans, to be 0.002 per one square meter floor area, then the Kisii District Hospital would need 10 outside lines and the Kericho District Hospital two outside lines. Similarly, assuming 0.02 extension lines per one square meter floor area, the Kisii District Hospital would need 100 extension lines and the Kericho District Hospital 20 extension lines. The existing PABXs of both hospitals have some unused capacity, but lack ability to be modified or have additional modules added. Therefore, new PABX equipment will be provided in the Project facilities.

Addition of new PABX and installation of cables from the existing PABXs to the newly installed terminal boards will be in Japanese scope of works; and contracts for drawing lines and modification of telephone sets, etc. will be in Kenya scope of works.

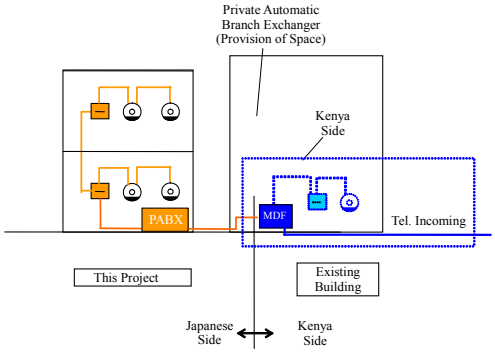


Figure 2-27 Telephone System Scheme

⑤ Hospital speaker system

A main part of the hospital speaker system will be installed in the Kisii District Hospital to enable the central control to make in-hospital announcement in the project areas, such as paging of doctors, guiding emergency evacuations in case of fires. Presently, the hospital has difficulty paging doctors; therefore, the hospital strongly requests that the speaker system be extended to the existing facilities. Accordingly, a speaker will be installed for each appropriately defined block.

The project for the Kericho District Hospital is small in scale; therefore, a hospital speaker system will not be installed.

⑥ Interphone facility

The rooms such as operation room where communication between inside and outside the room is necessary will be equipped with a two-way interphone system. Also, an interphone system will be provided between the air-conditioner room, etc. and the Machine Building for communication with the maintenance staff.

⑦ Automatic fire alarm system

Automatic alarm systems will be installed in principle in conformity with the Firefighting Act, Republic of Kenya, related regulations and standards, to enable early detection of fire and to prevent fire damages from spreading. If it is found necessary to supplement the Kenyan standards, Japanese standards are referred to. Escape gate indicators are installed but limited to the project facilities.

⑧ Television common antenna system

Although television antennas are not installed, a television set and a video player are placed at the waiting space for each diagnosis and treatment room for medical education and enlightenment purposes. They play such programs. This project will preserve the route (pipes, etc.) for antenna connection and install connection boxes, etc. at waiting rooms.

⑨ Cable piping for information network

Cable pipes and boxes will be installed from the shaft of each floor to necessary points to enable connection with the existing computer network. Installation of the instruments for computer network system, cables and circuit jackets will be the obligation of the Kenyan side.

(2) Machine facility plan

1) Kisii District Hospital

① Water supply system

Water is tapped from the 100mmφ main of city's waterworks system buried under the road to the south of the hospital by an 80mmφ pipe to the project facilities. The water receiving tank will have a capacity of 200m^3, equivalent to one day's consumption, assuming water supply failures lasting several hours. The receiving tank will be of a concrete tank installed above ground to prevent the content from contamination. An elevated cistern tower will be built near the Machine Building to supply water to the project facilities by natural gravity flow. The water supply system is to supply water to the elevated cistern tower, but a provision will be made to supply water to the existing elevated cistern tower. The water is high in colour test and turbidity according to the test results. Accordingly, a filtration-type water purification facility will be installed, and raw water and treated water will be supplied in two separate systems to the facilities depending upon which water is needed.

The water supply facilities within the project site and the water supply pipe to the existing elevated cistern tower will the Japanese side's works. The water tap line from the city's main to the site border and modification works within the existing facility areas will be the Kenyan side's works. It has been agreed that the Kenyan side will execute related construction works on the waterworks system, concurrent with implementation of the Japanese side' construction works, so that enough water may be supplies to the Kisii District Hospital.

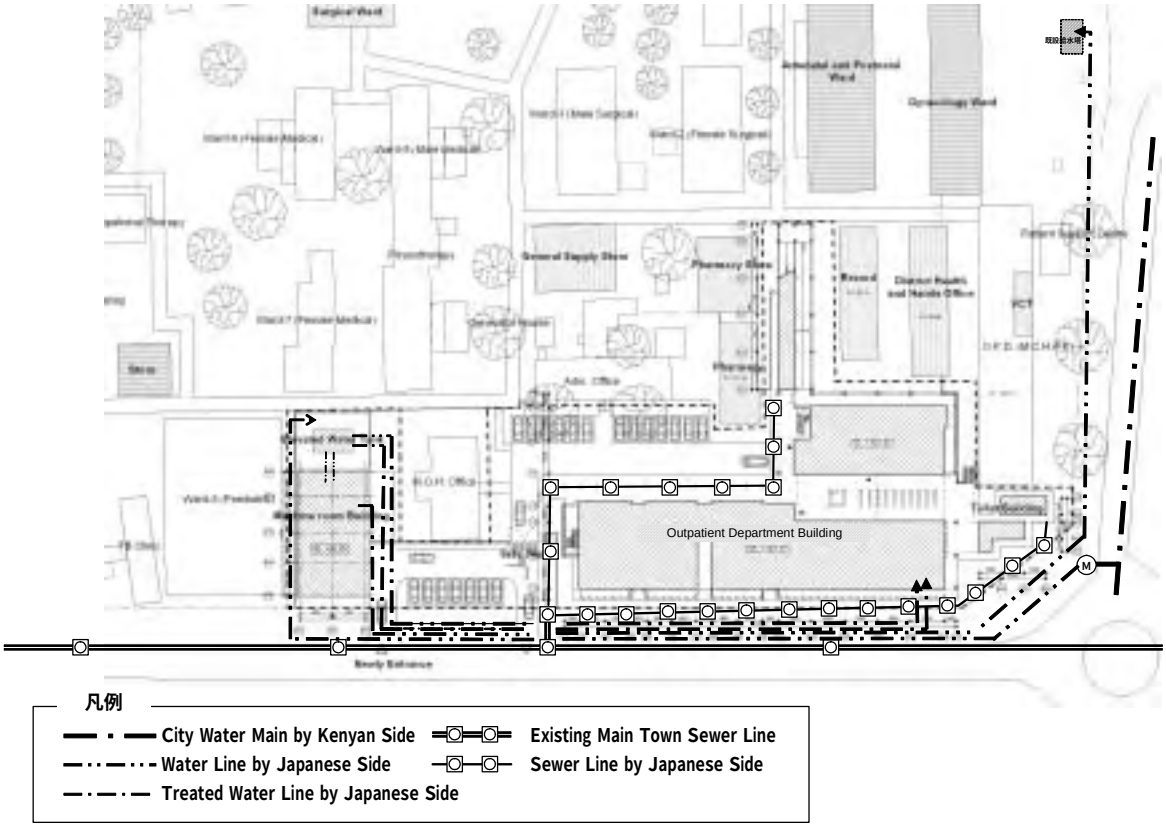


Figure 2-28 Water Supply and Drainage Piping Routes (Kisii District Hospital)

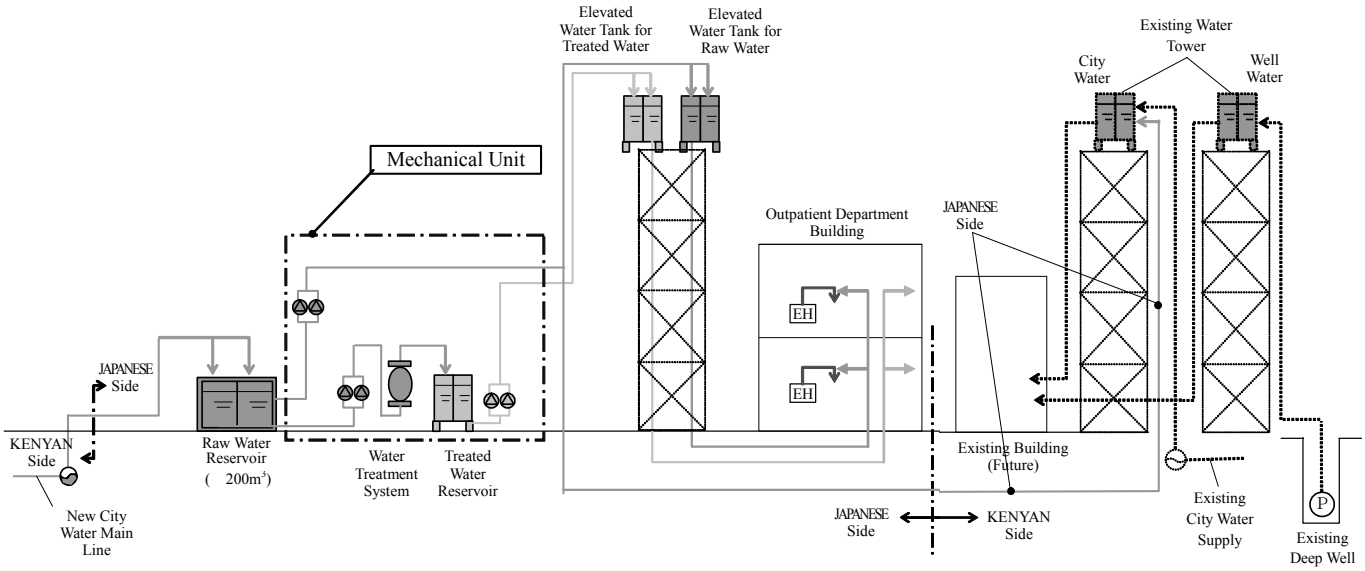


Figure 2-29 Water Supply and Hot Water Supply System (Kisii District Hospital)

② Waste treatment facility

Presently, the municipal wastes are piled open on the waste treatment lot of the Kisii District Hospital, and partly burned open. The medical wastes are treated by a small incinerator of self-sustained combustion type, and the combustion residues are also piled open. They seem to have been piled for an extended period, and flies inhabit the pile and crows gather there, and the pile generates disagreeable odours to the surroundings. The Kenyan side strongly requested Japan's cooperation for improvement of such a situation from the standpoint of sanitation management and prevention of environmental contamination. The project will plan proper places for sorted collection of wastes and installation of an incinerator. The incinerator will be sized to treat the wastes from the entire hospital, and its specifications will conform to the environmental standards of Kenya.

To facilitate management of maintenance of the incinerator, the incinerator will be a Kenyan manufacturer's product, and the plan calls for an arrangement of management and maintenance agreement between the hospital and the manufacturer to ensure smooth operation of the incinerator. During the field survey, the study team surveyed incinerator manufactures which have supplied incinerators to the Kenya Medical Research Institute (KEMRI), Kenyatta National Hospital and the Kericho District Hospital. These products were confirmed to be of specifications conforming to the environmental standards of Kenya.

The sorted collection should be considered to be an essential factor to realize efficient combustion, in case an incinerator is installed in the hospital site.

③ Air-conditioning facilities for the theatre

The theatre require higher degrees of cleanliness than other rooms. The theatre will therefore be equipped with an air-conditioning system containing a medium-performance filter as shown in Figure 2-30.

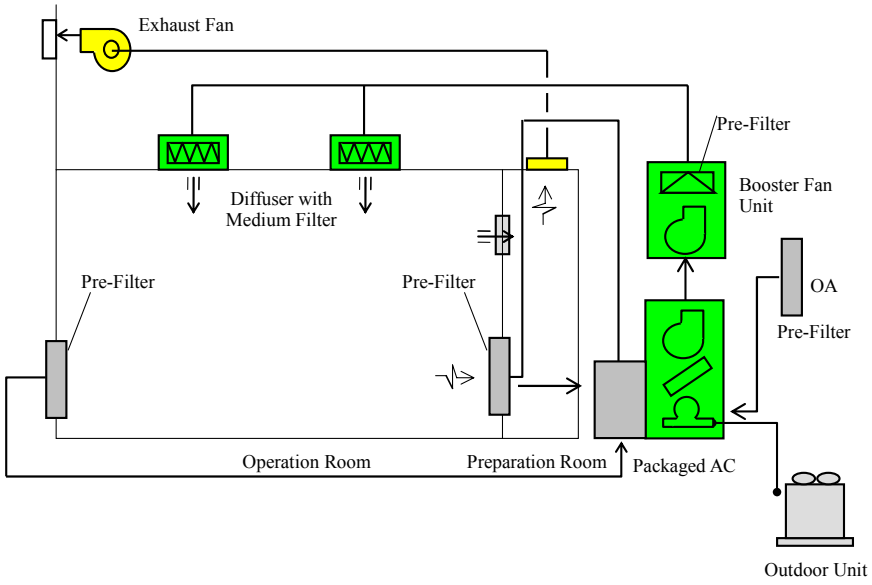


Figure 2-30 Air-conditioning System for the Theatre (Kisii District Hospital)

2) Kericho District Hospital

① Water supply system

The state of water supply in Kericho City is generally good. Water for this facility will be tapped from the 50mmφ city waterworks main buried in the road in front of the hospital to the northeast by a 40mmφ pipe to the hospital site. The water receiving tank will have a capacity of $20m^3$, equivalent to one day's consumption of the entire hospital. The receiving tank will be of a concrete tank installed above ground to prevent the content from contamination. An elevated cistern tower will be built near the Machine Building to supply water to the newly built buildings by natural gravity flow. The test results of city water satisfy the standards of Kenya and that of WHO. Therefore, water purification facility will not be installed.

The water supply facilities within the project site will be the Japanese side's works. The water tap line from the city's main to the site border will be the Kenyan side' works. Also, if modification of the existing facilities is necessary, this will be the Kenyan side's works.

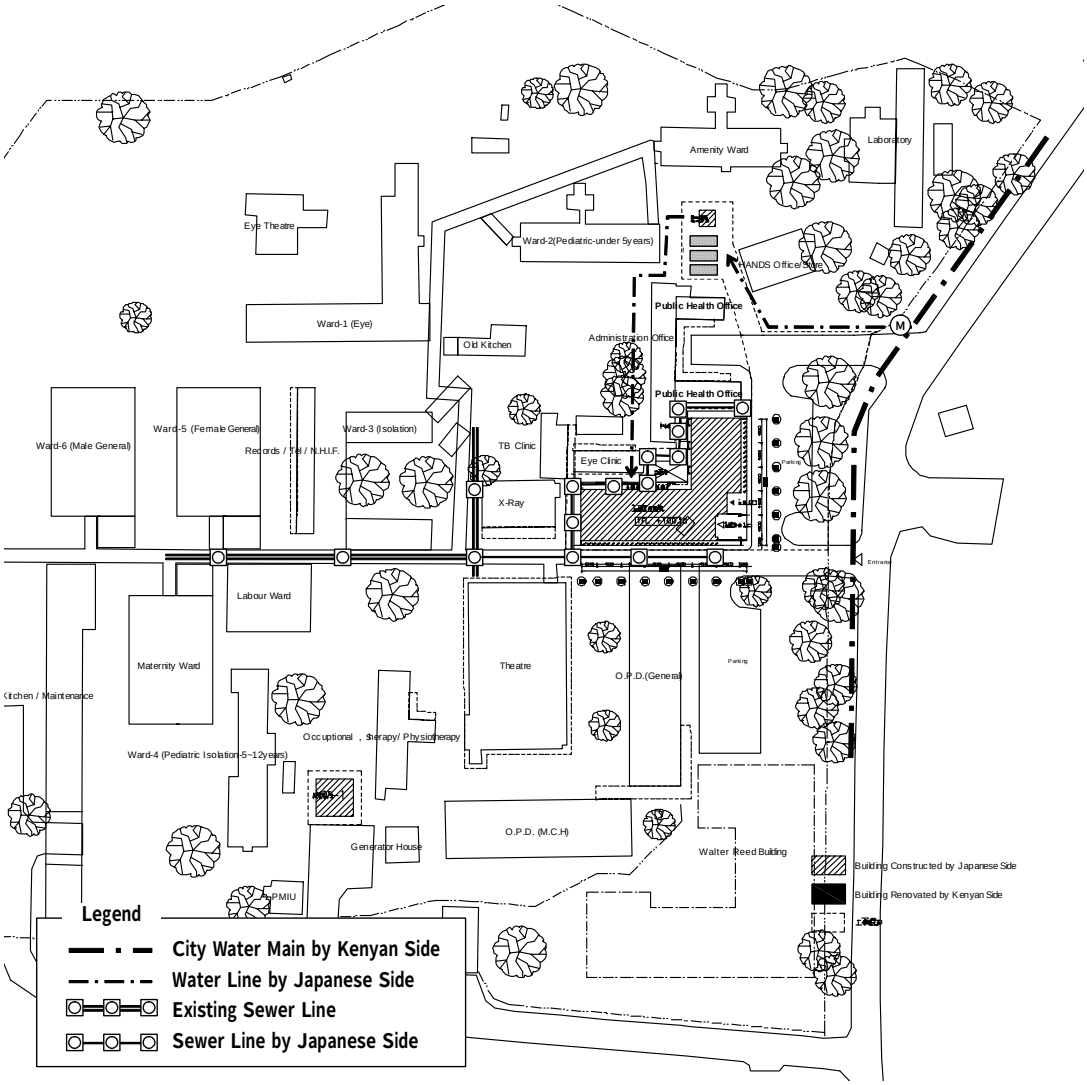


Figure 2-31 Water Supply and Drainage Piping Routes (Kericho District Hospital)

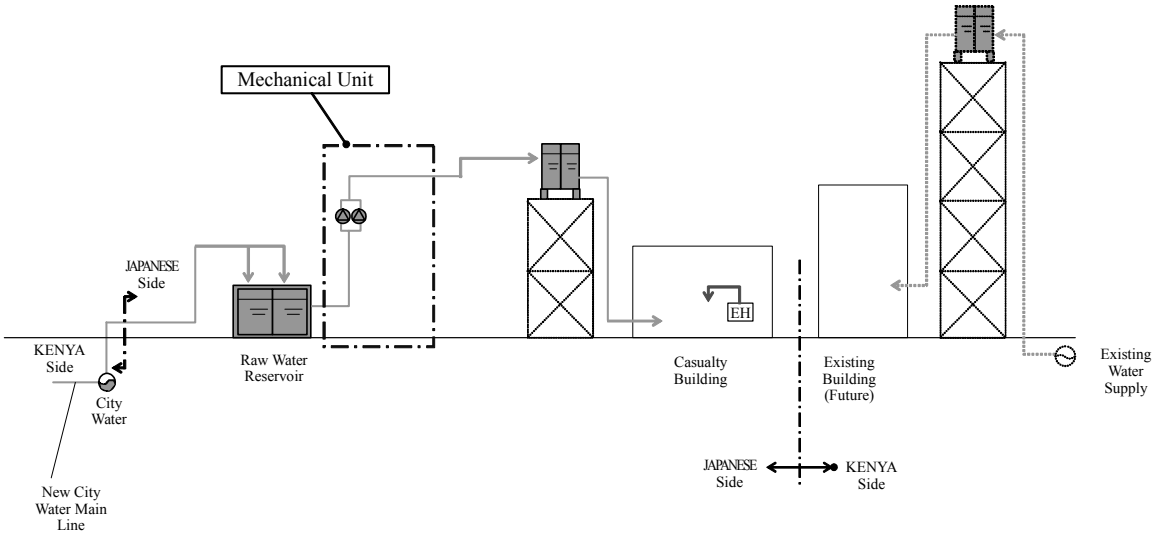


Figure 2-32 Water Supply and Hot Water Supply System (Kericho District Hospital)

② Waste treatment facility

Municipal wastes are collected by the city every day. The collected municipal wastes are piled open in the city's waste treatment facility and burned open. The problem is that this waste treatment facility is adjacent to southwest side of the hospital site, and the facility noticeably emits disagreeable odours to the wide neighbourhood area, which naturally adversely affects the hospital. The medical wastes are burned by a newly installed incinerator for medical wastes about three times a week. The study team has strongly requested the Kenyan side that the above-mentioned existing municipal waste treatment facility be improved from the standpoints of public sanitation and prevention of environmental contamination.

The system for collection of wastes has been reportedly established in the hospital. Notwithstanding, the present state is such that municipal wastes and medical wastes are found dumped at various places in the hospital site. It is therefore considered necessary that thorough technical training be done on the concerned hospital members.

3) Other machine facility plans common to both hospitals

① Wastewater system

The general wastewater (foul water and miscellaneous wastewaters) is discharged through the wastewater pipe to the main of the city's sewerage system. Likewise, the wastewater from the project facilities will be connected to the main of the city's sewerage system. Special wastewaters from the examination and infectious disease systems will be subjected separately to neutralization treatment and sterilization in compliance with the environmental standards of Kenya, and then discharged to the existing wastewater main with the general wastewater. However, Kericho district hospital does not have sewage facilities to handle special waste waters, Kerichi will not be provided with neutralization and sterilization tanks. For stormwater, gutters will be installed around buildings, and stormwater will be discharged to the existing wastewater roadside gutter.

The wastewater facilities, including the facilities to treat the special wastewater, to be installed in the project site are Japanese side's works. The waste water facilities outside the project site are Kenyan side's works.

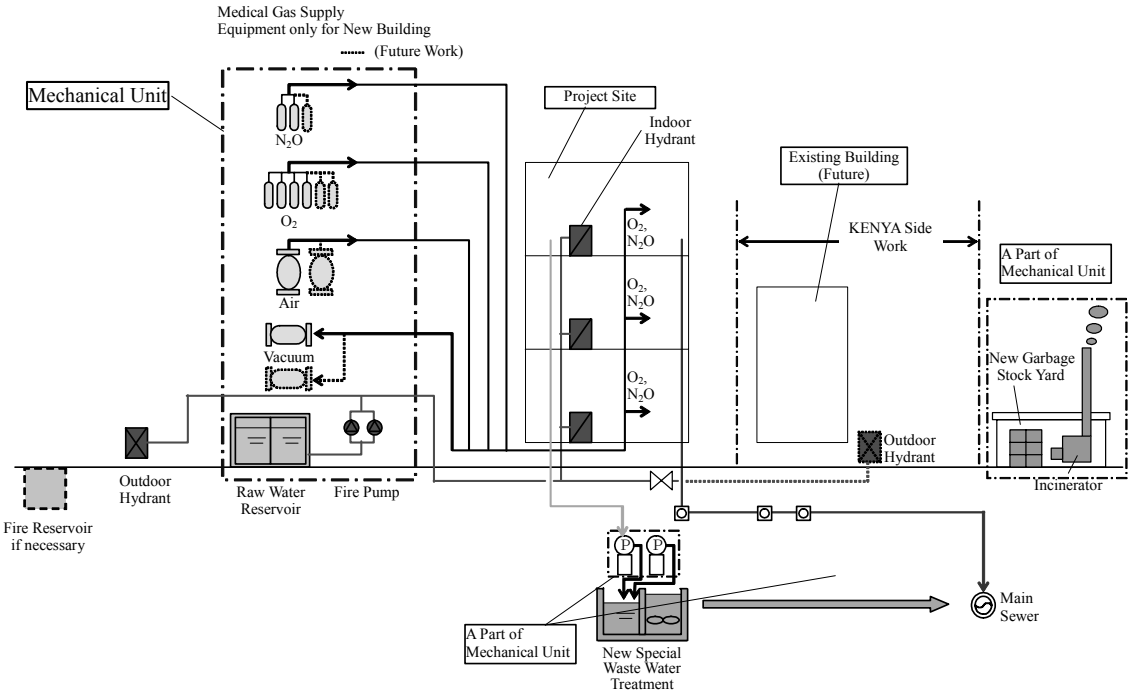


Figure 2-33 Wastewater Treatment and Sanitation Facility System (Kisii District Hospital)

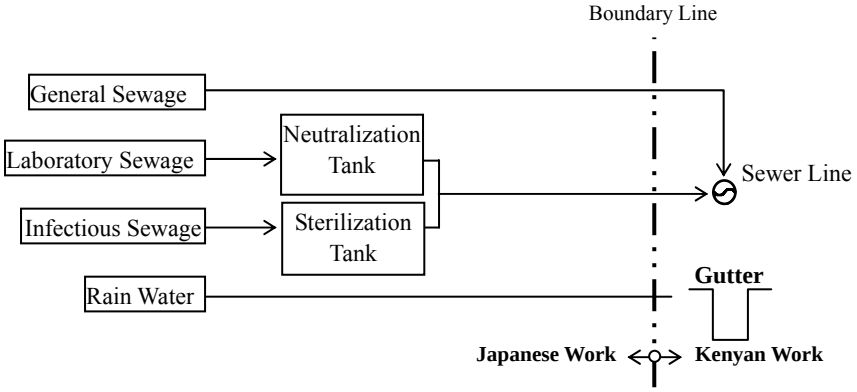


Figure 2-34 Wastewater Treatment Flow (Kisii District Hospital)

② Hot water supply system

Hot water will be supplied in principle by separate systems to such facilities as showers, wash stands, washing rooms. Basically, electric water heaters will be separately provided as necessary at these places to supply hot water.

