1-2 Examination of the Request

(1) Examination of the necessity and appropriateness on the request

The low income class which accounts for the majority of the residents in Tanzania relies on public institutions for health services at relatively low expenses. The institutions at 6 locations specified as the object of this project are engaging in activities as top referral hospitals, covering integral medicare items, for other public health institutions like regional and district hospitals and urban and rural health centres etc. which are installed in the areas. In other words, the proposed institutions of this project are the highest health facilities in these zones which can provide the district residents, including the low income residents, with such sophisticated medicares as surgery and physical therapies etc. Furthermore these institutions take on a duty of playing such an important role as fostering medicare professionals like graduates from medical colleges and nurses etc. Due to shortage of funds and mechanical equipment under untoward economic circumstances, the health care activity function of these institutions has notably declined.

It is judged feasible for these proposed institutions to provide effective services as top referral or educational hospitals through implementation of this project providing arrayed medicare equipment in them.

This project also cooperates with the "Priority Social Action Programme" steered by this country in procurement of medicare equipment, attempting restoration and revitalization of health care activity function of these institutions. Therefore the project can indirectly help attain the goal of the national health plan. Accordingly, in view of its object, undertaking this project is believed to be highly pertinent and necessary.

(2) Study on Project Components and Peripheral Maintenance State

This project is aimed at the restoration of the basic medical equipments dealing with most major diseases in the proposed areas, for the departments of the proposed institutions are remarkably deficient in medical services both in quality and quantity and in an urgent need

of improvement. The project has covered examinations on the major activities and peripheral upkeep of each institution and so on, as described hereunder with regard to their composing sectors.

1) Muhimbili Medical Centre

① Study on surgical department

In the Table 3-1, major operations and the number of cases performed are listed. With operation theatres, large and small, arranged at 8 locations, operations are performed approx. 7,500 cases per annum or 30 cases a day on the average, with operations of appendectomy, and herniorrhaphy as the major ones and including those of opthalmology, E.N.T. and minor surgery. Under the circumstances as they are, the presently existing mechanical equipments have become notably obsolescent, particularly adequate luminosity is not available, with only 1-2 of 10 bulbs in operating lamps turned on, and operating beds refusing to move up-down or obliquely, thus making it impossible to have the necessary positions for respective operations, resulting in the situation such that no efficient and effective operations could be provided. Further, suction units, electrosurgical units and anesthesia machines have likewise obsolesced, so that their urgent replacement is needed. In order to rectify these inconveniences, assuming that operations are performed 3 cases a day, it is considered necessary in pursuit of this project to improve main operation theatres at 3 locations so as to cover at least 1/3 of the average number of operation cases or 10 cases a day.

Table 3-1 Major Operation and Numbers

Operation	1991	1992	1993	3 Years Av.
General Surgery				
Cholecystectomy	35	39	48	41
Laparotomy	35	296	335	289
Appendectomy	760	650	663	691
Mastectomy	75	65	50	63
Herniorrhaphy	430	335	362	376
Gastro-Jujonostomy	250	220	180	217
Thyroidectomy	70	65	83	73
Prostatectomy	60	24	45	43
Hysterectomy	38	32	25	32
Others	325	218	201	248
Orthopedic	75	82	59	72
Minor Surgery	1,994	976	529	1,166
E.N.				
Tonsillitis	213	180	205	199
Laryngeal Tumours	20	103	125	83
Forein Bodies	199	165	130	165
Ophthalmology				
Cataract	455	484	796	578
Glaucoma	79	46	139	88

② Study on radiology department

X-Ray diagnosis is performed 400 cases a day on the average, and over 80% of which cases are for chest and limbs examination. X-Ray rooms are arranged in 10 locations, but among them only 5 units are available, and 30--20 patients are put off to the next day. It is considered possible to make smooth inspections on these patients by newly introducing 1 unit of basic X-ray unit (B.R.S.).

Table 3-2 Main X-ray Examination

Examination	1991	1992	1993	3 Year Av.
Simple X-ray Examination				
Chest	13,300	11,200	10,030	11,510
Abdomen	1,420	1,256	1,085	1,254
Limbs	9,250	9,980	8,620	9,283
Skull	980	865	667	837
Spine	321	315	287	308
Specialised Investigation (Contrast Medium)				
Barium Study	986	1,025	989	1,000
Urological	135	121	115	124
Hysterosaldin Gography	188	105	121	138

③ Study on Laboratory Department

Tests are conducted 100,000 cases per annum which include 12,000 test for malaria parasite and 35,000 test for hematological test. They are mostly given manually because of shortage of mechanical equipment, resulting in dispersed accuracy, and this poses an impediment to exact diagnosis. A judgment is passed on meeting the need in this project for upkeep of spectrophotometers and centrifuge for hematological test which counts large numbers and microscope for malaria parasite, etc.

Table 3-3 Main Laboratory Examination

Examinations	1991	1992	1993	1991/1993 Comparison
Hematological Test				
(WBC)	10,200	12,250	13,365	+31.0%
(RBC)	286	365	318	+11.2%
Hb	12,200	9,666	7,042	−42.3%
ESR	13,334	15,366	17,738	+33.0%
PCV	−	−	−	−
Coagulation	3,172	1,140	1,526	−51.9%
Liver Function Test				
Bilirubin	815	726	715	−12.3%
Protein	265	421	285	+ 7.5%
Cholestero	136	221	156	+14.7%
Alkaline Phosphatase	624	482	445	−28.7%
Urinalysis	7,676	7,299	5,708	−25.6%
Malarial Parasite	16,254	10,354	12,256	−24.6%

④ Others

Electrocardiographic examinations are performed as infrequently as 8 cases a day, and endoscopic examinations 1 or 2 cases. This results from the fact that instruments' usable periods run only 2~3 months a year, as these equipments have obsolesced. In pursuit of this project, the procurement of 1 set each of electrocardiograph and endoscope is deemed necessary.

Table 3-4 ECG·Endoscopy

Examinations	1991	1992	1993	3 Years Av.
E.C.G.	1,780	1,880	1,950	1,870
Gastroscopy	384	229	294	302

⑤ Study on Water Quality

Very higher numerical values are given than the Japanese water service standard in chromaticity, turbidity and iron and aluminum ion contents. For introduction of biochemical automatic analysers etc., apparatuses for removal of iron and turbidity are necessary, but since the project involves no supply of these high precision equipments, any special water treatment measures are not required.

Table 3-5 Water Quality

pH	Conduct.	Colour	Impurity	NH_4	NO_2	K Mn O
7.57	240.0μs/cm	20.0 deg.	20.0 deg.	0.10mg/ℓ	0.25mg/ℓ	3.40mg/ℓ
Cl^-	SO_4	$CaCO_3$	$CaCO_3$	Ca	Mg	Na
23.0mg/ℓ	5.70mg/ℓ	75.00mg/ℓ	65.71mg/ℓ	8.98mg/ℓ	10.50mg/ℓ	20.00mg/ℓ
K	Al	SiOz	Fe	Mn	$CaCO_3$	No_3
2.10mg/ℓ	0.455mg/ℓ	16.04mg/ℓ	0.40mg/ℓ	0.023mg/ℓ	150.0mg/ℓ	1.0mg/ℓ

Sample: Tab Water Water Temperature: 24.5℃

⑥ Study on Power Supply

To counteract frequent power failure, a motor-generator is provided on station. Although voltage fluctuations are relatively

small, power is supplied 2~3 times a day by the motor-generator at the time of outage,and at the switching moment, a large voltage fluctuation occurs. For this reason, precision mechanical equipments need to be equipped with automatic voltage stabilizers.

Table 3-6 Electric Power Condition

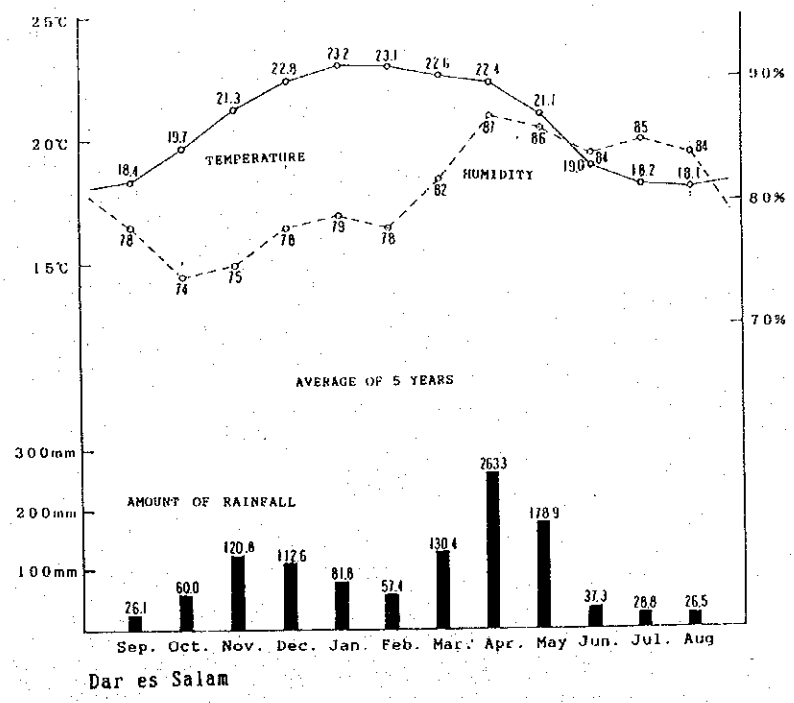
Voltage Cycles	Tested Date	Time	Measurement Data			Fluctuation %		Evaluation
			Max.	MIN.	AV.	+%	-%	
220V	Sept. 26th	09:58	216.9	202.5	212.2	2.21	4.57	GOOD
50Hz	27th	09:17	230.3	222.8	227.1	1.41	1.89	

Measuring Condition: 5 mn. Interval, 2 hour

⑦ Study on Atmospheric Condition

The project site is a lowland of a coast area and has a highly humid climate. However, the atmospheric temperature there is nearly constant throughout a year and proper ventilation measures are taken for the facilities. Accordingly, it is judged that no deleterious effect of meteorological conditions will be inflicted on the mechanical equipment to be supplied in accordance with this project.

Fig. 3-1 Temperature, Humidity, and Amount of Rainfall Through Year



Dar es Salam

(2) Mbeya Referral Hospital

① Study on Surgical Department

Operations are performed approx. 1,000 cases a year in operation theatres at 4 locations. There are no operation theatres actually working without trouble, and operating lamp and table, suction unit and electrosurgical unit etc. have lowered functions due to obsolescence. For these reasons, operations of general surgery such as laparotomy have been declining. The number of orthopedic surgery and minor surgery have leveled off. It is therefore believed necessary in this project to put half of the total operation theatres or those at 2 locations in good condition, thereby to restore the function of the Surgical Department of this hospital.

Table 3-7 Major Operation and Numbers

Operation	1991	1992	1993	3 Years Av.
General Surgery				
Cholecystectomy	105	98	76	93
Laparotomy	96	133	92	107
Appendectomy	15	24	30	23
Mastectomy	86	62	60	69
Herniorrhaphy	82	84	51	72
Gastro-Jujonostomy	76	79	63	73
Thyroidectomy	6	13	6	8
Prostatectomy	22	34	18	25
Hysterectomy	29	25	12	22
Others	268	215	226	236
Orthopedic	126	138	142	135
Minor Surgery	1,650	1,045	1,125	1,273
E.N.				
Tonsillitis	165	98	90	118
Laryngeal Tumours	15	2	3	7
Forein Bodies	261	154	188	201
Ophthalmology				
Cataract	222	203	180	202
Glaucoma	61	47	52	53

② Study on Radiology Department

There are provided with 5 units of X-ray equipment, of which 2 units are unusable, because their service lives are greatly exceeded and the remaining 3 units are apt to be in failure. In X-ray rooms at 3 locations, approx. 80 cases a day of diagnosis mainly for chest and limbs are conducted. However, this department has a demand amounting to 130 cases a day on the average and the functional decline due to obsolescence has led to shortage in quantity of the equipment. So the caseload of X-ray examination has been decreasing for 3 years. It is believed to be necessary to attempt restoration of the X-ray diagnosis function by procuring 1 X-ray unit in this project.

Table 3-8 Main X-ray Examination

Examination	1991	1992	1993	3 Year Av.
Simple X-ray Examination				
Chest	9,230	8,680	8,510	8,807
Abdomen	1,054	1,025	952	1,010
Limbs	8,865	7,295	7,240	7,800
Skull	665	621	618	635
Spine	311	276	220	269
Specialised Investigation (Contrast Medium)				
Barium Study	82	89	70	80
Urological	115	109	102	109
Hysterosaldin Gography	261	212	108	194

③ Study on Laboratory Department

As for examination equipment presently owned by this hospital, most have been in use over 15~20 years since being procured, and they are often in trouble. This hospital has a large maternity outhouse and its clinical examination mostly consists of hematological test. With statistics of the last 3 years, the caseload of malaria parasite test has been declining about 10%

because of obsolescence of the equipment. However urinalysis, which does not require high tech equipment, has been increasing by 46%.

Upkeep of such analytical equipment as centrifuge, spectrophotometer and microscope etc. are considered necessary.

Table 3-9 Main Laboratory Examination

Examinations	1991	1992	1993	1991/1993 Comparison
Hematological Test				
(WBC)	4,875	3,365	2,883	−40.9%
(RBC)	403	335	268	−33.5%
Hb	7,685	5,528	2,190	−71.5%
ESR	1,052	685	965	− 8.3%
PCV	−	−	139	−
Coagulation	3,321	2,586	2,658	−20.0%
Liver Function Test				
Bilirubin	283	321	130	−54.1%
Protein	225	286	177	−21.3%
Cholestero	134	127	125	− 6.7%
Alkaline Phosphatase	138	125	43	−68.8%
Urinalysis	2,685	3,341	3,932	+46.4%
Malarial Parasite	10,365	11,256	9,246	−10.8%

④ Others

Both electrocardiographs and endoscopes have excessively obsolesced, causing frequent failures; as a consequence, they are usable only 2~3 months a year on the average. On this account, the number of examination cases stops rising and varies widely. Then a judgment is passed on the need for renewal of these equipments.

Table 3-10 ECG·Endoscopy

Examinations	1991	1992	1993	3 Years Av.
E.C.G.	670	740	920	777
Gastroscopy	265	421	335	340

⑤ Study on Water Quality

The silica content is registered at somewhat a higher level. The chromaticity which is likely to be attributable to iron ion appears rather high (it shall be no more than 5 degree according to the Japanese standard). However, the use of the mechanical equipments which are scheduled to be procured in pursuit of this project is determined to involve no special problems.

Table 3-11 Water Quality

Mbeya Referral Hospital

pH	Conduct.	Colour	Impurity	NH_4	NO_2	K Mn 0
7.07	140.0μs/cm	6.0 deg.	1.0 deg.	0.10mg/ℓ	0.025mg/ℓ	1.90mg/ℓ
Cl^-	SO_4	$CaCO_3$	$CaCO_3$	Ca	Mg	Na
0.80mg/ℓ	3.70mg/ℓ	74.00mg/ℓ	33.91mg/ℓ	6.97mg/ℓ	4.00mg/ℓ	13.90mg/ℓ
K	Al	SiOz	Fe	Mn	$CaCO_3$	No_3
4.00mg/ℓ	0.057mg/ℓ	29.73mg/ℓ	0.016mg/ℓ	0.002mg/ℓ	90.0mg/ℓ	1.0mg/ℓ

Sample: TAB Water Water Temperature: 25.0℃

⑥ Study on Power Supply

A max. fluctuation runs to -7%, which approaches ±10% tolerance for typical electrical equipment. Accordingly, for insurance of safety of equipment, all equipments, except for electric heater elements, are required to be equipped with automatic stabilizers.

Table 3-12 Electric Power Condition

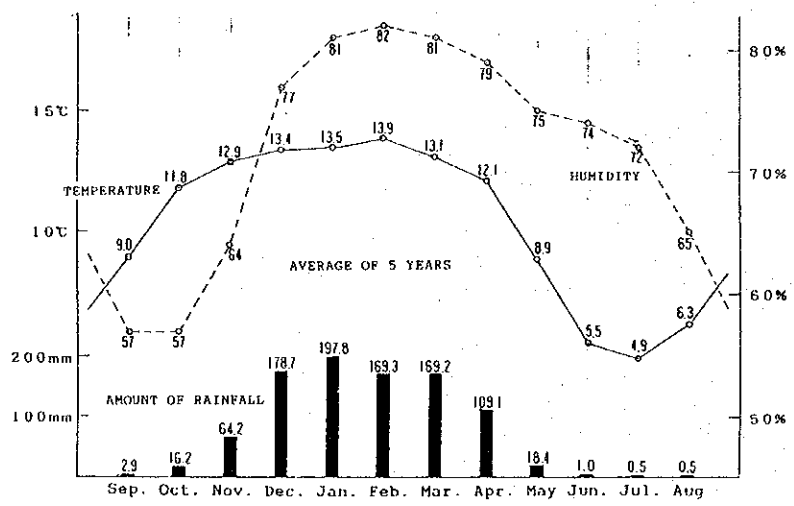
Voltage Cycles	Tested Date	Time	Measurement Data			Fluctuation %		Evaluation
			Max.	Min.	Av.	+%	−%	
220V	OCT. 3th	08:40	235.1	227.0	231.9	1.38	2.11	No good
50Hz	4th	09:35	238.4	214.6	230.9	3.25	7.06	

Measuring Condition: 5 Mn. Interval, 2 hour

⑦ Study on Atomspheric Condition

Located on a hilly land, this institution undergoes large changes in atmospheric temperature and humidity every year, but these changes fall within the allowable level for typical medicare equipment. Accordingly, the equipments supplied in accordance with this project is determined not to be deleteriously affected by the meteorological conditions.

Fig. 3-2 Temperature, Humidity and Amount of Rainfall Through Year



Mbeya

3) Kilimanjaro Christian Medical Centre

① Study on Surgical Department

Provided on station with 5 major operation theatres and 2 minor operation theatres, this sector annually performs 30,000 cases of operations. However, presently usable operation theatres are only 4 in number, and the equipments placed there are not satisfactorily functioning. Only about 20% of electric bulbs of operating lamps are turned on, and the operating beds can barely be driven up-down. For these reason, the operations of general surgery, orthopedic surgery, ENT, ophthalmology have been declining and the number of operations has not been rising for 3 years. Only the number of minor surgery has been increasing. The need for upkeep of complete equipment at least at two operation theatres in this project is admitted.

Table 3-13 Major Operation and Numbers

Operation	1991	1992	1993	3 Years Av.
General Surgery				
Cholecystectomy	15	23	43	27
Laparotomy	42	41	36	40
Appendectomy	30	48	74	51
Mastectomy	13	27	31	24
Herniorrhaphy	65	74	88	76
Gastro-Jujonostomy	38	38	45	40
Thyroidectomy	35	41	39	38
Prostatectomy	215	202	224	213
Hysterectomy	142	155	160	152
Others	232	336	295	287
Orthopedic	85	76	59	73
Minor Surgery	1,285	1,675	1,558	1,506
E.N.				
Tonsillitis	300	306	328	311
Laryngeal Tumours	95	110	69	61
Forein Bodies	45	62	72	60
Ophthalmology				
Cataract	854	821	733	802
Glaucoma	148	117	126	130

② Study on Radiology Department

Radiation rooms are arrayed on 5 locations, but only 3 units are operable. The activities of this department are positive, chest examination is 80% of the total and contrast medium investigation accounts for also 10%. For the last 3 year, examinations have been conducted 50 cases a day on the average and the number of examination cases is leveling off due to the capacity of now existing mechanical equipment. It is considered necessary to undertake restoration of the function of this sector by procuring 1 unit of X-ray equipment.

Table 3-14 Main X-ray Examination

Examination	1991	1992	1993	3 Year Av.
Simple X-ray Examination				
Chest	5,348	5,668	5,517	5,511
Abdomen	985	1,254	1,074	1,104
Limbs	2,860	2,995	2,828	2,894
Skull	2,360	2,033	2,074	2,156
Spine	1,050	1,201	1,466	1,239
Specialised Investigation (Contrast Medium)				
Barium Study	485	526	500	503
Urological	221	185	217	208
Hysterosaldin Gography	405	338	349	364

③ Study on Laboratory Department

Clinical examinations are performed 40,000 cases a year or approx. 160 cases a day. Hb test of Hematology has been increasing 19% for three years and cholesterotesy of liver function test 77%, other tests have not been rising. The presently available mechanical equipments are often in failure; and as a consequence, the present frequency of examination has reached their full capacity. In the event of failure of equipment, the examination function will be notably reduced. To overcome such present difficulties, it is necessary to procure such equipment for clinical examinations as centrifuge and spectrophotometers etc..

Table 3-15 Main Laboratory Examination

Examinations	1991	1992	1993	1991/1993 Comparison
Hematological Test				
(WBC)	7,647	7,786	8,412	+10.0%
(RBC)	110	125	101	− 8.2%
Hb	15,580	15,586	18,558	+19.1%
ESR	6,807	6,116	7,451	+ 9.5%
PCV	4,205	1,757	868	−79.4%
Coagulation	309	300	328	+ 6.1%
Liver Function Test				
Bilirubin	404	328	249	−38.4%
Protein	685		308	−19.8%
Cholestero	165		292	+77.0%
Alkaline Phosphatase	391	224	265	−32.2%
Urinalysis	8,348	8,234	7,399	−11.4%
Malarial Arasite	11,417	10,035	9,914	−13.2%

④ Others

Both electrocardiograph and endoscope which are presently in use are working in low gear and their service period is quite restricted. On this account, the electrocardiographic examination is performed no more than about 7 cases a day and the endoscopic examination about 1 or 2 cases a day. The number of both examination have not been increasing. It is considered necessary to procure at least one unit each of these mechanical equipment in this project.

Table 3-16 ECG·Endoscopy

Examinations	1991	1992	1993	3 Years Av.
E.C.G.	1,320	2,240	1 490	1,683
Gastroscopy	421	325	336	361

⑤ Study on Water Quality

Rather a high value is registered for silica. In designing a manufacturing system of reverse osmotic water as in artificial dialysis apparatuses, a combination of appurtenant equipment needs to be taken into account. The procurement in this project, however, is restricted to basic medical equipment and therefore the problem of treatment of feed water involved in the use of the equipment to be arrayed will not come up.

Table 3-17 Water Quality

Kilimanjaro Christian Medical Centre

pH	Conduct.	Colour	Impurity	NH_4	NO_2	K Mn 0
7.81	185.0μs/cm	2.0 deg.	1.0 deg.	0.1mg/ℓ	0.025mg/ℓ	5.00mg/ℓ
Cl^-	SO_4	$CaCO_3$	$CaCO_3$	Ca	Mg	Na
1.70mg/ℓ	3.40mg/ℓ	80.00mg/ℓ	9.46mg/ℓ	0.90mg/ℓ	1.75mg/ℓ	36.60mg/ℓ
K	Al	SiOz	Fe	Mn	$CaCO_3$	No_3
9.70mg/ℓ	0.048mg/ℓ	45.50mg/ℓ	0.014mg/ℓ	0.002mg/ℓ	120.0mg/ℓ	5.30mg/ℓ

Sample: TAB Water Water Temperature: 25.4℃

⑥ Study on Power Supply

Voltage fluctuation is very small at 2.43%, posing no problem for the use of typical medical equipment such as optical and thermal equipment, suction unit and electrosurgical unit. With regard to such precision electronic equipment as bedside monitor system and defibrillator etc., the procurement of automatic voltage stabilizers should be contemplated to secure of stable power supply.