③ Sanitary fixture

Water closet bowls used by the hospital staff will be of the Western style, attached with a roll paper holder. Asian type fixtures with a roll paper holder will also be provided, in addition to those of Western style, at toilets used by patients and a number of unspecified people. The flushing unit for the water closet bowls will be of the flush valve type, that is more durable. The urinals will be wall hung type, though urinals for small boys will be of floorstanding type attached with a flush valve.

④ Firefighting facility

As a result of a meeting with the Nairobi Fire Brigade and the Kisii Fire Brigade, it has been agreed that the firefighting facilities will in principle conform to the installation standards of Kenya, but the Japanese standard will applied to supplement the Kenyan standard. This project's firefighting facilities for the Kisii District Hospital are hose reels, outdoor hydrants, with two fire pumps and a water reservoir according to the concerned Kenyan acts, and fire extinguishers.

A hose reel system and fire extinguishers will be installed for the Kericho District Hospital.

⑤ Medical gas facility

A new medical gas system is planned for this project. The elements required are oxygen supply, vacuum suction, compressed air supply and N_2O gas supply. The central system is adopted from the standpoints of safety, operability and maintenance.

As the basic policy, oxygen and N_2O gas will be supplied by the central system to the newly built facilities. Also, compressed air and vacuum suction will be added to the Kisii District Hospital, in response to the strong request. The outlets of the medical gases will be the BS type now in use. The number of oxygen humidifiers and that of vacuum suction units will be 30 percent of these outlets in consideration of use rates. The rooms to which medical gas system is installed will be limited to the minimum as shown in the table below.

Table 2-39 Room at Which Medical Gas System Is Installed (Kisii District Hospital)

Room	Oxygen	N_2O gas	Vacuum suction	Compressed air	Note
Operation room	○	○	○	○	Installed on the ceiling and wall
Recovery room	○	○	○	○	Installed on the wall
HDU	○		○	○	Ditto
Emergency room	○		○		Ditto
Small operation room	○	○	○	○	Ditto
Delivery room	○		○		Ditto

⑥ Air-conditioning facility

Although natural ventilation is adopted for ordinary rooms, air-conditioning facilities will be installed in such rooms as theatre where highly clean environment is required. Individually air-cooled air conditioning, common in Kenya, will be mainly adopted. However, such rooms as operation room, recovery room, delivery room, newborn nursery, need heating, since the lowest temperature can be as low as nearly 10°C in January and February. Therefore, air-conditioning by air-cooled heat-pump type air conditioner, capable of heating as well as cooling, will be provided to these rooms. The type of air conditioners will be selected to suit the purpose of each room; from wall type, ceiling suspended type, ceiling cassette type and floor standing type, as shown in Table 2-40.

Rooms such as recovery room, HDU, small operation room, preparatory room for operation need a certain level of cleanliness; therefore, the ceiling cassette type air conditioners equipped with a medium-performance filter as shown in Figure 2-35 will be adopted.

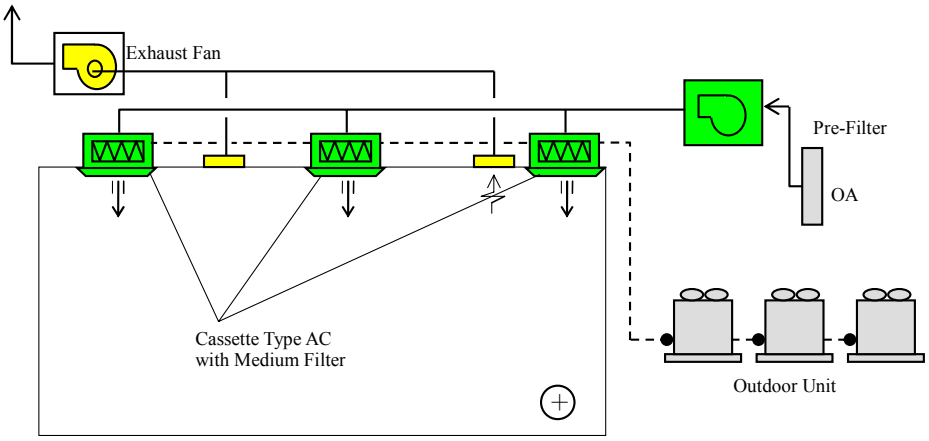


Figure 2-35 Individual Air-conditioning System for HDU, etc.

Table 2-40 Air Conditioning Requirement by Room (Kisii District Hospital)

Room	Air conditioner 1)	Room pressure 2)	Air filter 3)	Note 4)
Operation room	F	P	M	Cooling, heating *
Small operation room	C	E	M	Cooling, heating *
Recovery room	C	E	M	Cooling, heating *
HDU	C	E	M	Cooling, heating *
Preparatory room for operation	C	E	M	Cooling *
CSSD (clean area only)	C	E	M	Cooling
Delivery room	W	E	L	Cooling, heating *

Note 1) F: floor standing with duct
C: ceiling cassette type
W: wall type (or ceiling suspended type)
2) P: positive pressure
N: negative pressure
E: ambient pressure
3) M: medium performance
L: general performance
4) * Operable during power failure by electric power from the emergency generator

Rooms for which general air conditioning is good enough will be equipped with a wall type or ceiling suspended type air conditioner with a standard filter as shown in Figure 2-36. The long-life filter with a wider filtration area will be adopted as standard to reduce filter cleaning maintenance frequencies.

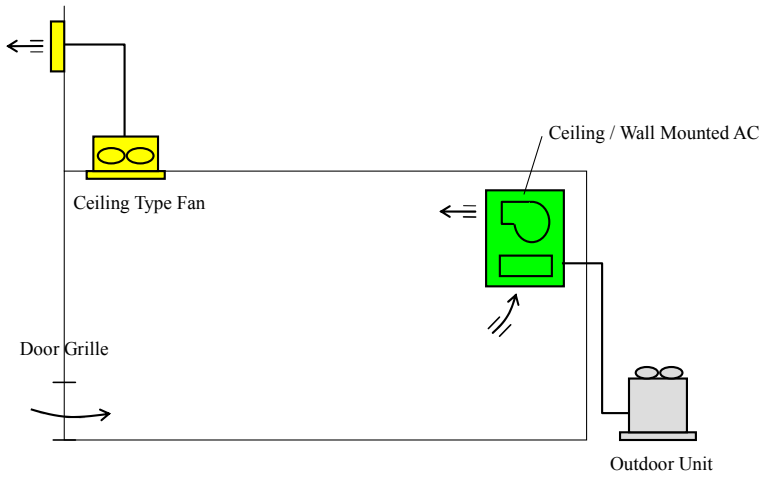


Figure 2-36 Individual Air-conditioning System

Rooms without air conditioning will be equipped with a ceiling fan or wall fans, aided by natural ventilation through open windows. Rooms without a window or rooms where heat, vapour, or an odour generates will be equipped with a mechanical ventilation system.

2-2-2-6 Construction material plan

In selecting construction materials, materials and construction methods established in Kenya are preferred for facilitating maintenance and management. The basic precautions common to both the Kisii and Kericho District Hospitals in the selection of materials and construction methods are as follows.

(1) Exterior surfacing material

1) Roof

To prevent water leaks, a factor that can deteriorate the building the most, sloped roofs with a gradient of about 1/10 are adopted. The structural materials are concrete slabs, which are covered with asphalt roofing. On top of that, the roofs will be thatched with folded plates to protect the asphalt roofing from deterioration caused by exposure to the ultraviolet rays and any solid objects that may fall on the roof.

2) External wall

The Kisii Stones, locally available at low prices and for which the technique of masonry structure is well established, will be the most important external wall material. For preventing burglary and ease of maintenance, glass blocks will be used for daylighting as necessary.

(2) Interior finishing material

1) Floor

The following types of materials will be selected depending upon the use and required performances of each room.

① Outpatient Department, toilets: These areas are heavily used by patients; therefore, the floors will be tiled with easy-to-clean and durable tiles.

② Various administrative rooms, wards, radiography rooms: These rooms are used quite normally, neither too heavily nor very lightly; therefore, these rooms will be tiled with inexpensive terrazzo tiles.

③ Clean areas of the Theatre Department and the Delivery Division: The floors that are likely to be contaminated are covered with easy-to-clean vinyl sheet flooring materials to make the rooms easy to be kept clean.

2) Interior wall

Such portions of walls of toilets, rooms where wastes are handled, shower rooms and similar rooms that are close to sinks that are likely to be stained with contaminated substances, and common use places of exterior corridors exposed to rains and winds that tend to be dirty will be finished with tiles that are relatively easy to clean. Other general parts will be cement mortared and finished with paints.

The radiography rooms will be made of reinforced concrete capable of shielding radiation, or protected by steel and lead materials.

The walls, inside walls and corners of pillars of the corridors that could be hit by stretchers or similar objects will have stretcher guards, that can also serve as hand rails, or corner guards.

3) Ceiling

The following types of materials will be selected depending upon the use and required performance of each room.

① Clean areas of the Theatre Department and the Delivery Division: These areas, being likely to be contaminated, will use easy-to-clean painted inorganic calcium silicate plates.

② Other ordinary rooms: Light gauge steel structures (T bar), with square rock wool sound insulating boards applied on them, generally used locally, will be used.

4) Fixture, etc.

External fixtures will be aluminium sashes to ensure durability. However, such portions as the entrances where personal traffic is busy, and theatre requiring easy cleanability and durability, will have stainless steel doors.

Internal fixtures, such rooms as radiography rooms and machine rooms will use steel fixtures. The radiography rooms where shielding of radiation is necessary will use fixtures lined with lead plates.

The above-mentioned finishing materials and related installation methods are summarized in Table 2-41 below.

Table 2-41 Finishing Material and Installation Method

Building element	Local method (including the existing buildings)	Method adopted	Reason for adopting the method
Roof	Sloped roof (thatched with roof tiles)	Sloped roof with concrete slabs (asphalt roofing plus folded plate thatching)	Maintenance is relatively easy. For backing, concrete slabs will be used as measures to prevent rainwater leaks.
External wall	Kisii Stone masonry structure with cement mortar finishing	Kisii Stone masonry structure cement mortared and paint finished	The method is commonly used locally and local people are skilled in maintaining this structure.
Floor	Terrazzo block tile	Terrazzo block tile Continuous sheet	The materials are commonly used locally and easy to maintain and clean. This is used as a measure to prevent nosocomial infection.
Interior wall	Tile Paint	Tile Paint	These materials are commonly used locally, and are relatively easy to maintain.
Ceiling	Paint Rock wool sound insulating board	Paint Rock wool sound insulating board	There materials are commonly used locally, and are relatively easy to maintain.
Fixture	Aluminium made Steel made Wooden	Aluminium made Steel made Wooden Stainless made	These products are commonly used locally, and are relatively easy to maintain. Portions where people's traffic is busy, or washability and durability are both required, stainless steel products are used.

(3) Associated facility for construction

The usable life of associated facilities range from 10 to 15 years, considerably shorter than construction materials. Therefore, selection of such facilities must be made so as to facilitate maintenance, including renewals, by the Kenyan side after these facilities have been handed over to the Kenyan side. In this context, these facilities will be procured locally, or from third countries of demonstrated performances, to the extent possible, while ensuring acceptable levels of quality.

2-2-2-7 Equipment Plan

Draft basic design equipment and specifications and use of major equipment are listed and shown as follows;

Table 2-42 Basic design equipment list

(1) Kisii district hospital

Item No.	Description	Qty
1. Casualty		
1-1 Treatment room-1		
A1- 1	Examination tables	2
A1- 2	Suction units	2
A1- 3	Resuscitators	1
1-2 Minor operating room		
A1- 4	Defibrillators	1
A1- 5	Operating table	1
A1- 6	Operating light	1
A1- 7	Instruments sterilizer	1
1-3 Recovery room		
A1- 8	Recovery beds	5
2. Out-patient department		
2-1 Psychiatry/ Internal medicine / Pediatrics / Surgery clinics		
A2- 1	X-ray film illuminators	3
A2- 2	Examination lights	4
A2- 3	Examination tables	4
2-2 ENT clinic		
A2- 4	ENT treatment chairs	2
A2- 5	ENT treatment units	2
A2- 6	Laryngoscopes	2
A2- 7	Nebulizer	1
2-3 Eye clinic		
A2- 8	Perimeter	1
A2- 9	Lens meter	1
A2- 10	Slit lamp microscopes	2
A2- 11	Refractometors	1
A2- 12	Hot air sterilizer	1
2-4 Dental clinic		
A2- 13	Dental units	2
A2- 14	Autoclave	1
A2- 15	Ultrasonic scalers	2
2-5 Ob/Gy clinic		
A2- 16	Examination table for Ob/Gy	1
A2- 17	Examination light	1
A2- 18	Ultrasonic diagnostic unit	1
A2- 19	Examination table	1
2-6 Radiology		
A2- 20	Mobile X-ray unit	1
A2- 21	Dental X-ray unit	1
A2- 22	X-ray film illuminator	1
2-7 Laboratory		

Item No.	Description	Qty
3. Operating theatre		
3-1 Operating theatre		
A3- 1	Operating tables	3
A3- 2	Operating lights	3
A3- 3	Suction units	3
A3- 4	Anesthetic ventilator	2
A3- 5	Electrosurgical units	3
A3- 6	ECG monitor	1
A3- 7	Pulse oxymeters	3
A3- 8	General surgical sets	3
A3- 9	Dermatome	1
A3- 10	Recovery beds	3
A3- 11	Respirators	2
A3- 12	Desk-top autoclave	1
3-2 Highly Dependence Unit (HDU)		
A3- 13	Gatch beds	10
A3- 14	ECG monitor	4
A3- 15	Nebulizers	6
A3- 16	Defibrillators	1
3-3 Central sterilization supply dept. (CSSD)		
A3- 17	High pressure steam sterilizers	2
A3- 18	Instruments sterilizers	1
4. Maternity		
A4- 1	Delivery tables	5
A4- 2	Suction units	2
A4- 3	Fetal heart detectors	3
A4- 4	Labor beds	12
A4- 5	Recovery beds	8
A4- 6	Incubators	4
A4- 7	Infant warmers	2
A4- 8	Phototherapy units	2
A4- 9	Bilirubin meter	1
A4- 10	Nebulizers	3
A4- 11	Delivery lights	5
A4- 12	Resuscitator	1
A4- 13	Instruments sterilizer	1
A4- 14	Baby cots	6
A4- 15	Vacuum extractor	1
A4- 16	Examination table	1
5. Physiotherapy		
A5- 1	UV lamp	1
A5- 2	Shortwave diathermy	1

Item No.	Description	Qty
A2- 23	Binocular microscopes	2
A2- 24	Teaching binocular microscopes	2
A2- 25	Autoclave	1
A2- 26	Distillation unit	1
A2- 27	Centrifuge	1
A2- 28	Spectrophotometer	1
2-8 Treatment room-2・3		
A2- 29	Examination tables	2
A2- 30	Suction unit	1
A2- 31	Examination lights	2
2-9 Consultation room		
A2- 32	Examination lights	4

Item No.	Description	Qty
A5- 3	Infra-red lamp	1
A5- 4	Stimulators	1
6. Hospital maintenance unit（HMU)		
A6- 1	Tool for electric	1
A6- 2	Tool for mechanic	1
7. Eye surgery		
A7- 1	Operating table	1
A7- 2	Ophthalmology operating microscope	1
A7- 3	Operating light	1
A7- 4	Autoclave	1
A7- 5	Indirect ophthalmoscope	1
A7- 6	Direct ophthalmoscope	1

(2) Kericho district hospital

Item No.	Description	Qty
1. Casualty department		
1-1 Filter clinic		
B1- 1	Examination lights	2
B1- 2	X-ray film illuminators	2
1-2 Treatment room		
B1- 3	Laryngoscopes	2
B1- 4	Resuscitation bags	2
B1- 5	Suction units	2
B1- 6	Autoclave	1
B1- 7-1	Stretchers	2
B1- 7-2	Examination tables	3
1-3 Minor operating room		
B1- 8	Operating table	1
B1- 9	Operating light	1
B1- 10	Defibrillator	1
1-4 Recovery room		
B1- 11	Recovery beds	5
2. Operation theatre		
B2- 1	Laryngoscope	1
B2- 2	Pulse oxymeter	1
B2- 3	Electrosurgical units	2
B2- 4	Orthopedic O/T table	1
B2- 5	Operating microscope	1
B2- 6	ECG monitors	2
B2- 7	Operation lights	3
B2- 8	General operation table	1
B2- 9	Dermatome	1
B2- 10	O/T table for Ob/Gy	1
B2- 11	Anesthetic ventilators	2
B2- 12	Suction units	2
3. Out patient department		
3-1 Internal medicine / Surgery / Psychiatry clinics		

Item No.	Description	Qty
3-4 dental clinic		
B3- 9	Dental units	2
B3- 10	X-ray film illuminator	1
B3- 11	Ultrasonic scalers	2
3-5 ENT		
B3- 12	ENT treatment chair	1
B3- 13	ENT treatment unit	1
B3- 14	Laryngoscope	1
B3- 15	Nebulizer	1
3-6 Eye		
B3- 16	Examination light	1
B3- 17	Ophthalmoscope	1
B3- 18	Slit lamp microscope	1
3-7 TB clinic		
B3- 19	X-ray film illuminator	1
4. Radiology		
B4- 1	Mobile X-ray unit	1
B4- 2	X-ray film processor	1
5. Laboratory		
B5- 1	Centrifuge	1
B5- 2	Microscope	1
6.Physiotherapy/Occupational therapy		
B6- 1	Shortwave therapy unit	1
B6- 2	Microwave therapy unit	1
B6- 3	Infra-red lamp	1
B6- 4	Ultrasound machine	1
B6- 5	Stimulator	1
B6- 6	Wax therapy unit	1
B6- 7	Plaster cutter	1
7. Maternity		
B7- 1	Suction machine	1
B7- 2	Fetal heart detectors	2

Item No.	Description	Qty
B3- 1	X-ray film illuminators	2
B3- 2	Examination tables	3
B3- 3	Examination sets	2
3-2 Ob/Gy clinic		
B3- 4	Ultrasonic diagnostic unit	1
B3- 5	Examination table for Ob/Gy	1
B3- 6	Examination light	1
3-3 Pediatrics		
B3- 7	X-ray film illuminator	1
B3- 8	Examination table	1

Item No.	Description	Qty
B7- 3	Delivery tables	2
8. Nursery		
B8- 1	Baby cots	6
B8- 2	Phototherapy units	2
B8- 3	Incubators	4
B8- 4	Suction units	2
B8- 5	Resuscitators	2
9. MCH/FP		
B9- 1	Fetal heart detector	1
10. Hospital maintenance unit（HMU)		
B10- 1	Tool for electric	1
B10- 2	Tool for mechanic	1

Table 2-43 Summaries of Specifications of Major Equipment

No.	Description	Planned quantity	Major Specifications	Purpose
A2-5 B3-12	ENT treatment units	3	Examination table: -Suction pump and compressor -Doctor chair	ENT treatment
A 2-11	Refractometor	1	Measurement range Sphere power:±20D or more Cylinder power:0 -±10D or more	Inspection of cornea shape and determining of refraction index
A2-13 B3-9	Dental chairs	4	Dental chair: -Movement : electric, hydraulic -back rest: provided -Operating light brightness： Operating stool: height-adjustable Other: -Amalgam mixer: to be provided	Dental treatment
A2-18 B3-4	Ultrasonic diagnostic unit	2	Probe: convex, with a printer Scanning method: linear, convex Image mode: B, B/M, M Max. scanning depth:20cm Monitor:9 inches wide or more Probe connection ports: 1 or more	Monitoring of fetal growth in perinatal examination
A2-20 B4-1	Mobile X-ray unit	2	X-ray tube voltage: 40-125kV mAs setting：0.5-100mAs Max. tube current：160mA or more Anode heat：60kHU or more	Taking an X‧ ray photo of cases at casualty department and operation theatre
A3-2 B2-7	Operating light	6	Ceiling type with satellite and battery Lamp : halogen	Securing brightness necessary for operations
A3-4 B2-11	Anesthesia machine with ventilator	4	Flow meter: O_2, N_2O Safety device: to be built-in Vaporizer: for halothane Respirator: to be provided	General anesthesia for operations
A 3-6 B 2-6	ECG monitor	3	Parameters: ECG, respiration, SpO2 etc. Display: 8.4inches or more Printer and cart: provided Rechargeable battery:	Monitoring of patients during operation
A3-11	Respirator	2	Tidal volume: 50-1300ml or more Frequency: 6-40times/minutes or more PEEP/CPAP: 0-20cmH2O or wider	Recovery of patients after surgical operations

No.	Description	Planned quantity	Major Specifications	Purpose
A3-17	High pressure steam sterilizer	2	Provided with booster pump, water softener, and electric boiler, Capacity: around 230 Litters, Material: stainless steel, Provided with safety device, and control panel	Efficient sterilizing of surgical instruments and surgical gowns
A 4-6 B 8-3	Incubators	8	Skin temperatures probe, mattress and ⅠV pall: provided Temperatures control: 25-38C or wider Skin temperatures control: 35-37C or wider	Keeping premature and low-weight infants or sick new-borns under the environment of proper temperatures, oxygenation, and humidity

2-2-3 Basic Design Drawings

Table 2-44 List of drawings

Kisii District Hospital

	Facilities	Drawing	Scale	Page
1	Outpatient Department Building	Site Plan	1/600	89
2		Ground Floor Plan	1/300	91
3		First Floor Plan	1/300	93
4		Roof Plan	1/300	95
5		Section Plan	1/300	97
6		Elevation Plan	1/300	99

Kericho District Hospital

	Facilities	Drawing	Scale	Page
1	Casualty	Site Plan	1/600	101
2		Floor Plan, Roof Plan, Elevation Plan, Section Plan	1/300	103

Building Constructed by Japanese Side

Building Renovated by Kenyan Side

Construction Area

KISII
DISTRICT HOSPITAL

Incinerator

Mortuary

Surgical Contraceptive

Surgical Ward

Amenity Unit

Antenatal and Postnatal Ward

Gynecology Ward

Ward-3 (Male Surgical)

Ward-6 (Female Medical)

Ward-5 (Male Medical)

Ward-2 (Female Surgical)

Occupational Therapy

Physiotherapy

General Supply Store

Pharmacy Store

Record
FL=102.15

District Health and Hands Office
FL=102.26

Patient Support Centre

VCT

Laundry
/Maintenance Workshop

Ward-7 (Female Medical)

Generator House

O.P.D. (M.C.H./FP)

Store

Pharmacy
FL=101.19

Adm. Office

1FL +102.33

Elevated Water Tank

1FL +100.40

Kitchen

Ward-8 (Paediatric)

M.O.H. Office

Machine room Building

Toilet Building

TB Clinic

1FL +99.00

Gate House

Outpatient Department Building

1FL +100.40

Newly Entrance

SITE PLAN
1/600

N

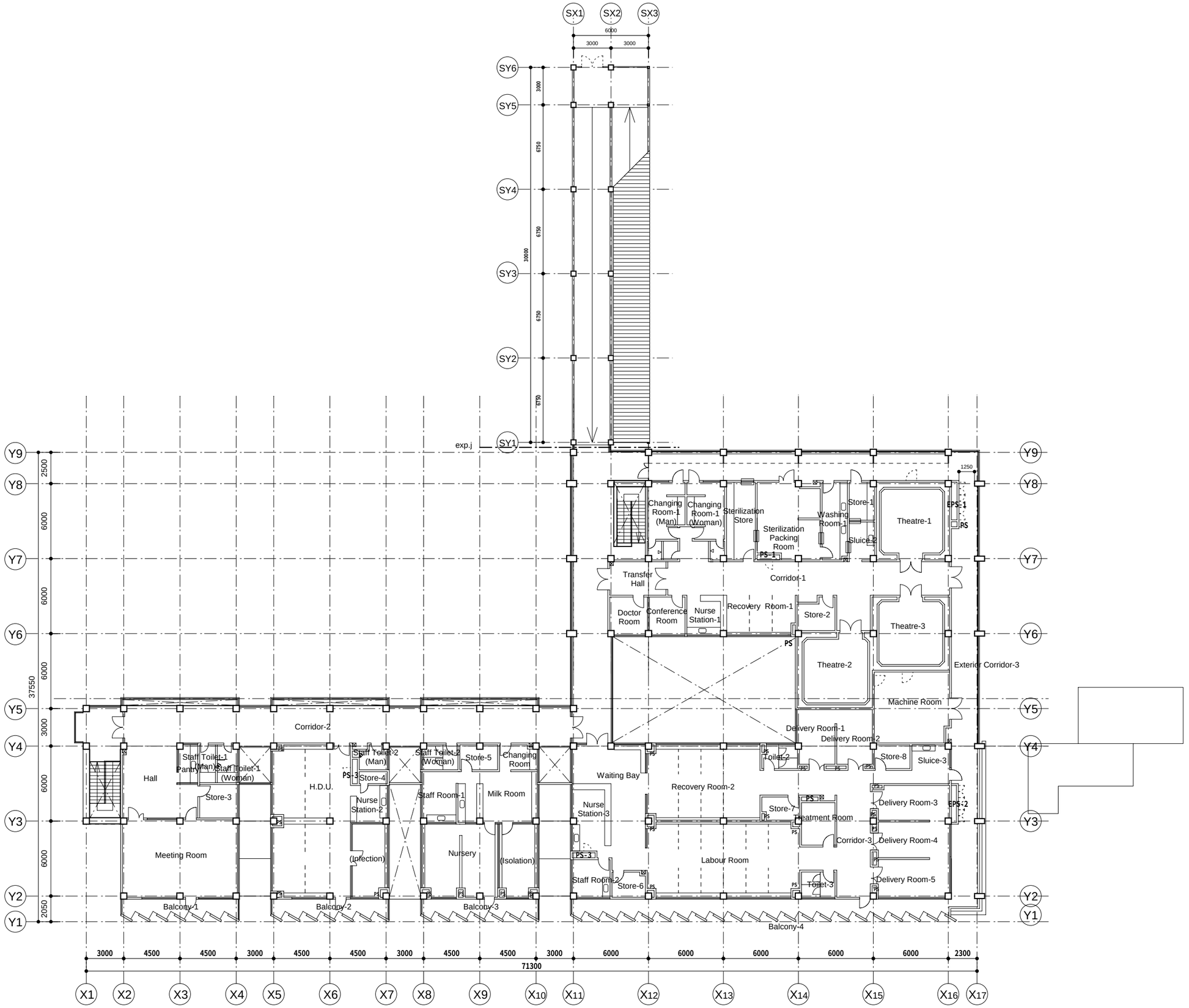
KISII
DISTRICT HOSPITAL

O.P.D(W.C.H/FP)

Store-3
Medical Gas Room-3
Medical Gas Room-2
Medical Gas Room-1
Security Office
Exterior Corridor-1
Miner theatre
Plaster Room
Staff Room-1
Observation Room
Store (Mobile X-Ray)
Sterilization
Sluice
Staff Toilet-1
Staff Toilet-2
Nurse Station-1
Filter Clinic-1
Filter Clinic-2
Filter Clinic-3
Filter Clinic-4
Shower Room
Treatment Room-1
Treatment Room-2
Wating Bay-1
Ambulance
Information
Wating Bay
Toilet-3(Man)
Toilet-3(Woman)
Dental Lab
Dental Office
Dental Clinic
Corridor-2
Wating Bay-2
E.N.T.
Corridor-3
Internal medicine
Surgery
Pediatric
Treatment Room-3
Wating Bay-3
Obsteric/Gynecology
Eye Clinic
Nurse Station-2
Accounts
Office
Toilet /Changing Room
X-ray-1
Store-4
Ultrasounds Room
Dark Room
Changing Space
X-ray-2
X-ray Office
Staff toilet-3
Staff toilet-4
Corridor-4
Ante Room
Psychiatry
Staff Room-2
Parasitology
Pathology
Lab
-Biochemistry
Immunology
-Hematology
Injection space
Toilet-1
Toilet-2

1F PLAN
1/300

KISII
DISTRICT HOSPITAL

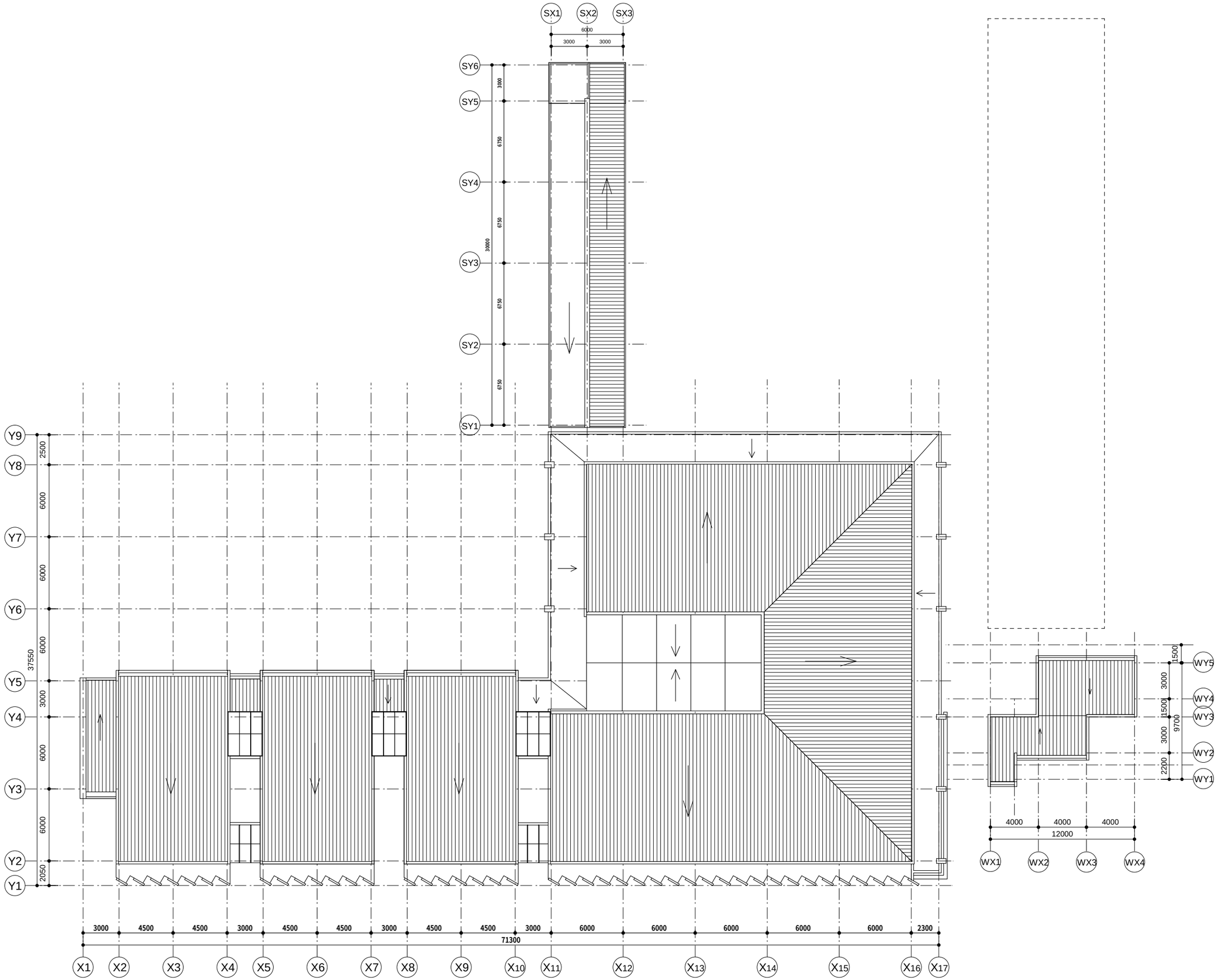


2F PLAN

1/300

N

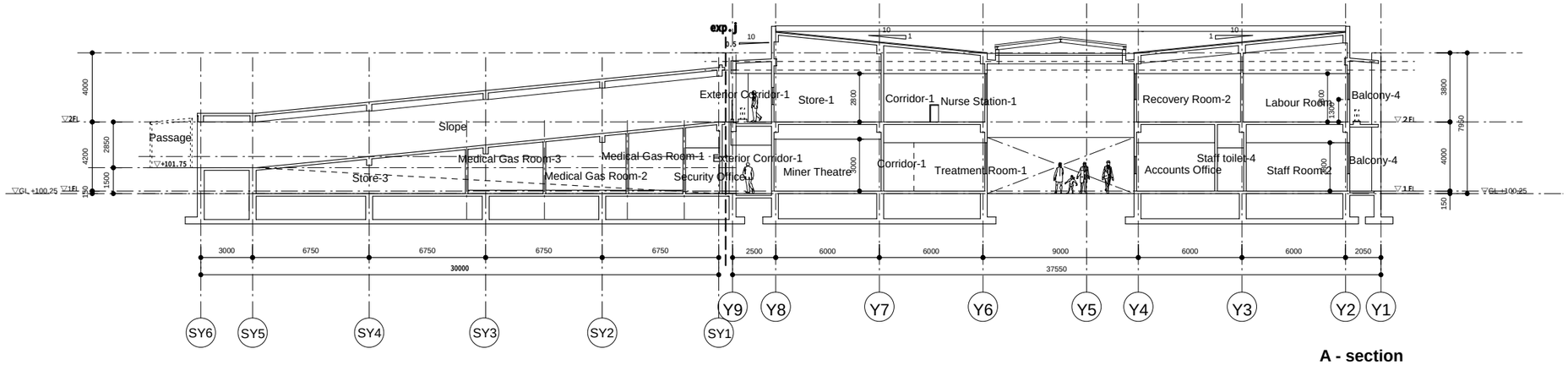
KISII
DISTRICT HOSPITAL



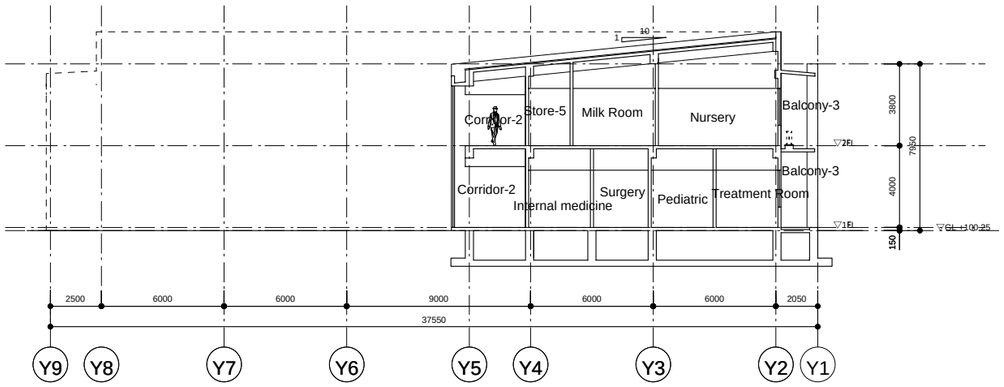
ROOF PLAN

1/300

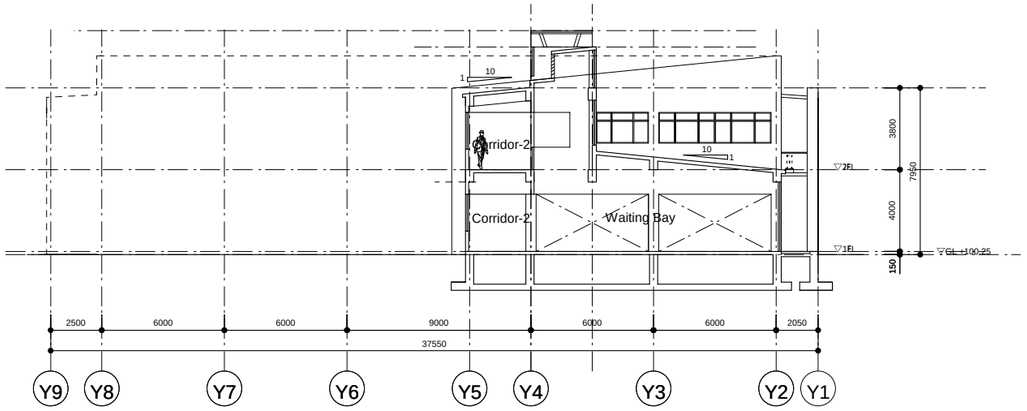
N



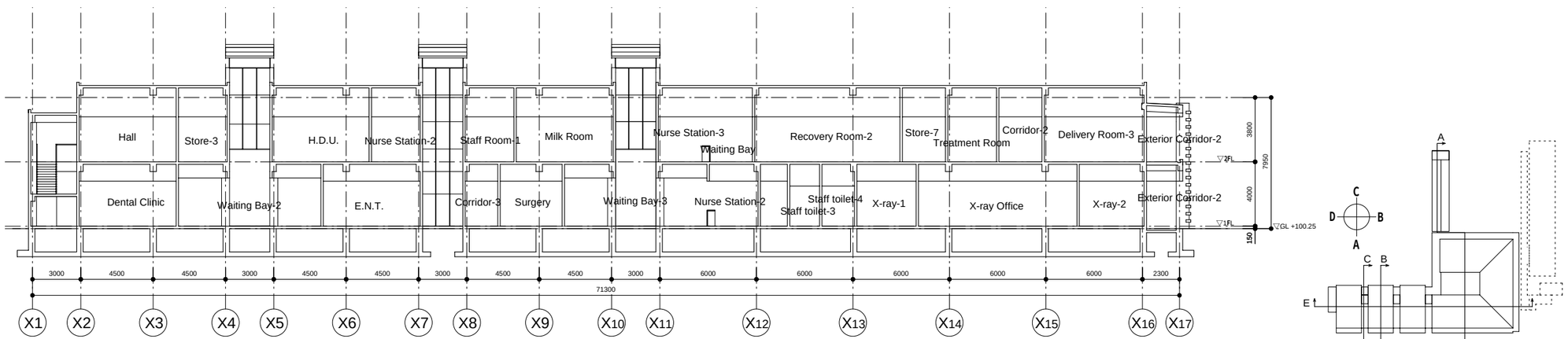
A - section



B - section



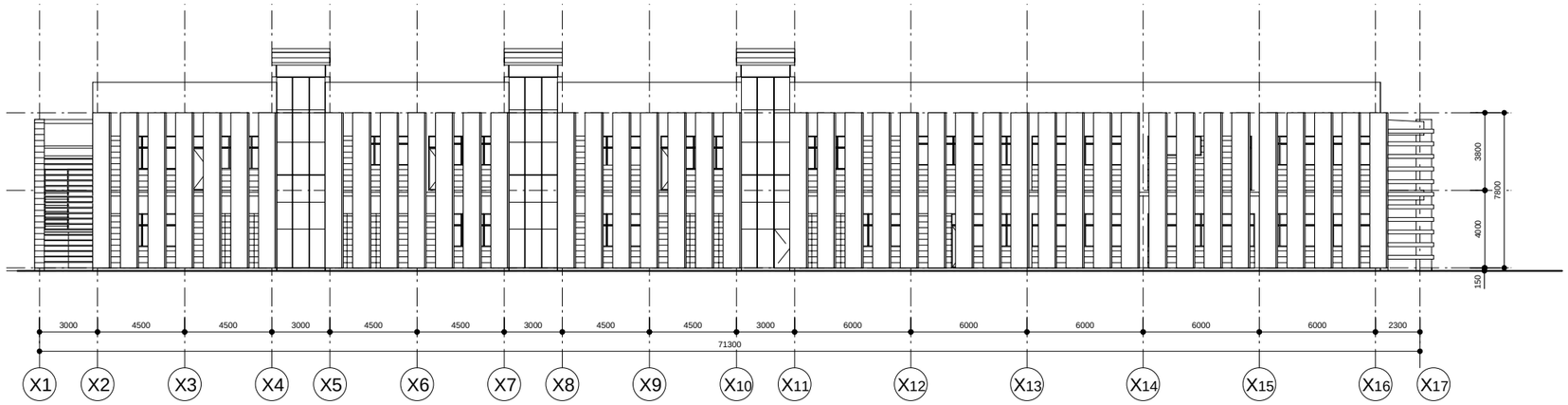
C - section



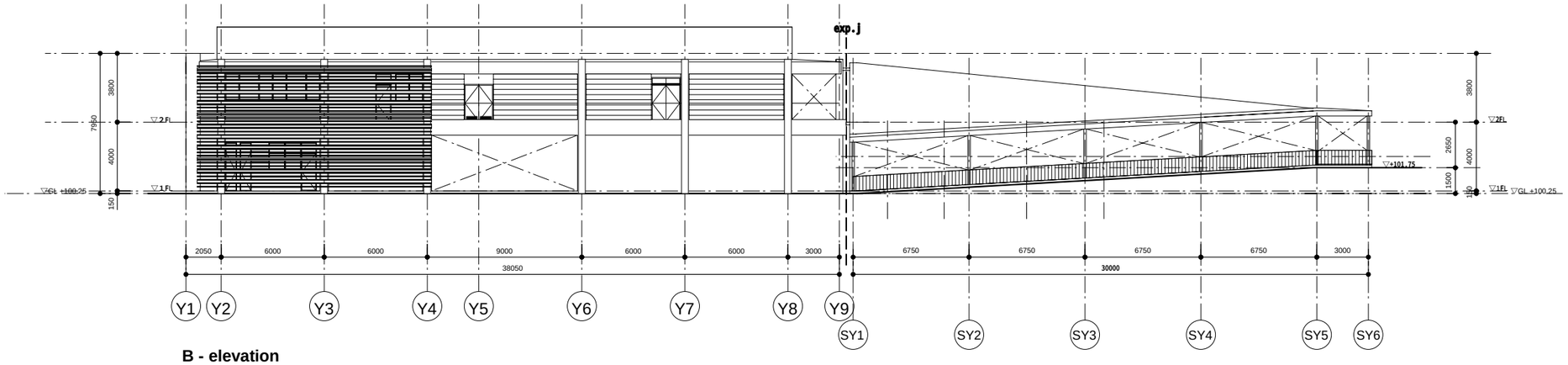
E - section

KISII
DISTRICT HOSPITAL

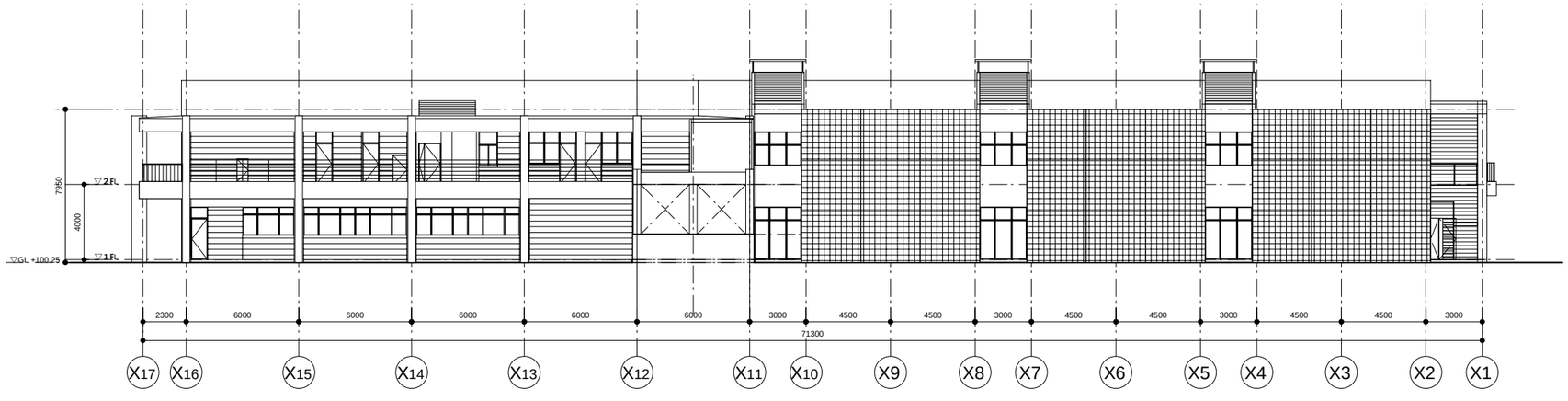
SECTION
1/300



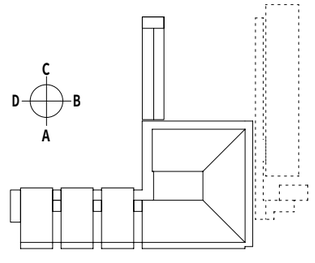
A - elevation



B - elevation



C - elevation



KISII
DISTRICT HOSPITAL

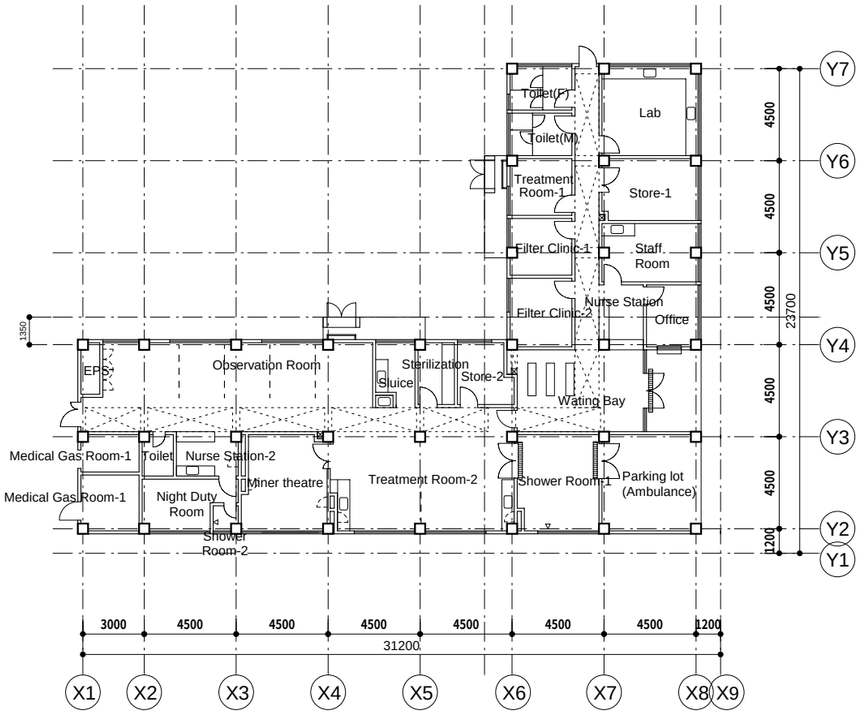
ELEVATION
1/300

KERICHO
DISTRICT HOSPITAL

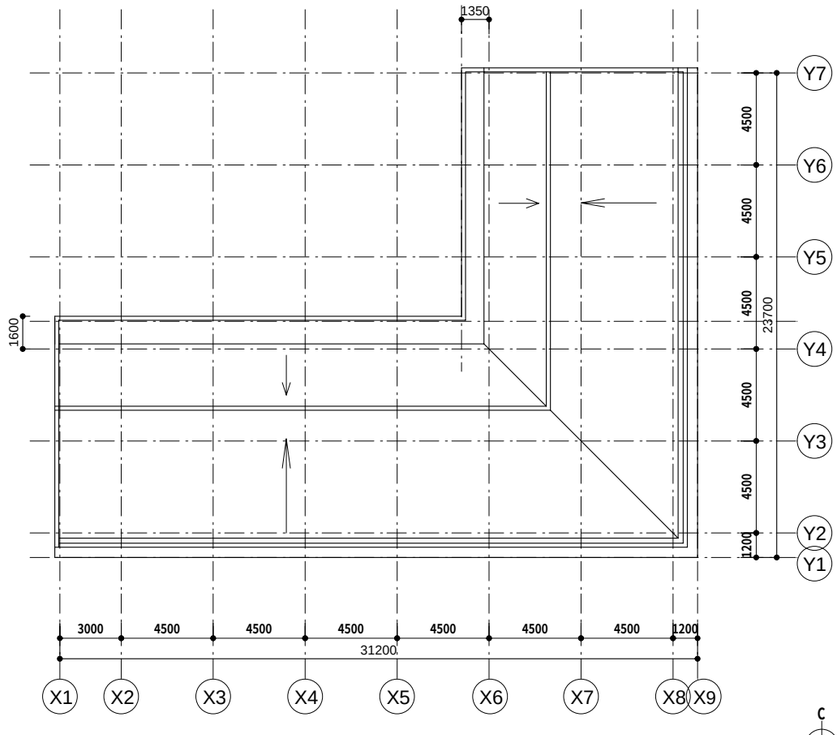
Amenity Ward
Laboratory
Elevated Water Tank
Water Tank
Machine room Building-2
HANDS Office/Store
Eye Theatre
Ward-2(Pediatric-under 5years)
Public Health Office
Ward-1 (Eye)
Old Kitchen
Administration Office
Public Health Office
Ward-6 (Male General)
Ward-5 (Female General)
Records / Tel / N.H.I.F.
Ward-3 (Isolation)
TB Clinic
Eye Clinic
Parking
X-Ray
Casualty
1FL +100.15
Entrance
Labour Ward
Laundry / Stores
Maternity Ward
Theatre
O.P.D.(General)
Parking
Kitchen / Maintenance
Occuptional Therapy/ Physiotherapy
Ward-4 (Pediatric Isolation-5~12years)
Machine room Building-1
O.P.D. (M.C.H)
Walter Reed Building
PMIU