Table 3-18 Electric Power Condition

Bugando Medical Centre

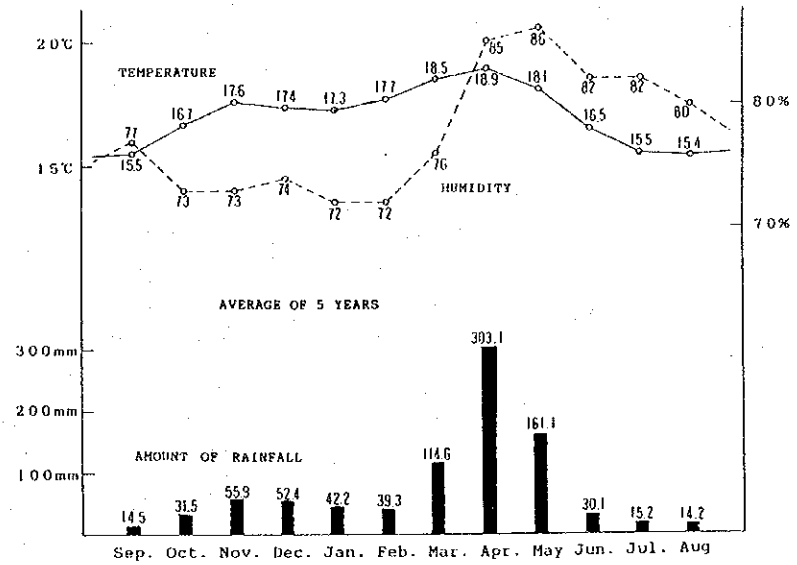
Voltage Cycles	Tested Date	Time	Measurement Data			Fluctuation %		Evaluation
			Max.	Min.	Av.	+%	−%	
220V	Sept. 28th	11:59	244.1	234.9	238.3	2.43	1.43	GOOD
50Hz	29th	09:23	239.6	234.9	237.2	1.01	0.97	

Measuring Condition: 5 Mn. Interval, 2 hour

⑦ Study on Atmospheric Condition

Situated on a mountainous zone, the institution is in stabilized atmospheric temperatures throughout a year. The humidity is high, running up to 85% max., but the atmospheric temperature is low. So it is recognized that the mechanical equipment which are scheduled to be procured will not be much affected.

Fig. 3-3 Temperature, Humidity and Amount of Rainfall Through Year



Moshi

4) Bugando Medical Centre

① Study on Surgical Department

In operation theatres at 5 locations, 3,500 cases of operation are performed in a year. It is a present state that mechanical equipments in all these operation theatres have been notably obsolesced, permitting only about 2~3 cases of operation to be performed. For these reasons, only herniorrapmy and laparotomy have been operated about 100~150 cases annually. Other operations have seldom been performed. In this project the renewal of complete mechanical equipment for at least 2 or more operation theatres, thereby to make for functional restoration of medical activities is deemed essential.

Table 3-19 Major Operation and Numbers

Operation	1991	1992	1993	3 Years Av.
General Surgery				
Cholecystectomy	5	3	4	4
Laparotomy	93	96	80	90
Appendectomy	63	51	64	59
Mastectomy	5	3	4	4
Herniorrhaphy	155	142	129	142
Gastro-Jujonostomy	4	3	3	3
Thyroidectomy	8	12	10	10
Prostatectomy	69	52	14	45
Hysterectomy	88	42	17	49
Others	265	334	315	305
Orthopedic	92	86	62	80
Minor Surgery	1,076	1,240	1,150	1,155
E.N.				
Tonsillitis	261	225	248	245
Laryngeal Tumours	7	6	3	5
Forein Bodies	245	148	115	169
Ophthalmology				
Cataract	93	128	118	113
Glaucoma	5	3	2	3

② Study on Radiology Department

There are 2 units of presently available X-ray equipments, which are often in failure. With these 2 units of equipment, examinations are provided approx.10,000 cases a year or 40 cases a day, and this is nearly approaching the limit of their capacity. So the number of X-ray examination has been decreasing, especially, the number of chest examination has been down about 40% from 6704 in 1991 to 3909 in 1993. It is then judged that this strait may be resolved by procuring 1 unit of X-ray equipment in this project.

Table 3-20 Main X-ray Examination

Examination	1991	1992	1993	3 Year Av.
Simple X-ray Examination				
Chest	6,704	6,983	3,909	5,865
Abdomen	551	552	200	434
Limbs	3,845	4,527	3,433	3,935
Skull	654	810	562	675
Spine	1,041	926	809	925
Specialised Investigation (Contrast Medium)				
Barium Study	289	126	1	139
Urological	215	180	172	189
Hysterosaldin Gography	467	354	0	274

③ Study on Laboratory Department

Examination are carried out at a rate of 50,000 cases a year. The AIDS test is performed by the screening test in technical cooperation with Swizerland, but the data obtained thereby have not been published. The number of WBC test has been increasing about 87% due to introducing of new cell counter. All other tests including alkaline phosphatase which have been decreasing about 49%, have been declining. Presently existing mechanical equipments are all obsolescent and are often in failure, interfering with daily duties. Renewal of such equipments related with blood test as centrifuge, spectrophotometers, microscopes and incubators etc. is deemed necessary.

Table 3-21 Main Laboratory Examination

Examinations	1991	1992	1993	1991/1993 Comparison
Hematological Test				
(WBC)	10,845	11,340	10,509	- 3.1%
(RBC)	620	1,168	1,163	+87.6%
Hb	14,400	14,340	12,507	-13.1%
ESR	11,760	10,816	9,573	-18.6%
PCV	-	--		-
Coagulation				
Liver Function Test				
Bilirubin	388	272	252	-35.1%
Protein	240	228	197	-17.9%
Cholestero	129	141	86	-33.3%
Alkaline Phosphatase	425	338	215	-49.4%
Urinalysis	10,370	8,703	7,723	-25.5%
Malarial Parasite	5,031	6,086	3,751	-25.4%

④ Others

Electrocardiographs have severely obsolesced, causing impediment. ECG examinations amount to an average of 2,500 cases annually, but the number dropped in 1992 because of machine trouble. Endoscopes, which were supplied long before, have become malfunctioning and unusable for examination since 1990. It is deemed necessary to procure one each of electrocardiograph and endoscope in this project.

Table 3-22 ECG・Endoscopy

Examinations	1991	1992	1993	3 Years Av.
E.C.G.	2,450	1,580	3,620	2,550
Gastroscopy	-	-	-	-

⑤ Study on Water Quality

No problem is recognized except for iron ion content and chromaticity. The mechanical equipment to be procured in this

project will be furnished without trouble.

Table 3-23 Water Quality

pH	Conduct.	Colour	Impurity	NH_4	NO_2	K Mn 0
7.69	100.0μs/cm	4.0 deg.	1.0 deg.	0.10mg/ℓ	0.025mg/ℓ	3.90mg/ℓ
Cl^-	SO_4	$CaCO_3$	$CaCO_3$	Ca	Mg	Na
3.70mg/ℓ	0.80mg/ℓ	45.00mg/ℓ	26.12mg/ℓ	5.42mg/ℓ	3.05mg/ℓ	15.70mg/ℓ
K	Al	SiOz	Fe	Mn	$CaCO_3$	No_3
4.10mg/ℓ	0.01mg/ℓ	2.67mg/ℓ	0.041mg/ℓ	0.002mg/ℓ	65.0mg/ℓ	1.0mg/ℓ

Sample: TAB Water Water Temperature: 25.8℃

⑥ Study on Power Supply

Power supply is in high gear, voltage fluctuation at the time of measurement being barely recognized. The procurement of automatic stabilizers is unnecessary, except for precision equipment like electrocardiographic monitors, etc.

Table 3-24 Electric Power Condition

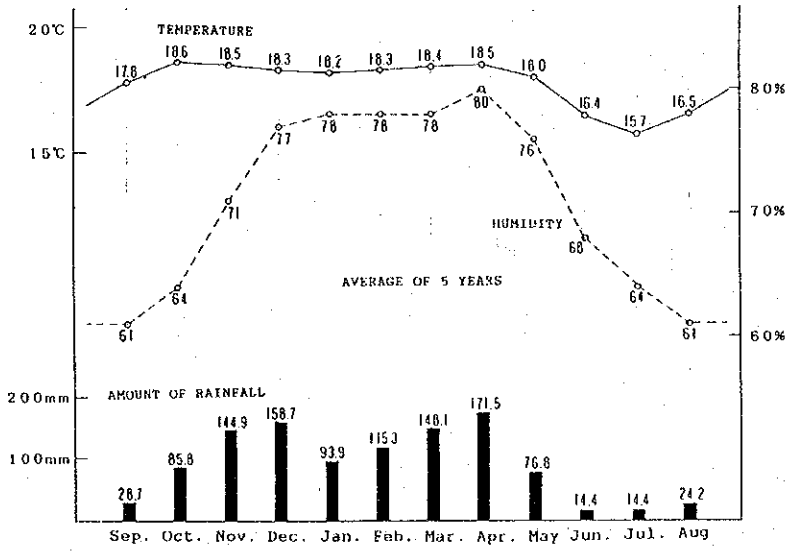
Voltage Cycles	Tested Date	Time	Measurement Data			Fluctuation %		Evaluation
			Max.	Min.	Av.	+%	−%	
220V	SEPT. 22th	09:04	228.5	224.4	226.5	0.88	0.93	Very good
50Hz	23th	10:12	230.3	222.8	227.1	1.41	1.89	

Measuring Condition: 5 Mn. Interval, 2 hour

⑦ Study on Atmospheric Condition

Located adjacent to a lake, the institution has high humidity in rainy season, but the atmospheric temperature fluctuation is as small as 15--18℃. The typical medicare equipment which are scheduled to be procured according to this project will pose no problem.

Fig. 3-4 Temperature, Humidity and Amount of Rainfall Through Year



Mwanza

5) Mirembe Hospital

① Study on Surgical Department

One operation theatre is provided on station and in action, mainly for emergency surgery. Operations were performed Av. 2~3 cases a day during the last three years, and have been increasing a little bit. Since an anesthesia apparatus is in failure, operations which may be dealt with anesthesia by means of injection are only performed. Operating beds and lamps are obsolescent, barely discharging their functions for now. The procurement of these operation theatre equipment is believed to be an urgent theme.

Table 3-25 Major Operation and Numbers

Operation	1991	1992	1993	3 Years Av.
General Surgery				
Cholecystectomy	–	–	–	–
Laparotomy	–	–	–	–
Appendectomy	–	–	–	–
Mastectomy	–	–	–	–
Herniorrhaphy	–	–	–	–
Gastro-Jujonostomy	–	–	–	–
Thyroidectomy	–	–	–	–
Prostatectomy	–	–	–	–
Hysterectomy	–	–	–	–
Others	–	–	–	–
Orthopedic	–	–	–	–
Minor Surgery	486	721	635	614
E. N.				
Tonsillitis	–	–	–	–
Laryngeal Tumours	–	–	–	–
Forein Bodies	–	–	–	–
Ophthalmology				
Cataract	–	–	–	–
Glaucoma	–	–	–	–

② Study on Radiology Department

One unit of obsolescent X-ray equipment is in operation, but its function has declined to such an extent that the number of patients to handle per diem is limited to 2~3 persons. Chest and limbs examinations account for 70% of total, but the number of contrast medium inspection are rarely performed. The procurement of 1 unit of X-ray equipment to this sector is believed to be essential in an attempt to restore the function of the health services in this hospital.

Table 3-26 Main X-ray Examination

Examination	1991	1992	1993	3 Year Av.
Simple X-ray Examination				
Chest	395	400	312	369
Abdomen	35	42	28	35
Limbs	354	310	212	292
Skull	65	70	75	70
Spine	117	82	126	108
Specialised Investigation (Contrast Medium)				
Barium Study	26	20	42	29
Urological	4	–	6	5
Hysterosaldin Gography	–	–	–	–

③ Study on Laboratory Department

This hospital is taking on malaria and urea tests as its main activities. The number of test sample has a tendency to increase: 10~38% of increase was seen in the last 3 years. However, with mechanical equipment for inspection almost in disorder or in failure, its inspection efficiency is very low. It is therefore believed to be necessary to ensure procurement of such basic examination equipment as centrifuge, colorimeters etc.

Table 3-27 Main Laboratory Examination

Examinations	1991	1992	1993	1991/1993 Comparison
Hematological Test				
(WBC)	1,550	1,655	1,920	+23.9%
(RBC)	1,300	1,350	1,800	+38.5%
Hb	2,100	2,225	2,350	+11.9%
ESR	1,300	1,350	1,800	+38.5%
PCV				
Coagulation				
Liver Function Test				
Bilirubin				
Protein				
Cholestero				
Alkaline Phosphatase				
Urinalysis	7,115	7,700	8,000	+12.4%
Malarial Parasite	6,100	6,900	7,560	+23.9%

④ Others

No examination by electrocardiograph or endoscope has been made.

Table 3-28 ECG・Endoscopy

Examinations	1991	1992	1993	3 Years Av.
E.C.G.	–	–	–	–
Gastroscopy	–	–	–	–

⑤ Study on Water Quality

In general water is not of good quality. Compared with other hospitals the ionic values of chlorine, sodium and sulfuric acid are extremely high. It is however estimated that the water quality will cause no substantial problem in the implementation of the project, as the equipment procured under the project does not include any sophisticated items such as auto-chemistry analyzer, hemodialysis machine.

Table 3-29 Water Quality

Mirembe Hospital

pH	Conduct.	Colour	Impurity	NH_4	NO_2	K Mn O
7.84	950.0μs/cm	10.0 dec.	2.0 dec.	0.20mg/ℓ	0.025mg/ℓ	6.60mg/ℓ
Cl^-	SO_4	$CaCO_3$	$CaCO_3$	Ca	Mg	Na
81.60mg/ℓ	72.50mg/ℓ	290.00mg/ℓ	158.92mg/ℓ	10.83mg/ℓ	32.00mg/ℓ	166.10mg/ℓ
K	Al	SiOz	Fe	Mn	$CaCO_3$	No_3
10.00mg/ℓ	0.018mg/ℓ	53.99mg/ℓ	0.123mg/ℓ	0.013mg/ℓ	600.0mg/ℓ	1.0mg/ℓ

Sample: TAB Water Water Temperature: 25.7℃

⑥ Study on Power Supply

The maximum voltage fluctuation is +9.0% and -6.7%, near± 10%, the allowable voltage variation range for general equipment. In order to protect the equipment from any possible damage due to voltage fluctuation, auto voltage stabilizer should be procured for any equipment except for such electric heating appliances as instrument sterilizers.

Table 3-30 Electric Power Condition

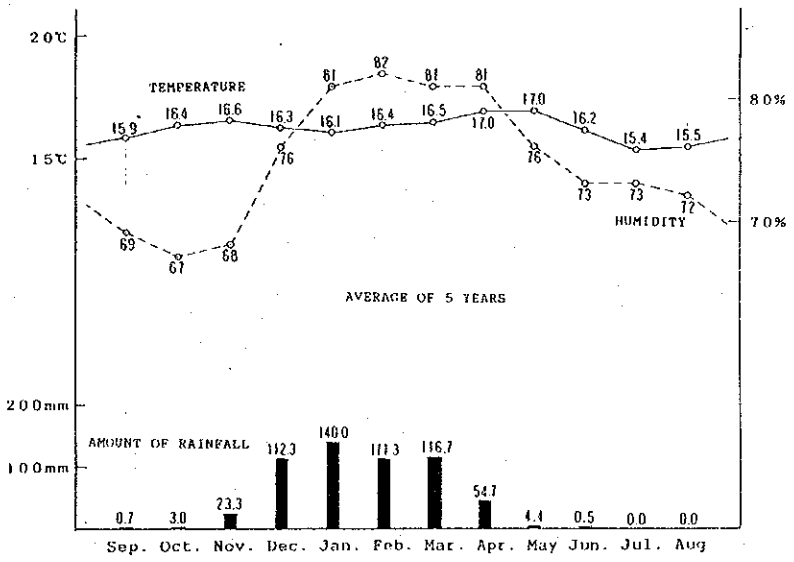
Voltage Cycles	Tested Date	Time	Measurement Data			Fluctuation %		Evaluation
			Max.	Min.	Av.	+%	−%	
220V	Sept. 20th	09:02	225.0	193.0	212.5	9.00	6.71	NO GOOD
50Hz	21th	08:44	215.0	184.0	197.2	1.41	1.89	

Measuring Condition: 5 Mn. Interval, 2 hour

⑦ Study on Atmospheric Condition

The site, situated inland, is exposed to high humidity in rainy season, but the temperature is subject to no heavy fluctuation throughout the year (on the order of 16°C). Therefore the climatic conditions will constitute no hindrance to the dispositions of the equipment to be procured in the general framework of the project.

Fig. 3-5 Temperature, Humidity and Amount of rainfall through year



Dodoma

6) Kibong'oto National Tuberculosis Hospital

① Study on Surgical Department

One operation theatre is in activity, centered on the emergency surgery. The number of operations has been 600 Av. and has not been increasing for 3 years. The average of two to three operations are performed a day. These operations have been limited however to those with the anesthesia by injection because the anesthesia machine is out of order. The operating table and lamps, which are dilapidated, seldom fulfill their function. It is considered urgent to procure these equipments for the operation theatre.

Table 3-31 Major Operation and Numbers

Operation	1991	1992	1993	3 Years Av.
General Surgery				
Cholecystectomy	–	–	–	–
Laparotomy	–	–	–	–
Appendectomy	–	–	–	–
Mastectomy	–	–	–	–
Herniorrhaphy	–	–	–	–
Gastro-Jujonostomy	–	–	–	–
Thyroidectomy	–	–	–	–
Prostatectomy	–	–	–	–
Hysterectomy	–	–	–	–
Others	–	–	–	–
Orthopedic	–	–	–	–
Minor Surgery	586	621	605	604
E.N.				
Tonsillitis	–	–	–	–
Laryngeal Tumours	–	–	–	–
Forein Bodies	–	–	–	–
Ophthalmology				
Cataract	–	–	–	–
Glaucoma	–	–	–	–

② Study on Radiology Department

The sole old X-ray apparatus has been used to examine 10 to 15 cases a day and Av. 5,000 cases annually. However, it frequently falls into trouble, the number of chest inspections has been decreased 30% in 1992. It is just a matter of time that the apparatus will go out of commission. It is hence considered indispensable to renew it in view of the rehabilitation of the facility.

Table 3-32 Main X-ray Examination

Examination	1991	1992	1993	3 Year Av.
Simple X-ray Examination				
Chest	2,955	2,000	3,377	2,777
Abdomen	–	–	5	5
Limbs	1,583	2,500	1,803	1,962
Skull	–	125	76	101
Spine	–	120	115	118
Specialised Investigation (Contrast Medium)				
Barium Study	–	–	–	–
Urological	–	–	–	–
Hysterosaldin Gography	–	–	–	–

③ Study on Laboratory Department

The number of hematological tests has not been rising. Urinalysis and malarial parasite reduced by more than 30% in these 3 years because of the troubles due to the obsolete damaged equipment. It is therefore considered necessary to supply, in order to recover the function of this department, such examination equipment as colorimeter, centrifuge, and microscope.

Table 3-33 Main Laboratory Examination

Examinations	1991	1992	1993	1991/1993 Comparison
Hematological Test				
(WBC)	1,250	1,160	1,265	+ 1.2%
(RBC)	1,210	1,053	1,335	+10.3%
Hb	2,050	1,980	1,876	− 8.5%
ESR				
PCV				
Coagulation				
Liver Function Test				
Bilirubin				
Protein				
Cholestero				
Alkaline Phosphatase				
Urinalysis	3,329	2,155	2,044	−38.6%
Malarial Parasite	5,509	4,689	3,833	−30.4%

④ Others

No examination by electrocardiograph or endoscope has been conducted.

Table 3-34 ECG・Endoscopy

Examinations	1991	1992	1993	3 Years Av.
E.C.G.	-	-	-	-
Gastroscopy	-	-	-	-

⑤ Study on Water Quality

Rather higher silica value was noted. Higher iron ion and color will cause no obstacle to the dispositions of the equipment to be procured within the framework of the project.

Table 3-35 Water Quality

Kibong'oto National Tuberculosis Hospital

pH	Conduct.	Colour	Impurity	NH_4	NO_2	K Mn 0)
7.64	140.0μs/cm	4.0 deg.	1.0 deg.	0.80mg/ℓ	0.025mg/ℓ	2.20mg/ℓ
Cl^-	SO_4	$CaCO_3$	$CaCO_3$	Ca	Mg	Na
2.10mg/ℓ	2.80mg/ℓ	72.00mg/ℓ	52.88mg/ℓ	4.67mg/ℓ	10.00mg/ℓ	10.80mg/ℓ
K	Al	SiOz	Fe	Mn	$CaCO_3$	No_3
1.50mg/ℓ	0.011mg/ℓ	81.42mg/ℓ	0.022mg/ℓ	0.002mg/ℓ	80.0mg/ℓ	1.0mg/ℓ

Sample: TAB Water Water Temperature: 25.7℃

⑥ Study on Power Supply

The power supply is rather in good conditions with at most ±2% of voltage fluctuation. However, since the sanatorium facility for tuberculars is situated on a hill far from human habitation, the power has been supplied poorly with 2 to 4 times of failure a week. The power supplied from generator in case of failure causes a large voltage fluctuation at the time of change-over, which is counted as one of the factors responsible for the malfunction of the equipment. Precision medical equipments therefore require an automatic voltage stabilizer.

Table 3-36 Electric Power Condition

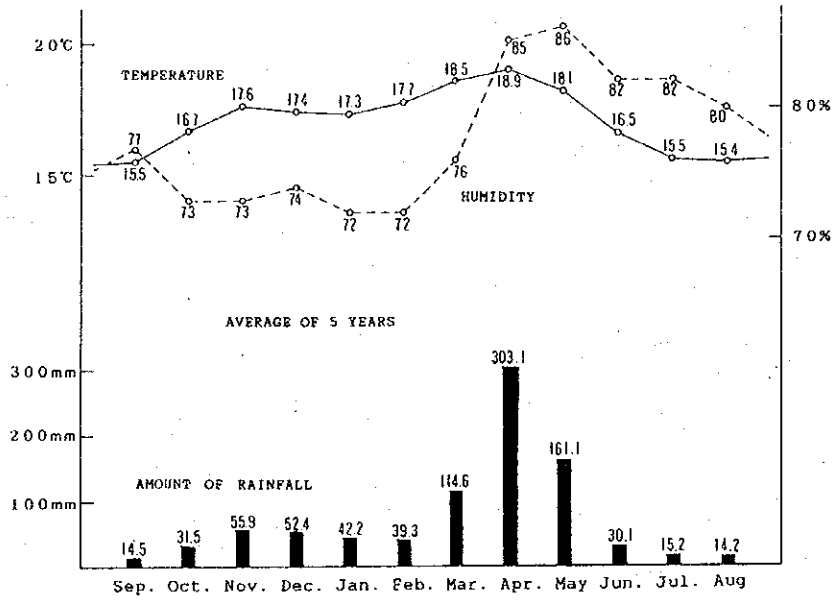
Voltage Cycles	Tested Date	Time	Measurement Data			Fluctuation %		Evaluation
			Max.	Min.	Av.	+%	−%	
220V	Oct. 1th	08:34	233.9	226.6	230.0	1.70	1.46	Very good
50Hz	3th	09:11	233.9	226.6	230.4	1.51	1.66	

Measuring Condition: 5 Mn. Interval, 2 hour

⑦ Study on Atmospheric Condition

The figure below gives the climatic data of Moshi City situated about 60 km. east-southeast of the site of the facility. The site is on a tract of land about 100 m higher. Temperature and humidity at the site is somewhat lower than average. Therefore it is estimated that the climatic conditions will bring no obstacle to the dispositions of the equipment to be procured in the framework of the project.

Fig. 3-6 Temperature, Humidity and Amount of Rainfall Through Year



Moshi

(3) Examination of Operating Plans

1) Personnel Plan

As has been shown in the aforesaid outline activities of the proposed facilities, the personnel corresponding to the respective medical activities have been posted in each facility. Since the hospital is now in activity and the equipment to be procured are either renewal of existing ones or their supplementation, it will not be necessary to increase or make up for any engineers or other personnel. The existing number of personnel will be enough to run the hospitals.

2) Budget of Facilities

As mentioned in the foregoing financial statement of the project sites, the operating budgets of the proposed facilities have been stably increasing. However, the allocated budgets are insufficient, remaining at 40 to 60% of the budgets demanded. Most part of the development budget has consequently been devoted to the procurement of the medical supplies required for the daily medical activities, leading thus to the lower portion of the development cost allotted for the maintenance of facilities and equipment. In order to get out of the present state and to ensure the sustainability of the respective medical facilities, the Ministry of Health phased in the Cost Sharing System (chargeable medical care system) from July 1993 and it was decided for any and all medical institutions to adopt this system from July 1994 onward. Shown hereunder are the medical consultation revenues so far obtained and the anticipated annual revenues in the proposed facilities. An estimation foresees recovery of the recurrent expenditure by 2.5 to 5% for the time being from the consultation revenue provided the Cost Sharing System is introduced. The Tanzanian government is planning to increase the revenue from the Cost Sharing System, expecting it to cover 10 to 13% of the recurrent expenditure. With that achieved, it is sure that the improvement of the operation of the proposed facilities will be promoted.

Table 3-37 Revenue of Cost Sharing System

Facility	Revenue on July. Aug.	Estimated Revenue of 1994/95	% OF Recurrent Cost
Muhimbili Medical Centre	State on 1993	Tsh 125,000,000(Acctual)	2.70%
Mbeya Referral Hospital	Tsh 2,150,000	12,900,000	5.47%
Kilimanjaro Christian Medical Centre	Tsh 4,400,000	26,400,000	4.43%
Bugando Medical Centre	Tsh 4,760,000	28,500,000	3.00%
Mirembe Hospital	Tsh 1,410,000	8,460,000	4.98%
Kibong'oto National Tuberculosis Hospital	Tsh 792,000	4,752,000	4.40%
Expected Annual Revenue Tsh 206,012,000			

(4) Examination on the relation with similar projects

Muhimbili Medical Center has laid a rehabilitation project amounting to total 59 million dollar (about 6 billion yen) under the aid from the African Development Bank (AfDB) which had been scheduled to start in July 1994. This programme has not yet been implemented. The rehabilitation project envisages the improvement of Centre's infrastructure as a whole as well as its medical facilities and equipment (mainly large-sized equipment). The outpatient & casualty and clinical laboratory test departments proposed in this project have been comprehended into the AfDB's project. However it is judged that the equipment to be renewed or supplemented under this project has been limited to the urgently required minimum quantity, and that such problems as an overlap with the AdDB project will not arise. The implementation of the AdDB's project having been delayed by more than a half year (scheduled to be accomplished in 1998), our project will be allowed to make effective use of the equipment to be procured three years or more sooner, thereby enabled to compensate, even a little, for the vacuum or deterioration of medical service due to lack of the equipment.

(5) Examination of requested equipment

Through this Project the Tanzanian government has requested the improvement of total 473 items of equipment: maternity (82 items), outpatient & casualty (85 items), orthopedics (109 items), anesthesiology & theatre (79 items), neurology (11 items), ophthalmology (7 items), clinical laboratory (23 items), radiodiagnosis (8 items), maintenance equipment (55 items) and other miscellaneous equipment (14 items). However, it should be noted here that the request had been prepared and submitted on the basis of the conditions before 1991 and that the situation has largely changed due to some economical worsening during these 4 to 5 years. There is a great disparity of the contents between the request and the actual state. The contents of the request range over such particular departments as outpatient & casualty, operation theatre, clinical laboratory, ophthalmology and ENT clinic. In the respective facilities proposed in this project, any and all the departments providing basic medical services suffer considerable shortage of equipment in number accompanying the superannuation or deterioration. The top referral hospitals especially require the procurement, renewal or supplementation of equipment not in some centralized departments but for any departments including basic medical services, because they are large both in scale and scope of activities.

In our consideration of the contents of the request we therefore held discussions, under the following 8 conditions, about the necessity of improvement and suitability and sustainability (self-aided development) of the equipment originally requested, on the basis of the deliberations with the Ministry of Health of Tanzania and the analyses resulting from the basic design study on the renewal/replenishment of the existing medical equipment, in order to recover the function of the facilities as top referral hospitals. The results have been evaluated by classifying into A, B and C (refer to Equipment Evaluation List).

EQUIPMENT LIST

Selection criteria
a. Not considered as a equipment for essential medical service
b. Not meeting level and function of hospital/Department
c. Not frequently used
d. Local procurement available
e. Not sustained by hospital financially/technically
f. Considered as consumables
g. Overlapping within the requested equipment
h. Overlapping with other donations

Table 3-38 Equipment Evaluation List

"○" REMARK ..... Appricable Criteria
Priority: A = 1st priority, B = 2nd priority, C = 3rd priority

Medical Equipments List

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
S: Maternity (for MMC only)									
1 Stethoscope									A
2 Digital Clinical Thermometer				○					C
3 Halogen Diagnostic Set							○		B
4 Sphygmomanometer									A
5 Infant Scale									A
6 Treatment Carriage									A
7 Stretcher									A
8 Examination Light									A
9 Weight & Height Scale									A
10 Instrument Cainet				○					C
11 Disposable Jar Pedal Operation				○					C
12 Instrument Tray (4 size)				○					C
13 Puss Basin (6 size)				○					C

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
14 Manual Resuscitator, Adult									A
15 Manual Resuscitator, Infant									A
16 Laryngoscope Set, Adult							○		B
17 Laryngoscope Set, Infant							○		B
18 Electrocardiograph									A
19 I.V. Hanger Stand									A
20 Syringe Infusion Pump			○						B
21 Laundry Cart									A
22 I.C.U Bed							○		B
23 Folding Canvas Bed				○					C
24 Labour Bed									A
25 Mattress, Adult				○					C
26 Defibrillator									A
27 Infusion Pump									A
28 Resuscitator, Adult						○			B
29 Resuscitator, Infant						○			C
30 Oxygen Tent		○							C
31 Vacuum Extractor									A
32 Suction Unit (A)									A
33 Suction Unit (B)									A
34 Instrumental Sterilizer									A
35 High Pressure Steam Sterilizer							○		B
36 Infant, Ventilator		○							C
37 Medical Refrigerator									A
38 Blood Bank Refrigerator		○							C
39 Hymacytometer			○						C
40 Hemoglobinmeter			○						C
41 Staining Jar				○					C
42 Ice Cube Machine	○								C
43 Blood Sedimentation Set			○						B
44 Refractometer							○		B

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
45 Microscope							○		B
46 Distilling Apparatus (2~4 lit.)					○				C
47 Kymographic Insufflation Apparatus						○			C
48 Hysteroscope, System									B
49 Gynecological Examination Unit									B
50 Nursing Bottle Warmer									A
51 Breast Pump				○					C
52 Oxgen Monitor					○				C
53 Bassinet Cart				○					C
54 Micro Slide Glass (100pcs/set)				○					C
55 Micro Cover Glass (100pcs/set)				○					C
56 Cornet Forceps				○					C
57 Staining Rack				○					C
58 Slide Glass Rack				○					C
59 Micro Slide Box				○					C
60 Sliding Staining Set				○					C
61 Vaginal Speculum									A
62 Vaginal Speculum									A
63 Vaginal Speculum									A
64 Uterine Dialators									A
65 Uterine Curettes									A
66 Uterine Forceps									A
67 Obsteric Instrument									A
68 Abdominal Retractor									A
69 Uterine Scissors									A
70 Vaginal Spatula									A
71 Holding Forceps									A
72 Obstetric Stethoscope						○			B
73 Obstetric Forceps									A
74 Obststric Forceps									A

DEPARTMENT / EQUIPMENT	REMARKS								PRIORITY
	a	b	c	d	e	f	g	h	
75 Obstetric Scoop									A
76 Obstetric Forceps									A
77 Obstetric Hook									A
78 Air Conditioner							○		B
79 Ambu Bag For Infant							○		B
80 Endotracual Tube									A
81 Bilirubinometer			○						B
82 Photo Thera Phy Unit									A

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
A: Out-patient & Casualty (6 Hospital)									
1 Stethoscope									A
2 Digital Clinical Thermometer				○					C
3 Halogen Diagnostic Set									A
4 Sphygmomanometer									A
5 Infant Scale				○					B
6 Treatment Carriage									A
7 Stretcher									A
8 Examination Light									A
9 Weight & Height Scale									A
10 Instrument Cabinet				○					C
11 Disposable Jar Pedal Operation				○					C
12 Instrument Tray (4 size)				○					C
13 Puss Basin (6 size)				○					C
14 Manual Resuscitator, Adult									A
15 Manual Resuscitator, Infant									A
16 Laryngoscope set, Adult									A
17 Laryngoscope set, Infant									A
18 Electrocardiograph							○		B
19 I.V. Hanger Stand									A
20 Syringe Infusion Pump			○						C
21 Laundry Cart							○		B
22 I.C.U. Bed									A
23 Folding Canvas Bed				○					C
24 Labour Bed							○		B
25 Mattress, Adult				○			○		C
26 Defibrillator									A
27 Infusion Pump							○		B
28 Resuscitator, Child, Adult							○		B
29 Resuscitator, Infant							○		B
30 Oxygen Tent		○							C

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
31 Vacuum Extractor							○		B
32 Suction Unit (B)									A
33 Instrument Sterilizer									A
34 High Pressure Steam Sterilizer							○		B
35 Infant Ventilator		○							C
36 Medical Refrigerator							○		B
37 Kymographic Insufflation Apparatus						○			C
38 Hysteroscope System			○						C
39 Gynaecological Examination Unit									A
40 Milk Bottle Warmer							○		B
41 Breast Pump	○								C
42 Oxygen Monitor							○		C
43 Revolving Chair	○								C
44 Trolley for Endoscope	○								B
45 Sterilization Box for Endoscope	○								C
46 Cabinet for Endoscope	○								C
47 Ventilator with Cart							○		B
48 Examination Table									A
49 Standard Gatch Bed with Mattress				○					B
50 Paediatrics Bed with Mattress				○					C
51 Oxygen Flowmeter							○		C
52 Kick Bucket				○					C
53 Emergency Cart							○		C
54 Consulting Chair				○					C
55 Single Screen				○					C
56 Infant Warmer							○		C

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
57 Phototherapy Unit							○		B
58 Doppler Fetal Heart Detector							○		B
59 Aspirator with Canula Set							○		B
60 Auto-correction Bilirubin Meter			○						C
61 Infant Bassinet Stand, Mattress				○					C
62 Ultrasonic Nebulizer									A
63 Hand Keratoscope			○						B
64 Head Mirror									A
65 Suction (ENT)									A
66 E.N.T. Treatment Chair									A
67 E.N.T. Treatment Unit									A
68 Anaerator	○								B
69 Magnet Stirrer	○								C
70 Pack Warmer with Pack				○					C
71 Bicycle Exerciser									A
72 Standing Table									A
73 Training Mat									A
74 Training Bed									A
75 Low Frequency Therapy Apparatus									A
76 Infrared Ray Lamp									A
77 Microwave Therapy Equipment	○								B
78 Walker									A
79 Wheeled Walker				○					B
80 Crutch				○					C
81 Goniometer									A
82 Wheel Chair									A
83 Ultrasonic Therapy Apparatus									A
84 Ultraviolet Ray Lamp									A
85 Cylinder Truck				○					C

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
B: Orthopedics									
1 Handle for taps						○			B
2 Screwdriver with universal joint						○			B
3 Pelvic reduction forceps						○			B
4 Semitubular plate 241.34						○			B
5 Semitubular plate 241.35						○			B
6 Semitubular plate 241.36						○			B
7 Semitubular plate 222.07						○			B
8 Semitubular plate 222.08						○			B
9 Narrow DCP 248.06						○			B
10 Narrow DCP 248.07						○			B
11 Small plates 5 holes						○			B
12 Small plates 6 holes						○			B
13 Small plates 7 holes						○			B
14 Small plates 8 holes						○			B
15 Large plates 8 holes						○			B
16 Large plates 9 holes						○			B
17 Large plates 10 holes						○			B
18 Large plaes 12 holes						○			B
19 T-plates 240.16						○			B
20 T-plates 240.18						○			B
21 T-plates 240.15						○			B
22 Plate buttress 240.34						○			B
23 Plate buttress 240.35						○			B
24 Buttress						○			B
25 Reconstruction plates 245.15						○			B
26 Reconstruction plates 245.16						○			B
27 Reconstruction plates 245.17						○			B
28 Reconstruction plates 245.18						○			B
29 Reconstruction plates 239.72						○			B

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
30 Reconstruction plates 239.55						○			B
31 Reconstruction plates 214.14						○			B
32 Reconstruction plates 214.16						○			B
33 Reconstruction plates 214.18						○			B
34 Reconstruction plates 214.20						○			B
35 Reconstruction plates 214.22						○			B
36 Reconstruction plates 214.24						○			B
37 Reconstruction plates 214.26						○			B
38 Reconstruction plates 214.28						○			B
39 Reconstruction plates 214.30						○			B
40 Reconstruction plates 214.32						○			B
41 Reconstruction plates 214.34						○			B
42 Reconstruction plates 214.36						○			B
43 Reconstruction plates 214.38						○			B
44 Reconstruction plates 214.40						○			B
45 Cortical 3.5mm 204.18						○			B
46 Cortical 3.5mm 204.22						○			B
47 Cortical 3.5mm 204.24						○			B
48 Cortical 3.5mm 204.26						○			B
49 Cortical 3.5mm 204.28						○			B
50 Cortical 3.5mm 204.30						○			B
51 Cortical 3.5mm 204.32						○			B
52 Cortical 3.5mm 204.34						○			B
53 Cortical 3.5mm 204.36						○			B
54 Cortical 3.5mm 204.40						○			B
55 Hand Drill						○			B
56 Quick Coupling						○			B
57 Universal Chuck						○			B
58 Connector						○			B
59 Drill bit 3.2mm						○			B
60 Drill bit 4.5mm						○			B

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
61 Drill bit 2.5mm						○			B
62 Drill bit 3.5mm						○			B
63 Drill bit 3.2mm						○			B
64 Drill bit 4.5mm						○			B
65 Tap 3.5mm						○			B
66 Tap 4.5mm						○			B
67 Tap sleeve						○			B
68 Tap sleeve 3.5mm						○			B
69 Drill sleeve 3.3mm						○			B
70 Drill bit 3.5mm						○			B
71 Handle for taps						○			B
72 Cancellous bone screws 217.45						○			B
73 Cancellous bone screws 217.50						○			B
74 Cancellous bone screws 217.55						○			B
75 Cancellous bone screws 217.70						○			B
76 Cancellous bone screws 217.85						○			B
77 Cancellous bone screws 217.90						○			B
78 Complete set of instruments						○			B
79 Std. femoral component cemented 7062						○			B
80 Std. femoral component cemented 7075						○			B
81 Std. femoral component cemented 7100						○			B
82 Std. femoral component cemented 7112						○			B
83 Std. femoral component cemented 7125						○			B
84 Std. femoral component cemented 7137						○			B
85 Std. femoral component cemented 7150						○			B

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
86 Std. femoral component cemented 7175						○			B
87 Std. femoral component cemented 7200						○			B
88 Trial Heads 28mm 7625-S						○			B
89 Trial Heads 28mm 7628-M						○			B
90 Trial Heads 28mm 7629-L						○			B
91 Femoral Heads s/steel 11281-S						○			B
92 Femoral Heads s/steel 11281-M						○			B
93 Femoral Heads s/steel 11281-L						○			B
94 Acetabular cups (inner dia. 28mm) cemented 44mm						○			B
95 -Ditto- 46mm						○			B
96 -Ditto- 48mm						○			B
97 -Ditto- 50mm						○			B
98 -Ditto- 52mm						○			B
99 -Ditto- 54mm						○			B
100 -Ditto- 56mm						○			B
101 -Ditto- 58mm						○			B
102 Acetabular Reamers with AO Shaft For Instrumentarium reamer ND-521						○			B
103 Instrumentarium reamer ND-520						○			B
104 Instrumentarium reamer ND-522						○			B
105 Instrumentarium reamer ND-523						○			B
106 Instrumentarium reamer ND-525						○			B
107 Instrumentarium reamer ND-527						○			B
108 Impact						○			B
109 Bone Cement Palacos						○			B

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
C: Anaethesiology & Theatere (6 Hospital)									
1 Arterial Blood Gas Analyser		○			○				C
2 Pulse Oximeter									A
3 Non Invasive BP Monitor					○				B
4 Infusion Pump									A
5 Perfusors	○								B
6 ECG Monitors									A
7 Defibrillators									A
8 Mechanical Lung Ventilators					○				B
9 Gas Autoclaring Facilities					○				B
10 Haematocrit Centrifuge							○		B
11 Serum Electrolyte Analyser (Na, K, Ca, Cl)					○				B
12 Incubator							○		B
13 Anaesthetic Machines							○		C
14 Operating Table									A
15 Suction Machine									A
16 Electro-surgical Unit									A
17 Operation Monitor							○		C
18 Bedside Monitor									A
19 Upper Gastrofiberscope									A
20 Light Source									A
21 Endoscopic Table		○							B
22 Lecture Scope									A
23 Camera for Endoscope									A
24 Anesthesia Apparatus Vaporizer									A
25 Electroencephalograph							○		B
26 Slit Lamp Microscope									A
27 Micro Slide Glass (100 pcs/set)				○					C
28 Micro Cover Glass (100 pcs/set)				○					C
29 Cornet Forceps							○		B

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
30 Staining Rack				○					C
31 Slide Glass Rack				○					C
32 Micro Slide Box				○					C
33 Slide Staining Set				○					C
34 Vaginal Speculum									A
35 Vaginal Speculum									A
36 Vaginal Speculum									A
37 Uterine Dialators									A
38 Uterine Curettes									A
39 Uterine Forceps									A
40 Obstetric Instrument									A
41 Abdominal Retractor									A
42 Uterine Scissors									A
43 Vaginal Spatula									A
44 Holding Forceps									A
45 Obstetric Stethoscope									A
46 Obstetric Forceps									A
47 Obstetric Forceps									A
48 Obstetric Scoop									A
49 Obstetric Forceps									A
50 Obstetric Hook									A
51 Endotracheal Set									A
52 Mosquito Hemostatic Forceps									A
53 Kocher Hemostatic Forceps									A
54 Kelly Hemostatic Forceps									A
55 Scissors									A
56 Operating knife									A
57 Standard Operating Scissors									A
58 Mayo Dissection Scissors									A
59 Scissors, Metzembaum									A
60 Dressing, Forceps									A

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
61 Tissue Forceps									A
62 Allis Intestinal Forceps									A
63 Operating Instrument Set							○		B
64 Small Operating Instrument Set									A
65 Surgical Instrument Set									A
66 Gastrectory Instrument Set			○						B
67 Cholecystomy Instrument Set			○						B
68 Nephrectomy Instrument Set			○						B
69 Emergency Tracheotomy Instrument Set			○						B
70 Appendectomy Instrument Set									A
71 Retractor							○		B
72 Antospy Instrument Set			○						B
73 Eustachian Catheter			○						B
74 Air Bag			○						B
75 Ear Speculum							○		B
76 Lempere Speculum			○						B
77 Kabierskie Powder Blower			○						B
78 Artificial Abortion Set			○						B
79 Cesarean Incision Set									A

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
D: Neurology (6 Hospital)									
1 Operation table neurological type									A
2 Bipolar Coagulator									A
3 Nerve Stimulater									A
4 Microsurgery Instrument									A
5 Lylabeltetaining Brain Batrator		○							B
6 Hasanectomy Instrument			○						B
7 Motor Nurve		○							B
8 Cloward Instrument		○							B
9 Bipolar Forceps		○							B
10 May Field Neuro			○						B
11 Image Intesnifier Opeating		○			○				B

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
E: Ophthalmology (6 Hospital)									
1 Fundus Camera									A
2 Ultrasound									A
3 Vitrectomy Set									A
4 Phacal Emulsificator			○						B
5 Laser Machine	○	○							C
6 Perimeter			○						C
7 Microsurgery Set for Opthalmology									A

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
F: Laboratory (6 Hospital)									
1 Automatic Slide Stainer		○							C
2 Bone Merrow Trephine Biopsy Needle			○						C
3 Platelet Counter		○							C
4 Coagulometer			○						C
5 Centrifuge									A
6 Centrifuge Haematocrit									A
7 Centrifuge Refrigerator	○		○						C
8 Spectrophotometer									A
9 Colourimeter									A
10 Microscope									A
11 Microscope Binocular Teaching Head									A
12 Ph Meter									A
13 Balance Analytical									A
14 Hot Air Oven									A
15 Autoclave									A
16 Flame Photometer									A
17 Anaerobic Jar				○					C
18 Step adj. fin pipetle 50~200ml									A
19 Step adj. fin pipetle 200~1000ml									A
20 Vacuum Pump				○					C
21 Cryostart			○						C
22 Incubator									A
23 Bone Nerrow Aspiration Needles			○						C

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
G: X-ray Diagnostic Equipment (6 Hospital)									
1 Basic X-ray Unit (B R S)									A
2 Ultrasound Machines									A
3 Mobile X-ray Machine									A
4 Mobile X-ray Machine for Theatre with TV Monitor (C-arm)									A
5 X-ray Illuminators									A
6 X-ray Tubes							○		B
7 Automatic Processor									A
8 Film Dryer									A

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
H: Maintenance Workshop Tools (6 Hospital)									
1 Signal Generator									A
2 Adjustable Voltage DC Power Supply									A
3 Dual Trace Ocilloscope									A
4 Defibrillator Energy Tester			○						C
5 ECG Bimulator			○						C
6 Rigel Safety Tester									A
7 Dosemeter (X-Ray)									A
8 Automatic Winding Machine									A
9 Megger Insulation Tester									A
10 Digital AV Meter (4 Digits)									A
11 Strip Boards				○					C
12 Strip Board Cutter				○					C
13 Pitch Boards				○					C
14 Torx Driver Set									A
15 Hexagon Driver Set									A
16 Ball Driver Set									A
17 Weller Soldering Equipment									A
18 Bench Magnifier									A
19 Internal & External Interchangeable Tip Circlip Plier									A
20 Feeler Gauges									A
21 Battery Gage									A
22 Screw Extractor, 2mm 6mm									A
23 Tape & Dies (mm.(1~10) set)									A
24 Tape & Dies (mm.(4~16) set)									A
25 A set of Metal Washer Cutter									A
26 (i) 6V Bulbs (Carl Zeiss)						○			C

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
27 (ii) Eye Pieces						○			C
28 (iii) Objectives x 10						○			C
29 x 40						○			C
30 x 100						○			C
31 (iv) Binocular Tube						○			C
32 (i) 6V Bulbs						○			C
33 (ii) Objectives x 40						○			C
34 x 100						○			C
35 (i) 240V Bulbs						○			C
36 (ii) 6V Bulbs						○			C
37 (iii) Objectives x 40						○			C
38 x 100						○			C
39 (i) 220V Bulb, Kyowa						○			C
40 (ii) Objectives x 40						○			C
41 x 100						○			C
42 (i) Colorimeter, 6V~1.2W Bulbs						○			C
43 (ii) IC L036						○			C
44 (iii) IC LH0042C						○			C
45 Autoclave (i) Heating Element 3,000W/220V						○			C
46 (ii) Thermostart						○			C
47 (iii)Door Sealing						○			C
48 Centrifuge Control Board						○			C
49 Motor 3,000 rev/min, 50Hz,50walts						○			C
50 (i) 6V,10W Bulb for Spectrophotometer						○			C
51 (ii) Through Flow Cell						○			C
52 (iii)Digital Display Board						○			C

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
53 Thermostart for Waterbath						○			C
54 Heating Elements, 175W/220V						○			C
55 Cooling Unit						○			C

DEPARTMENT / EQUIPMENT	REMARKS a	b	c	d	e	f	g	h	PRIORITY
I: Other Equipment (6 Hospital)									
1 Air Conditioner									A
2 Slide Screen									A
3 Slide Projector									A
4 Ambulance (4 WD)									A
5 Blood Donor Recruitment Cars							○		C
6 Pick-up Car (4 WD)									A
7 Mobile Workshop Vehicles (4 WD)									A
8 Automatic Washer									A
9 Drying Tumbler	○								C
10 Spinner	○								C
11 Generator (100 KVA)	○								C
12 Mortuary Refrigerator									A
13 Deep Freezer	○								C
14 Computer									A

For the equipment enumerated below, it is estimated to be appropriate to add them to the project judging from the status quo and actual activities of the facilities:

Main Equipment Added	Reason of Addition
Autoclave	Keenly needed as basic medical equipment for operation theatre.

Based on the results of the foregoing discussions on the equipment requested, we repeatedly evaluated the equipment of the project for each department from the viewpoints of the "Components of the Project" and "Implementation and Operation Plan" to adjust their quantity required. As a result, the following were determined as the departments and primary equipment of this project. Table 4-39 indicates the procurement schedule of the equipment and their quantity and reasons of the selection.