Building Renovated by Kenyan Side
Building Constructed by Japanese Sid
Construction Area

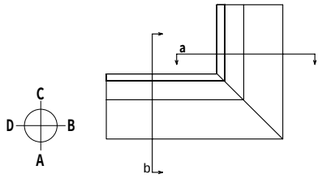
SITE PLAN
1/600

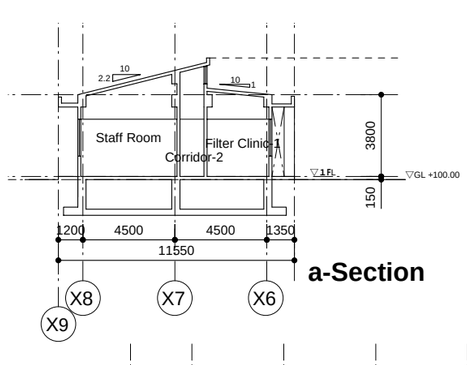


1F Plan

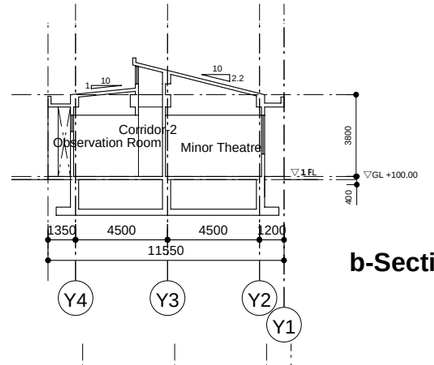


Roof Plan

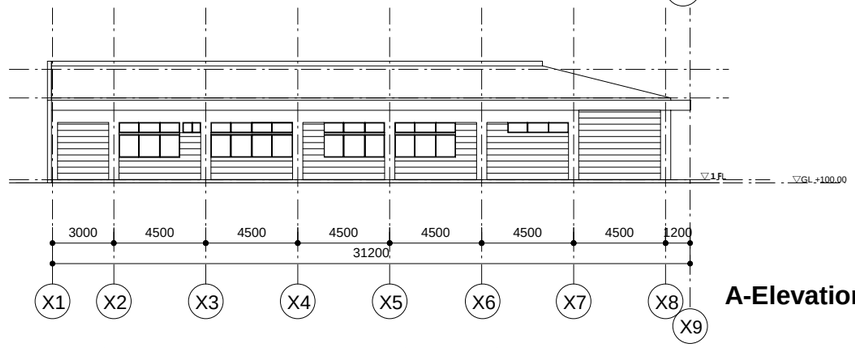




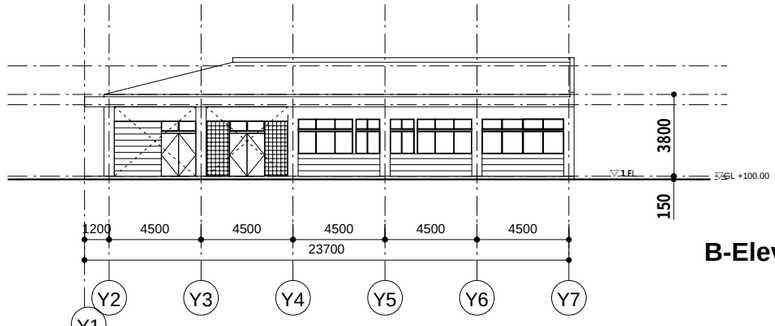
a-Section



b-Section



A-Elevation



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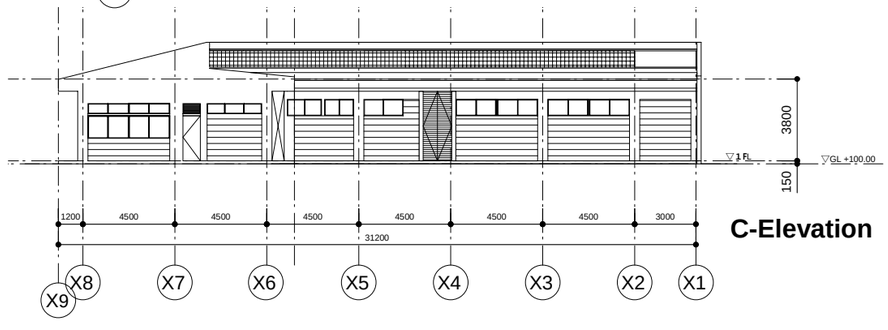
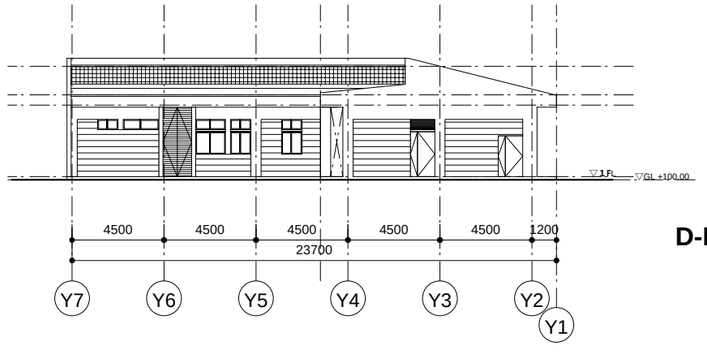


C-Elevation



D-Elevation

KERICHO
DISTRICT HOSPITAL

CASUALTY : PLAN
ROOF PLAN
SECTION
ELEVATION

1/300

N

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Organization for project implementation

This project will be implemented according to the system of Japan's grant aid program, after cabinet approval of the government of Japan, and after exchange of notes (E/N) on the project has been effected between the government of Kenya and the government of Japan.

The responsible organization and the executing agencies on the part of the government of Kenya for this project are the Ministry of Health and the Kisii District Hospital and the Kericho District Hospital, respectively. The Kenyan contracting party is the Ministry of Health, which will seal the consulting contract with the consultant, and seal the construction / equipment procurement contracts with the contractor. The Ministry of Health will also execute constructions of the portions of this project which are obligations of the Kenyan side.

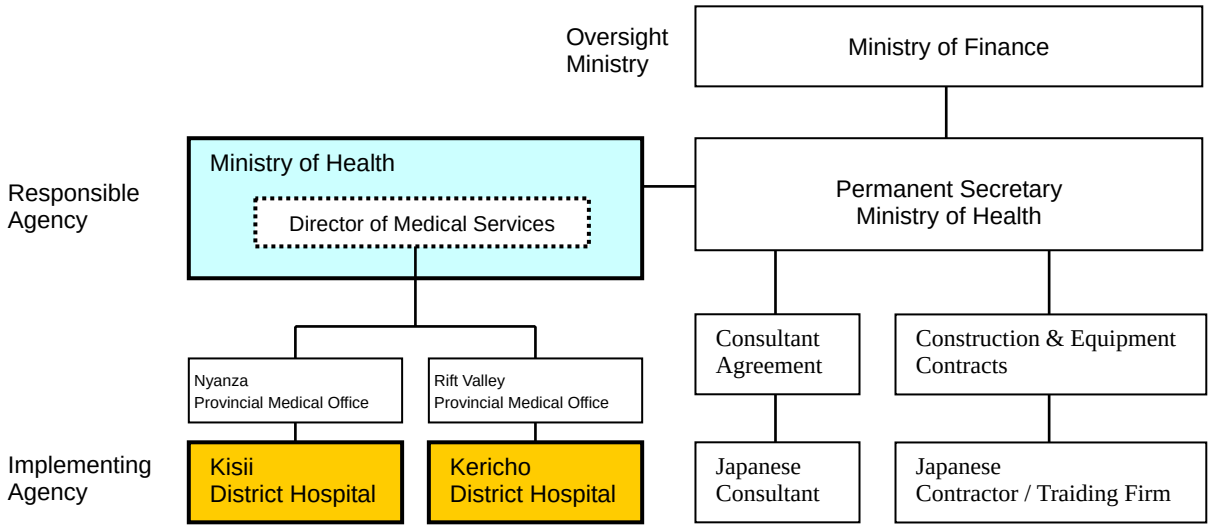


Figure 2-37 Relation among Project Executing Organizations

1) Establishment of committees for project promotion

It has been confirmed that the Project Management Committee, with the Ministry of Health, the responsible organization, as the core member organization, and the Technical Study Committee, with the both district hospitals as the core member organization, will be established to smoothly promote the project. The members and roles of these committees are shown below.

Project Management Committee

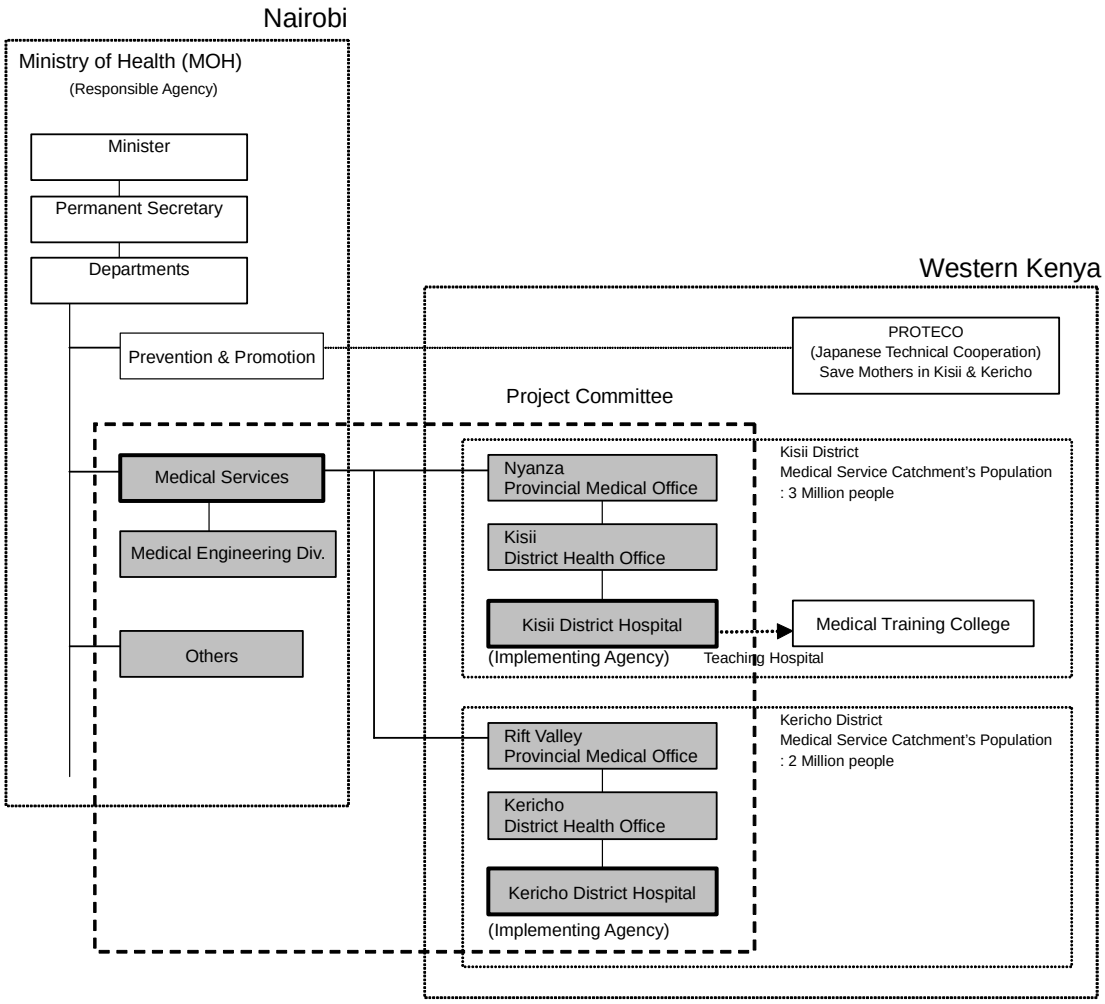


Figure 2-38 Organization of the Project Management Committee

The members (tentative) of the Project Management Committee are as follows.

Chairperson: Vice General Manager, Medical Service Bureau, Ministry of Health

Committee member: Director of Medical Services, Ministry of Health
Dept. of Curative Services and Rehabilitation, MOH
Deputy Secretary, Development, MOH
Chief Finance Officer, MOH
Provincial Medical Officer, Nyanza Province
Kisii District Health Officer
Medical Superintendent, Kisii District Hospital
Provincial Medical Officer, Rift Valley Province
Kericho District Health Officer
Medical Superintendent, Kericho District Hospital
Kisii District Works Officer
Kericho District Works Officer

The major roles of the Project Management Committee are as follows.

- Project implementation including tender works, sealing of signatures, etc. on contract documents, etc.
- Tax and duty exemption, acquisition of necessary permits
- Securing of persons and appointment thereof necessary for project implementation (including expenses)
- Other measures necessary for smooth implementation of the project

Technical Working Groups

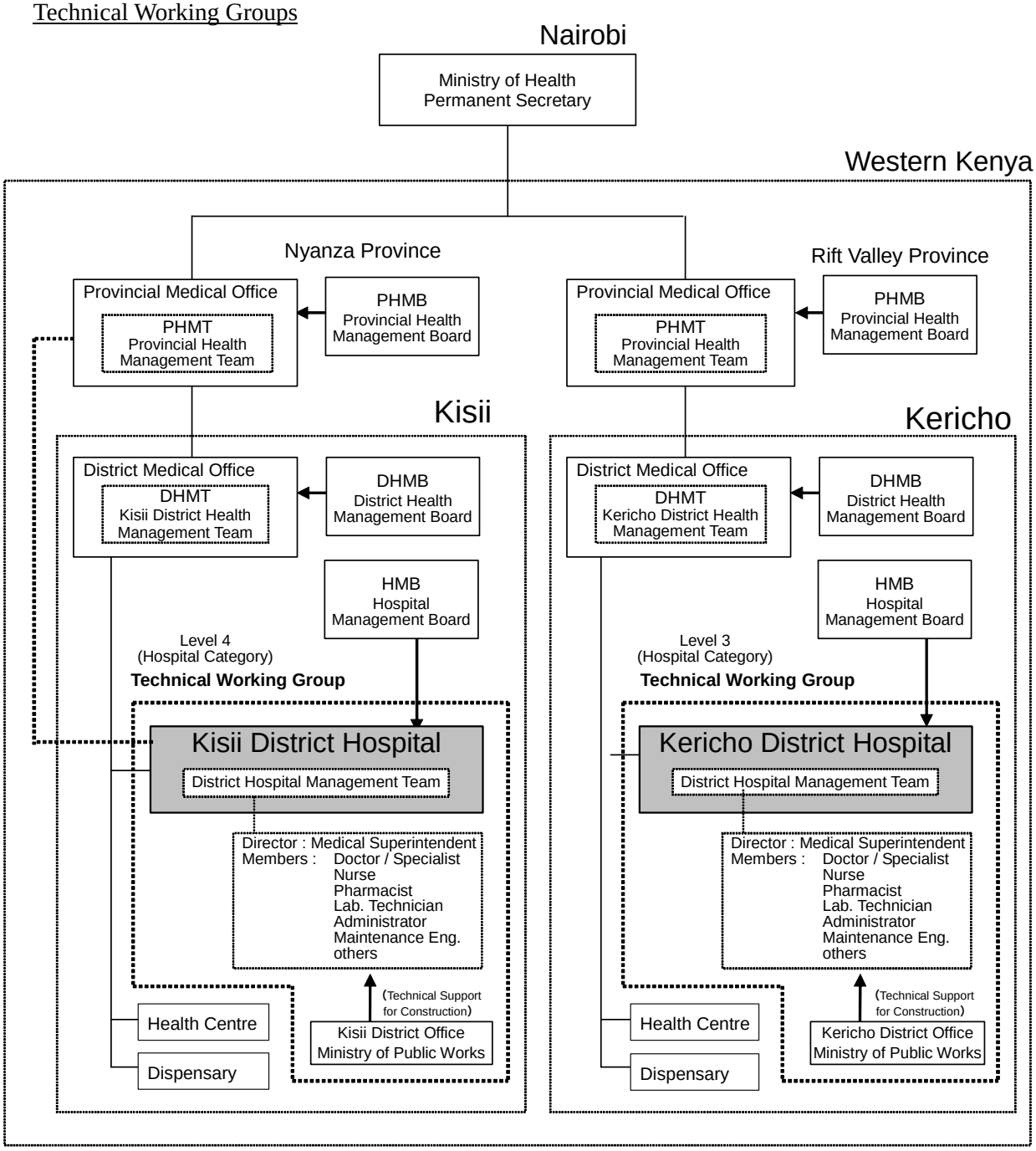


Figure 2-39 Organization of the Technical Working Groups

The Technical Working Groups consists of the following members with the general managers of the hospitals as chairperson.

The major roles of the Technical Working Groups are as follows.

- Discussions and recommendations regarding buildings, machines, electrical facilities, etc. related to the project
- Discussions and recommendations regarding infrastructure (city waterworks, sewerage system, electric power supply, etc.) related to the project
- Discussions and recommendations regarding medical equipment related to the project
- Request for building certification, acquisition of necessary legal permits
- Other measures necessary for smooth execution of the project

2) Exemption of duty and tax

Japan's grant aid programs are extended in principle on condition of exemption of duties and taxes. It has been agreed that the Ministry of Health of the government of Kenya takes necessary measures to concerned authorities to ensure that Japanese juridical persons, Japanese nationals, construction materials, equipment, etc. related to this project are exempted from various duties and taxes. The procedures for exemption of duties and taxes that may be imposed in Kenya have been changed from the system for payback effective until 2002 to the system of exemption by prior application, as shown in the figure below.

Exemption Method (imported goods)

Customs Duties	Exemption
VAT	Exemption

Exemption Method (local procurement)

VAT	Exemption

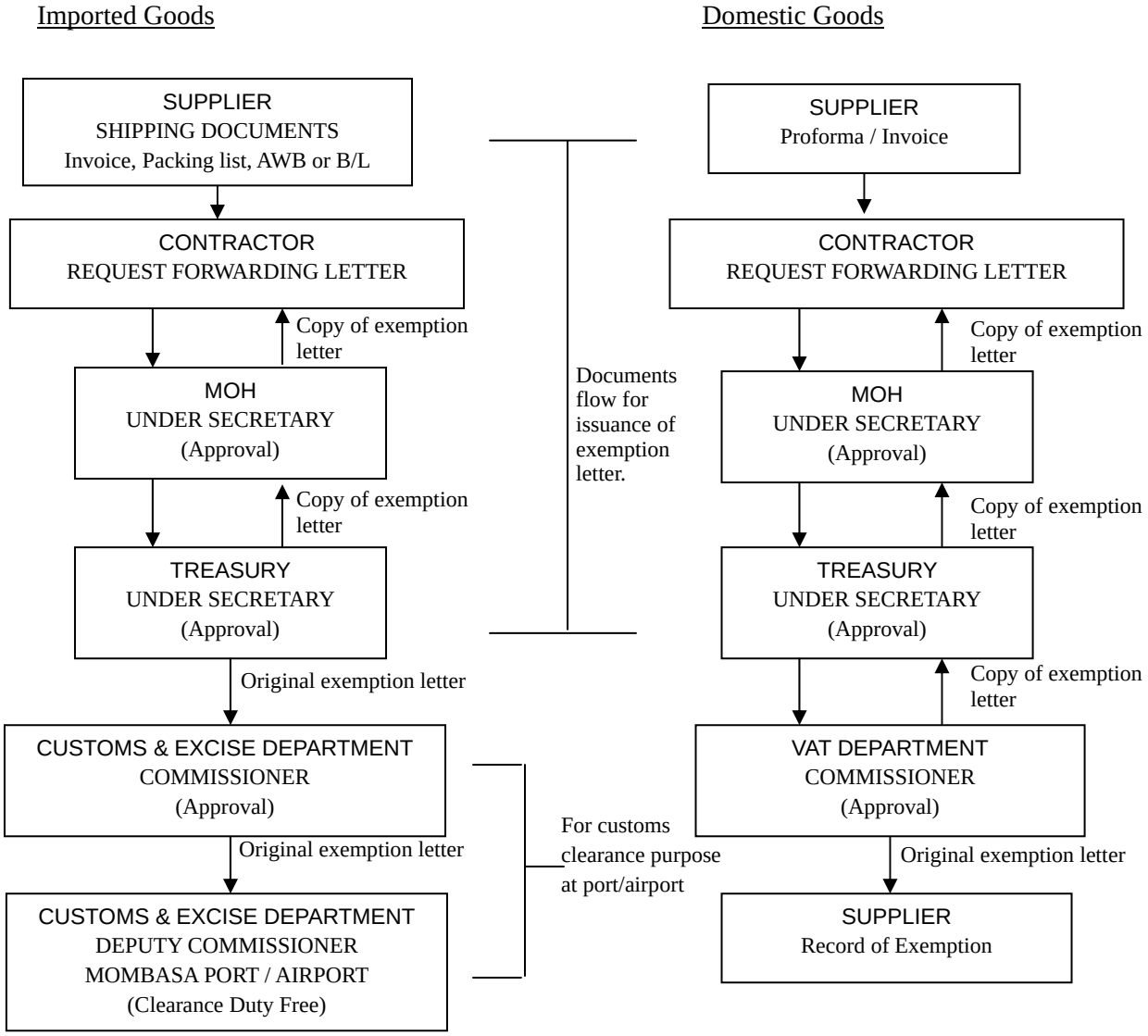


Figure 2-40 Outline of Duty and Tax Exemption Procedure

(2) Consultant

After the exchange of notes having been effected, the Ministry of Health shall seal contracts on detailed design and consultant supervision with a consultant, having a status of Japanese juridical person. The contracts with the consultant become effective after verification by the government of Japan.

In order to promote this project smoothly, it is important that the consulting contract be sealed as quickly as possible after the exchange of notes has been effected. The consultant, after the contract has been sealed, prepares the tender documents (detailed design drawings, specification documents, etc.) based on this basic design study report, in consultation with the Ministry of Health, for approval by the Kenyan side according to the above-mentioned procedure for approval. The tender work and the consultant supervision will be executed according to the contents of the tender documents.