Out-Patient & Casualty	Kinds	Equipment
Consultation room for Internal Medicine	6	Diagnostic Instrument Sterilizer
Gynecologic Clinic	6	Gynecological Exam. Instrument Set
ENT Clinic	6	ENT Treatment Unit
EYE Clinic	6	Funds Camera Operating Microscope
Casualty	13	Resuscitator Defibrillator
Physiotherapy	20	Bicycle Exerciser Traction Unit
Anesthesiology & Theater		
O.T. for General Surgery	14	Anesthesia Machine EGG Monitor
O.T. for Orthopedic	8	Lower Leg Traction Attachment Anesthesia Machine
O.T. for Gynecology	4	Suction Unit Instrument Set for Caesarean
O.T. for Neurology	6	Bipolar Coagulator
Endscopy Unit	6	Upper Gastrofiberscope Lecture Scope
Recovery Room	6	Bedsode Monitor

CSSD	2	Autoclave
Maternity		
Ward	14	Electrocardiograph Defibrillator
Delivery Room	10	Labour Vacuum Extractor
Neonatal & Nursing	4	Phototherapy Unit Infant Incubator
Laboratory	14	Centrifuge Microscope Colorimeter
X-ray Diagnostic Equipment	9	Basic X-ray Unit Ultrasound Machine
Maintenance Workshop Tools	26	Mobile Workshop Vehicle Tool Kit for ME Equipment
Other		
Seminor & Education	2	Slide Projector Slide Screen
Maintenance Vehicles	2	Ambulance(4WD) Pick Up Car(4WD)
Laundry	2	Automatic Washer Hand Iron
Mortuary	1	Mortuary Refrigerator(2 Bodies)
Administration	1	Computer Air Conditioner

Table 3-39 Designed Equipment

Study / Evaluation Criteria
A. To be used for essential medical services.
B. To maintain basic medical services.
C. To be improved urgently due to insufficient in number because of supeannivation equipment.
D. To be use for special medical services which is most important on each facilities.
E. To be used for training of medical staff who will suport medical services in the hospitals.

	① MNC		② Mbeya		③ KCMC		④ BMC		⑤ MIB		⑥KIB		Qunt.	Reference Number	Remarks
	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study		Requested Item	
A: Out-Patient & Casualty															
1A: Room for Internal Medicine															
A01 Stethoscope	4	A・C	3	A・C	3	A・C	3	A・C	2	A・C	2	A・C	17	A1	
A02 Diagnostic Set	4	A	3	A	3	A	3	A	2	A	2	A	17	A3	
A03 Sphygmomanometer	4	A	3	A	3	A	3	A	2	A	2	A	17	A4	
A04 Examination Light	4	A・C	3	A・C	3	A・C	3	A・C	1	A・C	1	A・C	15	A8	
A05 Examination Table	4	A	3	A	3	A	3	A	1	A	1	A	15	A48	
A06 Instrument Sterilizer	4	B・C	3	B・C	3	B・C	3	B・C	1	B・C	1	B・C	15	A33	
2A: G;ynecologic clinic															
A07 Stethoscope	4	A・C	3	A・C	2	A・C	2	A・C	–	–	–	–	11	A1	
A08 Sphygmomanometer	4	A	3	A	2	A	2	A	–	–	–	–	11	A4	
A09 Weight & Height Scale	4	A	3	A	2	A	2	A	–	–	–	–	11	A9	
A10 Gynecological Exam. Unit	4	C・D	3	C・D	2	C	2	C	–	–	–	–	11	A39	
A11 Gye. Exam. IInstrument Set	4	C・D	3	C・D	2	C	2	C	–	–	–	–	11	C34～50	・It shall be offered in set
A12 Instrument Sterilizer	4	B・C	3	B・C	2	B・C	2	B・C	–	–	–	–	11	A33	
3A: Ent Clinic															
A13 Ultrasound Nebulizer	2	A	1	A	2	A	1	A	–	–	–	–	6	A62	
A14 Head Mirror	2	A	1	A	2	A	1	A	–	–	–	–	6	A64	
A15 Suction & Press Pump	2	A	1	A	2	A	1	A	–	–	–	–	6	A65	
A16 Ent Treatment Chair	2	A	1	A	2	A	1	A	–	–	–	–	6	A66	
A17 Ent Treatment Unit	2	A・C	1	A・C	2	A・C	1	A・C	–	–	–	–	6	A67	
A18 Instrument Sterilizer	2	B・C	1	B・C	2	B・C	1	B・C	–	–	–	–	6	A33	

	① MMC		② Mbeya		③ KCMC		④ BMC		⑤ MFB		⑥KIB		Qunt.	Reference Number	Remarks
	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study		Requested Item	
4A: Eye Clinic															
A19 Fundus Camera	1	C	1	C	2	D	1	C	–	–	–	–	5	E 1	
A20 Ultrasound	–	–	–	–	2	D	–	–	–	–	–	–	2	E 2	
A21 Vitrectomy Set	1	C	–	–	2	D	1	C	–	–	–	–	4	E 3	
A22 Microsurgery Set for Opht.	1	C	–	–	2	D	1	C	–	–	–	–	4	E 7	
A23 Slit Lump Microscope	1	C	1	C	2	D	1	C	–	–	–	–	5	C 2 6	·A24:Was not originally requested, but added as is
A24 Operating Microscope	1	C	–	–	2	D	1	C	–	–	–	–	4	Added	essencial equipment for eye surgery.
5A: Casualty															
A25 Stethoscope	4	A・C	2	A C	2	A C	2	A C	1	A C	1	A C	1 2	A 1	
A26 Diagnostic Set	4	A	2	A	2	A	2	A	1	A	1	A	1 2	A 3	
A27 Sphygmomanometer	4	A	2	A	2	A	2	A	1	A	1	A	1 2	A 4	
A28 Treatment Carriage	2	B	2	B	2	B	2	B	1	B	1	B	1 0	A 6	
A29 Stretcher	4	A	2	A	2	A	2	A	1	A	1	A	1 2	A 7	
A30 Manual Resuscitator, Adult	4	A・C	2	A・C	2	A・C	2	A・C	1	A・C	1	A・C	1 2	A 1 4	
A31 Manual Resuscitator, Infant	2	A・C	1	A・C	1	A・C	1	A・C	1	A・C	1	A・C	7	A 1 5	
A32 Laryngoscope set, Adult	2	A・C	2	A・C	2	A・C	2	A・C	1	A・C	1	A・C	1 0	A 1 6	
A33 Laryngoscope Set, Infant	1	A・C	1	A・C	1	A・C	1	A・C	1	A・C	1	A・C	6	A 1 7	
A34 I.V Hanger Stand	5	A	5	A	5	A	5	A	3	A	3	A	2 6	A 1 9	
A35 Defibrillator	1	A	1	A	1	A	1	A	–	–	–	–	4	A 2 6	
A36 Suction Unit, Portable	2	A	1	A	1	A	1	A	1	A	1	A	7	A 3 2	
A37 Instrument Sterilizer	2	B・C	1	B C	1	B・C	1	B・C	1	B・C	1	B・C	7	A 3 3	
6A: Physiotherapy															
A38 Bicycle Exerciser	2	A・D	1	A	–	–	1	A	–	–	–	–	4	A 7 1	
A39 Standing Bed	2	A・D	1	A	–	–	–	–	–	–	–	–	3	A 7 2	
A40 Training Mat, Platform Type	2	A・D	1	A	–	–	–	–	–	–	–	–	3	A 7 3	
A41 Joint Mat	6	A・D	–	–	–	–	–	–	–	–	–	–	6	A 7 3	
A42 Training Bet(Therapy Bed)	1	A・D	–	–	–	–	–	–	–	–	–	–	1	A 7 4	

	① MNC		② Mbeya		③ KCMC		④ BMC		⑤ MIB		⑥KIB		Qunt.	Reference Number Requested Item	Remarks
	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study			
A43 Low Frequency Therapy App.	1	A・D	1	A	1	A	1	A	–	–	–	–	4	A75	
A44 Infrared Ray Lamp	1	A・D	1	A	–	–	–	–	–	–	–	–	2	A76	
A45 Walker	5	A・D	2	A	2	A	2	A	–	–	–	–	11	A78	
A46 Wheel Chair, Adult	5	C	2	C	4	C	2	C	–	–	–	–	13	A82	
A47 Wheel Chair, Pediatric	3	C	1	C	1	C	1	C	–	–	–	–	6	A82	
A48 Timer	6	A・D	3	A	3	A	3	A	–	–	–	–	15	Added	
A49 Goniometer	1	A・D	1	A	1	A	1	A	–	–	–	–	4	A81	
A50 Ultrasound Therapy App.	1	A・D	1	C	1	C	1	C	–	–	–	–	4	A83	
A51 Ultraviolet Pay Lamp	1	A・D	1	C	1	C	–	–		–	–	–	3	A84	
A52 Traction Unit	2	A・D	–	–	–	–	–	–		–	–	–	2	Added	・A52~57:Shall be considered to be added, as was badly
A53 Parallel Bars	2	A・D	–	–	–	–	–	–	–	–	–	–	2	Added	needed because of insufficient in number.
A54 Exercise Unit	1	A・D	–	–	–	–	–	–	–	–	–	–	1	Added	
A55 Arm Balancer	1	A・D	–	–	–	–	–	–	–	–	–	–	1	Added	
A56 Muscle Stimulator	1	A・D	–	–	–	–	–	–	–	–	–	–	1	Added	
A57 Weight Band Set	1	A・D	–	–	–	–	–	–	–	–	–	–	1	Added	
B: Anaethesiology & Theater															
1B:O.T.for Grneral Surgery															
B01 Operating Lamp	2	A	1	A	2	A	2	A	–	–	–	–	7	Added	・B01,B02:
B02 Operating Lamp.Mobile Type	–	–	–	–	–	–	–	–	1	A・C	1	A・C	2	Added	
B03 General Surgery O.T.	2	A	1	A	2	A	2	A	–	–	–	–	7	C14	
B04 Minor Surgery O.T.	–	–	–	–	–	–	–	–	1	A・C	1	A・C	2	C14	
B05 Anesthesia Machine	2	A・C	1	A・C	2	A・C	2	A・C	–	–	–	–	7	C24	
B06 Electro Surgical Unit	2	A・C	1	A・C	2	A・C	2	A・C	–	–	–	–	7	C16	
B07 Ecg Monitor	2	A	1	A	2	A	2	A	–	–	–	–	7	C6	
B08 Pulse Oximeter	2	A	1	A	2	A	2	A	–	–	–	–	7	C2	
B09Defibrillators	2	A	1	A	2	A	2	A	–	–	–	–	7	C7	
B10 Suction Unit	2	A	1	A	2	A	2	A	1	A・C	1	A・C	9	C15	
B11 Minor Operating Inst. Set	–	–	–	–	–	–	–	–	2	A・C	2	A・C	4	C64, C52~62	
B12 General Surgery Inst.	3	A	3	A	3	A	3	A	–	–	–	–	12	C65, C52~62	

	① MMC		② Mbeya		③ KCMC		④ BMC		⑤ MIB		⑥KIB		Qunt.	Reference Number Requested Item	Remarks
	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study			
B13 Appendectomy Inst.	3	A	3	A	3	A	3	A	–	–	–	–	12	C70	B14:
B14 Prostatectomy Inst.	2	A	2	A	2	A	2	A	–	–	–	–	8	Added	
2B: O.T. for Orthopedic															
B15 Operating Lamp	1	A・C	1	A・C	1	A・C	1	A・D・C	–	–	–	–	4	Added	・B15:
B16 Operating Table for Orth.	1	A・C	1	A・C	1	A・C	1	A・D・C	–	–	–	–	4	C14	
B17 Lower Traction Attachment	1	A・C	1	A・C	1	A・C	1	A・D・C	–	–	–	–	4	B1～109	・B17:
B18 Anesthesia Machine	1	A・C	1	A・C	1	A・C	1	A・C	–	–	–	–	4	C24	
B19 Pulse Oximeter	1	A・C	1	A・C	1	A・C	1	A・C	–	–	–	–	4	C2	
B20 Suction Unit	1	A	1	A	1	A	1	A	–	–	–	–	4	C15	
B21 Total Hip Replacement Set	1	A	1	A	1	A	1	A・D	–	–	–	–	4		
B22 Basic Bone Operating Set	1	A	1	A	1	A	1	A・D	–	–	–	–	4		
3B: O.T. for Gynecology															
B23 Operating Lamp	1	D・C	1	D・C	1	C	1	C	–	–	–	–	4	Added	・B23:
B24 Operating Table for Neur.	1	D・C	1	D・C	1	C	1	C	–	–	–	–	4	C14	
B25 Suction Unit	1	D・C	1	D・C	1	C	1	C	–	–	–	–	4	C15	
B26 Inst. Set for Caesarean	2	D・C	2	D・C	1	C	1	C	–	–	–	–	6	C79	
4B: O.T. for Neurology															
B27 Operating Lamp	1	D・C	–	–	–	–	–	–	–	–	–	–	1	Added	・B27:
B28 Operating Table for Neur.	1	D・C	–	–	–	–	–	–	–	–	–	–	1	D1	
B29 Suction Unit	1	D・C	–	–	–	–	–	–	–	–	–	–	1	C15	
B30 Bipolar Coagulator	1	D・C	–	–	–	–	–	–	–	–	–	–	1	D2	
B31 Norve Stimulator	1	D・C	–	–	–	–	–	–	–	–	–	–	1	D3	
B32 Microsurgery Inst. Set	1	D・C	–	–	–	–	–	–	–	–	–	–	1	D4	
5B: Endscopey Unit															
B33 Upper Gastrofiberscope	1	A	1	A	1	A	1	A	–	–	–	–	4	C19	
B34 Light Source	1	B	1	B	1	B	1	B	–	–	–	–	4	C20	

	① MMC		② Mbeya		③ KCMC		④ BMC		⑤ MIB		⑥KIB		Qunt.	Reference Number Requested Item	Remarks
	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study			
B35 Lecture Scope	1	E	1	E	1	E	1	E	–	–	–	–	4	C 2 2	
B36 Camera for Endoscope	1	A	1	A	1	A	1	A	–	–	–	–	4	C 2 3	
B37 Trolley for Endoscope	1	B	1	B	1	B	1	B	–	–	–	–	4	Added	·B37:
B38 Cleaning Set	1	B	1	B	1	B	1	B	–	–	–	–	4	Added	·B38:
6B: Recovery Room															
B39 Infusion Pump	3	A	2	A	2	A	2	A	–	–	–	–	9	C 4	
B40 Bedside Monitor	3	A・C	2	A・C	2	A・C	2	A・C	–	–	–	–	9	C 1 8	
B41 ICU Bed	3	A	2	A	2	A	2	A	–	–	–	–	9	A 2 2	
B42 Suction Unit	3	A	2	A	2	A	2	A	–	–	–	–	9	C 1 5	
B43 Instrument Sterilizer	1	B・C	1	B・C	1	B・C	1	B・C	–	–	–	–	4	A 3 3	
B44 Ventilator	1	B・C	1	B・C	1	B・C	1	B・C	–	–	–	–	4	A 4 7	
7B: Cssd															
B45 Autoclave (M)	2	B	2	B・C	2	B・C	2	B・C	–	–	–	–	8	Added	·B44~45:
B46 Autoclave (S)	–	–	–	–	–	–	–	–	1	B・C	1	B・C	2	Added	
C: Maternity Ward															
1C: Ward															
C01 Stethoscope	10	A・D	–	–	–	–	–	–	–	–	–	–	10	S 1	
C02 Sphygmomanometer	10	A・D	–	–	–	–	–	–	–	–	–	–	10	S 4	
C03 Infant Scale	4	D	–	–	–	–	–	–	–	–	–	–	4	S 5	
C04 Treatment Carriage	4	D	–	–	–	–	–	–	–	–	–	–	4	S 6	
C05 Strectcher	4	D	–	–	–	–	–	–	–	–	–	–	4	S 7	
C06 Examination Tabele	4	A・D	–	–	–	–	–	–	–	–	–	–	4	A 4 8	
C07 Examination Light	4	A・D	–	–	–	–	–	–	–	–	–	–	4	S 8	
C08 Weight & Height Scale	2	D	–	–	–	–	–	–	–	–	–	–	2	S 9	
C09 Manual Resuscitator. Adult	3	A・D	–	–	–	–	–	–	–	–	–	–	3	S 1 4	
C10 Manual Resuscitator. Infant	3	A・D	–	–	–	–	–	–	–	–	–	–	3	S 1 5	
C11 Erectrocardiograph	1	A・D	1	A	1	A	1	A	–	–	–	–	4	S 1 8	
C12 I.V. Hanger Stand	10	A・D	–	–	–	–	–	–	–	–	–	–	10	S 1 9	

	① NMC		② Mbeya		③ KCMC		④ BMC		⑤ MIB		⑥KIB		Qunt.	Reference Number	Remarks
	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study		Requested Item	
C13 Landry Cart	4	B・D	–	–	–	–	–	–	–	–	–	–	4	S21	
C14 Defibrillator	1	A・D	–	–	–	–	–	–	–	–	–	–	1	S26	
2C: Delivery Room															
C15 Labour Bed	4	A・D	2	A・D	2	A	2	A	–	–	–	–	10	S24	
C16 Infusion Pump	2	A・D	1	A・D	1	A	1	A	–	–	–	–	5	S27	
C17 Vacuum Extractor	1	A・D	1	A・D	1	A	1	A	–	–	–	–	4	S31	
C18 Suction Unit. Portable	2	A・D	1	A・D	1	A	1	A	–	–	–	–	5	S32	
C19 Manual Suction Unit	2	A・D	1	A・D	1	A	1	A	–	–	–	–	5	S33	
C20 Obstetric Instrument Set	2	A・D	1	A・D	1	A	1	A	–	–	–	–	5	S61～77	・C20:
C21 End Tracual Tube	1	A・D	1	A・D	1	A	1	A	–	–	–	–	4	C51, S80	
C22 Instrument Sterilizer (M)	2	B・D	1	B・D	1	B	1	B	–	–	–	–	5	S34	
C23 Instrument Sterilizer (L)	1	B・D	–	–	–	–	–	–	–	–	–	–	1	S34	
C24 Medical Refrigerator	2	B・D	1	B・D	1	B	1	B	–	–	–	–	5	S37	
3C: Neonatal & Nursing															
C25 Nursing Bottle Warmer	2	B・D	1	B・D	1	B	1	B	–	–	–	–	5	S50	
C26 Phototherary Unit	2	A・D	2	A・D	2	A	2	A	–	–	–	–	8	S82	
C27 Fetal Heart Detector	2	A・D	1	A・D	1	A	1	A	–	–	–	–	5	A58	
C28 Infant Incubator	3	A・D	3	A・D	2	A	2	A	–	–	–	–	10	Added	・C28:
D: Laboratory															
D01 Centrifuge	1	B・C	1	B・C	1	B・C	1	B・C	1	B・C	1	B・C	6	F5	
D02 Haematocrit Centrifuge	1	B・C	1	B・C	1	B・C	1	B・C	1	B・C	1	B・C	6	F6	
D03 Spectrophotometer	1	B・C	1	B・C	1	B・C	1	B・C	–	–	–	–	4	F8	
D04 Clorimeter	1	B・C	1	B・C	1	B・C	1	B・C	2	B・C	2	B・C	8	F9	
D05 Microscope	6	B	4	B	3	B	3	B	1	B・C	1	B・C	18	F10	
D06 Teaching Microscope Head	2	B・E	1	B・E	1	B・E	1	B・E	–	–	–	–	5	F11	
D07 PH Meter	1	B・C	1	B・C	1	B・C	1	B・C	1	B・C	1	B・C	6	F12	
D08 Analytical Balance	3	B	2	B	2	B	3	B	–	–	–	–	10	F13	

	① MMC		② Mbeya		③ KCMC		④ BMC		⑤ MIB		⑥KIB		Qunt.	Reference Number Requested Item	Remarks
	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study			
D09 Hot air Oven	2	B	1	B	1	B	1	B	1	B・C	1	B・C	7	F14	
D10 Autoclave	2	B	1	B	1	B	1	B	1	B・C	1	B・C	7	F15	
D11 Flame Photometer	1	B	–	–	–	–	–	–	–	–	–	–	1	F16	
D12 Pipette.50~200ml	4	B	2	B	2	B	2	B	1	B・C	1	B・C	12	F18	
D13 Pipette.200~1000ml	4	B	2	B	2	B	2	B	1	B・C	1	B・C	12	F19	
D14 Incubator	2	B	1	B	1	B	1	B	1	B・C	1	B・C	7	F22	
E: X-ray Diagnostic Equipment															
E01 Basic X-ray Unit(B.R.S)(A)	–	–	–	–	–	–	–	–	1	A・C	1	A・C	2	G1	
E02 Basic X-ray Unit(B.R.S)(B)	1	A	1	A	1	A	1	A	–	–	–	–	4	G1	
E03 Ultrasound Machine	1	A・C	1	A・C	1	A・C	1	A・C	–	–	–	–	4	G2	
E04 Mobile X-ray Machine	1	A	1	A	1	A	1	A	–	–	–	–	4	G3	
E05 C-arm X-ray Machine	1	A	–	–	–	–	–	–	–	–	–	–	1	G4	
E06 X-ray Illumination	4	A	2	A	2	A	2	A	1	A・C	1	A・C	12	G5	
E07 Automatic Processor	1	B	–	–	–	–	–	–	–	–	–	–	1	G7	
E08 Manual Processor	–	–	1	B	1	B	1	B	1	B	1	B	5	Added	・E08:
E09 Film Dryer	–	–	1	B	1	B	1	B	–	–	–	–	3	G8	
F: maintenance Workshop Tools															
F01 Mobile Workshop Vehicle	1	B・D・C	1	B・C	1	B・C	1	B・C	–	–	–	–	4	I7	
F02 Tool Kit for Me Equipment	2	B・D・C	1	B・C	1	B・C	1	B・C	–	–	–	–	5	Added	・F02~03:
F03 Tool Kit for Mechanicals	2	B・D・C	1	B・C	1	B・C	1	B・C	–	–	–	–	5	Added	
F04 Sinnal Generator	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H1	
F05 Voltage DC Power Supply	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H2	
F06 Dual Trace Oscilloscope	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H3	
F07 Rigel Safety Tester	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H6	
F08 Dosimeter	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H7	
F09 Automatic Winding Machine	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H8	
F10 Megger Insulation Tester	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H9	
F11 Digital AV Meter	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H10	

	① MMC		② Mbeya		③ KCMC		④ BMC		⑤ MIB		⑥KIB		Qunt.	Reference Number	Remarks
	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study		Requested Item	
F12 Driver Set	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H 1 4	
F13 Hexagon Driver Set	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H 1 5	
F14 Ball Driver Set	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H 1 6	
F15 Welder Soldering Equipment	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H 1 7	
F16 Bench Magnifier	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H 1 8	
F17 Plier Set	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H 1 9	
F18 Feeler Gauges	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H 2 0	
F19 Hydrometer Battery Gage	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H 2 1	
F20 Reamers Screw Extractor	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H 2 2	
F21 Tape & Dies 1~10mm Set	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H 2 3	
F22 Tape & Dies 4~16mm Set	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H 2 4	
F23 Metal Washer Cutter Set	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	H 2 5	
F24 Electric Drill	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	Added	・F24~26:
F25 Dueled Grinder	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	Added	
F26 Vice	1	B・D・C	–	–	–	–	–	–	–	–	–	–	1	Added	
G: Other															
1G Seminer & Education															
G01 Slide Projector	1	E	1	E	1	E	1	E	1	E	1	E	6	I 3	
G02 Slide Screen	1	E	1	E	1	E	1	E	1	E	1	E	6	I 2	
2G: Maintenance Vehicles															
G03 Ambulance(4 WD)	1	A	1	A	1	A	1	A	1	A	1	A	6	I 4	
G04 Pick Up(4 WD)	1	B	–	–	–	–	–	–	–	–	–	–	1	I 6	
3G: Laundry															
G05 Automatic Washer	–	–	–	–	–	–	–	–	–	–	2	B・C	2	I 8	・G06:
G06 Hand Iron	–	–	–	–	–	–	–	–	–	–	4	B	4	Added	

	① NMC		② Mbeya		③ KCMC		④ BMC		⑤ MIB		⑥KIB		Qunt.	Reference Number	Remarks
	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study	Qunt.	Study		Requested Item	
4G: Mortuary															
G07 Mortuary Refrigerator	2	B	2	B	2	B	2	B	1	B・C	1	B・C	10	I 1 2	
5G: Administration															
G08 Computer	2	B・E	1	B・E	1	B・E	1	B・E	1	B・E	1	B・E	7	I 1 4	
G09 Air Conditioner	2	B	1	B	1	B	1	B	1	B	1	B	7	I 1	

(6) Necessity of Technical Cooperation

Most of the equipment scheduled for procurement under this project is for the renewal or supplementation of the existing equipment, and from technical aspect the present medical staff are fully able to handle it. Even if the equipment needs new skill for operation, there will happen no problems as the supplier will provide training after installation of it.

The maintenance and management of the equipment is conducted through a maintenance system of the maintenance workshop in the consultant hospitals, giving the initiative to Muhimbili Medical Centre. Although these workshops have fairly adequate organization and personnel, the system for the maintenance and management of equipment is not yet fully developed in terms of its structure, responsibility and recording system. The Ministry of Health is planning the reorganization of these sections to build up the maintenance and management system.

If the procured equipment should be utilized for a long time, an expert should be sent to the hospitals to provide technical training concerning maintenance.

2 . Subjected Facilities of the Project

The object of the project is for rehabilitation of medical services by procuring necessary medical equipment for the 6 top referral hospitals as follows.

1. Muhimbili Medical Centre (MMC)	Dar es Salam
2. Mbeya Referral Hospital (Mbeya)	Mbeya
3. Kilimanjaro Christian Medical Centre (KCMC)	Moshi
4. Bugando Medical Centre (BMC)	Mwanza
5. Mirembe Hospital (MIR)	Dodoma
6. Kibong'oto National Tuberculosis Hospital (KIB)	Moshi

3 . Implementation System of the Project

3-1 Execution Agency

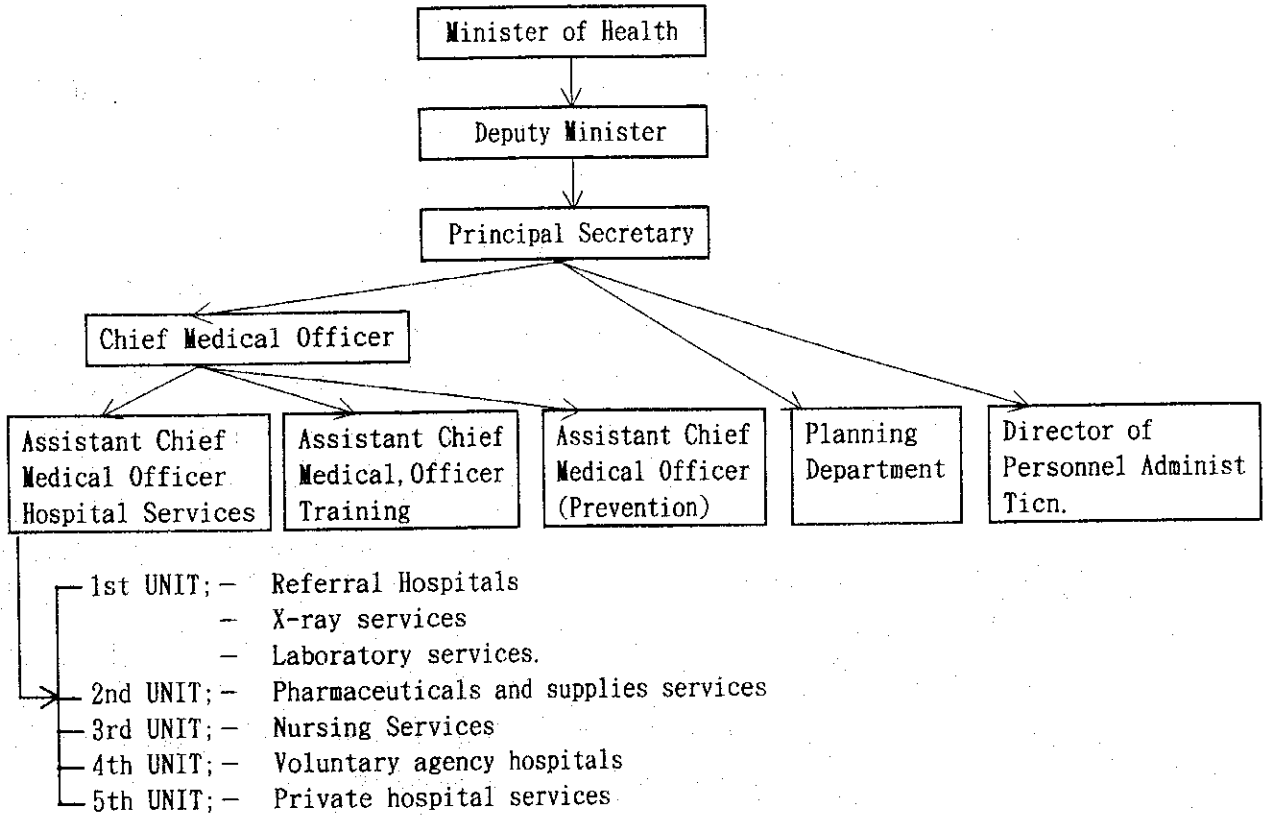
Implementation body of this Project is the Ministry of Health, Government of the Tanzania. Principal Secretary of the Ministry is the

representative of the Tanzanian side for this project and will act as main official in charge, and Assistant Chief Medical Officer of hospital services department will carry out implementation works. The subjected facilities are under the control of the hospital services department.

3-2 Organization and Staff

The following is the structure of the Ministry of Health in Tanzania, which indicates the departments concerned in this project. The project aiming at replenishing the equipment falling short due to deterioration or superannuation in the existing medical facilities now in activity, we have no particular need for any additional personnel for the equipment procured.

Fig. 3-7 MOH Organization Chart



3-3 Budget Plan

As has been thus far stated, the medical facilities concerned are in activity and necessary budgetary measures have been taken for the existing equipment. It is estimated that no special budgetary measures are required because the equipment to be procured are intended mainly to renew or make up for the existing equipment and the equipment operating cost accompanying the introduction of these equipment amounts only to several percent of the recurrent budget of each facility.

3-4 Cost of Operation and Maintenance

In the event that the projected materials are procured, we will need annual operation cost of equipment of the order of Tsh.4,531,120 (¥22,655,603) as well as the maintenance cost of Tsh.1,138,000 (¥5,690,000) including the cost of possible maintenance contract of Tsh.648,000 (¥3,240,000). The cost is broken down as follows:

(1) Operation Cost of Equipment

The principal equipment requiring the operating cost including the medical consumables are anesthesia machine, X-ray apparatus and electrocardiograph. For any other equipment it was decided that no particular operation cost will be needed additionally since their quantity procured is few and their procurement is no other than the renewal of the existing ones. As for electric charges and sewage disposal cost they were put out of the substantial calculation because their consumption is little and their cost has already been included in the operating cost of the existing facilities in activity.

Unit Price of Consummables

1) Medical Gas

① Oxgyen(O_2) : ¥1,958(Tsh 9,790)/40cm³ Cylinder

Volume ⇒ Press 150kg/cm³ × 40cm³ = 6,000 Litter

Unit Price ⇒ ¥0.3263/Litter

② Nitrous Oxide: ¥25,000(Tsh 125,000)/7.5kg Cylinder (Gas Only)
(N_2O) Volume ⇒ 1kg= 640 Litter at 28°C,
7.5kg Cylinder= 4,800 Litter
Unit Price ⇒ ¥5.2/Litter

③ Halothane : ¥3,518(Tsh 17,590) /250mL
Unit Price ⇒ ¥14.07/mL(cc)

There are used open-circuit anesthesia for appendictomy and orthopedic surgery, and close-circuit anesthesia for choledocholithotomy, nephrectomy, gastrectomy etc. in Tanzania. The following are calculation of cost for medical gas.

Consumption of Medical Gas on Close-circuit System

	Operation	Oxygen (O_2)		Nitrous Oxide (N_2O)		Halothane		
	Time	Consumption per min.	Total Consumption	Consumption per min.	Total Consumption	Density	Flow	Consumption
Pre-operation	10 min.	3.0 Litter	30 Litter	4.0 Litter	40 Litter			
Operation	130 min.	2.5 Litter	325 Litter	3.0 Litter	390 Litter	2%	5.5 Litter	71.5 mℓ
Post-operation	15 min.	2.0 Litter	30 Litter			(AV.)		
		Total	385 Litter	Total	430 Letter		TOTAL	71.5 mℓ

Consumption of Medical Gas on Open-circuit System

	Operation	Oxygen (O_2)		Nitrous Oxide (N_2O)		Halothane		
	Time	Consumption per min.	Total Consumption	Consumption per min.	Total Consumption	Density	Flow	Consumption
Pre-operation	10 min.	2.5 Litter	25 Litter	2.0 Litter	20 Litter			
Operation	30 min.	2.5 Litter	75 Litter	3.0 Litter	90 Litter	2%	5.5 Litter	16.5 mℓ
Post-operation	15 min.	2.0 Litter	30 Litter			(AV.)		
		Total	130 Litter	Total	110 Litter		Total	16.5 mℓ

※ Calculation bases: Density × Flow × 3(Coefficient) × Operation Time = Consumption(mℓ)

2) Medical Consummables

① X-ray Film : ¥3,576(Tsh 17,880) /100 sh. size 10"× 12"

Unit Price ⇒ ¥35.76/Sh.

② X-ray Film Developing Cost

Manual developing

Developing Solution : ¥118(Tsh 590) /1kg Powder ⇒ 2 Litter

Consumption ⇒ 50cc/10"× 12"film 40sh./2ℓ

Unit Price ⇒ ¥2.95/10"× 12"film

Fixing Solution : ¥226(Tsh 1,130) /1kg Powder ⇒ 2 Litter

Consumption ⇒ 50cc/10"× 12"film 40sh./2ℓ

Unit Price ⇒ ¥5.65/10"× 12"film

Automatic Developing

Developing Solution : ¥2,600(Tsh 13,000) /16 Litter

Consumption ⇒ 50cc/10"× 12" 320sh./16ℓ

Unit Price ⇒ ¥8.12/10"× 12"

Fixing Solution : ¥2,000(Tsh 10,000) /16 Litter

Consumption ⇒ 60cc/10"× 12" 266sh./16ℓ

Unit Price ⇒ ¥7.51

③ ECG paper: ¥25,000(Tsh 500,000)/100 rolls 30 meter

Number of Examination ⇒ 30 meter÷60 cm

(Consumption/Ex.) ⇒ 50 Examinations

Unit Price ⇒ ¥250/roll÷50 Ex. ⇒ ¥5/Ex.

From the above caluculation bases, operation cost for the equipment procured under the project are shown below. It is estimated to be about 113.2 million Tsh. for the 6 top referral hospitals.

1. Muhimbili Medical Centre

Anesthesia Apparatus

Method	Consumables	Consumption per Operation	Unit Price	Number of Operation		Quant	Cost per Year
				per Month	Year		
C.C.	O_2	385 litter	¥0.3263/litter	40	480	3sets	¥ 180,901
	N_2O	430 litter	¥5.2/litter	40	480		¥3,219,840
	Halothen	71.5 mℓ	¥14.07/mℓ	40	480		¥1,448,647
O.C.	O_2	130 litter	¥0.3263/litter	30	360		¥ 45,813
	N_2O	110 litter	¥5.2/litter	30	360		¥ 617,760
	Halothen	16.5 mℓ	¥14.07/mℓ	30	360		¥ 250,727
						Total	¥5,763,688

X-ray Apparatus

Consumables	Price/Film (10"x12"size)	Number of Film		Quant	Cost per Year
		per Month	Year		
X-ray Film	¥ 36.76	120shp	1,440shp	2sets	¥ 105,869
Developing Solution	¥ 8.12	120shp	1,440shp		¥ 23,386
Fixing Solution	¥ 7.51	120shp	1,440shp		¥ 21,629
				Total	¥ 150,884

Calculation are based on automatic processing unit.

Electrocardiograph

Consumables	Cost/Test	Number of Test		Quant	Cost per Year
		per Month	Year		
Recording Paper	¥ 5	80	960	1	¥ 4,800

Cost of Medical Consumables for designed equipment: Tsh 29,596,860.-

2. Mbeya Referral Hospital

Anesthesia Apparatus

Method	Consumables	Consumption per Operation	Unit Price	Number of Operation per Month	Number of Operation Year	Quant	Cost per Year
C.C.	O_2	385 litter	¥0.3263/litter	40	480	2sets	¥ 120,600
	N_2O	430 litter	¥5.2/litter	40	480		¥2,146,560
	Halothen	71.5 mℓ	¥14.07/mℓ	40	480		¥ 965,765
O.C.	O_2	130 litter	¥0.3263/litter	30	360		¥ 30,542
	N_2O	110 litter	¥5.2/litter	30	360		¥ 411,840
	Halothen	16.5 mℓ	¥14.07/mℓ	30	360		¥ 83,576
						Total	¥3,758,883

X-ray Apparatus

Consumables	Price/Film (10"x12"size)	Number of Film per Month	Number of Film Year	Quant	Cost per Year
X-ray Film	¥ 36.76	120shp	1,440shp	2sets	¥ 105,869
Developing Solution	¥ 2.95	120shp	1,440shp		¥ 8,496
Fixing Solution	¥ 5.65	120shp	1,440shp		¥ 16,272
				Total	¥ 130,637

Calculation are based on manual processing system.

Electrocardiograph

Consumables	Cost/Test	Number of Test per Month	Number of Test Year	Quant	Cost per Year
Recording Paper	¥ 5	80	960	1	¥ 4,800

Cost of medical consumables for designed equipment: Tsh 19,471,600.-

3. Kilimanjaro Christian Medical Centre

Anesthesia Apparatus

Method	Consumables	Consumption per Operation	Unit Price	Number of Operation		Quant	Cost per Year
				per Month	Year		
C.C.	O_2	385 litter	¥0.3263/litter	40	480	3sets	¥ 180,901
	N_2O	430 litter	¥5.2/litter	40	480		¥3,219,840
	Halothen	71.5 mℓ	¥14.07/mℓ	40	480		¥1,448,647
O.C.	O_2	130 litter	¥0.3263/litter	30	360		¥ 45,813
	N_2O	110 litter	¥5.2/litter	30	360		¥ 617,760
	Halothen	16.5 mℓ	¥14.07/mℓ	30	360		¥ 250,727
						Total	¥5,763,688

X-ray Apparatus

Consumables	Price/Film (10"x12"size)	Number of Film		Quant	Cost per Year
		per Month	Year		
X-ray Film	¥ 36.76	140shp	1,680shp	2sets	¥ 123,514
Developing Solution	¥ 2.95	140shp	1,680shp		¥ 9,912
Fixing Solution	¥ 5.65	140shp	1,680shp		¥ 18,984
				Total	¥ 152,410

Calculation are based on manual processing system.

Electrocardiograph

Consumables	Cost/Test	Number of Test		Quant	Cost per Year
		per Month	Year		
Recording Paper	¥ 5	80	960	1	¥ 4,800

Cost of medical consumables for designed equipment: Tsh 29,604,490.-

4. Bugando Medical Centre

Anesthesia Apparatus

Method	Consumables	Consumption per Operation	Unit Price	Number of Operation		Quant	Cost per Year
				per Month	Year		
C. C.	O_2	385 litter	¥0.3263/litter	50	600	3sets	¥ 226,126
	N_2O	430 litter	¥5.2/litter	50	600		¥4,024,800
	Halothen	71.5 mℓ	¥14.07/mℓ	50	600		¥1,810,809
O. C.	O_2	130 litter	¥0.3263/litter	20	240		¥ 30,542
	N_2O	110 litter	¥5.2/litter	20	240		¥ 411,840
	Halothen	16.5 mℓ	¥14.07/mℓ	20	240		¥ 167,152
						Total	¥6,671,269

X-ray Apparatus

Consumables	Price/Film (10"x12"size)	Number of Film		Quant	Cost per Year
		per Month	Year		
X-ray Film	¥ 36.76	120shp	1,440shp	2sets	¥ 105,869
Developing Solution	¥ 2.95	120shp	1,440shp		¥ 8,496
Fixing Solution	¥ 5.65	120shp	1,440shp		¥ 16,272
				TOTAL	¥ 130,637

Calculation are based on manual processing system.

Electrocardiograph

Consumables	Cost/Test	Number of Test		Quant	Cost per Year
		per Month	Year		
Recording Paper	¥ 5	80	960	1	¥ 4,800

Cost of medical consumables for designed equipment: Tsh 34,033,530.-

5. Mirembe Hospital

Anesthesia Apparatus

Method	Consumables	Consumption per Operation	Unit Price	Number of Operation		Quant	Cost per Year
				per Month	Year		
C.C.	O_2	385 litter	¥0.3263/litter				
	N_2O	430 litter	¥5.2/litter				
	Halothen	71.5 mℓ	¥14.07/mℓ				
O.C.	O_2	130 litter	¥0.3263/litter				
	N_2O	110 litter	¥5.2/litter				
	Halothen	16.5 mℓ	¥14.07/mℓ				
						Total	

X-ray Apparatus

Consumables	Price/Film (10"x12"size)	Number of Film		Quant	Cost per Year
		per Month	Year		
X-ray Film	¥ 36.76	90shp	1,080shp	1 set	¥ 39,701
Developing Solution	¥ 2.95	90shp	1,080shp		¥ 3,186
Fixing Solution	¥ 5.65	90shp	1,080shp		¥ 6,102
				Total	¥ 48,989

Calculation are based on manual processing system.

Electrocardiograph

Consumables	Cost/Test	Number of Test		Quant	Cost per Year
		per Month	Year		
Recording Paper	¥ 5				

Cost of medical consumables for designed equipment: Tsh 244,945.-

6. Kibong'oto National Tuberculosis Hospital

Anesthesia Apparatus

Method	Consumables	Consumption per Operation	Unit Price	Number of Operation		Quant	Cost per Year
				per Month	Year		
C.C.	O_2	385 litter	¥0.3263/litter				
	N_2O	430 litter	¥5.2/litter				
	Halothen	71.5 mℓ	¥14.07/mℓ				
O.C.	O_2	130 litter	¥0.3263/litter				
	N_2O	110 litter	¥5.2/litter				
	Halothen	16.5 mℓ	¥14.07/mℓ				
						Total	

X-ray Apparatus

Consumables	Price/Film (10"x12"size)	Number of Film		Quant	Cost per Year
		per Month	Year		
X-ray Film	¥ 36.76	120shp	1,440shp	1 set	¥ 52,934
Developing Solution	¥ 2.95	120shp	1,440shp		¥ 4,248
Fixing Solution	¥ 5.65	120shp	1,440shp		¥ 8,136
				Total	¥ 65,318

Calculation are based on manual processing system.

Electrocardiograph

Consumables	Cost/Test	Number of Test		Quant	Cost per Year
		per Month	Year		
Recording Paper	¥ 5				

Cost of medical consumables for designed equipment: Tsh 326,590.-

Total operation cost of equipment for

6 top-referral hospitals: Tsh 4,531,120.-

(2) Maintenance Cost of Equipment

Table 3-40 below indicates the costs of periodically replaced parts and maintenance service contract required for their maintenance after a year of manufacturers'guarantee period. The cost was calculated on the assumption that their service life will be 7 to 10 years. The maintenance service contract comprises the periodical inspection of three times a year and engineering fee for repair when the equipment fall in trouble (the parts cost excluded). The estimated total annual cost is petty, only 0.0086% (Tsh 1.13 million or ¥5,690,000) of the total approved budget of the Ministry of Health 1993/94 (Tsh 13,144 million or ¥65,720,000,000).

As the following periodical replacement parts will be included in each equipment as spare parts (one piece for each equipment), maintenance cost will be somewhat lightened for the time being. However, as mentioned above, the service life of the equipment will be 7 to 10 years. The Tanzanian side is recommended to make depreciation reserves for its replacement in future.

The total amount of the equipment which may require depreciation reserves is Tsh.2,500 million and depreciation reserves for each year will be Tsh.281.3 million on the calculation that the service life of the equipment is fixed at eight years.

Table 3-40 Cost of Periodical Replacement Parts and Maintenance Service Contract

Equipment	Periodical Replacement Parts				Quant.	Total	Cost of Maintenance Contr
	Parts	Unit Price	Periodical	Avnual Cost			
X-ray Apparatus (WHO Model)	X-ray Tube	¥0.75M.	3 Year	¥ 250,000	6 Sets	¥1,500,000	@200,000x6 ¥1,200,000
Surgical Immage X-ray Unit	X-ray Tube II-Tube	¥0.60M. ¥1.00M.	3 Year 5 Year	¥ 200,000 ¥ 220,000	1 Set	¥ 200,000 ¥ 220,000	¥ 250,000
Mobile X-ray Unit	X-ray Tube	¥0.40M.	5 Year	¥ 80,000	4 Sets	¥ 320,000	@150,000x4 ¥ 600,000
Ultrasonic Scanner	Sector Probe Lianer Probe	¥0.60M. ¥0.30M.	4 Year 4 Year	¥ 150,000 ¥ 100,000	4 Sets	¥ 600,000 ¥ 400,000	@100,000x4 ¥ 400,000
					Total	¥3,240,000	¥2,450,000

3-5 Operation and Maintenance System

As mentioned above, the Referral Hospitals at present have Biomedical Engineering Centre under the control of Maintenance Engineering Department. However, since the engineers and equipment of the Centre have been organized with more emphasis on general facilities than medical equipment, the maintenance of the latter is not fully supported by an adequate maintenance system. In relation to the execution of this project, it is considered necessary that the organization of Maintenance Engineering Department, the maintenance system, and the maintenance budget should be reorganized, reformed, and improved as follows.

(1) Reorganization of Maintenance System

The conventional organization did not have horizontal linkage and cooperation system among different institutions. Each site having its peculiar administration system for maintenance, a large difference is observed with the organization for equipment maintenance as a whole. No clearcut delimitation has been drawn in the communication system with the Ministry of Health as regards the failure and subsequent repair of equipment, a line of command in the organization and the responsibility of the engineers in charge of maintenance. To cope with these problems, it is therefore necessary to establish such organization as shown in Fig. 3-8. The organization shall be incorporated and developed into the maintenance department (workshop) as provided actually in the Muhinbili Medical Centre to establish the repairing center for medical equipment. The nation shall be divided into 4 blocks with outpost at each general hospital and 2 to 3 technical persons shall reside there. These technical persons shall take charge of any minor failures or malfunction. For intricate failures or troubles technical experts shall be dispatched from the maintenance department of the Muhinbili Medical Centre, and in case the reconditioning or refit is impracticable the dispatched persons shall return to the centre to ask the agents of the manufacturers to repair. Further the repairing centre shall dispatch their technical persons to regional medical facilities to cover basically the maintenance of any and all medical equipment. The technical persons residing at each site

shall be assigned their respective equipment to be taken charge of to delimit their responsibility for any failure of equipment.

In this organization, each engineer in charge of an equipment unit will be responsible for the routine inspection and the instruction to the operator concerning the proper use of the unit.

Furthermore, in future, it is hoped that the Biomedical Engineering Centre will grow independently as a Biomedical Engineering Section as a part of MOH, and hoped that engineers will be posted in Muhimbili Medial Centre like other general hospitals, so that the command system will be established in the organization.