(3) Order for construction work / equipment procurement

The construction work of this cooperation project consists of the "construction work per se" in which the facilities are constructed, and "procurement work" in which facilities and equipment are procured, installed and test operated. The eligible candidates for the contractors are limited to Japanese juridical persons meeting certain qualifications. The contractor will be selected by the general competitive bidding with limited qualifications.

The Ministry of Health shall seal a contract with each of the contractor for construction and that for procurement duly selected by bidding, and shall receive verification of the contract documents from the government of Japan. Thereafter, the contractor for construction and that for equipment procurement shall begin their respective works without delay, and shall complete their works according to the contracts.

(4) Commissioning of local consultant

Since the project adopts local construction method, the project will retain local architectural engineers for supervision of the construction works, to work with the Japanese manager stationed locally. Since this cooperation project concerns medical facilities, the project involves more machine works and electrical works than ordinary building projects, and some buildings require very high degrees of cleanliness, the project will employ facility engineers.

(5) Commissioning of local architectural engineer and dispatch of Japanese professional specialist

The Kenyan construction industry has about 100 major construction companies. However, very few official data indicating the scales of these companies are available.

Large-scale construction works are private-sector construction works. The ratio of architectural works is generally larger than that of civil works such as roads, bridges. There is no local construction company of Japanese capitals but some of local construction companies have worked as subcontractor for architectural works related to Japan's ODA. The contractor, a Japanese juridical person, needs to employ local architectural engineers under the supervision of the Japanese engineers to minutely conduct detailed examination of process, quality, safety management of the project implementation, and also to realize technology transfer to these local engineers.

This cooperation project represents the latest medical facilities to Kenya, and involves construction works, such as theatre and laboratory, that require relatively high levels of quality control. Therefore, technical guidance and construction management by experienced Japanese professional specialists in this particular field are indispensable. The project plans to dispatch professional specialists from Japan in such special fields as medical equipment.

2-2-4-2 Implementation Conditions

(1) Temporary work plan

This cooperation project, in both the Kisii District Hospital and the Kericho District Hospital, constitutes construction of new buildings and modification / expansion of the existing buildings within the present hospital premises. The project sites face the southeastern road and the northeastern road, respectively, in the cases of Kisii District Hospital and the Kericho District Hospital. Therefore, it is relatively easy to bring the materials, facilities and equipment to the construction sites for both cases. Nevertheless, utmost care must be exercised to secure the safety of patients coming to the hospitals, and people coming to see the patients.

Hoardings of corrugated galvanized steel sheets will be erected around the construction sites to protect third persons from accidents and for guarding and security reasons. Barbed wire fences will be placed on the hoardings on the borders of the hospitals. The temporary construction office, construction shed, construction material stockyard, assembly yard will be placed close to the construction site.

(2) Material procurement

A shop dealing in metal products in Kisii City sells such construction materials as cement, mesh, Kisii Stones in small quantities. No such shop dealing in construction materials is found in Kericho City. Given such a circumstance, most construction materials needed for construction works of this project will be procured in Nairobi, the capital city, and transported on land to the construction sites in Kisii City and Kericho City.

Dealers of imported products and shops dealing in construction materials gather in Nairobi City, and procurement of necessary materials should be relatively easy there. These construction materials found there are mostly products of neighbouring countries, notably South Africa, Turkey, European countries, Southeast Asian countries, and are always available in the Kenyan domestic markets.

Procurement of Japanese materials, facilities and equipment for construction works of this project is disadvantageous in cost, schedule control, and even in maintenance, because of the very long transportation distance. Therefore, procurement from Japan is limited only to such construction material, facilities, equipment classified as special hospital facilities and equipment.

(3) Special construction method

There is no ready-mixed concrete dealer in Kenya. Only few construction companies have their own concrete mixing plants. Use of job-mixed concrete prepared by a rotary mixer placed on the construction site is the commonest method in Kenya for pouring concrete. Depending upon the scale of work, mixed concrete is poured by such means as relaying of buckets by hand, bringing to the pouring points by cart, lifting buckets by crane. The amount of mixed concrete that can be poured a day is very limited by any of such methods; therefore, the construction schedule should have some allowance.

In Kenya it is common, in forming building frames, to use a two-step pouring method in which concrete is first poured to pillars to the height of beams and second to beams and slabs. Local construction companies are accustomed to this method but not to the monolithic pouring in which concrete is poured to the form enclosing pillars, beams and slabs, commonly adopted in Japan. Accordingly, the subject cooperation project will adopt the two-step pouring method.

In applying cement mortar to a building, it is common to place thickly mixed cement mortar on a trowel and fling it onto the wall to form a lump of mortar on the wall, and then to press the lump by trowel to extend it on the wall. This method is said to be effective in preventing cracks from

developing later. In Kenya, after excavating the ground for foundation building, they apply anti-termite treatments on the plane where floors are fixed.

(4) Procurement

There are some items of medical equipment that need coordination with construction work. For instance, operating lights need anchor bolts prior to being installed on the ceiling, and high pressure steam sterilizers need plumbing work for water supply and drainage. Therefore, the consultants should coordinate their contractor schedules with those of suppliers and provide instructions to them.

The supplier is required to carry out equipment installation work so as not to hinder the hospitals' activities. This project includes shifting existing equipment to the new buildings; thus, the consultant should discuss with the Kenyan side shift procedures and schedule to secure smooth shift of the equipment.

In Kericho hospital, it is recommended that the Kenyan side will complete modification work of the existing operation theatre prior to the equipment installation. The Kenyan side is also suggested to implement the related work to secure alternative theatre during installation work.

2-2-4-3 Scope of Works

To implement this cooperation project, works of Kenyan side and Japanese are defined as shown below.

Kisii District Hospital

Table 2-45 Works of Kenyan Side and Japanese Side (Kisii District Hospital)

Japanese side work	Kenyan side work
	Securing of the construction site
	Application for building certification and acquisition of approval thereof
	Site preparation, removal of the existing facilities, etc. 1) Removal of the existing structures from the site 2) Removal of the existing facilities from the site 3) Removal of the existing power cable passing the site, and reinstallation 4) Removal of the existing telephone cable passing the site, and reinstallation 5) Removal of the existing water supply pipe passing the site, and reinstallation 6) Removal of the existing wastewater pipe passing the site, and reinstallation
	Construction of gate and fences surrounding the site
	Construction of parking lot 1) Parking lots outside the site
Construction of road 1) Roads within the site	Construction of road 1) Roads outside the site
Exterior construction work in the site 1) Planting in the building surroundings and inner courts, outdoor lighting facilities, roadside gutters for stormwater discharge	Exterior construction work in the site 1) Landscaping and planting (excepting the inner courts)
Building construction 1) Architectural construction works Including built-in furniture and medical curtains 2) Electric facility installation Electric power supply system, lighting and wall power outlet systems, lightning arrester and grounding device, telephone system, hospital speaker system, interphone system, automatic fire alarms, television common antenna system, PC network piping 3) Machine facility construction work Water supply system, wastewater system, hot water supply system, sanitary fixtures, firefighting facility, air conditioning facility, ventilation facility 4) Special facility Emergency power generator facility, medical gas facility, supplied water purification facility, special medical wastewater treatment facility, incinerator	
Supply and discharge facility for electric power, telephone, water, wastewater, and other supply facilities 1) Electric power a. Wiring work within the site b. Main breaker and high-voltage transformers (covering the demand of the existing facilities) c. Piping for lead-in cable, including manholes and hand holes, from the site boundary to the main breaker d. Low-voltage wiring to the existing main power panels	Supply and discharge facility for electric power, telephone, water, wastewater, and other supply facilities 1) Electric power a. Installation of a high-voltage lead-in cable to the main breaker of the building b. Transformer for future plans c. Modification works within and outside the existing buildings d. Power supply to incinerator

Japanese side work	Kenyan side work
2) Water supply a. Water supply facilities within the site: water receiving tank (capacity covering the demands of the existing facilities), cistern tower, water supply facilities to the new buildings b. Water supply piping to the elevated cistern for the existing buildings 3) Wastewater a. Wastewater facilities within the site 4) Telephone a. Installation of lead-in cables to the new buildings b. Installation of cables from the new facilities to the MDF (PABX) for new installation 5) Furniture and equipment a. Curtain rail b. Business (medical) furniture, built-in furniture c. Provision and installation of medical equipment	2) Water supply a. Tapping of water from city's waterworks system to the site b. Modification works within and outside the existing buildings c. Water supply to incinerator 3) Wastewater a. Wastewater facilities outside the site b. Modification works within and outside the existing buildings 4) Telephone a. Installation of lead-in cables to the MDFs (PABXs) of the existing buildings b. Modification works within and outside the existing buildings 5) Furniture and equipment a. Curtain, blind b. General furniture c. Removal and reinstallation of the existing facilities

Kericho District Hospital

Table 2-46 Works of Kenyan Side and Japanese Side (Kericho District Hospital)

Japanese side work	Kenyan side work
	Securing of the construction site
	Application for building certification and acquisition of approval thereof
	Site preparation, removal of the existing facilities, etc.
	1) Removal of the existing structures from the site 2) Removal of the existing facilities from the site 3) Removal of the existing power cable passing the site, and reinstallation 4) Removal of the existing telephone cable passing the site, and reinstallation 5) Removal of the existing water supply pipe passing the site, and reinstallation 6) Removal of the existing wastewater pipe passing the site, and reinstallation
	Construction of gate and fences surrounding the site
	Construction of parking lot 1) Parking lot outside the site
Construction of road 1) Roads within the site	Construction of road 1) Roads outside the site
Exterior construction work in the site 1) Planting in the building surroundings and inner courts, outdoor lighting facilities, roadside gutters for stormwater discharge	Exterior construction work in the site 1) Landscaping and planting (excepting the inner courts)
Building construction 1) Architectural construction works Including built-in furniture and medical curtains 2) Electric facility installation Electric power supply system, lighting and wall power outlet systems, lightning arrester and grounding device, telephone system, hospital speaker system, interphone system, automatic fire alarms, television common antenna system, PC network piping 3) Machine facility construction work Water supply system, wastewater system, hot water supply system, sanitary fixtures, firefighting facility, air conditioning facility, ventilation facility	

Japanese side work	Kenyan side work
4) Special facility Emergency power generation facility, medical gas facility, special medical wastewater treatment facility	
Supply and discharge facility for electric power, telephone, water, wastewater, and other supply facilities 1) Electric power a. Wiring work within the site b. Installation of the main breaker c. Piping for lead-in cable, including manholes and hand holes, from the site boundary to the main breaker d. Low-voltage wiring to the existing main power panels 2) Water supply a. Water supply facilities within the site: water receiving tank (capacity for the new facilities only), cistern tower, water supply facilities to the new buildings 3) Wastewater a. Wastewater facilities within the site 4) Telephone a. Installation of lead-in cables to the new buildings b. Installation of cables from the new facilities to the MDF (PABX) for new installation 5) Furniture and equipment a. Curtain rail b. Business (medical) furniture, built-in furniture c. Provision and installation of medical equipment	Supply and discharge facility for electric power, telephone, water, wastewater, and other supply facilities 1) Electric power a. Installation of a new low-voltage lead-in cable to the main breaker of the building b. Expansion of the existing KPLC's high-voltage transformer (from 200KVA to 300KVA, etc.), coordination for the lead-in installation to the new Walter Reed's building, capacity of the KPLC's transformers c. Modification works within and outside the existing buildings 2) Water supply a. Tapping of water from city's waterworks system to the site b. Modification works within and outside the existing buildings 3) Wastewater a. Wastewater facilities outside the site b. Modification works within and outside the existing buildings 4) Telephone a. Installation of lead-in cables to the MDFs (PABXs) of the existing buildings b. Modification works within and outside the existing buildings 5) Furniture and equipment a. Curtain, blind b. General furniture c. Removal and reinstallation of the existing facilities

One of important factors essential to smooth promotion of this project is schedule control between various construction works for buildings, electric and mechanical facilities and installation works of facilities and equipment. Persons concerned either with the construction or with the installation should have a good understanding of the conditions and details necessary for installation of medical equipment, and should coordinate their respective schedules.

Also, the works of Kenyan side obligation -- removal of the existing buildings, infrastructure construction and improvement, exterior construction works -- will be being implemented. It is therefore very important that both Kenyan side and the Japanese side confirm state of progress of the other party's work. It has been firmly confirmed with the Kenyan side that the construction and improvement of infrastructure (electric power, water supply, etc.) will have been completed by the time the construction of this project starts. Nevertheless, detailed discussions will be done at the time of draft report presentation, and others, so that the Kenyan side works will be done in time for the start of the construction work of this project, and will not hinder smooth implementation of this project. It should be noted that construction works for tentative modifications of the pipes and wires to the existing buildings are needed, prior to the construction and improvement of infrastructure.

2-2-4-4 Construction Supervision

A Japanese consultant firm will conclude the Agreement for Consultants Services with the Ministry of Health and the said consultant will prepare the tender documents for construction and equipment procurement. After assisting in tendering of the Project, upon the award of construction and equipment procurement contract(s), the consultant will commence the construction supervision services. The purpose of supervision services executed by the consultant is to oversee the construction of the facilities and the procurement and installation of equipment, to ensure quality and construction progress is consistent with the contents of contract documents. To secure this, the consultant as a supervisor will issue guidance, advice and coordination to the contractor(s) regarding quality of works and progress of construction schedule. The consultant services includes the following items:

(1) Assistance in tendering of construction and equipment procurement contract(s)

This item includes the preparation of tender documents necessary to select the contractor(s) for construction and equipment procurement and also the issuance of Tender Notice, acceptance of tender applications, pre-qualification of applicants, holding of explanatory meeting for tendering, distributing tender documents and accepting and evaluation of tenders. Furthermore, the consultant will lend guidance and assistance for the contract signing procedure between the successful tenderer and the Ministry of Health.

(2) Issuing guidance, advice and coordination to contractor(s)

The consultant will examine the construction schedule, construction plans, procurement plan of construction materials and procurement & installation plans for equipment submitted by the contractor and issue guidance, advice and provide coordination.

(3) Inspection and approval of working drawings and shopdrawings prepared by contractor(s), subcontractors and suppliers.

The consultant will inspect the work drawings, shop drawings and other construction documents and provide approval along with any necessary guidance.

(4) Confirmation and approval for construction materials and production equipment

The consultant will inspect the proposed construction materials and equipment for conformity with the contract documents and issue approval of their use and procurement.

(5) Inspections of works

The consultant will conduct factory inspections of construction materials and procured equipment, attend construction tests and conduct tests to measure quality and performance compliance as necessary.

(6) Progress report of construction and installation.

The consultant will ascertain the status of construction schedule and site conditions and report on the construction progress to concerned agencies of both countries.

(7) Confirmation and verification of trial run results and final inspection upon completion.

The consultant will conduct completion inspections for buildings, ancillary systems and equipment procurement and conduct trial runs of the equipment to confirm that the completed facilities meet the performances stipulated in the contract documents and submit a completion inspection report to the Ministry of Health.

(8) Construction Supervision Organization

The consultant will assign one resident engineer to perform the activities described above. In addition, the consultant will send experts in relevant fields to the site, as necessary, following the progress of the construction works. The experts will conduct discussions, inspections, guidance and coordination necessary for project implementation. Furthermore, the consultant will assign experts in Japan to establish a back up system. Finally the consultant will report to the concerned agencies of the Government of Japan concerning relevant matters on the progress of the Project, payment procedures, completion and handing over and other matters.
A draft Supervision Organization is shown in the following Figure.

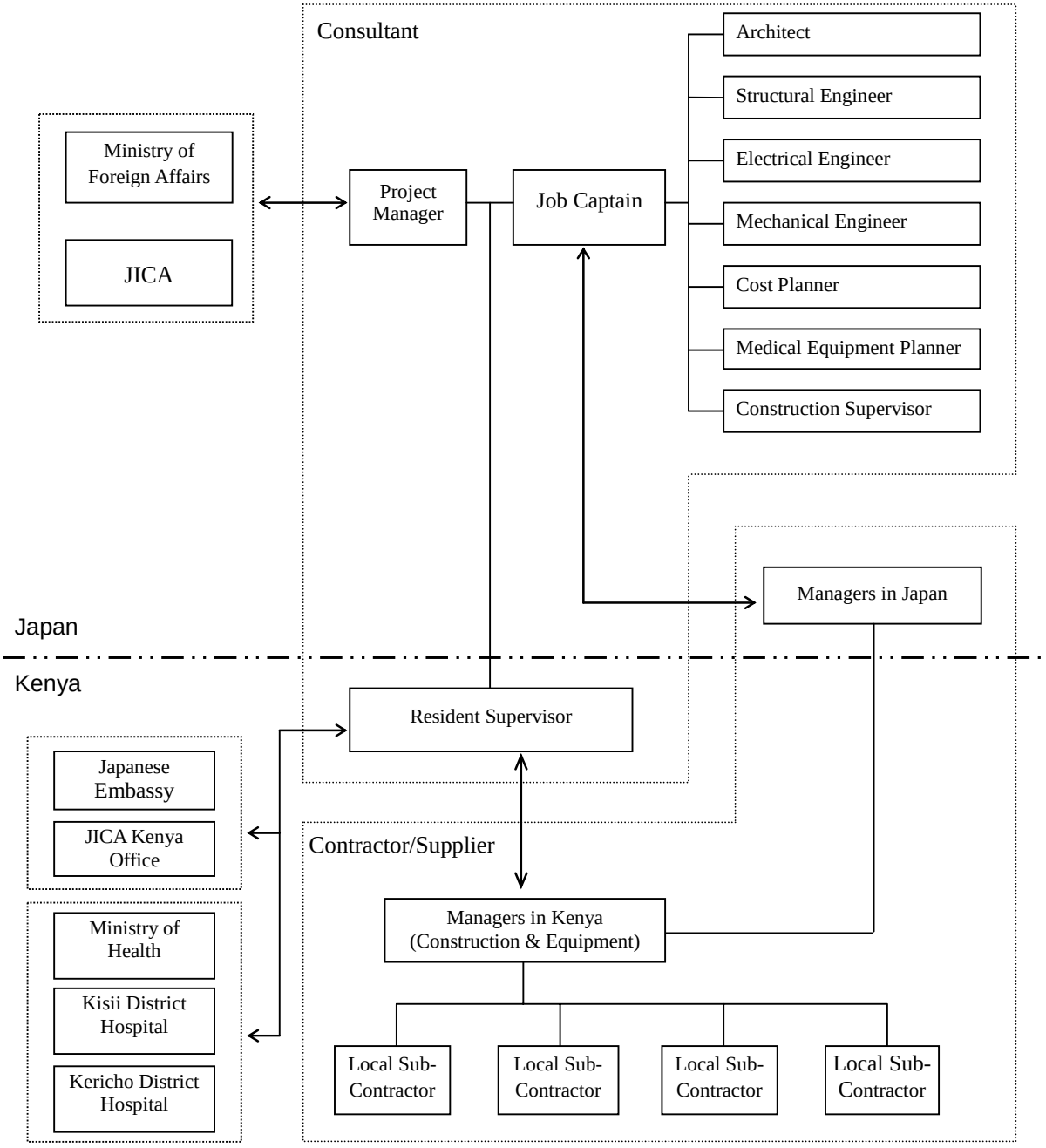


Figure 2-41 Supervision System

2-2-4-5 Quality Control Plan

(1) Material

•Cement

Cement meeting the BS or Kenyan specifications is manufactured domestically. Ordinary Portland cement or comparable products are generally used.

•Aggregate

The aggregate is not sufficient in terms of both quality and quantity. Normally available aggregates have problems with particle distribution, and are not suited to use for high-strength concrete. The fine aggregates to be used are either crushed stones or sand. In case sea sand is used, chloride ion should be held within the tolerable limit of the JASS5 (Japanese Architectural Standard Specification 5). The coarse aggregates should be river gravel or crushed stone, of a maximum size of 20mm. As a countermeasure against the alkali-aggregate reaction, the aggregate should be subjected to the alkali silica reaction test.

•Cement admixture

In Kenya in-situ cement mixing is common practice, and in this project we plan to adopt the in-situ mixing method. We also plan to use an air entraining agent in order to reduce the unit content of water and improve workability.

•Water

Water should have a quality comparable to the waterworks water. Recovered water is not used in principle.

(2) Mixing plan

Concrete mixing will be basically onsite mixing by rotary mixer, or use of job-mixed concrete in other words. By this method, mixing is done by component volume ratio control; therefore, control of weights and specific gravities of the components will be important. Also important is curing of cement and aggregates. Care must be exercised to select mixing times suited to local climatic conditions.

(3) Pouring of concrete

Concrete pouring common in Kenya is to bring the mixed concrete by cart to the pouring point and to pour the concrete from the carts. Thanks to the local climatic conditions, drying shrinkage is small; however, the workability of the job mixing and cart pouring method is not good. Therefore, attention should be paid to the gap-filling property of the mixed concrete, and measures such as use of vibrator will be planned to realize solid pouring of concrete. In Kenya it is common first to pour concrete to form the pillars, and second to arrange bars and assemble frames for the beams, and then to pour the concrete to form the beams.

(4) Strength

The standard of Kenya specifies a strength of 20 to 40N/mm^2 (28-day cube strength) for structural members. Considering the conditions of aggregates and the scale of the buildings, a strength specification of 25 to 30N/m^2 is planned. Strength control is done at the times of 7-day strength = 0.65Fc, 28-day strength = 1.0Fc.

(5) Quality control of concrete

Although the quality control of concrete will be done by the method commonly adopted in Kenya, control methods of the Japanese Architectural Standard Specification for Reinforced Concrete Work (JASS5) will be applied as necessary.

Since the strength of specimens cured by the standard method and strength of structural member differ, the standard strength for quality control is set at "design strength + 3N/mm^2," according to the JASS5 standard. Strength of mixed concrete will be determined by test mixing. The strength of specimen is confirmed to exceed the standard strength for quality control by the 28-day control. For this work, the X-R control chart will be developed.

Since there is no testing body of a third-party nature near the construction sites of the project, a test room will be provided in the project sites equipped with a water bath suited to standard curing of concrete specimens. Compression tests of the specimens will be done in principle by a third party organization, and the testing frequency is every day in which pouring work was done and once in every 150m^3 of concrete poured. Frequency of concrete pouring works will be many, in view of the pouring method to be adopted, compression tests by a third party organization would probably be done once in every 50m^3.

Tests on the chloride content in fresh concrete will be done by a method commonly adopted in Japan, and the content will be confirmed not to exceed 0.3kg/m^3.

2-2-4-6 Procurement Plan

(1) Procurement of construction material and equipment

The subject cooperation project is construction of hospital facilities; therefore, materials and equipment that meet the purposes of their uses, -- sustainably clean, easy-to-clean and sturdy in other words --, should be selected. The materials and equipment that meet the BS standards, commonly accepted locally, will be selected; however, regarding materials and equipment for which BS standards do not exist, they are selected according to the JIS specifications. The policy toward procurement of materials and equipment is basically as follows.

1) Local procurement

The materials and equipment will be procured locally to the extent possible to facilitate repairs, maintenance and management after commissioning. In so doing, care will be exercised to confirm their quality level and availability for procurement to ensure that the locally materials and equipment may not adversely affect the construction schedule and other important elements of construction. Those imported materials and equipment which are procurable without restriction in the local market (those always available in the Kenyan market without taking importation procedure) are regarded as local products.

Kisii City, the location of the construction site, is 366km apart via Kericho City from Nairobi, the capital city. Being not available in Kisii City, materials and equipment that may be procured in Nairobi will be transported on land to Kisii City in about 6.5 hours. Kericho City, the location of another construction site, is about 275km apart from Nairobi. Materials and equipment, not available in Kericho City and procured in Nairobi, will be transported to Kericho City in about five hours.

Paved national roads connect Nairobi and both construction sites, except for an about four-kilometre portion between Naivasha and Nakuru.