Figure 3-8 HOSPITAL MAINTENANCE NEW ORGANIZATION STRUCTURE

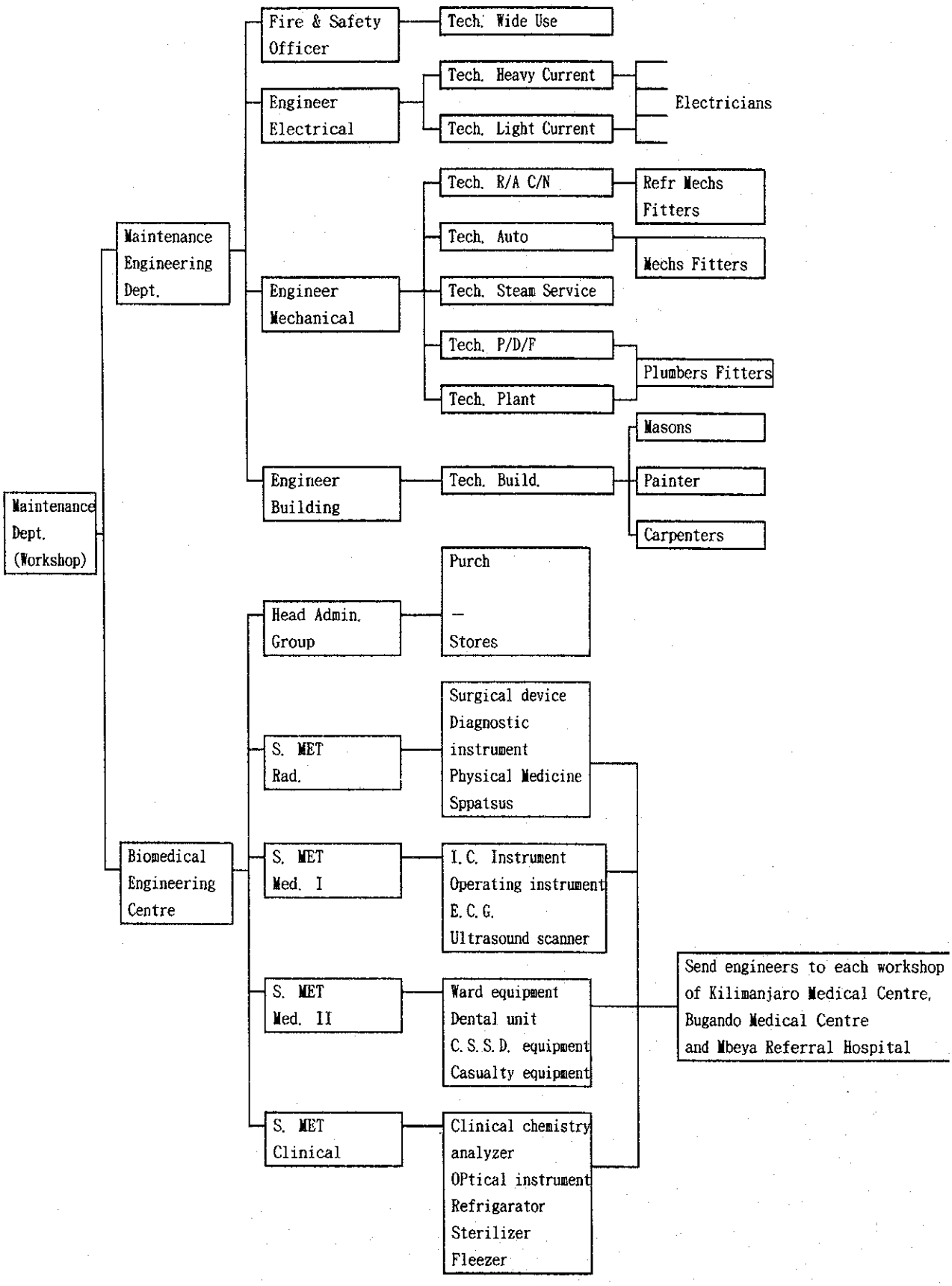


Table 3-41 Maintenance Service Area

Zone	Maintenance Service Area	Institution in Charge
1. Central Zone	Tanga, Morogoro, Coast, Dares Salaam and Zanzibar	Muhimbili Medical Centre Biomedical Engineering Services Centre
2. North Highlands Zone	Arusha and Kilimanjaro	Kilimanjaro Medical Centre Biomedical Engineering Services Workshop
3. Lake Zone	Tabora, Kigoma, Shinyanga Kagera, Mwanza, and Mara	Bugando Medical Centre Biomedical Engineering Services Workshop
4. Central Zone	Dodoma, Singida, Iringa, Mbeya, Rukwa, Lindi, Mtwara, and Ruvuma	Mbeya Referral Hospital Biomedical Engineering Services Workshop

※ Biomedical Engineering Centre takes charge of equipment maintenance of medical institutions for all regions as well as the task share shown above.

(2) Innovation of the Maintenance System

According to the vertical channels of communication, the maintenance system should be organized as follows:

1) Recording System

The following recording forms should be provided in order to enable comprehensive and strict maintenance. These forms should be maintained for an indiviual unit of the equipment.

① Equipment Record Card

The registration number, date of procurement, position of installation, name of manufacturer, year of manufacture, model, service life, name of sales agent, conditions of maintenance contract, name of the section in charge, and other basic information should be recorded on this card and controlled cellectively.

② Weekly/Monthly Works Sheet

Regular inspection should be conducted daily, weekly, and monthly according to the conditions of maintenance and the frequency of use. The results of inspection should be recorded on this sheet by the engineer who conducted inspection. The engineer should try to detect abnormal conditions and troubles so that serious troubles can be avoided.

③ Preventive Maintenance Work Order

Checking of periodically replaced parts and inspection of the performance and the working conditions of the equipment should be conducted at intervals of 6 months or 1 year. If there are damaged parts or parts requiring replacement, these should be recorded and adequate action should be taken.

④ Corrective Maintenance Work Order

On the request for repair, the personnel in charge of the equipment should conduct the repairs, referring to the results of provious regular inspection and previous repairs, and record the results of the work. The cost of repairs should be charged on the relevant personnel in the field, so that they will be aware of the costs.

2) System of Responsibility

① A person should be assigned to take charge of each equipment, and this person should control the above recording system with responsibility.

② Each section should assign an engineer in charge of each equipment, who takes responsibility for the proper use and management of the equipment in the field.

③ An engineer in charge shall be given the authority to give advice and instruction concerning the proper handling of equipment to medical personnel in the field.

④ An engineer in charge of maintenance should take responsibility for the equipment which he is requested to repair until the completion of repair. If the repair is impossible, the fact should be noticed to the relevant section with the reasons and recommended measures.

Fig. 3-9 Communication Concerning the Request of Repair

Person in charge of the management of equipment

↓ Submit the request for repair.

Person in charge of medical equipment in a division

↓ Confirm the contents of the above request for repair and notify
↓ it to Biomedical Engineering

Biomedical Engineering Services
Person in charge of maintenance

↓ Confirm the contents of the request for repair and assign the
↓ person to take charge of the repair.

Management Section of Biomedical Engineering

↓ Record the contents of request and notify to the person in
↓ charge.

Maintenance engineer in charge of the equipment
Person in charge of maintenance

↓ Record repair works, inspection, and the result of repair.
↓ Deliver the equipment via Biomedical Engineering to the section
↓ using it.
↓ If repair is impossible, write the reasons and recommended
↓ measures on the request sheet and return it to the person in
↓ charge of medical equipment in the division. Decide on
↓ necessary actions, such as the purchase of parts.

Biomedical Engineering Services

↓ Record the history of repair and the cost of repair.

Person in charge of medical equipment in a division

↓ Confirm the operation of the equipment and deliver it to the
↓ person in charge of the management of equipment.

3-6 Maintenance Service System by Private Agent

(1) Current situation of Maintenance Services by Private Sectors

Almost no medical equipment is produced in the United Republic of Tanzania. The country depends for most of such equipment on the importation from other countries. When a local agent of a foreign manufacturer sells a machine, the agent and the customer, or a medical institution in this case, make various service contracts ranging from a spot repair contract, under which the agent visits the customer only when a trouble has occurred, to a comprehensive maintenance contract including regular inspection. The type of contract is determined according to the frequency of use, the grade of equipment, and the urgency of repair. Private medical institutions which have affluent financial resources enter into maintenance contracts for advanced medical equipment and receives nearly perfect services. The equipment installed at such private institutions is maintained in excellent conditions, and the machines are rarely out of order or out of use. Spare parts and supplies are also provided smoothly. Some of the local agents do maintenance service of x-ray unit, which is well within the bounds of their technology.

(2) List of Local Agents of Manufacturers

Table 3-42 lists major local agents of medical equipment which is widely used in Tanzania. There are a few companies in Tanzania who represent overseas manufacturers, so some equipment shall be maintained through local agents in Kenya.

Table 3-42 Local Agent of Main Medical Equipment

Company Name	Address	Main Handling Items
TANZANIA		
1. Lab Equipment Exports Ltd.	P. O. Box 20254 DRS	Binocular electrical microscope, Surgical Instrument, Electro-Cardiograph, Analytical Balance
2. Mokashi Medical System and Electronic Ltd.	P. O. Box 1778 DRS	X-ray apparatus, Ultrasound scanner
3. Palray Ltd.	P. O. Box 1913 DRS	Beds, Chairs
4. Raha Beds Ltd.	P. O. Box 1916 DRS	Bed
5. Survet Ltd.	P. O. Box 20089 DRS	Stethoscope, Sphygmoma nometer, Bed, Couch
6. Elite Computers (T) Ltd.	P. O. Box 19817 DRS	Personal Computer, Printer
KENYA		
1. Meditec System Ltd.	P. O. Box 48698 NRB	X-ray apparatus, Ultrasound scanner
2. Nairobi X-ray Supplies	P. O. Box 41669 NRB	X-ray apparatus, Ultrasound scanner, ME equipment
3. United Import Agencies	P. O. Box 43951 NRB	X-ray apparatus, Ultrasound scanner, ME equipment
4. Kodak (K) Ltd.	P. O. Box 18210 NRB	Automatic phocessor, Film
5. Medical & Healthcare Industries	P. O. Box 60647 NRB	Electrosurgical unit, Suction unit, Operating table
6. Coulter Electronics Ltd.	P. O. Box 25157 NRB	Blood gas analyzer, Blood cell counter
7. Bayer Diagnostics	P. O. Box 30321 NRB	Clinical chemistry analyzer
8. Sciencescope Ltd.	P. O. Box 72963 NRB	Microscope, Optical instrument

4. Basic Design

4-1 Design Policy

1) Scale and Scope of the Project

The scope of the cooperation in the Project shall be as follows:

1. The Project aims at the recovery of consultation function of the medical service activities of the subjected facilities that will be required by most of the patients and whose renewal and or refit will be most urgent.

2. The scale of the Project shall be within the range of the operating and administrative capability of the respective facilities forming the subject of the Project.

3. The scope of the Project shall be within the range of the financial and technical sustainability (autonomous development) of the respective facilities forming the subject of the Project.

4. The contents of the Project shall not overlap with other foreign aids.

2) Criteria for Selection of Equipment

The selection standards of the projected equipment are as follows:

<Standards as Viewed from Demand>

1. The projected equipment shall endure the natural conditions (high temperature, high humidity) in Tanzania.

2. The projected equipment shall be provided principally for basic medical service.

3. The projected equipment shall be intended for diagnosis and therapy of diseases, not for research and study.

4. The existing equipment that are either dilapidated or out of order shall be renewed or replenished.

5. The projected equipment shall be those which will require urgent renewal or replacement among the existing equipment whose absolute number is short.

6. The projected equipment shall not necessitate any fostering of medical personnel but be able to be coped with by the current technical level of the personnel.

7. The projected equipment shall be those whose operating cost after introduction will be relatively inexpensive and that can be financially maintained by the respective facilities forming the subject of the Project.

<Standards as Viewed from Technical Facet>

1. The equipment procurement plan shall be laid down setting, in terms of the scale, range and content of the activities of the facilities forming the subject of the Project, the level of a part of the projected equipment such as for operation theatre and radiodiagnosis, into: ① that of consultant hospitals and ② that of special hospitals.

2. The operation theatres of respective consultant hospitals that are most frequently used and whose equipment extremely are impoverished (1 to 3 rooms) shall be renewed or improved. The projected equipment shall be those versatile ones that will be able to back up the activities of general hospitals and be commonly used with other surgery departments.

3. The medical equipment to be used in the operation theatres of special hospitals shall be renewed or replenished in good match with the actual medical activities in the light of their use frequency and the nature of the operations; for instance, the glareless lamp

(operating lamp) shall be mobile type with four bulbs and the operating table shall be for minor surgical operation.

4. Also improved shall be such auxiliary equipment as postoperative recovery room, central sterilized supply department and other related departments that will support the basic medical services of internal, surgical, pediatric, and obstetrics/gynecology departments.
5. The special hospitals located in the region with poor electric power supply shall be provided with the X-ray apparatus incorporating an electrical storage sets that will be operable even when the power fails or reduces.

6. To avoid the failure of precision electronic equipment due to voltage fluctuation, an auto voltage regulator shall be provided that can cope with ±15% voltage variation.

7. To back up the consolidation of the maintenance system promoted by Ministry of Health, an mobile workshop vehicle shall be provided in four workshops nationwide (one car for each workshop) and a pick-up car (intended for transfer of engineers and equipment) shall be provided for the workshop of the Muhinbili Medical Center that will stand as the center of the maintenance system.

8. The respective workshops shall be furnished with the maintenance tool kits required for maintenance of the medical equipment to reinforce the maintenance departments (workshops).

9. Also projected shall be the provision, with the equipment as programmed, of the repair parts, periodical replacement parts required 2 to 3 years after execution of the Project as well as the consumables and other supplies required for the initial operation of the equipment. The parts shall be divided into two categories: general repair parts that can be readily available for easy repairing including bulbs, fuses, lens of microscopes, valves of

sphygmomanometers, door packings of incubators, gaskets/heaters of autoclaves on the one hand, and on the other, the technical parts whose 1 to 2 pieces will suffice for plural equipment such as the probes of ultrasound PCB, valves of autoclaves, mechanical parts of radiological equipment. The general repair parts shall be supplied respectively into the four workshops, while the technical parts shall be integrally furnished to the workshop of Muhinbili Medical Center, thus securing the central control system. Any and all consumables shall be taken charge of by the department in charge of the respective facilities forming the subject of the Project.

10. X-ray apparatuses, ultrasound machines and others shall be procured from a third country taking into due consideration that the medical engineers of the facilities concerned are most familiar with their manipulation from long years of experience and that the maintenance system has been established by the agents of their manufacturer.

11. As for the facilities with poor radiological protection in the rooms to be provided with X-ray apparatuses such as Mirembe Hospital and Kibong'ot Tuberculosis Hospital, the walls shall be coated with barium plaster within the framework of the Project so that the IAEA's standard for radiologic protection should be met. Further any and all windows and breathers whose height is not more than the maximum value of the X-ray generating tube shall be either blocked with concrete or else shielded with lead rubber sheet or lead sheet with 1.5 mPb or higher lead equivalent. Similarly any and all doors without radiological protection shall be shielded either with lead rubber sheet or with lead sheet.

12. In order to overcome the environmental pollution problems in future, the refrigerators for medical supplies and air conditioners, for instance, shall be of the type that will use non-Freon gas (three Foreon gas mixed).

4-2 Examination of Design Condition

The design accuracy between the basic design and the detailed designs relating to the present Project is set within ±10%. For laying down the scale and specifications of the Project, the subjected facilities are roughly divided, in terms of their activities and scale, into: large-sized consultant hospital with 400 to 1,500 beds and relatively small hospitals with 150 to 250 beds. Then according to the type of medical service the numbers of patients are estimated as follows.

Table 3-43 Estimated Numbers of Patients According to the Type of Medical Service

Department	Content of Services	Estimated number of patients	
		Consultant Hospital Muhimbili Medical Centre Mbeya Referral Hospital Kilimanjaro Christian Medical Centre Bugando Medical Centre	Special Hospital Mirembe Hospital Kibong'oto National Tuberculosis Hospital
Out-Patient & Casualty	General Out-Patient Cinteanal	1,057~1,317Per./Day	170~240Per./Day
	Medicion Miner Surgery Pediatric		
	Ob-Gyn	140~ 163Per./Day	————
	Ent	60~ 72Per./Day	20~ 25Per./Day
	Ophthalmology	60~ 88Per./Day	10~ 20Per./Day
	Casualty	10~ 17Per./Day	6~ 10Per./Day
	Physiotherapy	30~ 61Per./Day	————
Anesthesia & Operation	Major Operation	3~ 6Per./Day	————
	Minor Operation	3~ 6Per./Day	2~ 3Per./Day
	Orthopedic Suraery	4~ 5Per./Day	————
	Gynecology	3~ 5Per./Day	————
	Neuro-Suraery	1~ 2Per./Day	————
	Endoscopy Examination	3~ 4Per./Day	————
	Post Operation	7~ 10Per./Day	
	C.S.S.D.	6~ 10m³	2~ 3m³

Department	Content of Services	Estimated number of patients	
		Consultant Hospital Muhimbili Medical Centre Mbeya Referral Hospital Kilimanjaro Christian Medical Centre Bugando Medical Centre	Special Hospital Mirembe Hospital Kibong'oto National Tuberculosis Hospital
Clinical Laboratory	Blood Chemistry	150~ 188Test/Day	20~ 22Test/Day
	Micro Biology	30~ 38Test/Day	18~ 24Test/Day
	Parasitlogy	35~ 41Test/Day	25~ 34Test/Day
	Immunology	20~ 28Test/Day	————
Radio Diagnosis	X-Ray Examination(Barium Study)	10~ 20Ex. /Day	————
	(Single X-Ray)	240~ 250Ex. /Day	15~ 18Test/Day
	Ultrasonic Scanner(Interial MED)	20~ 22Ex. /Day	————
	(Obstetrics)	27~ 30Ex. /Day	————
Maintenance	Moble Workshop Vehicles	13Time, 1,500km/Mo.	13Time, 1,500km/Mo.
Others	Ambulance	35Time, 1,000km/Mo.	35Time, 1,000km/Mo.
	Maintenance Vehicles	8Time, 3,200km/Mo.	————
	Murtuary Refrigerator	16Body x 3Day/Mo.	10Bodyx 3.5Day/Mo.

4-3 Basic Plan

(1) Equipment Distribution Plan

Based on the basic design policies and conditions described above, the quantities and kind of items which was considered appropriate were as follows:

Table 3-44 Projected Equipment

	MMC	MBEYA	KCMC	BMC	MIR	KIB	TOTAL
A: Out-patient & Casuatly							
1A : Consultation Room for Internal Medicine							
A01 Stethoscope	4	3	3	3	2	2	17
A02 Diagnostic Set	4	3	3	3	2	2	17
A03 Sphygmomanometer	4	3	3	3	2	2	17
A04 Examination Light	4	3	3	3	1	1	15
A05 Examination Table	4	3	3	3	1	1	15
A06 Instrument Sterilizer	4	3	3	3	1	1	15
2A : Gynecologic Clinic							
A07 Stethoscope	4	3	2	2	-	-	11
A08 Sphygmomanometer	4	3	2	2	-	-	11
A09 Weight & Height Scale	4	3	2	2	-	-	11
A10 Gynaecological Exam. Unit	4	3	2	2	-	-	11
A11 Gynaecological Exam. Instrument Set	4	3	2	2	-	-	11
A12 Instrument Sterilizer	4	3	2	2	-	-	11
3A : ENT Clinic							
A13 Ultrasonic Nebulizer	1	1	1	1	-	-	4
A14 Head Mirror	1	1	1	1	-	-	4
A15 Suction & Press Pump	1	1	1	1	-	-	4
A16 ENT Treatment Chair	1	1	1	1	-	-	4
A17 ENT Treatment Unit	1	1	1	1	-	-	4
A18 Instrument Sterilizer	1	1	1	1	-	-	4
4A : Eye Clinic							
A19 Fundus Camera	1	1	1	1	-	-	4
A20 Ultrasound	-	-	1	-	-	-	1
A21 Vitrectomy Set	1	-	1	1	-	-	3
A22 Microsurgery Set for Opthalmology	1	-	1	1	-	-	3
A23 Slit Lamp Microscope	1	1	1	1	-	-	4
A24 Operating Microscope	1	-	1	1	-	-	3
5A : Casualty							
A25 Stehoscope	4	2	2	2	1	1	12
A26 Diagnostic Set	4	2	2	2	1	1	12
A27 Sphygmomanometer	4	2	2	2	1	1	12

	MMC	MBEYA	KCMC	BMC	MIR	KIB	TOTAL
A28 Treatment Carrige	2	2	2	2	1	1	10
A29 Strecher	4	2	2	2	1	1	12
A30 Manual Resuscitator, Adult	4	2	2	2	1	1	12
A31 Manual Resuscitator, Infant	2	1	1	1	1	1	7
A32 Laryngoscope Set, Adult	2	2	2	2	1	1	10
A33 Laryngoscope Set, Infant	1	1	1	1	1	1	6
A34 I.V. Hanger Stand	5	5	5	5	3	3	26
A35 Defibrillator	1	1	1	1	-	-	4
A36 Suction Unit, Portable	2	1	1	1	1	1	7
A37 Instrument Sterilizer	2	1	1	1	1	1	7
6A : Physiotherapy							
A38 Bicycle Exerciser	2	1	-	1	-	-	4
A39 Standing Bed	2	1	-	-	-	-	3
A40 Training Mat, Platform Type	2	1	-	-	-	-	3
A41 Joint Mat	6	-	-	-	-	-	6
A42 Training Bed (Therapy Bed)	1	-	-	-	-	-	1
A43 Low Frequency Therapy Apparatus	1	1	1	1	-	-	4
A44 Infrared Ray Lamp	1	1	-	-	-	-	2
A45 Walker	5	2	2	2	-	-	11
A46 Wheel Chair, Adult	5	2	2	4	-	-	13
A47 Wheel Chair, Pediatric	3	1	1	1	-	-	6
A48 Timer	6	3	3	3	-	-	15
A49 Goniometer	1	1	1	1	-	-	4
A50 Ultrasonic Therapy Apparatus	1	1	1	1	-	-	4
A51 Ultraviolet Ray Lamp	1	1	1	-	-	-	3
A52 Traction Unit	2	-	-	-	-	-	2
A53 Parallel Bars	2	-	-	-	-	-	2
A54 Exercise Unit	1	-	-	-	-	-	1
A55 Arm Balancer	1	-	-	-	-	-	1
A56 Muscle Stimulator	1	-	-	-	-	-	1
A57 Weight Band Set	1	-	-	-	-	-	1
B: Anaethesiology & Theatere							
1B : O.T. for General Surgery							
B01 Operating Lamp	2	1	2	2	-	-	7
B02 Operating Lamp, Mobile stand type	-	-	-	-	1	1	2
B03 Operating Table for General Surgery	2	1	2	2	-	-	7
B04 Operating Table for Minor Surgery	-	-	-	-	1	1	2
B05 Anesthesia Machine w/Ventirator	2	1	2	2	-	-	7
B06 Electro-surgical Unit	2	1	2	2	-	-	7
B07 ECG Monitors	2	1	2	2	-	-	7
B08 Pulse Oximeter	2	1	2	2	-	-	7
B09 Defibrillators	2	1	2	2	-	-	7
B10 Suction Unit	2	1	2	2	1	1	9

	MMC	MBEYA	KCMC	BMC	MIR	KIB	TOTAL
B11 Minor Operating Instrument Set	-	-	-	-	2	2	4
B12 Instrument Set for General Surgery	3	3	3	3	-	-	12
B13 Instrument Set for Appendicetomy	3	3	3	3	-	-	12
B14 Instrument Set for Prostatectomy	2	2	2	2	-	-	8
2B : O.T. for Orthopedic							
B15 Operating Lamp	1	1	1	1	-	-	4
B16 Operating Table for Orthopedic	1	1	1	1	-	-	4
B17 Lower Leg Traction Attachement	1	1	1	1	-	-	4
B18 Anesthesia Machine	1	1	1	1	-	-	4
B19 Pulse Oximeter	1	1	1	1	-	-	4
B20 Suction Unit	1	1	1	1	-	-	4
B21 Basic Set for Total Hip Replacement	1	1	1	1	-	-	4
B22 Basic Bone Operation Set	1	1	1	1	-	-	4
3B : O.T. for Gynecology							
B23 Operating Lamp	1	1	1	1	-	-	4
B24 Operating Table for Gynecology	1	1	1	1	-	-	4
B25 Suction Unit	1	1	1	1	-	-	4
B26 Instrument Set for Caesarean	2	2	1	1	-	-	6
4B : O.T. for Neurology							
B27 Operating Lamp	1	-	-	-	-	-	1
B28 Operating Table for Neurology	1	-	-	-	-	-	1
B29 Suction Unit	1	-	-	-	-	-	1
B30 Bipolar Coagulator	1	-	-	-	-	-	1
B31 Norve Stimulater	1	-	-	-	-	-	1
B32 Microsurgery Instrument Set	1	-	-	-	-	-	1
5B : Endscopey Unit							
B33 Upper Gastrofiberscope	1	1	1	1	-	-	4
B34 Light Source	1	1	1	1	-	-	4
B35 Lecture Scope	1	1	1	1	-	-	4
B36 Camera for Endoscope	1	1	1	1	-	-	4
B37 Trolley for Endoscope	1	1	1	1	-	-	4
B38 Cleaning Set	1	1	1	1	-	-	4
6B : Recovary Room							
B39 Infusion Pump	3	2	2	2	-	-	9
B40 Bedside Monitor	3	2	2	2	-	-	9
B41 ICU Bed	3	2	2	2	-	-	9
B42 Suction Unit	3	2	2	2	-	-	9
B43 Instrument Sterilizer	1	1	1	1	-	-	4
B44 Ventilator	1	1	1	1	-	-	4