2) Overseas procurement

Those materials and equipment which are considered difficult to procure in the domestic market, of which domestic products do not meet the required quality, of which domestic products are not stable in supply, will be procured from Japan or from third countries. In the case of overseas procurement, the contractor should coordinate with the Ministry of Health about import and customs clearance so that various procedures may be executed smoothly.

Also, if the “price + packing and transportation cost” of importation from Japan or third countries is found lower than the “locally procured price” of a given product, the product will be procured overseas and imported.

The major trading port of Kenya is Mombasa on the coast of the Indian Ocean. Goods procured from Japan or third countries and imported will be transported by sea to Mombasa. Regular container ship service is available once a month between Japan and Mombasa, which normally takes about one month one way. The imported goods will be transported on land via Nairobi, the capital city, to the construction sites in Kisii City and Kericho City after customs clearance and disposal of goods having been duly completed. The roads en route are paved national roads, and the distance of transportation from Mombasa Port to Nairobi is about 500km, which takes one to two days, and transportation from Mombasa to Kericho or to Kisii takes two to three days. Imported goods can be brought to the site in two to three days from Mombasa.

3) Transportation plan

The national roads en route are paved, but the surface conditions are not necessarily goods. Road construction and maintenance are not in good progress. An 80km speed regulation is imposed on freight vehicles; actually, such large freight vehicles as container trailer are seen running much slower. Therefore, transportation schedule should be planned with ample allowance.

Some of the materials and equipment are so vulnerable to impacts, high humidities and high temperatures that their performances may deteriorate upon exposure to such conditions. These goods should be packaged in such a way to resist such effects.

The time required for overseas procurement may be uncertain ranging from one month to two months, depending upon the situations in which the supplier is placed. Care must be taken to such uncertainties in scheduling the project execution.

4) Procurement plan

Table 2-47 shows major construction materials and equipment, broken down into local procurement, procurement from Japan and procurement from third countries, and reasons for selecting the procurement source.

Table 2-47 Procurement Plan for Major Construction Materials and Equipment

Type of work	Material and equipment	Procurement			Note
		Local	Japan	Third country	
Reinforced concrete work	Portland cement	○			No problem with the local products
	Fine aggregate	○			Crushed sand, pit sand are in general use.
	Coarse aggregate	○			Crushed stones are in general use.
	Deformed bar		○	○	Local availability insufficient, procured from Japan or third countries
	Form	○		○	Plywood for exposed concrete finish is locally procurable but highly priced, and is therefore procured from third countries.
Steel work	Steel frame (small and ordinary steel members)	○			A small number of imported products are procurable in the domestic market.
Masonry	Concrete block	○			Local products are available but they are low in strength against the Japanese specifications.
	Ventilation block	○			No problem with the local products
Waterproofing work	Silicon sealing material (for pane and sash peripheral sealing)	○			There is no domestic product, but foreign country products can be procured through local agents.
Plastering work	Cement mortar	○			No problem with the local products
Tile work	Homogeneous ceramic tiles (295 × 295, 195 × 195, 95 × 95)	○			There is no domestic product, but products of neighbouring countries are available in the domestic market.
Masonry and stone surfacing work	Stone material	○			Kisii Stone masonry is the generally accepted structure.
	Terrazzo block (300 × 300)	○			Only 300-square products are available. Water polished products are not available. The common practice is to polish the blocks after being pasted.
	Terrazzo block work	○			Commonly used
Carpentry	Timber for fitting works	○			Local materials are generally not insecticide treated, nor dry controlled. They are used for limited applications.
Roofing work	Roof tile	○			No problem with the local products
	Steel folded plate	○			No problem with the local products

Type of work	Material and equipment	Procurement			Note
		Local	Japan	Third country	
Metal work	Light-weight ceiling substrate (T bar)	○			There is no domestic product, but foreign country products can be procured through local agents.
	Light-weight ceiling substrate (double tier)		○		Procured in Japan for quality and durability reasons
	Decorated metalware, handrail	○			Locally procurable products are used.
	Curtain rails for ward		○		Local products have quality problems.
	Roof drain, stainless steel downpipe, stainless steel floor pit cover, frame, aluminium ceiling inspection hole, stainless steel expansion metal, stainless steel expansion joint, trap for pit, stainless steel stretcher guard		○		There is no local product. Third country products are difficult to procure. Japanese products are procured for reasons of quality and performance.
Wooden fixture work	Door, fixture, frame			○	Local products are not finely finished. Third country products will be procured.
Metal fixture work	Aluminium fixtures			○	Locally assembled products are poor in accuracy, airtightness, water proofing. Third country products will be procured.
	Light steel fixture		○		Japanese products will be procured for reasons of quality and performance.
	Steel fixture (airtight)		○		Ditto
	X-ray shielding door, window		○		Ditto
	Metal parts for fixture		○		Locks will be Japanese products for reasons of performance and durability of the master-key system. Door closers, etc. will also be Japanese products.
Glass work	Ordinary sheet glass, 6mm	○			There is no domestically manufactured product. Imported products are available in the market. They have no quality problem.
	Glass block	○			There is no domestically manufactured product. Imported products are procurable through local agents.
Paining work	Interior painting	○			No problem with the local products
	Exterior painting	○			Local products are planned to be procured in view of maintenance.
Interior finish work	Plaster board	○			There is no locally manufactured product. Thai products are generally marketed.
	Rock wool sound insulating board	○			There is no locally manufactured product. Imported products for T-bar are procurable through agents.
	Factory painted calcium silicate board		○		(Ceiling of theatre) There is no domestically manufactured product. They are planned to be imported from Japan.
	PVC ceiling cornice		○		There is no domestically manufactured product. Third country products are difficult to procure.
Finishing unit work	Sink, medical sink	○	○		Local products are procured except for stainless steel sinks. Stainless steel sinks are procured from Japan for reasons of quality and durability.
	Overhead cabinet	○			Ditto
	Wooden furniture	○			Ditto
	Doorplate, guide plate, etc., building plaque		○		Procured from Japan

Type of work	Material and equipment	Procurement			Note
		Local	Japan	Third country	
Exterior work	Interlocking block	○			Domestic products are available but variation in dimension and accuracy should be minded.
	Curb	○			No problem with the local products
	Galvanized grating		○		There is no domestically produced product. They are procured from Japan.
Electric facility work	Wiring accessory	○		○	Local procurement, but partially third country procurement
	Lighting equipment	○	○	○	Special products are procured from Japan or third countries.
	Boards	○	○	○	Local procurement, but partially third country or Japan procurement
	Emergency power generator	○		○	Special products are procured from third countries.
	Wires, cables	○	○	○	Special products are procured from Japan or third countries.
	Telephone exchange		○	○	There is no domestically manufactured product. Third country products are procurable.
	Interphone		○		None in Kenya satisfies the required performances.
	Hospital speaker system		○		Ditto
	Fire alarm		○	○	Special ones will be procured from third country.
Machine facility, installation	Electric water heater		○	○	There is no domestically manufactured product.
	Pump		○		None in Kenya satisfies the required performances.
	Air conditioner		○	○	Japan or third countries, depending upon specifications
	Forced and exhaust ventilator		○	○	Ditto
	Ventilating fan, ceiling fan		○	○	Ditto
	Air intake and outlet		○	○	Ditto
	Sanitary ware	○	○		Special ones will be procured from Japan.
	Duct material	○	○		Kenya or Japan, depending upon the specifications
	Piping material	○	○		Ditto
	Thermal insulating material	○	○		Ditto
	Automatic control equipment	○	○		Ditto
	Medical gas facility		○		High performances are required, and they are procured from Japan.
	Special wastewater treatment tank		○		There is no domestically manufactured product.
	Incinerator	○			A local product will be procured to facilitate maintenance.

(2) Procurement of medical equipment

Most of the medical items of medical equipment are imported in Kenya except medical furniture, which is locally manufactured. Though the cost of locally made medical furniture is relatively low, the quality has not reached the standard level to accept. Therefore, it is planned to procure locally such items prevailed in local hospitals such as examination tables and stretchers. Since targeted hospitals have technologists who have been trained in Japan for Japanese-made items of medical equipment and the ratio of relatively basic items of equipment are high in numbers, this equipment will be procured from Japan.

However, consideration may be given to procurement from third countries to secure fair competition and to avoid taking into consideration that manufacturer's agents are required for after-sales services such as operations-related items.

The procurement plan for major items of medical equipment is shown as follows;

Table 2-48 Draft procurement plans of major items of medical equipment

Descriptions	Local	Japan	Third countries
Defibrillator, Instruments sterilizer (table-top), Laryngoscope, Examination table for GB/GY, Binocular microscope, Teaching binocular microscope, Anesthetic machine with ventilator, Electrosurgical unit, ECG monitor, Pulse oxymeter, Respirator, High pressure steam sterilizer, Instruments sterilizer (floor stand), Delivery table, Incubator, Infant warmer and Examination set	-	○	○
Examination tables, recovery beds, Gatch beds, labour beds, baby cots, and stretchers	○	○	-

2-2-4-7 Soft Component

(1) Background of the soft component plan

The Project for Improvement of District Hospital in the Western Part of Kenya aims to improve the medical service of the Kisii District Hospital and the Kericho District Hospital. In the soft component for these hospitals' facilities and the procurement of equipment under this project, the outpatient, central diagnosis and treatment building will be built at the Kisii District Hospital, and at the Kericho District Hospital an emergency diagnosis and treatment building will be constructed. In addition, the Project will provide necessary medical equipment and appliances.
The study team pointed out, as a result of its site survey carried out from January 15 to February 10, 2005, the following problems as for the current system of facilities maintenance.

① Possible risk of environmental deterioration in the surrounding area and nosocomial infections incurred by the discharge of untreated medical wastewater and collection of untreated medical wastes

② Possible risk of nosocomial infections caused by a breakdown of air-conditioning system and ventilation system in the operation room or in the examination room

③ Possibility of a lowered quality of medical service due to a trouble with facilities and/or medical equipment

To deal with the above problems, the Kenyan side confirmed with the Japanese side about the necessity of technical training concerning a maintenance system of facilities and equipment and a treatment system of medical waste and wastewater.

In parallel with this project, the Ministry of Health plans to strengthen the manpower of the Maintenance Division for the hospital facilities and medical equipment so that the division may be able to properly conduct maintenance of the hospital facilities and medical equipment, and also plans to enter into a closer relationship with agents, who deal in hospital facilities and equipment, after the grant aid program has been completed, in order to properly operate and maintain the hospital facilities and equipment of the Kisii District Hospital and the Kericho District Hospital.

The Kisii District Hospital's Maintenance Division for facilities and medical equipment has persons in charge of maintenance of buildings, machines, electrical facilities and medical equipment. The Maintenance Division consists of ten persons, led by the chief technologist (who has received four years' education on maintenance at university), supported by the assistant technologist, and manned by four technicians (who have received two years' education on maintenance at college) and four staff members. Almost all technical works are burdens of the two responsible technologists. Under the present system of personnel, the Maintenance Division is not considered sufficiently staffed to maintain the hospital facilities and equipment, with new ones added by this project. In the Kericho District Hospital, the Facilities and Equipment Maintenance Division is responsible for the maintenance of facilities, machinery, electrical facilities and medical equipment. It has one chief technologist under whom five technicians and six staff members are assigned. In fact, however, the chief technologist is the only person who assumes the responsibility of maintenance. As in the Kisii District Hospital, the makeup of the Maintenance Division is obviously far from adequate in the Kericho District Hospital.
The Maintenance Division of the facilities and medical equipment of the Kericho District Hospital as well as the Kisii District Hospital has a maintenance shop equipped with basic tools. The shop is responsible for fixing small problems, but in case of a serious mechanical trouble the machine is supposed to be sent to the agent of its manufacturer for repairs. However, many machines and appliances such as boiler, washing machine and electric water heater are left without being repaired. Further, the stock of spareparts for the hospital facilities and equipment, medical facilities is not properly replenished; consequently, they cannot timely cope with failures of facilities and equipment, associated with an increased maintenance cost. Besides, the staff of

the Facilities and Equipment Maintenance Division collects wastes, without basic knowledge on waste collection. Naturally, sorted collection is not properly done. Actually, medical wastes are dumped just as the municipal wastes in the hospital premises.

In order for the hospital to become able to deal properly with these problems, the hospital needs to regard the Facilities and Equipment Maintenance Division as important as part of the hospital function, and to conduct proper maintenance activities which consider predictive maintenance. Regarding wastes, it is necessary to assist in establishing proper maintenance system, to enhance awareness and technical capabilities of each engineer about wastes. Accordingly, this project will extend cooperation, while including in the soft component establishment of a maintenance system of facilities and equipment, including strengthening of cooperation between the Maintenance Division and the Spareparts Division in the district hospital, and establishment of the hospital waste collection and treatment system based on waste sorting (colour coding) recommended by WHO. The facility construction of this project for the Kisii District Hospital includes construction of an incinerator to treat hospital wastes in the hospital premises. The waste treatment system considers proper operation and effective utilization of the incinerator, such as separated incineration of polyvinylchlorides that tend to generate highly poisonous dioxins, mixed incineration of plastics and materials that contain water at high concentrations at proper ratios; the former, if burned alone, generates such high temperatures that can damage the incinerator.

It is expected that the technical training under the soft component system will

1) reconfirm and firmly establish awareness of the importance of the maintenance of facilities and medical equipment among hospital employees in the light of surrounding environment, nosocomial infections and uninterrupted medical service and, at the same time, upgrade the technical level of the staff.
2) optimize the assignment of personnel required for the Maintenance Division for the hospital facilities and medical equipment and build a maintenance system in collaboration with the Ministry of Health and provincial hospitals.
3) make it possible to appropriate regularly a budget through keeping ledgers for facilities and medical equipment and establishing a maintenance system that enables to have a good grip on problem records and installation places, an inventory control system of expendables and spare parts and a maintenance system of daily and periodical inspections, thereby shortening a period of out-of-order, lessening the risk of nosocomial infections and maintaining the quality of medical service.
4) improve the environment within and without the hospital through optimizing the operation of the treatment system of medical waste and wastewater.

To ensure sustainable development, the formulation of the plan should be of a participatory type upon implementing the soft component. In other words, the approach is that workshops are held to develop and finalize the plan. However, the scale of the plan for the Kericho District Hospital is small. Hence, the Kenya side will be requested to make arrangements that the staff of its Facilities and Equipment Maintenance Division will come to the Kisii District Hospital to perform the work for specific technical training together with the staff of the latter's Maintenance Division.

(2) Target of the soft component

1) To have the Ministry of Health, the Healthcare Bureaus of Kisii and Kericho Districts, the Kisii District Hospital and the Kericho District Hospital recognize the importance of establishing the system of maintenance of hospital facilities and equipment

2) To establish the system of maintenance of facilities and equipment in the Kisii District Hospital and the Kericho District Hospital

3) To establish the system of medical waste and wastewater treatment of the Kisii District Hospital and the Kericho District Hospital

(3) Achievement of the soft component (direct effect)

Table 2-49 Direct Effect of the Soft Component

Item for technical transfer	Direct effect	Target division
Instruction on importance of maintenance system	Recognition of importance of strengthening the maintenance system Establishment of a self-reliant maintenance system, and securing proper manpower	Ministry of Health, Healthcare Bureau of Districts, General Manager of the hospitals, Regional Maintenance Units
Instruction on the establishment of maintenance system and maintenance capacity building	Capacity building in maintenance of the staff Proper use and management of the facilities, improvement in measures for coping with failures, implementation of scheduled inspections	Regional Maintenance Unit
Instruction on formulation and execution of yearly maintenance plan	Securing of proper manpower (number of ability) Preparation of yearly maintenance plan and regular allocation of the budget Clarification of the names, numbers and expenses of required consumables and spareparts for subsequent fiscal year, and hence smooth execution of maintenance works	Healthcare Bureaus of the Districts, General Managers of the hospitals, Regional Maintenance Units
Instruction on establishment of medical wastes and wastewater treatment system	Enhanced awareness of waste treatment which leads to sure sorting of medical wastes of infectious nature Realization of proper operation of the incinerator	General Manager of the hospitals, each diagnosis and treatment division, sub divisions in charge of waste treatment

(4) Method for confirming degree of achievement

Table 2-50 Method for Confirming Degree of Achievement

Item	Method for confirmation
Instruction on the importance of maintenance system	Securing of maintenance personnel Securing of maintenance budget
Instruction on establishment of maintenance system and maintenance capacity building	Development maintenance system flow Preparation of the equipment ledger Periodic inspection and adjustment of facilities and equipment is planned. As found necessary, explanation and instruction are done by the Regional Maintenance Unit to doctors and nurses.
Instruction on formulation and execution of the yearly maintenance plan	Ledgers for facilities and equipment are prepared. Such documents as maintenance record, yearly maintenance plan are prepared. Maintenance budget plan for the subsequent year is prepared.
Instruction on establishment of the system for medical waste and wastewater treatment	The manual for medical waste treatment is prepared. The incinerator operation system is established.

(5) Soft component activity (input plan)

Table 2-51 Activity of the Soft Component

Item	Activity	Target division	Output	
			Japan	Recipient country
Instruction on the importance of maintenance system	・Workshops will be held for the Administration Division and the Maintenance Division separately to enhance awareness of the importance of maintenance from the standpoints of surrounding environment, nosocomial infections and uninterrupted medical service. ・The Japan's maintenance system will be introduced and the bones of a maintenance system and an outline of workflow chart will be drafted as part of practical training. 【Technical standard】 ・A technical standard that is higher than that of the technologist and technician is required. That is, all the staff of the Maintenance Division should meet the standard. ・An equipment basic registry for the facility equipment and the medical equipment should be created.	Ministry of Health Healthcare Bureau of the District General Manager of the Hospital Maintenance Division	Japan's maintenance system	Outline draft of maintenance system Organization chart Placement plan of personnel
Instruction on establishment of maintenance system and maintenance capacity building	・Maintenance system flow, workflow chart and various formats will be laid out by using Japan's forms as examples. ・A workshop will be organized with doctors and nurses of the hospital and the maintenance request format will be designed. ・A equipment ledger will be prepared for facilities, equipment and materials. 【Technical standard】 ・A technical standard that is higher than that of the technologist and technician is required. That is, all the staff of the Maintenance Division should meet the standard.	Each division of the hospital Maintenance Division	Flow of the Japan's maintenance system Japan's equipment ledger	Maintenance work plan Various formats Ledger for facilities and equipment
Instruction on formulation and execution of yearly maintenance plan	・Instruction is given on the formulation of a yearly maintenance plan. ・Instruction is given on the formulation of a yearly budget. ・Instruction is given on the systems of placing an order for renewal parts and inventory control.	Healthcare Bureau of the District General Manager of the hospital	Japan's annual maintenance plan Japan's maintenance budget plan	Yearly maintenance plan Maintenance budget plan

Item	Activity	Target division	Output	
			Japan	Recipient country
	【Technical standard】 ・A technical standard that is higher than that of the technologist and technician is required. That is, the leader and the sub-leader should attain the standard. ・A waste gathering route will be selected. A waste separation (color loading) system will be established and relevant training will be provided. ・An operation system of neutralizing and sterilizing chambers will be set up and relevant training will be provided. ・The measures to control infections within and without the hospital will be established and pertinent training will be offered.	Accounting Division Maintenance Division		
Instruction on establishment of the system for medical waste treatment	・The collection route of wastes will be planned. ・Instruction is given on the establishment of waste sorting system (colour coding). ・The operation system of incinerator will be built. 【Technical standard】 ・A technical standard which is higher than the technologist is required. It is necessary for the leader and the sub-leader of the Maintenance Division to meet the standard.	General Manager of the hospital Each division of the hospital Persons in charge of waste disposal	Japan's medical waste disposal manual	Medical waste operation plan Operation plan on the neutralizing and sterilizing chambers Manual on the measures to control infections within and without the hospital

(6) Preparation of resource for execution of the soft component

The soft component shall take the form of direct assistance. In Kenya there are neither consultants who are specialized in facilities and equipment maintenance nor maintenance companies for facilities and equipment.

(7) Implementation process of the soft component

The consultant in charge of instruction will at first develop documents indicating contents of instruction and cooperation, and the overall schedule, based upon the agreement with people in the Ministry of Health, the Healthcare Bureaus of the districts, the Kisii District Hospital and the Kericho District Hospital. Thereafter, the consultant will conduct instruction works, in a stepwise manner, while evaluating inputs and achievements. The total work flow is conceived as follows.

1) Home office preparatory work

The consultant prepares various materials, formats, work flowcharts, etc, regarding the facility and equipment maintenance system, medical waste treatment system, to the extent the consultant can suppose without going to Kenya so that the consultant may be able to present them as similar cases at the first works shop.

2) 1st field instruction

The consultant holds a workshop to enhance awareness of each responsible person and person in charge of maintenance on strengthening of the maintenance system, and to identify problems with the present maintenance system, by means of workshop. The consultant gives instruction on preparation of the resource input plan. The consultant confirms each hospital framework and maintenance/operation organization for soft component implementation. The consultant also introduces outlines of the maintenance system and teaches how to make a equipment ledger. The consultant instructs that the maintenance will have been done based on these formats prepared by the time of the subsequent field

instruction. The consultant will dispatch one facility maintenance engineer for conducting above-mentioned education and instruction.

3) 2nd field instruction

The engineers dispatched by the consultant will confirm various formats, states of implementation of maintenance system and medical waste treatment system that were developed in the 1st field instruction, and will make modifications on the systems and formats and give additional instructions as found necessary.

The selection of certain facilities (air conditioning, medical gas, wastewater treatment, receiving and distribution of electric power, generator, light electrical appliance, etc.), incinerator, equipment of the project will have been finished by this time. And, some of them will have been delivered to the site. Accordingly, the engineers will give instructions on preparation of more specific ledgers of new facilities and equipment.

Also, the ledgers which should be completed during the 2nd field instruction period but have not been completed should be continually prepared by the hospitals' engineers after the Japanese engineers return home. For conducting above-mentioned education and instruction, the consultant will dispatch one facility maintenance engineer (in charge of air conditioning, sanitation, wastewater treatment, medical gas facilities, electric power receiving and distribution, generator, light electrical appliances), and one equipment and medical waste management engineer.

4) Home office work

The home office work will summarize the results of the 1st field instruction and 2nd field instruction, and make necessary adjustments to the instruction items, flow chart, and the formats. At this time an adjustment will be made between the maintenance system and the facilities and equipment to be actually installed.

5) 3rd field instruction

The 3rd field instruction will give final confirmation of and revisions to the various ledgers and formats prepared in the 2nd field instruction, and gives instructions on preparation of the draft final maintenance plan for the newly installed facilities and equipment, referring to the final instruction items prepared during the home office work. The dispatched engineers give final instructions while confirming the already installed facilities and equipment. The engineers give instructions on yearly maintenance plan, the yearly maintenance budget plan and the yearly sparepart control plan, in particular, and make a report on the finalized maintenance plan. Two facility maintenance engineers (in charge of mechanical and in charge of electrical) and one equipment and medical waste management engineer will be dispatched from Japan.

6) Home office work

The consultant will summarize the results of the 1st, 2nd and 3rd field instruction and make a final report.

The Japanese consultant shall dispatch the following three engineers and realize the planned technology transfer to the hospitals.

① Facility maintenance engineer (1): for air conditioning, sanitary and special facilities

② Facility maintenance engineer (2): for power receiving and distribution facilities, light electrical appliances

③ Equipment and medical waste management engineer: for equipment, medical wastes

In executing technical instruction in the field, the hospitals are asked to nominate persons of computer knowledge who will coordinate and assist technology transfer from the Japanese consulting engineers to the staff of the Facilities and Equipment Maintenance Division at the Kisii District Hospital and the Kericho District Hospital. It is important that local engineers who receive technology transfer be appointed by the hospitals in the sense that these engineers can keep on instruction for a certain period after the Japanese engineers have returned home, thereby surer technology transfer is realized.