	MMC	MBEYA	KCMC	BMC	MIR	KIB	TOTAL
7B : C S S D							
B45 Autoclave (M)	2	2	2	2	-	-	8
B46 Autoclave (S)	-	-	-	-	1	1	2
C: Maternity							
1C : Ward							
C01 Stethoscope	10	-	-	-	-	-	10
C02 Sphygmomanometer	10	-	-	-	-	-	10
C03 Infant Scale	4	-	-	-	-	-	4
C04 Treatment Carriage	4	-	-	-	-	-	4
C05 Strectcher	4	-	-	-	-	-	4
C06 Examination Table	4	-	-	-	-	-	4
C07 Examination Light	4	-	-	-	-	-	4
C08 Weight & Height Scale	2	-	-	-	-	-	2
C09 Manual Resuscitator, Adult	3	-	-	-	-	-	3
C10 Manual Resuscitator, Infant	3	-	-	-	-	-	3
C11 Electrocardiograph	1	1	1	1	-	-	4
C12 I.V. Hanger Stand	10	-	-	-	-	-	10
C13 Laundry Cart	4	-	-	-	-	-	4
C14 Defibrillator	1	-	-	-	-	-	1
2C : Delivery Room							
C15 Labour Bed	4	2	2	2	-	-	10
C16 Infusion Pump	2	1	1	1	-	-	5
C17 Vacuum Extractor	1	1	1	1	-	-	4
C18 Suction Unit, Portable	2	1	1	1	-	-	5
C19 Manual Suction Unit	2	1	1	1	-	-	5
C20 Obsteric Instrument Set	2	1	1	1	-	-	5
C21 End-tracual Tube	1	1	1	1	-	-	4
C22 Instrument Sterilizer, M Size	2	1	1	1	-	-	5
C23 Instrument Sterilizer, L Size	1	-	-	-	-	-	1
C24 Medical Refrigerator	2	1	1	1	-	-	5
3C : Neonatal & Nursing							
C25 Nursing Bottle Warmer	2	1	1	1	-	-	5
C26 Phototherapy Unit	2	2	2	2	-	-	8
C27 Dopper Fetal Heart Detector	2	1	1	1	-	-	5
C28 Infant Incubator, Closed Type	2	2	1	1	-	-	6
, Open Type	1	1	1	1	-	-	4
D: Laboratory							
D01 Centrifuge	1	1	1	1	1	1	6
D02 Haematocrit Centrifuge	1	1	1	1	1	1	6
D03 Spectrophotometer	1	1	1	1	-	-	4
D04 Colorimeter	1	1	1	1	2	2	8

	MMC	MBEYA	KCMC	BMC	MIR	KIB	TOTAL
D05 Microscope	6	4	3	3	1	1	18
D06 Microscope w/Teaching Head(TV Monitor)	2	1	1	1	-	-	5
D07 Ph Meter	1	1	1	1	1	1	6
D08 Analytical Balance	3	2	2	3	-	-	10
D09 Hot Air Oven	2	1	1	1	1	1	7
D10 Autocalve	2	1	1	1	1	1	7
D11 Flame Photometer	1	-	-	-	-	-	1
D12 Step adj. fin pipette, 50~200ml	4	2	2	2	1	1	12
D13 Step adj. fin pipette, 200~1000ml	4	2	2	2	1	1	12
D14 Incubator	2	1	1	1	1	1	7
E: X-ray Diagnostic Equipment							
E01 Basic X-ray Unit(B.R.S.)w/Battery Unit	-	-	-	-	1	1	2
E02 Basic X-ray Unit(B.R.S.)	1	1	1	1	-	-	4
E03 Ultrasound Machine	1	1	1	1	-	-	4
E04 Mobile X-ray Machine	1	1	1	1	-	-	4
E05 C-arm X-ray Machine with TV (Theatere)	1	-	-	-	-	-	1
E06 X-ray Illuminators	4	2	2	2	1	1	12
E07 Automatic Processor	1	-	-	-	-	-	1
E08 Manual Processor	-	1	1	1	1	1	5
E09 Film Dryer	-	1	1	1	-	-	3
F: Maintenance Workshop Tools							
F01 Mobile Workshop Vehicles (4 WD)	1	1	1	1	-	-	4
F02 Tool Kit for ME Equipment	2	1	1	1	-	-	5
F03 Tool Kit for Mechanical Equipment	2	1	1	1	-	-	5
F04 Signal Generator	1	-	-	-	-	-	1
F05 Voltage DC Power Supply, adjustable	1	-	-	-	-	-	1
F06 Dual Trace Ocilloscope	1	-	-	-	-	-	1
F07 Rigel Safety Tester	1	-	-	-	-	-	1
F08 Dosemeter	1	-	-	-	-	-	1
F09 Automatic Winding Machine	1	-	-	-	-	-	1
F10 Megger Insulation Tester	1	-	-	-	-	-	1
F11 Digital AV Meter	1	-	-	-	-	-	1
F12 Driver Set	1	-	-	-	-	-	1
F13 Hexagon Driver Set	1	-	-	-	-	-	1
F14 Ball Driver Set	1	-	-	-	-	-	1
F15 Welder Soldering Equipment	1	-	-	-	-	-	1
F16 Bench Magnifier	1	-	-	-	-	-	1
F17 Plier Set	1	-	-	-	-	-	1
F18 Feeler Gauges	1	-	-	-	-	-	1
F19 Hydrometer Battery Gage	1	-	-	-	-	-	1
F20 Reamers Screw Extractor, 2mm/6mm	1	-	-	-	-	-	1
F21 Tape & Dies (mm.(1~10)set)	1	-	-	-	-	-	1
F22 Tape & Dies (mm.(4~16)set)	1	-	-	-	-	-	1

	MMC	MBEYA	KCMC	BMC	MIR	KIB	TOTAL
F23 Metal Washer Cutter Set	1	-	-	-	-	-	1
F24 Electric Drill	1	-	-	-	-	-	1
F25 Dualend Grinder	1	-	-	-	-	-	1
F26 Vice	1	-	-	-	-	-	1
G: Others							
1G : Seminar & Education							
G01 Slide Projector	1	1	1	1	1	1	6
G02 Slide Screen	1	1	1	1	1	1	6
2G : Vehiles							
G03 Ambulandce(4 WD)	1	1	1	1	1	1	6
G04 Pick-up Car (4 WD)	1	-	-	-	-	-	1
3G : Laundry							
G05 Automatic Washer	-	-	-	-	-	2	2
G06 Hand Iron	-	-	-	-	-	4	4
4G : Mortuary							
G07 Mortuary Refrigerator (2 Bodies)	2	2	2	2	1	1	10
5G : Adminstration							
G08 Computer	2	1	1	1	1	1	7
G09 Air Conditioner	2	1	1	1	1	1	7

(2) Plan for the Distribution of Main Equipment

Details of the main equipment under this project are shown in Table 3-45. It is considered necessary to procure some of the equipment from third countries (European countries) in light of the maintenance system and procurement of spare parts. The following also shows the eligible country to provide equipment with A or B.

A: Procurable from Japan

B: Including a third country

Table 3-45 Main Equipment

Unit Model	Specifications		Use Purpose/Suitability of Equipment Standard:
ENT Treatment Chair	Switching :Remote control system by microswitch Seat position :Highest -810mm Lowest -510mm Up-down strokes:300mm Rotation :360°	A	Used when treating primarily the outpatients of otorhinopharyngolaryngology department. Considered shall be the type that will enable to easily change the sitting position of the patients.
ENT Treatmen Unit	Suction&Exhaust:Automatic. 4 Sprays :Automatic. Direct connection with rubber tube Ventilation :Cock open-close system Lighting arm :Telescopic arm with spring built in. Dimensions :1,070(W) x 515(D) x 880mm(H) - up to top surface 1,850mm(H)-up to top of lighting stand	A	Used with the above chairs to treat the affected parts of patients. Projected shall be basic therapeutic unit in the otorhinopharyngolaryngology.
Eye Clinic	Type :Mydriatic Type Field Angle :60° & 40° Image Magnification on 35mm Film: 1.7x(at 60°), 2.5x(at 40°) Image Magnification of Observation: 8.5x(at 60°), 12x(at 40°)	A	Used when fluorescence fundus photography by intravenous injection is taken to record the eyeground alteration in eyeground disease and detect any abnormality in vascular system such as retina and any disorders in retinal pigment epithelia. Essential equipment in the ophthalmological department in general hospitals.

Ultrasound	:10MHz Mord :B, AB :250 Monitor :CRT	A	Used exclusively in the ophtalmological department for detecting neoplastic lesions and foreign bodies in the eye and for measurement of thickness of cornea and the length of optic axis. considered shall be such types as enable concomitant use of both A and B modes that will allow for diagnosing not merely the nature but also the largeness and spread of foci.
Operating Microscope	Binocular Tube :Straight type, 10X Object lens :W.D.230 and 400mm Magnification :Manual step by step changing Light source :Halogen lamp	A	Equipment necessary for microsurgery that is impossible with unaided eye (for ophthalmological patients).
Defibri-llator	12 Lead, with ECG Out put : 3~360J. Monitor : 5~5.5 inchi Battery : Bult-in Power source : AC/DC	A	An equipment used to recover the rythm intrinsical to the heart, flowing endermically DC current into the ventricle which fibrillates most frequently leading to cardiac standstill. Essential equipment in any general hospitals.
Operating Table for General Surgery	Dimensions :1,810 x 525mm Height adjustable :780mm to 1,130mm Trendelenburg :45° Lateral tilt :30° both sides Back section :90° up and 40° down Gear manual controlled	A	Desirable is to adopt such operating table as can allow for general surgery in large operating rooms and enable to hold most confortable posture for the patients.
Operating Table for Minor Surgery	Table top :190 x 45 cm Elevation :75 - 100 cm Trendelenburg :25° Lateral tilt :20° each side Oil-hydraulic foot pump	A	General-purpose operating table used for general minor surgical operations. Considered shall be the foot pedal up and down type that will facilitate the maintenance.
Anesthesia Machine	Anesthesia Apparatus Main unit w/Ventirator :Mobile with flowmeter unit, CO_2 absorber BP meter & top shelf for monitoring equipment. Flowmeter :O_2.....0.1 - 10 lit./min. N_2O....0.5 - 10 lit./min. Anesthetic Ventilator Main unit :With circuit pressure meter, hinged control unit and bellows system. Minute volume :1 ~ 20 lit./min. Breathing frequency:5 ~ 40 times/min. Alarm	A	Necessary for the general anesthesia using inhalation anesthesic. Combining the function of ventilator it can be used also as auxiliary to the intravenous anesthesia.

Electro-surgical Unit	Output :Cutting, Coagulation, Blend, Bipolar Output indication :Digital indication Cutting :0 ~ 350 W Coagulation :0 ~ 130 W Blend :0 ~ 250 W Bipolar :50 W	A	An essential tool for operating room, that is used when dissecting the living structure of patients in an operation, when performing hemostatic dissection and for coagulation.
ECG Monitors	Display : ECG, VPC Heart rate : 12~300 p/m	A	An essential equipment required to measure and record the heart rate and pulse wave of patients under operation thereby grasping accurately thei r conditions.
Operating Table for Orthopedic	Dimensions :2,140 x 525 mm Height adjustable :870mm to 1,290mm Trendelenburg :25° Lateral tilt :30° both sides Traction unit incorporated underneath the table top. Moter-Power/Oil hydraulic combined type.	A	It is recommended to adopt such type of operating table as enables fine adjustment so as to cope with special operations in orthopaedic surgery.
Respirator	Volume control type. With integrated compressor. Compatible with IMV, CPAP, and PEEP.	A	For assistance of patients showing spontaneous respiration and those requiring forced ventilation.
Operating Table for Gynecology	Dimensions :1,950 x 525mm Height adjustable :700mm to 1,030mm Trendelenburg :30° Lateral tilt :30° both sides	A	It is hoped to adopt such type of operating table as facilitates the fine adjustment of its position so as to cope with special operations in gynecology.
Operating Table for Neurology	Table top :50 x 190cm Elevation :52.5-102.5cm Trendelenburg :25° each Lateral tilt :20° right & left Oil-matic electromotive type	A	Recommended shall be such type of operating table as facilitates the fine adjustment of its position so as to cope with special operations in neurosurgery.
Upper Gastrofiber-scope	Working length : 1,000mm over Range of view : 80° up Field of view : 10~100mm Dia.(size) : 100mm	A	Used for diagnosis of gastric diseases. Considered shall be the type that will cope with photographing and biopsy.
Bedside Monitor	Waveform display of ECG, non-ionvasive blood pressure, and respiration curve. Numerical display of heart rate, blood pressure, temperature, and respiration rate.	A	An equipment required for monitoring the heart function of the patients after operation and the heart function of the patients in intensive care units over a certain period.

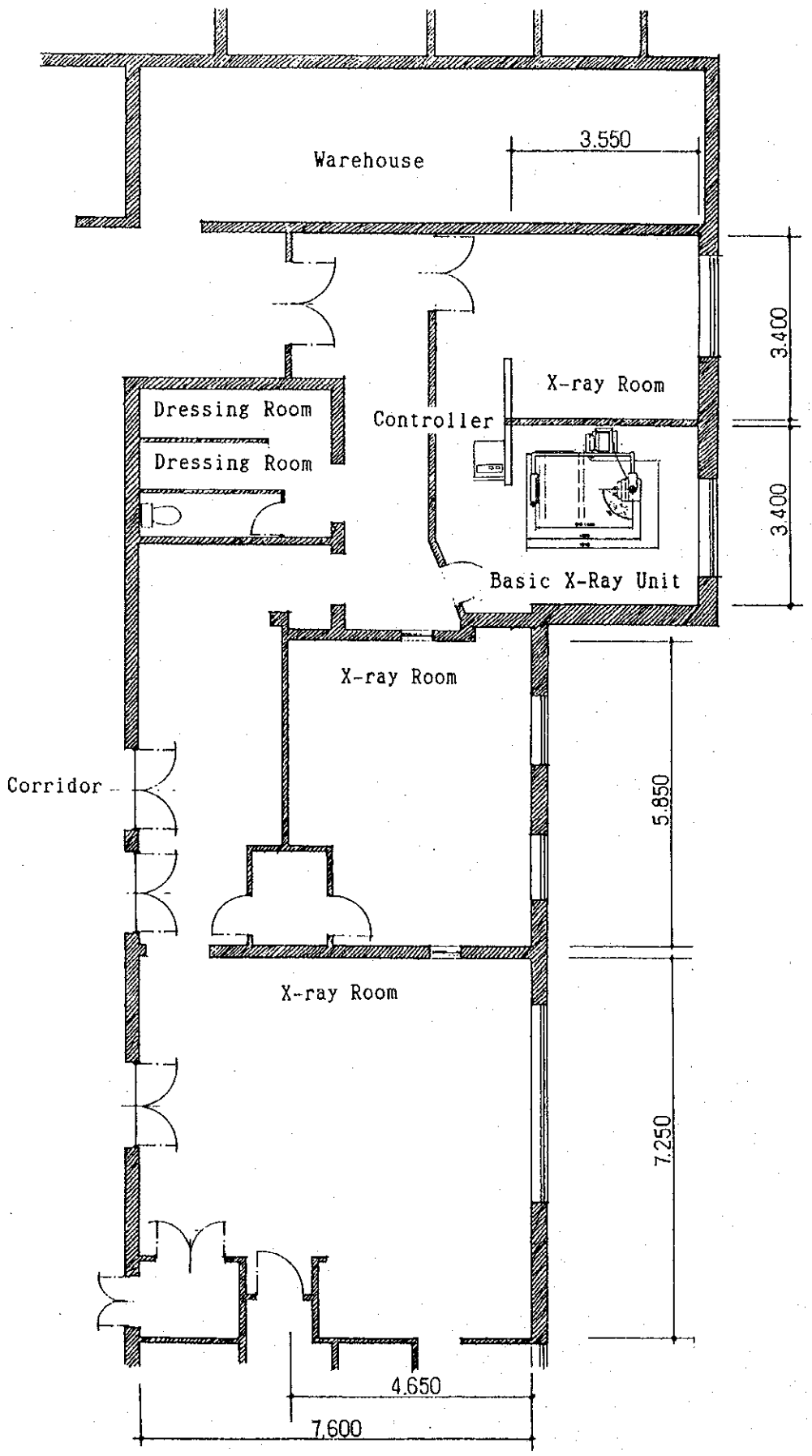
Autoclave (M)	Chamber Dimensions :500 dia. x 900(D)mm Door :Stainless steel with doorgasket Locke by radial holding arms Sterilizing Temperature :120℃(1.1kg/cm²) and 132℃(2.0kg/cm²) selectable	A	Required for protection from hospital-acquired infection. Used for sterilizing the forceps, linens and so forth that will endure 120 ℃ or higher steam used after washing in surgical operations.
Flame Photometer	Fuel :Butane or Natural gas Sample size :20 - 40 μL Performs :Na, K, Li analysis Accuracy :±2%	A	Serves for direct measurement and examination of sodium, potassium, and lithium in the blood, sera and lymphatic liquid and for indirect measurment and examination of potassium in the urin. Frequently used in clinical laboratories.
Basic X-ray Unit (B.R.S) A type	FED : 1,400mm Arm rotation : 150° (-30°~120°) Height adjust. : 1,300mm Tube focusing : 5.0mm Out put : 30W KV select : 45,55,60,70,80,90 and 120 MAS range : 0.5~500mAs Enegy store : Built in	B	The basic X-ray system (BRS) recommended by WHO is a system having capability to perform at least 80% X-ray examination required at the level of specialized departments. It can exaime skeleton, head, chest, abdomen and soft tissue. Owing to its simpli-fied design, BRS facilitates its maintenance and even the repairing when fallen into trouble. Suited to any local hospitals in the region with poor power supply. It is also appropriate to adopt it in any general hospitals with numerous out-patients in the Metropolitan area.
Basic X-ray Unit (B.R.S) B type	FED : 1,400mm Arm rotation : 150° (-30°~120°) Height adjust. : 1,300mm Tube focusing : 5.0mm Out put : 30W KV select : 45,55,60,70,80,90 and 120 MAS range : 0.5~500mAs Enegy store : Built in	B	The basic X-ray system (BRS) recommended by WHO is a system having capability to perform at least 80% X-ray examination required at the level of specialized departments. It can exaime skeleton, head, chest, abdomen and soft tissue. Owing to its simpli-fied design, BRS facilitates its maintenance and even the repairing when fallen into trouble. Suited to any local hospitals in the region with poor power supply. It is also appropriate to adopt it in any general hospitals with numerous out-patients in the Metropolitan area.

Ultrasound Machine	Methord of scanning: Sector, linear. Display : B, M and B+M mode	B	It is recommendable to adopt such type of ultrasound as allows for a large extent of diagnosis including general ultrasonic examination in the gastric organs, early diagnosis of pregnancy in obstetrics and diagnosis of presentation and position.
Mobile X-ray Machine	Generator : Capaciter Tube current : 300mA max. Tube voltage : 105 kV max.	B	This unit is a carriage with wheels driven by internal battery and motor that is loaded with compacted high tension generator, and X-ray tube holder. Essential to examine the patients unable to come out of their sick-room.
C-arm X-ray Machine with TV (Theatere)	Rotation : +90° -25° Generator : High frequency converter Current : 20mA Voltage : 105kV Tube focusing : 0.6/1.5mm Display : TV monitor	B	Used for operations in orthopedic department. Television monitor imaging the portion that cannot be seen with an unaided eye will facilitate the operations.
Automatic Processor	Film size : 4'x4'~14'x17' Capacity : 220 films Tank cap. : 10 litter Processing time: 90 sec.	A	Automatic film development is possible after X-ray photographing. Reduced is the time required from the development to the drying and diagnosis. Estimated necessary for any general hospitals existing in the Metropolitan area. Mortuaries of respective hospitals shall be provided with this refrigerator for temporary custody of dead patients. Mylembe specialized hospital and Gobongot hospital having no such refrigerator, it is estimated appropriate to provide them with this type of refrigerator each able to accomodate two bodies.
Mobile Workshop Vehicle	Type :Two boxes-van Seats :2 Engine :2,500cc, Water cooled 4-cylinder, diesel Axle :4x4 Axle configuration Wheel base :Longer than 2,750cm Transmission :Forward-5 steps revers-1 step Horse power :55Hp or more Equipment :Tool cabinet, electric tool	A	Vehicle shall be used for maintenance of medical equipment in regional hospitals, district hospitals and health centers. These facilities are located in remote area where road conditions are terribly bad. Thus vehicles should be 4 wheel-drive vehicles which is superior to 2WD ones.

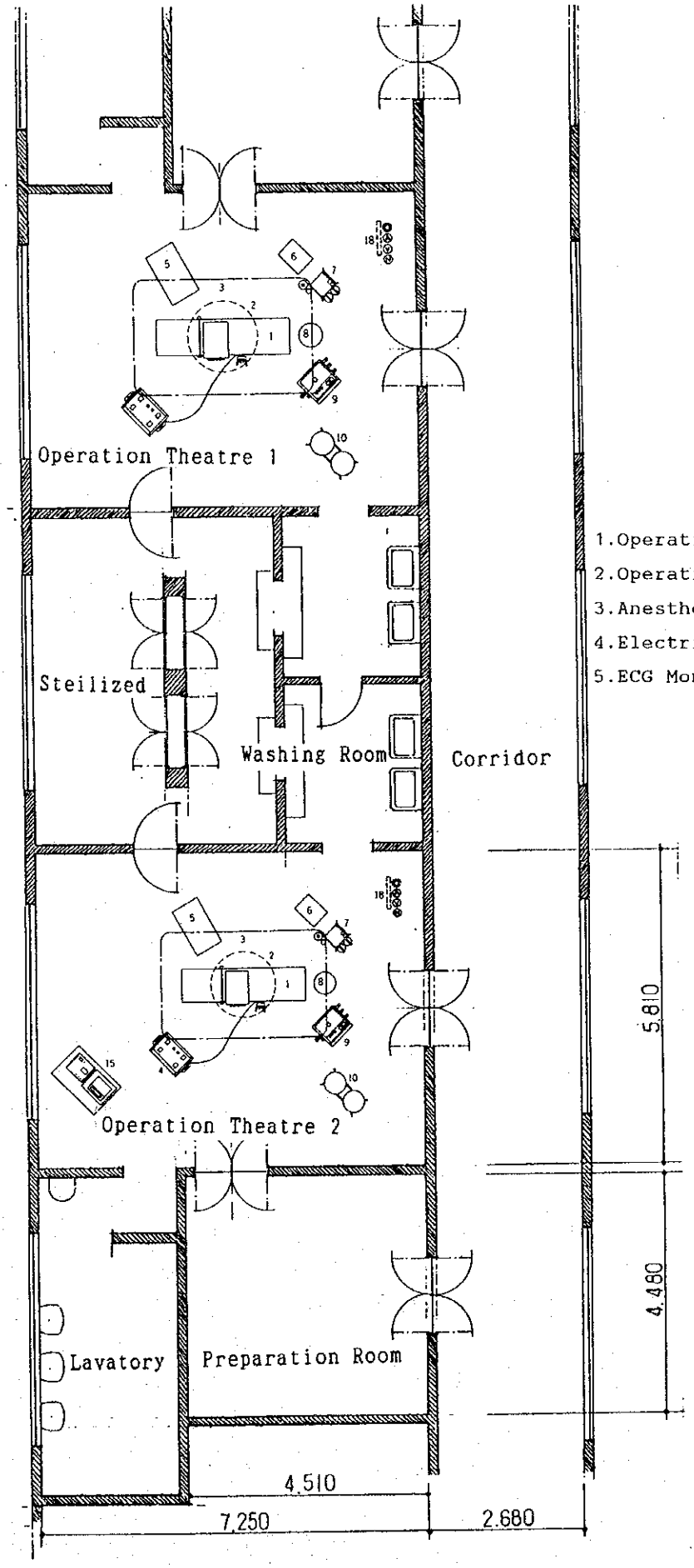
Ambulance	Type Seats Engine Axle Wheel base Transmission Horse power Equipment	:Two boxes-van :3 (including attendant) :2,800cc or more, water cooled 4-cylinder, diesel :4x4 Axle configuration :Longer than 2,950cm :Forward-5 steps, revers-1 step :65Hp or more :Beacon lamp, Motor siren, Siren amplifier speaker, Roof signboard, Rear step, Stretcher, Rear lamp, First-aid box.	A	Service areas of each facility are within a radius of 500Km which include mountain area, savanna, desert and swampland and most of the roads are in bad condition for transportation. Especially, in rainy season, roads are flooded because of imperfection of drainage system. To manage these road condition, 4-wheel drive vehicles shall be required.
Mortuary Refrigerator (2 Bodies)	Capacity Temperature Tray Refrigeration Dimensions	:2 bodies :0℃ to +10℃ in the ambient :Standard setting +5℃ :2 removable cadaver trays :Hermetically sealed, air-cooled vibration-free :1,080(W)x2,800(D)x1,770(H)mm	A	To keep bodies in good condition. At hospitals, Mirembe Hospital and Kibong'oto Hospital have not been provided these mortury refrigerator which need badly.