Table 2-52 Implementation Schedule of the Soft Component (draft)

Item / Month	1	2	3	4	5	6	7	8	9	10	11	12	13
Facility construction	Start												Completion
Soft component (Kenya field work)	1st field instruction						2nd field instruction				3rd field instruction		

(8) Output of soft component

Table 2-53 Output of Soft Component

Item	Output
Instruction on the importance of maintenance system	Draft outline maintenance system Organization chard Manning plan
Instruction on establishment of maintenance system and maintenance capacity building	Maintenance work plan Various formats Ledgers of facilities and equipment
Instruction on formulation and execution of yearly maintenance plan	Yearly maintenance plan Maintenance budget plan
Instruction on medical wastes and wastewater treatment system	Medical waste collection and treatment plan Incinerator operation plan

(9) Responsibility of the implementing agency of Kenya

This soft component plan is executed to secure the self-reliant development of the Kenyan side. Therefore, every aspect of instruction should be done in a manner to promote voluntary activities of the Kenyan side. This would only be possible with a thorough understanding of the soft component and devoted cooperation by the implementing agencies of the Kenyan side.

Specifically, a thorough understanding of and considerations to the targets and implementing procedures of this project by responsible persons of the Ministry of Health, the Healthcare Bureaus of the concerned Districts, the Kisii and Kericho District Hospitals are first of all necessary. It is also a matter of prime importance that persons for executing the soft component be properly deployed. Accordingly, it is necessary for the Kenya side to employ facility maintenance engineers with a certain level or higher of technical capability, and reinforce the staff of medical equipment maintenance engineers. The Japanese side will conduct technology transfer and technical cooperation to these engineers.

Also, during the period of implementation after completion of the soft component, the implementing agencies, or the Ministry of Health, the Healthcare Bureau of the District, the general managers of the Kisii and Kericho District Hospitals, and other responsible persons, should continually execute instructions and management of the facilities and medical equipment, as responsible manager of the Kisii District Hospital and the Kericho District Hospital.

2-2-4-8 Implementation Schedule

The implementation schedule of the project after the exchange of notes has been effected is as per shown in Figure 2-42. The work consists basically of the detailed design and the tender by the consultant, the construction by the contractor and the consultant supervision on the construction.

(1) Detailed design

The Ministry of Health and a Japanese consulting company, a Japanese juridical person, seal a consulting contract on the detailed design (preparation of tender documents) on this project, and the ministry has this contract verified by the government of Japan. Thereafter, the consultant prepares the tender documents, in consultation with the Ministry of Health, based on the basic design study report, and has it approved by the Ministry of Health.

The detailed design (preparation of the tender documents) is expected to take four months.

(2) Tender work

The tender work is expected to take three months.

(3) Construction by contractor and consultant supervision

On completion of the contract for construction, the contractor begins construction work. Concurrently, the consultant begins the consultant supervision.

The construction is expected to take 13 months, of which details are shown below.

Table 2-54 Construction Detail of the Kisii District Hospital

Facility construction	<Outpatient Department Building > Reinforced concrete structure with 2 stories, 3,704.0m^2 Ground floor: General Outpatient / Casualty, Special Clinic, Physiological / Pathological Examination Division, X-ray Examination Division (1,976.30 m^2) First floor: Theatre / HDU (high dependency unit) Division, Delivery Division, Material Sterilization Room, Training Room (1,727.70m^2) <Ancillary facility> Machine Building: High Voltage Electric Room, Low Voltage Switchboard Room, Pump Room, Generator Room, Elevated cistern, , Raw water reservoir, Elevated water tank (309.01 m^2) Toiler Building: Toilet for outpatients (65.04 m^2) Incinerator furnace: Sorted waste storage space, incinerator furnace (57.42 m^2) Others: Gate house (3.73 m^2)
Equipment procurement	The equipment necessary for the Project facilities and some existing facilities (Dental chairs, Ultrasonic diagnostic unit, Mobile X-ray unit, etc.)

Table 2-55 Construction Detail of the Kericho District Hospital

Facility construction	< Casualty > Reinforced concrete structure with 1 story, 425.10 m^2 Casualty, Emergency Physiological / Pathological Examination Room <Ancillary facility> Machine Room Building-1: Low Voltage Switchboard Room, Generator Room (46.10 m^2) Machine Room Building-2: Elevated cistern, pump room (13.98 m^2) Others: Raw water reservoir, Elevated water tank (16.92 m^2)
Equipment procurement	The equipment necessary for the Project facilities and some existing facilities (Dental chairs, Ultrasonic diagnostic unit, Mobile X-ray unit, etc.)

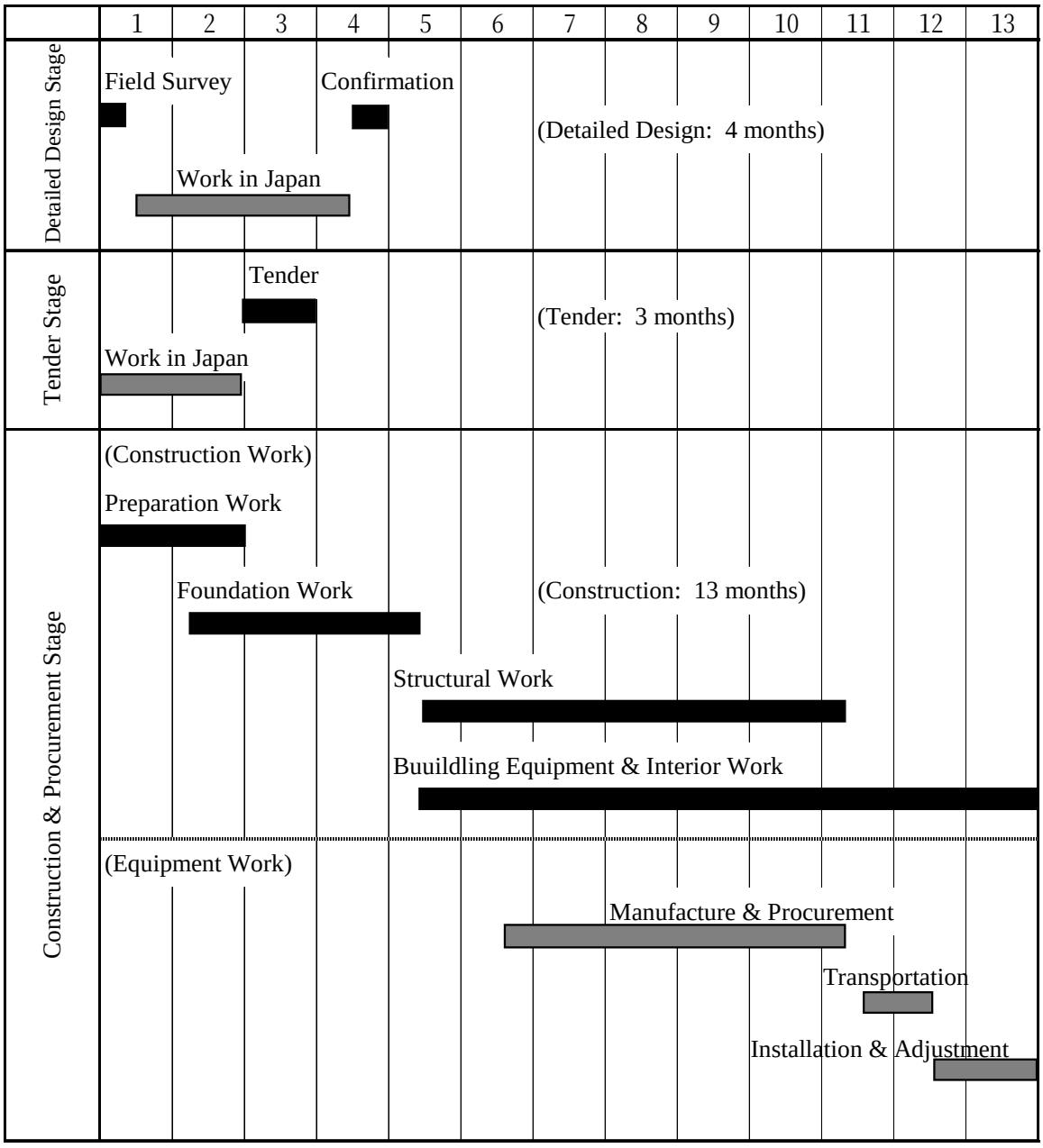


Figure 2-42 Project Schedule

2-3 Obligations of Recipient Country

The following are main items of the obligations of the Kenyan side.

(1) Procedure

1) Application for and acquisition of building permits regarding this cooperation project
2) Procedures for the bank arrangement (B/A) and for issuance of the authorization to pay (A/P) and bearing of commission fees associated with them
3) Prompt landing of imported facilities and equipment cargos at port, procedures for exemption of duties, customs clearance, and assurance thereof, and securing of prompt domestic transportation
4) Provision of convenience necessary for entry to and stay in Kenya to the Japanese nationals who intend to execute provision of facilities and equipment and execution of other works according to the verified contract
5) Exemption of all duties and all taxes in Kenya to the Japanese nationals who intend to execute provision of facilities and equipment and execution of other works according to the verified contract
6) Securing of the budget required for effective use and maintenance of the facilities and equipment constructed and procured by this grant aid program
7) Procedures, contracts and installation fees for power supply, telephone services, gas supply and sewage for the Project facilities.

(2) Related construction work

1) Relocation of the gates and parking lots in the construction sites of the cooperation project
2) Demolition of the existing facilities in the construction sites of the cooperation project
3) Bearing of the relocation of the demolished facilities
4) Site preparation of the construction sites of the cooperation project
5) Construction of water supply facilities to the facilities of the cooperation project
6) Preparation of facilities regarding medical wastes to the facilities of the cooperation project
7) Preparation of other infrastructure to the facilities of the cooperation project
8) Construction of walls and fences surrounding the sites of the cooperation project
9) Purchase of general furniture and supplies
10) Bearing of the expenses of relocation to the newly built buildings

(3) Transportation of the existing equipment to the newly constructed building after completion

1) Prior preparation, PR activities
2) Relocation and installation of part of existing equipment to the subject cooperation facilities (medical furniture and fixture, medical equipment, etc.)
3) Transfer of patients of the Obstetrics Department and the Surgery Department (the Kisii District Hospital)
4) Practical training of the hospital staff at the new buildings

(4) Modification of facilities

The Kericho District Hospital plans to modify a locker room of the Operation Building to add one general operation room. The particulars of the modification work are as follow.

1) Removal of the partition of the locker room, and installation of a door through an existing wall.
2) Electric facility installation woks associated with transfer of equipment transfer
3) Relocation of existing facilities (operating table, anesthesia machine, electric cautery, instrument cart, etc.)

(5) Others

Bearing of costs for items not provided by the grant aid program Table 2-56 shows implementation schedule of Kenyan side obligation works.

Table 2-56 Schedule of the Kenyan Side Obligation Works

Item	Schedule
Kisii District Hospital	
1. Relocation of the existing gate and access road	April, 2007 ～ June, 2007
2. Demolition of the existing facilities and building site preparation in the site of the cooperation project	April, 2007 ～ June, 2007
3. Cost of transfer of the demolished facilities and replacement of existing infrastructure	June, 2007 ～ July, 2007
4. Improvement of the power system	April, 2007 ～ June, 2007
5. Purchase of general furniture (incl. Medical consultation desk set), and supplies	December, 2008 ～ January, 2009
6. Bearing of the expenses of relocation to the newly built buildings	December, 2008 ～ January, 2009
Kericho District Hospital	
1. Demolition of the existing facilities and building site preparation in the site of the cooperation project	April, 2007 ～ June, 2007
2. Cost of transfer of the demolished facilities and replacement of existing infrastructure	April, 2007 ～ June, 2007
3. Improvement of the power system	April, 2007 ～ June, 2007
4. Purchase of general furniture (incl. Medical consultation desk set), and supplies	December, 2008 ～ January, 2009
5. Bearing of the expenses of relocation to the newly built buildings	December, 2008 ～ January, 2009

2-4 Project Operation Plan

(1) Manning plan

The Kisii District Hospital is currently staffed with 453 employees and its personnel expenses amount to approximately 55 million KShs (equivalent to about 86 million yen). The completion of the cooperation target project will entail an increase of 82 persons, which is translated into an estimated amount of approximately 11 million KShs (roughly 18 million yen) that accounts for about 21% of the present personnel expenses. On the other hand, the Kericho District Hospital is currently staffed with 294 employees and its labour cost amounts to approximately 36 million KShs (equivalent to about 55 million yen). Upon the completion of the cooperation target project, it will become necessary for the hospital to increase its staff by 34 employees. Its total labour cost is estimated at approximately 4 million KShs (or about 6 million yen) that represents roughly 11% of the current personnel expenses.

In Kenya the Ministry of Health bears the staff costs of the district hospital in general. Thus, the Ministry directly pays the personnel expenses of the Kisii and Kericho District Hospitals. Hence, under the responsibility and authority of the Ministry of Health, it has made a commitment to pay the increased staff costs of the two hospitals as well as the recruitment of personnel required.

Table 2-57 Kisii District Hospital Manning Plan

Breakdown of medical and healthcare professional	Annual salary (Ksh.)	Existing manning		Reinforcement manning	
		Total number of staff in hospital	Existing manning cost (Ksh.)	Reinforcement for new building	Necessary manning cost (Ksh.)
Consultant	996,000	9	8,964,000	3	2,988,000
Medical officer	468,000	16	7,488,000	2	936,000
Clinical officer	144,000	36	5,184,000	4	576,000
Registered nurse	144,000	27	3,888,000	10	1,440,000
Enrolled nurse	108,000	176	19,008,000	30	3,240,000
Clinical laboratory technologist	144,000	14	2,016,000	5	720,000
Clinical laboratory technician	108,000	0	0	0	0
Radiographer	144,000	4	576,000	4	576,000
Physiotherapist, Occupational	144,000	19	2,736,000	0	0
Medical Engineering technologist	144,000	2	288,000	2	288,000
Medical Engineering technician	108,000	4	432,000	2	216,000
Others	36,000	146	5,256,000	20	720,000
Total	—	453	55,836,000	82	11,700,000
		Increasing rate		21%	

Source: Response to a questionnaire to the Kisii District Hospital

Table 2-58 Kericho District Hospital Manning Plan

Breakdown of medical and healthcare professional	Annual salary (Ksh.)	Existing manning		Reinforcement manning	
		Total number of staff in hospital	Existing manning cost (Ksh.)	Reinforcement for new building	Necessary manning cost (Ksh.)
Consultant	996,000	5	4,980,000	0	0
Medical officer	468,000	12	5,616,000	2	936,000
Clinical officer	144,000	32	4,608,000	2	288,000
Registered nurse	144,000	19	2,736,000	4	576,000
Enrolled nurse	108,000	102	11,016,000	15	1,620,000
Clinical laboratory technologist	144,000	3	432,000	1	144,000
Clinical laboratory technician	108,000	7	756,000	1	108,000
Radiographer	144,000	5	720,000	0	0
Physiotherapist, Occupational	144,000	8	1,152,000	0	0
Medical Engineering technologist	144,000	1	144,000	1	144,000
Medical Engineering technician	108,000	5	540,000	0	0
Others	36,000	95	3,420,000	8	288,000
Total	—	294	36,120,000	34	4,104,000
		Increasing rate		11%	

Source: Response to a questionnaire to the Kericho District Hospita

(2) Maintenance plan

1) Facility

Under the present maintenance system, the hospital facilities are maintained through cooperation of three bodies; namely, (1) district hospitals' facility and medical equipment maintenance division (DH), (2) District Public Health Officer (DPHO), and (3) District Public Works Department.

The problem with the present maintenance system is that, because of the responsibility for facility and equipment maintenance being distributed on the three organizations, there is no responsible person who unliterary and thoroughly gets hold of the entire maintenance work of the district hospital. Under such a situation, there is no systematic hospital maintenance organizational structure which can plan and execute maintenance of the entire hospital. Given such a situation, the study team requested that the above (1) and (2) be integrated into the (1), the facility and medical equipment maintenance division of the hospital. However, this is a basic organizational structure for hospital maintenance of the Kenyan side, and is therefore not changeable. The study team also requested that maintenance of facilities, electric facilities, mechanical facilities and maintenance of medical equipment be separated to better execute facility maintenance. This system is also found not changeable.

Presently, the Kisii District Hospital and the Kericho District Hospital are maintained by a 10-person staff and six-person staff, respectively. At present, minimum required levels of maintenance works are possible by the present forces, because there are not special machines and equipment in these hospitals. However, the present project has such special facilities as listed below, the maintenance of which needs a maintenance staff equipped with professional knowledge.

High-voltage power receiving facility
Generator facility

Air conditioning facility for the theatres, etc.
Medical gas facility
Special medical wastewater treatment facility
Incinerator facility
Sorted collection of wastes

In order to be able to maintain such systems, reinforcement of the maintenance forces is essential, and the study team requested the Kenyan side that the hospitals' maintenance forced be strengthened.

The study team has confirmed through the present study necessity of technical cooperation and technical support in the following fields in particular. Regarding specific methods, the study team will study with the concerned divisions dispatch of experts, JOCV, senior overseas volunteers, in addition to execution of the soft component included in this project.

Maintenance of facilities and equipment
Hospital management (statistical control, financial control)

In this project, the Kenyan side plans, after implementation of the grant aid program, to reinforce the staffs for the hospital maintenance divisions for hospital facilities and medical equipment to properly implement operation and maintenance, and to tie up with agents in Kenya for such facilities and equipment. It is important that the hospitals recognize the importance of their Maintenance Divisions and the District Public Health Officers, and conduct proper maintenance activities. Also important is establishment of proper maintenance system of the hospitals' Maintenance Divisions and District Public Health Officers, and enhancement of the awareness toward importance of maintenance work and upgrading of technical capabilities of each engineer on both parties.

2) Medical equipment

As for medical equipment, the HMU controls its maintenance and management. The Kisii HMU has six staff members: one technologist and an average of five technicians. Principally, distinct hospital HMU looks after all the items of equipment that belong to lower level health institutions located in the same district; thus the technicians inspect the present status of medical equipment based upon visit schedules and go for repair services to such institutions when informed that some items are malfunctioning.
District hospitals also conduct scheduled maintenance check-up and repair services for items that malfunction. The technologists/technicians seem to have reached the level in which they can trouble-shoot both mechanical and electric items of equipment. There are some cases in which they cannot repair the items, since it is hard to obtain spare parts in case that local agent is not available.
The Japanese side has invited technologists of HMU to train them for medical equipment management and control through such schemes as counterpart training; both targeted hospitals have sent technologists to Japan. There are some technologists who understand the operation method and maintenance for Japanese-made items of equipment. Kisii HMU has one technologist who has learned the maintenance method especially for Japanese-made medical equipment by the said training. Items such as imaging equipment are repaired by local agents who have a maintenance contract with the hospitals. As for spare parts, there are spare parts stores keeping spare parts for basic items of medical equipment as the sub-organization of MOH. These are located at four places: Mombassa, Kisum, Nairobi and Eldred. Public hospitals can send an order to the stores and purchase the spare parts. The HMU have such forms as scheduled check-up tables, job cards, and repair records and can control repair records and the number of items of equipment by department.
However, the unit has not reached the level to compile and control such data as procurement date, model number, manufacturer's name, and agents' contacts. Therefore, it is expected that targeted hospitals need to learn to make a more smooth and timely equipment and spare parts procurement if technical transfer is implemented to enhance ability of the equipment management system.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

Total Project Cost: 1,350 million yen

(1) Cost of Japanese Scope of Works

The cost to be borne by the Japanese side is as follows.

Table 2-59 Approximate Estimation of Project Cost

Approx. 1,312 million yen

Kisii District Hospital (total building floor area: about 4,139m^2)
Kericho District Hospital (total building floor area: about 502m^2)

Item		Approximate project cost (million yen)		
Facility construction	Kisii District Hospital (Outpatient Department Building)	850	999	1,159
	Kericho District Hospital (Casualty)	149		
	Furniture, fixture	0		
Equipment procurement	Kisii District Hospital	102	160	
	Kericho District Hospital	58		
Detailed design, consultant supervision, Soft component		153		
Total		1,312		

This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant.

(2) Cost of Kenyan side Scope of Works

The estimated cost to be borne by the Kenyan side is as follows.

Table 2-60 Cost of the Kenyan Obligation Works for the Kisii District Hospital

(Unit: KShs)

Item	Cost
1. Relocation of the existing gate and access road	2,000,000
2. Demolition of the existing facilities and building site preparation in the site of the cooperation project	1,500,000
3. Cost of transfer of the demolished facilities and replacement of existing infrastructure	500,000
4. Improvement of the power system	9,850,000
5. Purchase of general furniture (incl. Medical consultation desk set), and supplies	5,000,000
6. Bearing of the expenses of relocation to the newly built buildings	500,000
Total	19,350,000 (About 29.9 million yen)

Table 2-61 Cost of the Kenyan Obligation Works for the Kericho District Hospital

(Unit: KShs)

Item	Cost
1. Demolition of the existing facilities and building site preparation in the site of the cooperation project	2,500,000
2. Cost of transfer of the demolished facilities and replacement of existing infrastructure	300,000
3. Improvement of the power system	1,373,440
4. Purchase of general furniture (incl. Medical consultation desk set), and supplies	1,000,000
5. Bearing of the expenses of relocation to the newly built buildings	300,000
Total	5,474,440 (About 8.4 million yen)

The Ministry for Roads and Public Works of Kenya shall be responsible for the demolition of the two hospital buildings and the reinstallation of the existing equipment at its own cost. The budget for such works have been confirmed in the letter from the Permanent Undersecretary of the Ministry of Health "Proposed GOK Component for JICA Financed Projects; 2006/2007 Financial Year." Likewise, a budget for the works to improve power supply is included in the budget for each hospital in the "District Allocation Budget 2006/2007" in the budget plan of the Ministry of Health. Each hospital has confirmed the budget item in its "Work Plan." With respect to the expenses incurred in purchasing general furnishings and in movement to new facilities to be completed under this project, the Permanent Undersecretary of the Ministry of Health made a commitment to pay the expenses in the Minutes prepared and duly signed at the time of explaining the draft.

The above works will entail a total amount of 24,824,440 KShs, which accounts for 0.32% of the development budget, 7,659,000,000 KShs, of the Ministry of Health. Thus, we believe that the Kenyan side can afford the cost without imposing a heavy burden.

We have advised the Kenyan side to take the greatest possible care in dealing with asbestos in the demolition of the existing facilities.

(3) Condition of Cost Estimation

1) Time of Cost Estimation

February 2006

2) Exchange rate

1 KShs = 1.55 Japanese Yen

3) Construction term

The period detailed design, construction and procurement of equipment is identified in the implementation schedule.

4) Other

This Project will be implemented though the system of the Grant Aid cooperation by the Government of Japan.

2-5-2 Operation and Maintenance Costs

(1) Maintenance Cost

The maintenance cost of the facilities and equipment of this project is as per shown in the table below, calculated incorporating the expected reduction of electric power cost by adoption of high-voltage power receiving and efficiency improvement of the air conditioning systems, and rational use of various filters corresponding to various degrees of cleanliness demanded by each room. The table below shows the maintenance cost for the initial year and the second year onward.

Kisii District Hospital

Table 2-62 Result of Preliminary Calculation of Maintenance Cost

Unit: KShs

Item	Initial fiscal year	Following fiscal years
①Electricity charge	3,294,000	3,294,000
②Telephone charge	418,200	418,200
③Fuel cost of generator	2,925,000	2,925,000
④Water charge	354,000	354,000
⑤LPG charge	360,000	360,000
⑥Oxygen charge	1,008,000	1,008,000
⑦N_2O gas charge	279,000	279,000
⑧Building maintenance cost	0	413,300
⑨Replacement part (filter replacement)	0	788,000
Sub total ① to ⑨ (facility maintenance cost)	8,638,200	9,839,500
⑩Equipment maintenance cost	3,156,000	3,156,000
Total ① to ⑩	11,794,200	12,995,500

① Electric charge ..... 3,294,000 KShs/year

The contract demand of electric power of the planned facilities is presumed as shown below from the capacities and other details of the facilities.
The actual consumption is supposed to be about 60% of the contract demand on average.

Table 2-63 Presumed Electric Power Consumption

	Contract demand (kW)	Actual consumption (kW)
Newly built facility	500	300

・Price structure

Electric power minimum charge (1)	2,000	KShs/month
Electric power minimum charge (2)	200	KShs/kW
Electric power meter rate	4.6	KShs/kWh

・Electricity charge

	Charge (KShs)	Consumption (kW)	Used hour (h)	Day	Month	Load factor	Total
Newly built facility							
Minimum charge (1)	2,000	-	-	-	12	1.0	24,000
Minimum charge (2)	200	500	-	-	12	1.0	1,200,000
Meter rate	4.6	300	10	25	12	0.5	2,070,000
Total							3,294,000

② Telephone charge …….....418,200 KShs/year

The telephone charge varies depending upon how many times the services are used. The frequency of uses combined for each facility is supposed and the charge is calculated from the supposition.

・Price structure

Line charge

Domestic call	city call	6.5 KShs/3min
	long distance call	23.0 KShs/min
International telephone call		180.0 KShs/min

・Telephone charge

	Charge (KShs)	Number of lines	Used hour (min/each)	Frequency (times/day)	Day	Month	Load factor	Total
City call	6.5	-	-	100	25	12	1.0	195,000
Long distance call	23.0	-	3	10	25	12	1.0	207,000
International call	180.0	-	3	0.1	25	12	1.0	16,200
Total								418,200

③ Fuel cost of generator…….....2,320,500 KShs/year

Power failures occur in Kisii four times a month, each lasting about 15 minutes on average. On this supposition, the fuel cost is calculated.
The project plans a 250 kVA power generator.

・Price structure

Generator fuel consumption	150	Litres/h
Fuel unit price	65	KShs/Litres

・Fuel cost

	Cost (KShs)	Consumption (litres)	Used hour (h)	Day	Month	Annual consumption (litres)	Load factor	Total (KShs)
Generator fuel Consumption	65	150	1	25	12	45,000	1.0	2,925,000
Total								2,925,000

④ Water charge …….....354,000 KShs/year

The consumption of water from the city waterworks by the project facilities is as follows.

Table 2-64 Presumed Waterworks Water Consumption

	Water supply per day (m^3/day)
Newly installed facilities	100
Total	100

・Price structure

Meter rate (average) 27 KShs/m^3

Minimum rate 25 KShs/month・m^3

・Water charge

	Charge (KShs)	Water supply	Day	Month	Rate of city water consumption	Load factor	Total
Newly installed facility							
Minimum rate	25	100		12		1.0	30,000
Meter rate	27	100	25	12	0.5	0.8	324,000
Total							354,000

⑤ LPG charge……360,000 KShs/year

LPG is used in the examination room. Consumption by the facility is presumed as follows.

Table 2-65 LPG Consumption

Facility	Use	Consumption per day (kg/day)
Examination room	Test	10
Total		10

・Price structure

LPG price 150 KShs/kg

・LPG charge

	Price (KShs)	Consumption (kg)	Day	Month	Annual consumption (kg)	Load factor	Total (KShs)
LPG price	150	10	25	12	3,000	0.8	360,000
Total							360,000

⑥ Oxygen charge…….....1,008,000 KShs/year

Oxygen is used in the theatres, recovery rooms, etc., and its consumption is presumed as follows.

Table 2-66 Oxygen Consumption

Facility	Use	Consumption per day (kg/day)
Newly built facility	Theatre, etc.	20
Total		20

・Price structure

O_2 price 280 KShs/kg

・Oxygen charge

	Charge (KShs)	Consumption (kg)	Day	Month	Annual Consumption (kg)	Load factor	Total (KShs)
O_2 charge	280	20	25	12	6,000	0.6	1,008,000
Total							1,008,000

⑦ N_2O gas charge …….....279,000 KShs/year

N_2O gas is used in the theatres, recovery rooms, and the consumption is presumed as follows.

Table 2-67 N_2O Gas Consumption

Facility	Use	Consumption per day (kg/day)
Newly built facility	Theatre, etc.	5
Total		5

・Price structure

N_2O gas price 310 KShs/kg

・Gas price

	Price (KShs)	Consumption (kg)	Day	Month	Annual consumption	Load factor	Total (KShs)
N_2O gas price	310	5	25	12	1,500	0.6	279,000
Total							279,000

⑧ Building maintenance cost …….....413,300 KShs/year

The buildings of this project adopt exterior and interior finishing materials that are relatively easy to maintain. For this reason, the building maintenance cost required for exterior and interior finishing, electric facilities, water supply and drainage, purchase of replacement parts and spareparts for air conditioning facilities is presumed 1/3 to 1/2 of Japan's similar cases'. The building maintenance cost is necessary from the second year and onward.

・Price structure

100 KShs/m^2/year

・Building maintenance cost

	Cost (KShs)	Area (m^2)	Day	Month	Load factor	Total
Building maintenance cost	100	4,133	-	-	1.0	413,300
Total						413,300

⑨ Replacement part (filter replacement)…… .....788,000 KShs/year

A high-performance filter and medium-performance filter are installed in the theatre and the associated facilities. Also, a pre-filter is installed on each air conditioner.

The frequencies of filter replacements are presumed as shown below. The pre-filter is of regenerative type and replacement cost is presumed not necessary.

・Price structure

Pre-filter	About twice/month	Cleaning
Medium-performance filter	About once/year	(27,000 KShs/piece)
High-performance filter	About one/year	(35,000 KShs/piece)

・Filter replacement cost

	Cost (KShs)	Number	Load factor	Total (KShs)
Newly installed facility				
Medium performance filter	27,000	30	0.8	648,000
High performance filter	35,000	4	1.0	140,000
Total				788,000

⑩ Equipment maintenance.....3,156,000 KShs/year

Equipment plan is conceived to satisfy the needs of medical services mainly by equipment procurement and to supplement equipment of shortage in number. The scale is limited to such range of equipment as MOH and targeted hospitals can maintain properly. Therefore, Kisii District Hospital needs to secure the budget to cover the maintenance cost which equipment procurement will increase as for new buildings. The project implementation increase the maintenance cost by around KShs 3.2 million a year and its breakdown is shown as follows:

Cost	Kisii District Hospital
Consumables cost	¥3,646,000
Spare parts cost	¥868,000
Total	¥4,514,000 （KShs 3,156,000）

The breakdown of consumable items and spare parts cost is shown as follows:

Table 2-68 Equipment that need consumable items

No.	Equipment name	Qty	Consumable items	Unit price (¥1000)	Cost (¥1000)
1	Suction units	3	Catheter	180	540
2	High pressure steam sterilizers	1	Chart paper	150	150
3	Patient monitors	4	Chart	450	1,800
4	Phototherapy unit	1	Eye masks	15	15
5	Defibrillators	2	Chart	300	600
6	Infant warmer	2	Probe cover	90	180
7	Fetal heart detectors	3	Gel	37	111
8	Nebulizers	10	Masks	25	250
	Sub total				3,646

Table 2-69 Equipment that need spare parts

No.	Equipment name	Qty	Spare parts	Unit price (¥1000)	Cost (¥1000)
1	High pressure steam sterilizers	1	Gasket	200	200
2	Distillation units	1	Element	12	12
3	Patients monitor	4	Reed	23	92
4	Operating lights	1	Bulb	48	48
5	Operating lights	6	Bulb	26	156
6	Examination lights	10	Bulb	7	70
7	Phototherapy units	1	Bulb	4	4
8	Defibrillator	2	ECG cable	7	14
9	Infant warmers	2	Probe	16	32
10	Pulse oxymeters	3	Probe	50	150
11	Nebulizers	10	tubes	9	90
	Sub total				868

Kericho District Hospital

Table 2-70 Result of Preliminary Calculation of Maintenance Cost

Unit: KShs

Item	Initial fiscal year	Following fiscal years
①Electricity charge	481,800	481,800
②Telephone charge	88,500	88,500
③Fuel cost of generator	140,400	140,400
④Water charge	70,800	70,800
⑤LPG charge	72,000	72,000
⑥Oxygen charge	252,000	252,000
⑦N_2O gas charge	111,600	111,600
⑧Building maintenance cost	0	50,200
⑨Replacement part (filter replacement)	0	129,600
Sub total ① to ⑨ (facility maintenance cost)	1,217,100	1,396,900
⑩Equipment maintenance cost	1,523,000	1,523,000
Total ① to ⑩	2,740,100	2,919,900

① Electric charge ..... 481,800 KShs/year

The contract demand of electric power of the planned facilities is presumed as shown below from the capacities and other details of the facilities.
The actual consumption is supposed to be about 60% of the contract demand on average.

Table 2-71 Presumed Electric Power Consumption

	Contract demand (kW)	Actual consumption (kW)
Newly built facility	70	42

・Price structure

Electric power minimum charge (1)	2,000	KShs/month
Electric power minimum charge (2)	200	KShs/kW
Electric power meter rate	4.6	KShs/kWh

・Electricity charge

	Charge (KShs)	Consumption (kW)	Used hour (h)	Day	Month	Load factor	Total
Newly built facility							
Minimum charge (1)	2,000	-	-	-	12	1.0	24,000
Minimum charge (2)	200	70	-	-	12	1.0	168,000
Meter rate	4.6	42	10	25	12	0.5	289,800
Total							481,800

② Telephone charge …….....88,500 KShs/year

The telephone charge varies depending upon how many times the telephone services are used. The frequency of uses by the project facilities is supposed and the charge is calculated from the supposition.

・Price structure

Line charge

Domestic call	city call	6.5 KShs/3min
	long distance call	23.0 KShs/min
International telephone call		180.0 KShs/min

・Telephone charge

	Charge (KShs)	Number of lines	Used hour (min/each)	Frequency (times/day)	Day	Month	Load factor	Total
City call	6.5	-	-	20	25	12	1.0	39,000
Long distance call	23.0	-	3	2	25	12	1.0	41,400
International call	180.0	-	3	0.05	25	12	1.0	8,100
Total								88,500

③ Fuel cost of generator…….....140,400 KShs/year

Supposing that in Kericho power failures occur four times a month, each lasting one hour on an average, the fuel cost is calculated.
The project plans a 50 kVA generator.

・Price structure

Generator fuel consumption	45	Litres/h
Fuel unit price	65	KShs/Litres

・Fuel cost

	Cost (KShs)	Consumption (litres)	Used hour (h)	Day	Month	Annual consumption (litres)	Load factor	Total (KShs)
Generator fuel Consumption	65	45	4	-	12	2,160	1.0	140,400
Total								140,400

④ Water charge …….....70,800 KShs/year

The consumption of water from the city waterworks by the project facilities is as follows.

Table 2-72 Presumed Waterworks Water Consumption

	Water supply per day (m^3/day)
Newly installed facilities	20
Total	20

・Price structure

Meter rate (average) 27 KShs/m^3

Minimum rate 25 KShs/month・m^3

・Water charge

	Charge (KShs)	Water supply	Day	Month	Rate of city water consumption	Load factor	Total
Newly installed facility							
Minimum rate	25	20		12		1.0	6,000
Meter rate	27	20	25	12	0.5	0.8	64,800
Total							70,800

⑤ LPG charge……72,000 KShs/year

LPG is used in the examination room. Consumption by the facility is presumed as follows.

Table 2-73 LPG Consumption

Facility	Use	Consumption per day (kg/day)
Examination room	Test	2
Total		2

・Price structure

LPG price 150 KShs/kg

・LPG charge

	Price (KShs)	Consumption (kg)	Day	Month	Annual consumption (kg)	Load factor	Total (KShs)
LPG price	150	2	25	12	600	0.8	72,000
Total							72,000

⑥ Oxygen charge…….....252,000 KShs/year

Oxygen is used in the theatres, recovery rooms, etc., and its consumption is presumed as follows.

Table 2-74 Oxygen Consumption

Facility	Use	Consumption per day (kg/day)
Newly built facility	Theatre, etc.	5
Total		5

・Price structure

O_2 price 280 KShs/kg

・Oxygen charge

	Charge (KShs)	Consumption (kg)	Day	Month	Annual Consumption (kg)	Load factor	Total (KShs)
O_2 charge	280	5	25	12	1,500	0.6	252,000
Total							252,000

⑦ N_2O gas charge …….....111,600 KShs/year

N_2O gas is used in the theatres, recovery rooms, and the consumption is presumed as follows.

Table 2-75 N_2O Gas Consumption

Facility	Use	Consumption per day (kg/day)
Newly built facility	Theatre, etc.	2
Total		2

・Price structure

N_2O gas price 310 KShs/kg

・Gas price

	Price (KShs)	Consumption (kg)	Day	Month	Annual consumption	Load factor	Total (KShs)
N_2O gas price	310	2	25	12	600	0.6	111,600
Total							111,600

⑧ Building maintenance cost …….....50,200 KShs/year

The buildings of this project adopt exterior and interior finishing materials that are relatively easy to maintain. For this reason, the building maintenance cost required for exterior and interior finishing, electric facilities, water supply and drainage, purchase of replacement parts and spareparts for air conditioning facilities is presumed 1/3 to 1/2 of Japan's similar cases'.

・Price structure

100 KShs/m^2/year

・Building maintenance cost

	Cost (KShs)	Area (m^2)	Day	Month	Load factor	Total
Building maintenance cost	100	502	-	-	1.0	50,200
Total						50,200

⑨ Replacement part (filter replacement)…… .....129,600 KShs/year

A medium-performance filter is installed in the small theatre. Also, a pre-filter is installed on each air conditioner.

The frequencies of filter replacements are presumed as shown below. The pre-filter is of regenerative type and replacement cost is presumed not necessary.

・Price structure

Pre-filter	About twice/month	Cleaning
Medium-performance filter	About once/year	(27,000 KShs/piece)

・Filter replacement cost

	Cost (KShs)	Number	Load factor	Total (KShs)
Newly installed facility Medium performance filter	27,000	6	0.8	129,600
Total				129,600

⑩ Equipment maintenance.....1,523,000 KShs/year

The equipment plan for Kericho district hospital is conceived as similarly to the plan for Kisii district hospital, which is described in the preceding clause. The hospital also should secure the budget measures about the equipment maintenance cost that will increase.
The details of the operation and maintenance cost, that will increase is provisionally calculated as an increase of about KShs 1.5 million a year as follows:

Items	Kericho district hospital
Consumables cost	¥1,919,000
Spare parts cost	¥259,000
Total	¥2,178,000 (KShs 1,523,000)

Details of consumable items and spare parts cost are as follows.

Table 2-76 Equipment that need consumable items

No.	Equipment name	Qty	Consumable items	Unit price (¥1000)	Expense (¥1000)
1	Suction units	3	Catheter	180	540
2	Ultrasound diagnostic unit	1	Gel etc.	300	300
3	Patient monitors	1	Recording paper	450	450
4	Anesthetic ventilators	1	Soda lime	500	500
5	Phototherapy units	2	Eye masks	15	30
6	Fetal heart detectors	2	Gel	37	74
7	Nebulizers	1	Masks	25	25
	Sub total				1,919

Table 2-77 Equipment that need spare parts

No.	Equipment name	Qty	Spare parts	Unit price (¥1000)	Expense (¥1000)
1	Patients monitor	1	Reed etc.	23	23
2	Operating lights	2	Bulbs	48	96
3	Operating lights	2	Bulbs	26	52
4	Examination lights	3	Bulbs	7	21
5	Phototherapy units	2	Bulbs	4	8
6	Pulse oxymeters	1	Probe	50	50
7	Nebulizers	1	Tube etc.	9	9
	Sub total				259

Recently, cost-sharing allocation of both district hospitals shows an increase from 10 to 15%. It accounts for 64% of the total budget of the Kisii district hospital, and it accounts for 70% of the Kericho district hospital. It seems possible to supplement with this income for sufficient equipment purchases and maintenance expenses. It is thought that the expansion of the cost-sharing allocation is in the background and the budgetary allocation from MOH is not enough. In the items of expenses, transportation expense, the purchase of equipment and material, and the maintenance expense, etc. increased. These financial situations were reported to MOH, and it was assumed that there will be an adjustment to the increase and decrease of the budget allocation when the budget is claimed

(2) Financial situation operation and maintenance cost

The total annual budget for operation of the Kisii District Hospital was approximately 46 million KShs (roughly 71.3 million yen) for the fiscal year of 2004/2005. It is estimated that this project will entail an increase of 13 million KShs (roughly 20.15 million yen) in management and maintenance expenses (from the second year onward after the implementation of the project). This increase makes up 28% of the total operation budget of the Kisii District Hospital. On the other hand, the total annual operation budget of the Kericho District Hospital was approximately 22.9 million KShs (roughly 35.5 million yen) for the fiscal year of 2004/2005. Similarly, an increment in management and maintenance expenses (since the second year onward after the implementation of the project) is estimated at 2.92 million KShs (about 4.52 million yen). This amount represents 13% of the total operation budget of the Kericho District Hospital.
The second year after the implementation of this project falls on the fiscal year of 2009/2010 of Kenya. Supposing that the budget for operation shows an annual increase of 6% (i.e. an increment from 13 million KShs to 15.6 million KShs in 2009/2010) and 3% (i.e. an increment

from 2.92 million yen to 3.6 million KShs in 2009/2010) over that of 2004/2005 in the Kisii District Hospital and the Kericho District Hospital respectively, each hospital can afford the increased amount in their management and maintenance expenses. However, the Ministry of Health has made a commitment to meet the increment in the management and maintenance expenses of both hospitals.

Chapter 3 Project Evaluation and Recommendations

CHAPTER 3. PROJECT EVALUATION AND RECOMMENDATIONS

3-1 Project Effect

(1) Expected Direct

It is expected that the project will produce the following direct effect:

Kisii District Hospital

1) To improve the medical service function of the Hospital through bringing together the outpatient division and the central diagnosis and treatment division in the same building

The project will bring together the outpatient division and the central diagnosis and treatment division, which are separately located in the precincts of the Hospital at present as antiquated facilities, in the Outpatient Department Building. Thus, the rearrangement of the facilities at the optimum size will enable the Hospital to provide medical service efficiently and restore the normal service of diagnosis and treatment. After the optimization of facilities the numbers of operations and ultrasonographies will increase from 2,166 per year (in 2005) and 2,453 per year (in 2005) respectively.

2) To upgrade the quality of secondary medical service provided by the Kisii District Hospital

In addition to Japan's grant aid, the facilities improvement program has been under way with aid from the World Bank and others. The aid will improve the function of the Kisii District Hospital as secondary medical organization which has been one of the original purposes of the Hospital. That is, the Kisii District Hospital is classified also as a quasi-province hospital that is expected to accept patients from other district hospitals in the surrounding region. Hence, it will become possible for the Kisii District Hospital to provide appropriate secondary medical service to residents living in a wider area (i.e. to strengthen the referral system).

3) To achieve efficient hospital management

Through technical training offered under the soft component system, each of the Ministry of Health (including the office in the District of Kisii), Kisii District Hospital and Kericho District Hospital will have a growing awareness of the importance of facility maintenance from its own standpoint and build an appropriate system of management and maintenance based upon such awareness. Thus, each hospital will enhance the efficiency of its management. Likewise, the hospital will establish a medical waste treatment system, thereby contributing not only to the prevention of nosocomial infections but also to the establishment of management in full consideration for the issue of ensuring safety outside the hospital.

4) Model hospital of secondary medical level

The Kisii District Hospital will function pertinently as a secondary medical organization through the implementation of the JICA's cooperation project and also through improvements in the hospital wards at the expense of Kenya. As a result, from a long- and medium-ranged perspective it is expected that the referral system be strengthened in the target region. In addition, the Kisii District Hospital will play the role of a model hospital for developing secondary medical facilities in other regions in the future.

Kericho District Hospital

1) To improve the emergency diagnosis and treatment function

The Kericho District Hospital currently provides its emergency medical service in the General Outpatient Department, thereby lowering the medical service capacity of the Outpatient Department in general. When a new emergency diagnosis and treatment

building is constructed at the Kericho District Hospital under this project, it will be able to provide speedy and efficient medical service to seriously ill or wounded emergency patients. One of its results will be seen as an increase in the number of outpatients from 86,374 cases per year (in 2005).

2) To upgrade the quality of secondary medical service

The construction of the emergency diagnosis and treatment building and the installation of necessary equipment will enhance the functions of the Hospital as a secondary medical organization. In particular, the function of its referral system for emergency patients will be strengthened.

(2) Expected indirect effects

It is expected that this project will produce the following indirect effect.

1) To enhance the function as an education hospital

The Kisii District Hospital is the implementing agency for training activities of lower level health workers as well as being the only secondary level health facility in Kisii District. Furthermore, it is the education hospital of the neighbouring Kenya Medical Training College Kisii Branch. Therefore, the provision of training rooms in Kisii District Hospital will enable the secure provision of rooms for training activities, enhancing the functions as an educational hospital and contribute to the improvement of medical services in the District.

2) Smooth implementation of technical cooperation activities

The Kisii District Hospital will be equipped with a training room, thus making it possible to implement technical cooperation activities more smoothly. As a result, it is expected that the project will contribute to achieving the objectives of technical cooperation (such as strengthening of the management and maintenance function of the primary medical institution and improvements in healthcare service to pregnant women).

3) Improvement of financial independence

It is possible for the Hospital to provide speedy and correct emergency medical service, thereby increasing its revenue from treatment fees in parallel with its efficient management. Hence, it is expected to enhance the financial independence of the Hospital.

(3) Performance indicators

An increase in the following numerical value shall be a performance indicator that demonstrates the achievement of the project's goal in the target hospital.

<u>Kisii District Hospital</u>

1) Increase in the number of operations (2,166 cases in 2005)

The existing hospital facilities are equipped with two operation rooms, one of which cannot be used due to its outmoded facilities. Under such circumstances, the number of operations which could not be performed was 440 in 2005. When this project is completed, a new building will have three operation rooms and the Hospital will have the capacity to perform operations which have not been carried out in the past, thereby increasing the number of operations.

2) Increases in the numbers of ultrasonography (2,453 cases in 2005)

The existing facilities are poorly equipped in that the same room is used for X-ray radiography and ultrasonography. As a result, the demand for these tests from patients has not been necessarily satisfied. Under the project, a room will be separately constructed for

each testing, which will increase the number of ultrasonography test upon its completion.

Kericho District Hospital

1) Increase in the number of outpatients (86,374 persons in 2005: including emergency patients)

Currently, emergency patients are treated in the General Outpatient Department. An independent emergency diagnosis and treatment building will be constructed under this project, whereby it will become possible for emergency patients to receive medical service exclusively in the Emergency Diagnosis and Treatment Building. It is expected that the Hospital as a whole will be able to accept a greater number of outpatients (including emergency patients).

3-2 Recommendations

This project will no doubt improve the functions of the two district hospitals upon its completion. In addition, in order for the two hospitals to enjoy the abovementioned direct and indirect effects through their smoother and more effective management, it will be critically important to address the following issues.

(1) The Kisii District Hospital suffers from an extremely poor supply of water. In fact, the water supply program for the entire city of Kisii has been reviewed, and it is planned to construct water pipes used exclusively by the Kisii District Hospital. For smooth management of the Hospital vitally necessary is that it receives a stable supply of water. Therefore, it is of importance that the Kenya side complete piping works with its own budget in coordination with the schedule of the hospital building's construction and the time of its completion.

(2) It is essential that the facilities and equipment which will be provided under this cooperation project be maintained in good conditions for continuous use through budgeting for their maintenance and offering training to a medical staff in charge of their maintenance. The office of the Ministry for Roads and Public Works in each District shall be also responsible for the maintenance of the facilities together with the Hospital. Hence, it will be imperative to build a system in which necessary information (a maintenance manual and etc.) is accessible to all people concerned.

(3) In order to deal with an unexpected problem of any equipment promptly, a budget should be regularly allocated as repair expenses for medical equipment. This will enable the hospital to control the deterioration of medical service to its minimum. In the future, it is recommended that the hospital set aside a reserve fund for the purchase of equipment which has expired its service year for smooth renewal.

(4) It is essential to design an appropriate financial and funding program and constantly hold an accurate grip on its revenue and expenditure so as to reflect its financial situation in improving the hospital management. This practice will be useful also for sustainable development through sound management of the hospital.

(5) Persons employed by each District Office of the Ministry for Roads and Public Works, as well as people working for the Ministry of Health and hospitals, assume the responsibility of maintaining facilities and equipment. Hence, it is necessary to make preparations and coordinate training schedules for providing the technical training under the soft component system also to those persons.