(3) Layout of the Equipment

The layout plan of each department in the next page shows the equipment to be procured in the general framework of the project that will require installation and setup works.

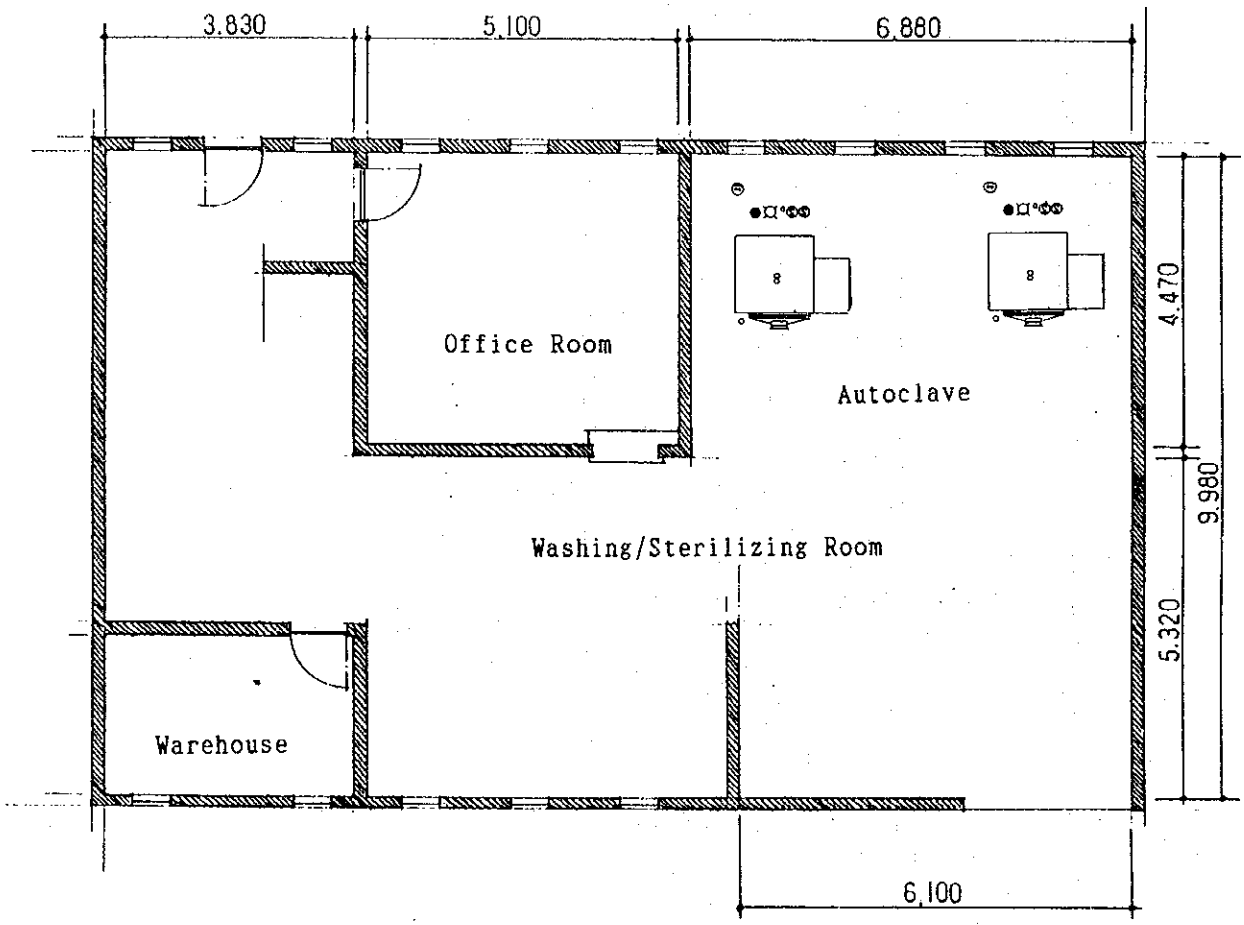


Muhinmbili Medical Centre X-ray Room

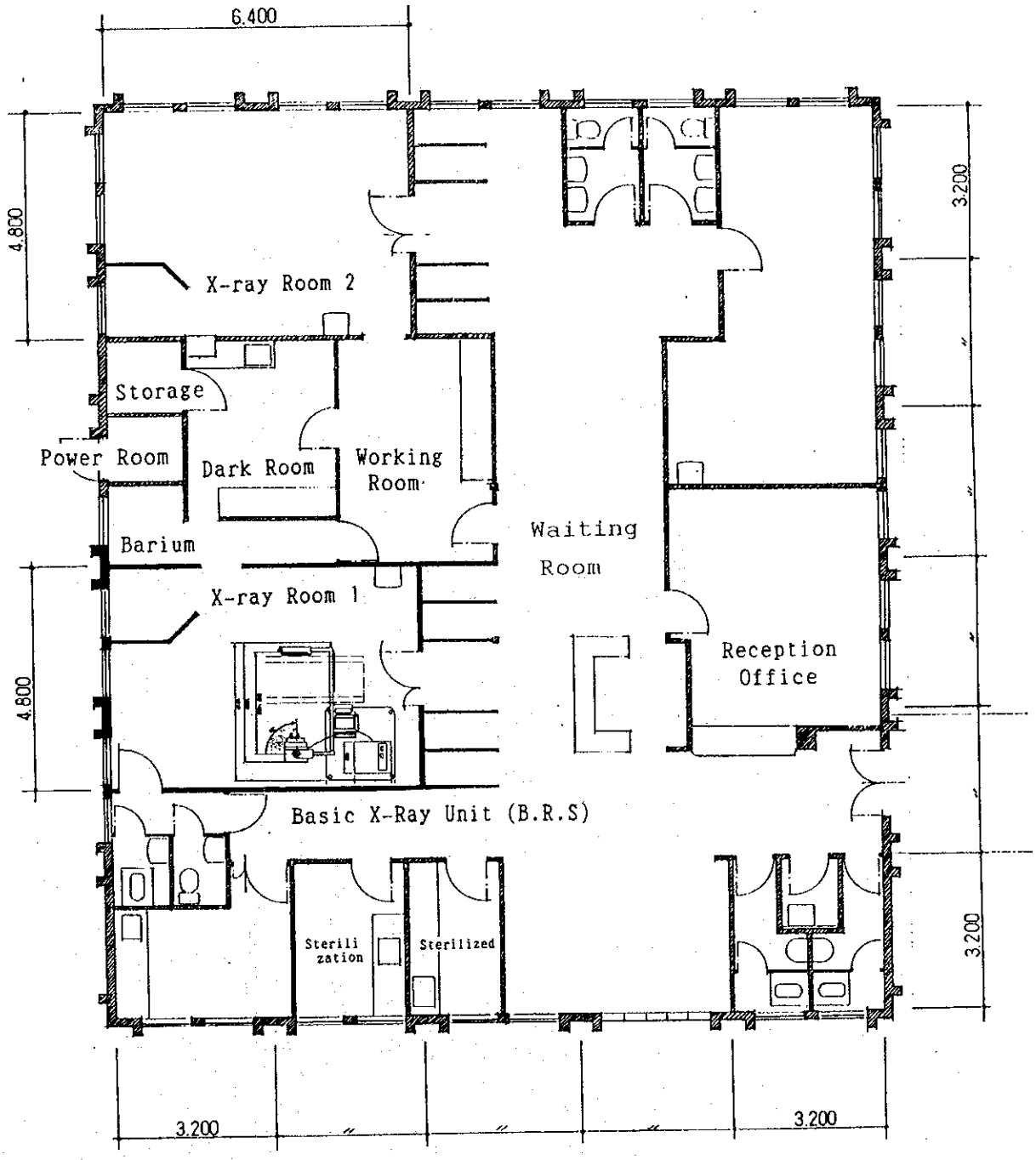


1.Operating Table
2.Operating Lamp
3.Anesthesia Apparatus
4.Electric Surgical Unit
5.ECG Monitor

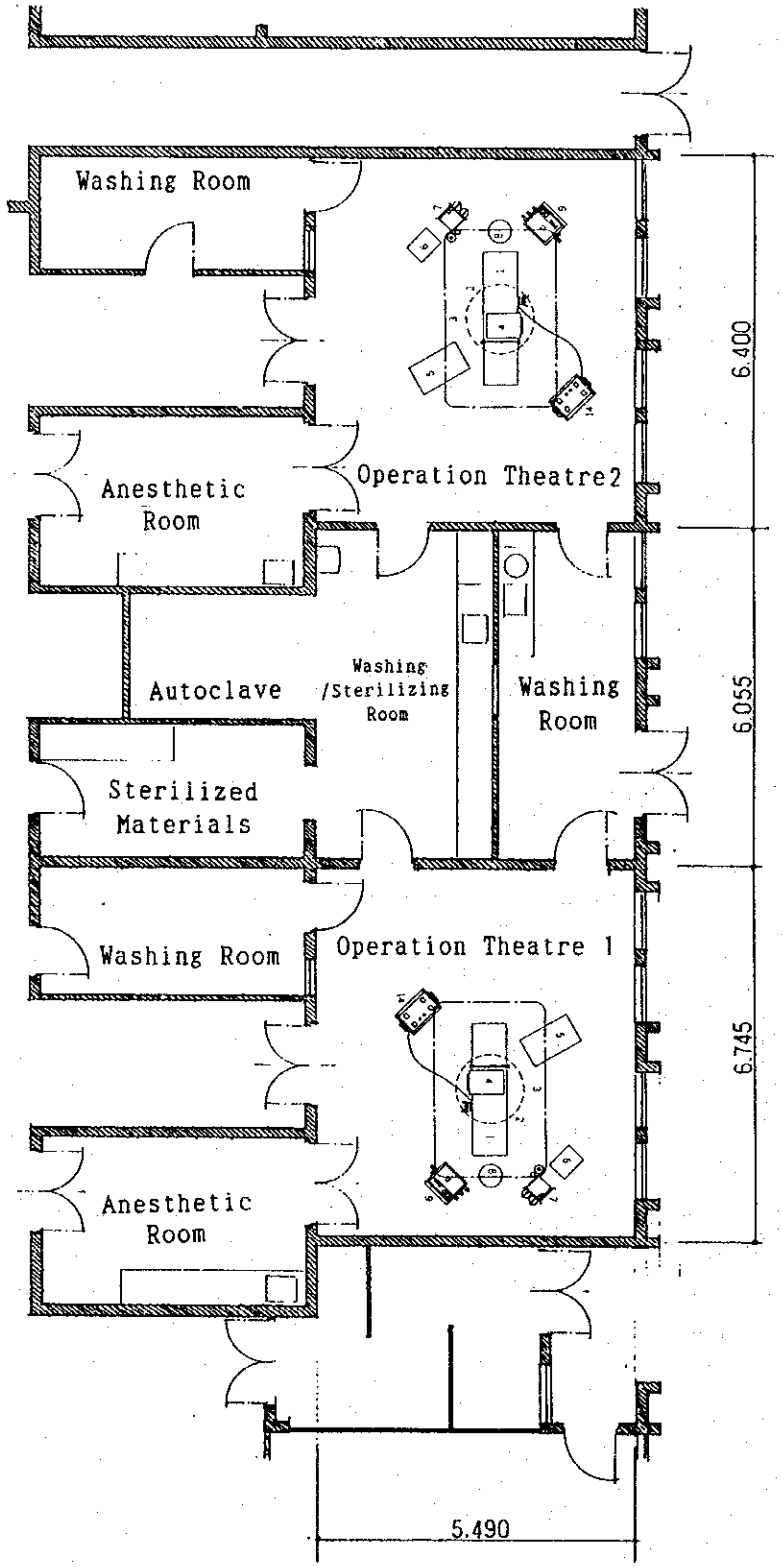
Muhimbili Medical Centre Operation Theatre



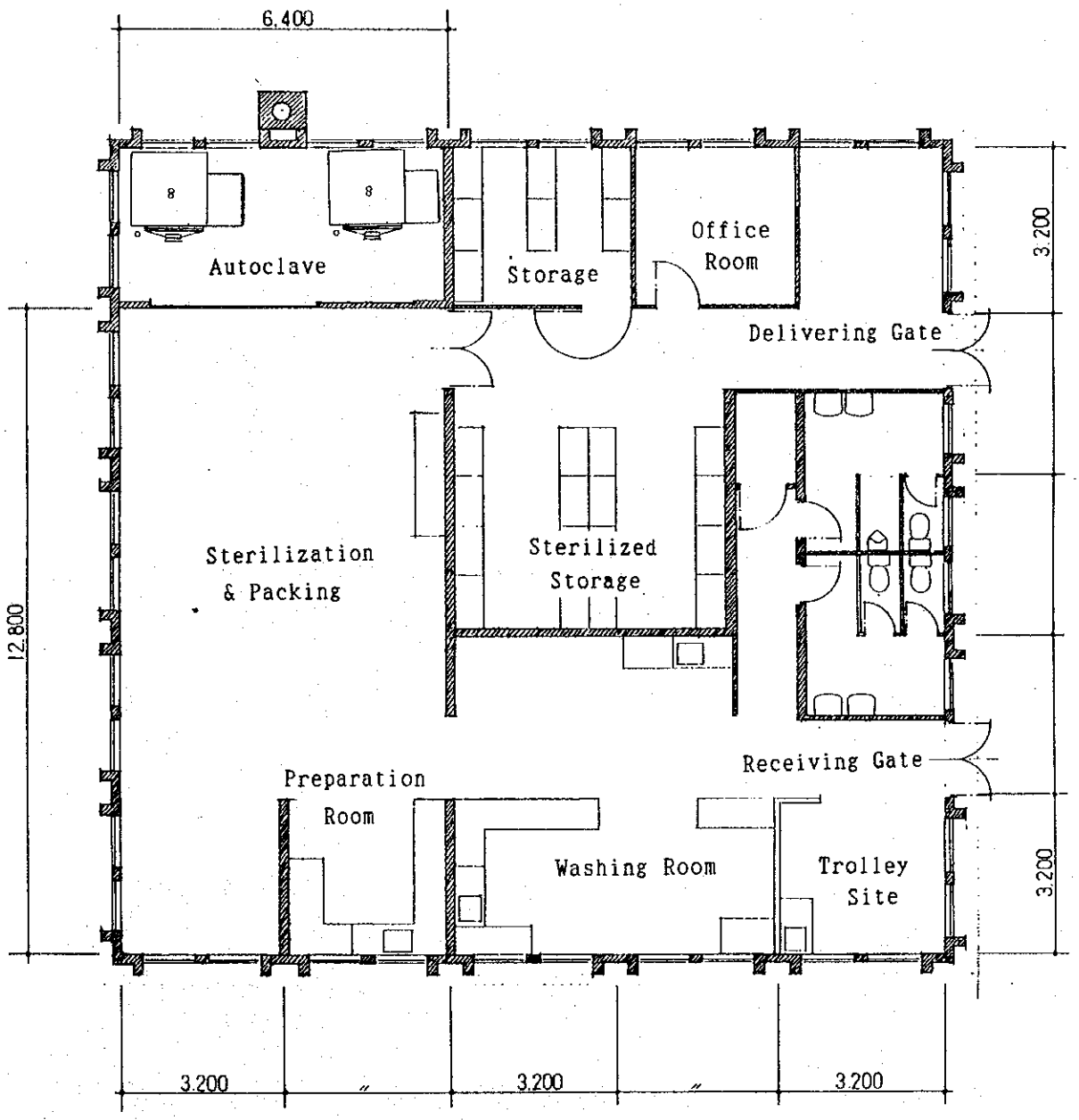
Muhimbili Medical Centre Central Sterilized Supply Department



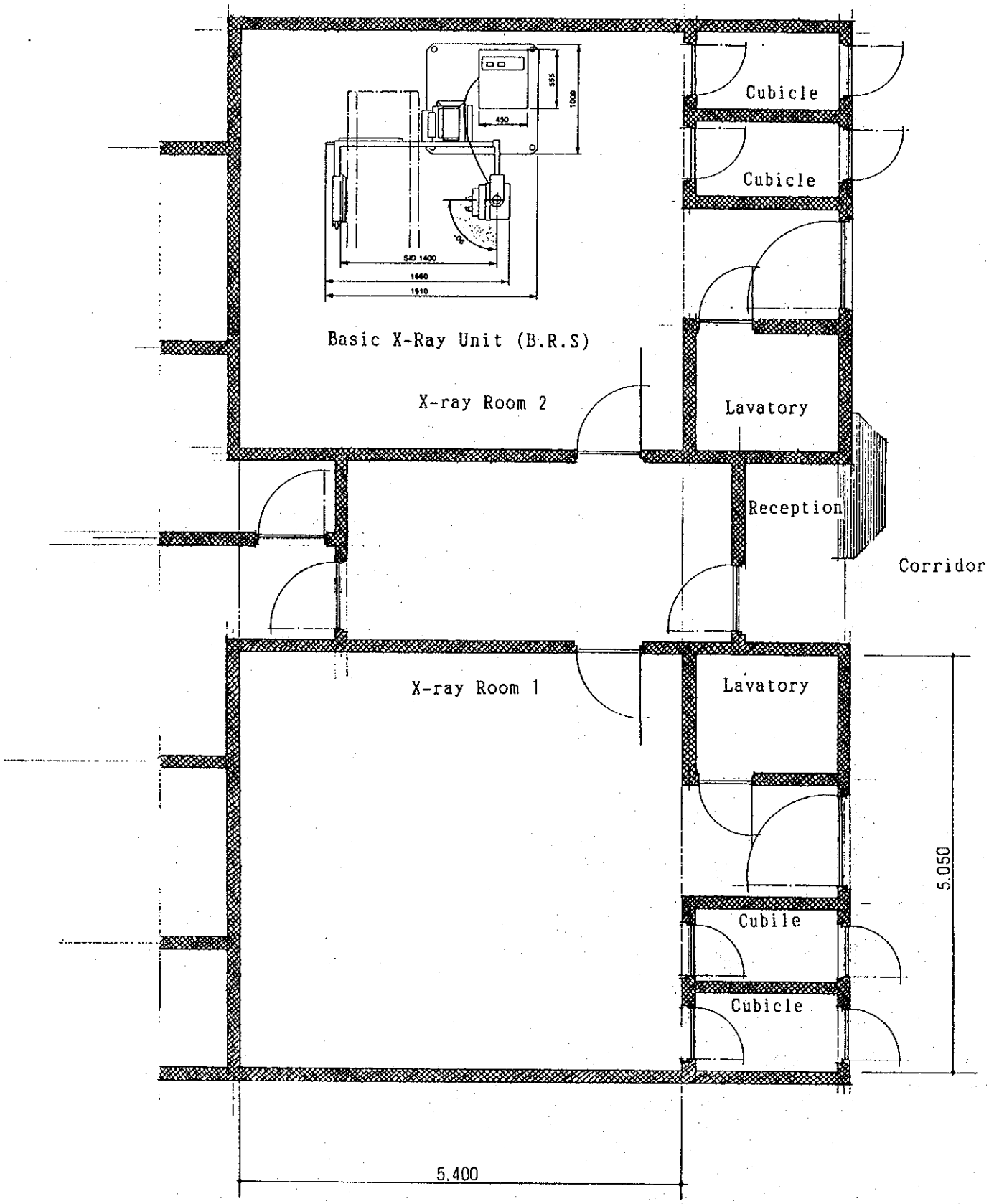
Mbeya Referral Hospital X-ray Room



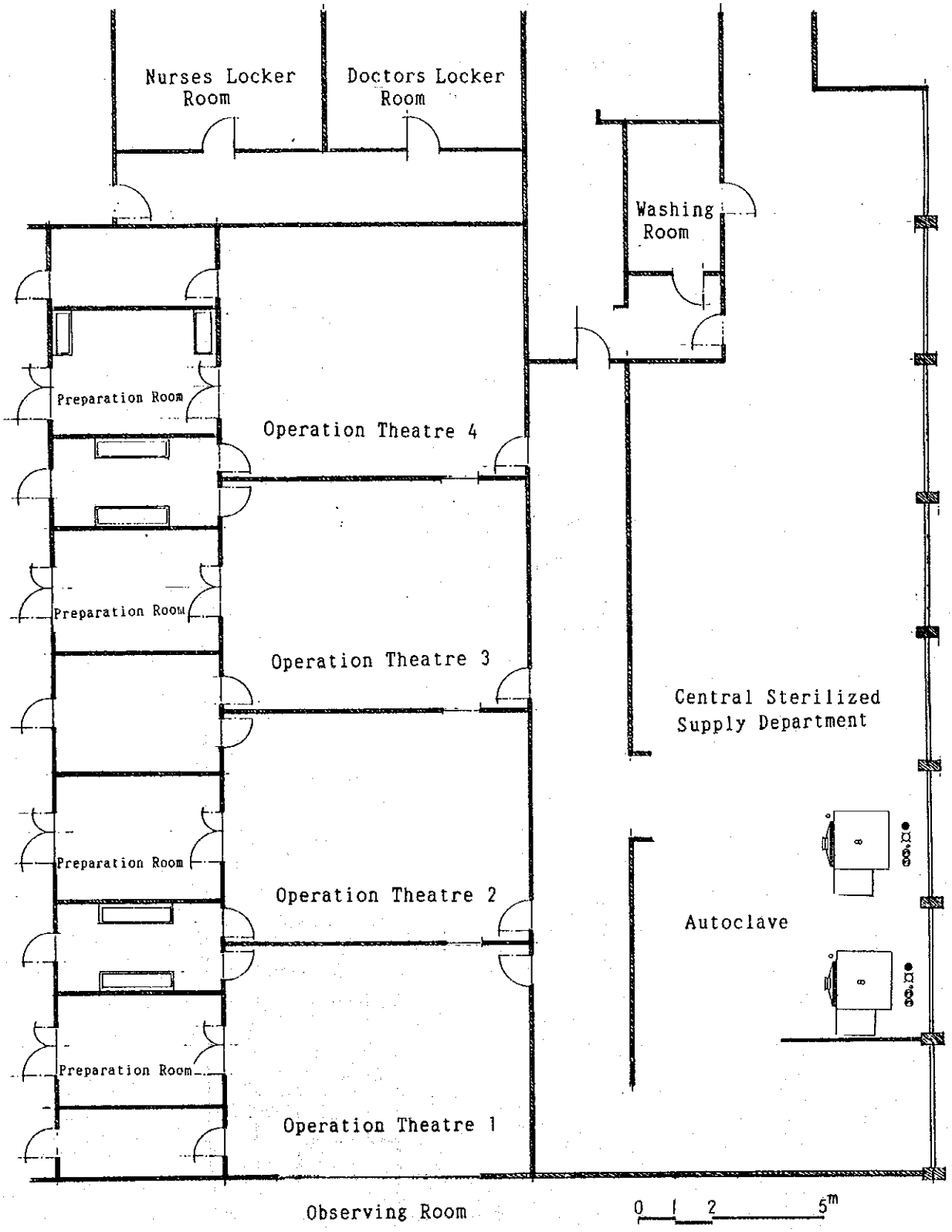
Mbeya Referral Hospital Operation Theatre



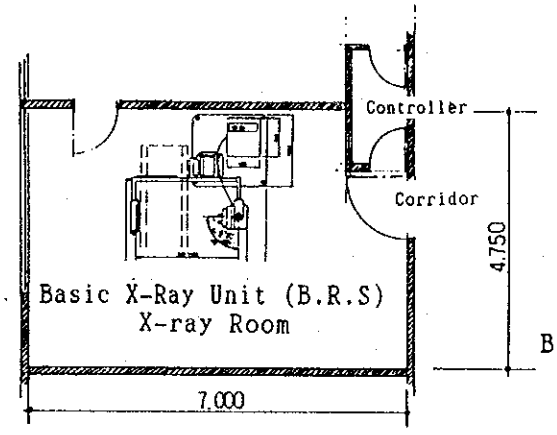
Mbeya Referral Hospital Central Sterilized Supply Department



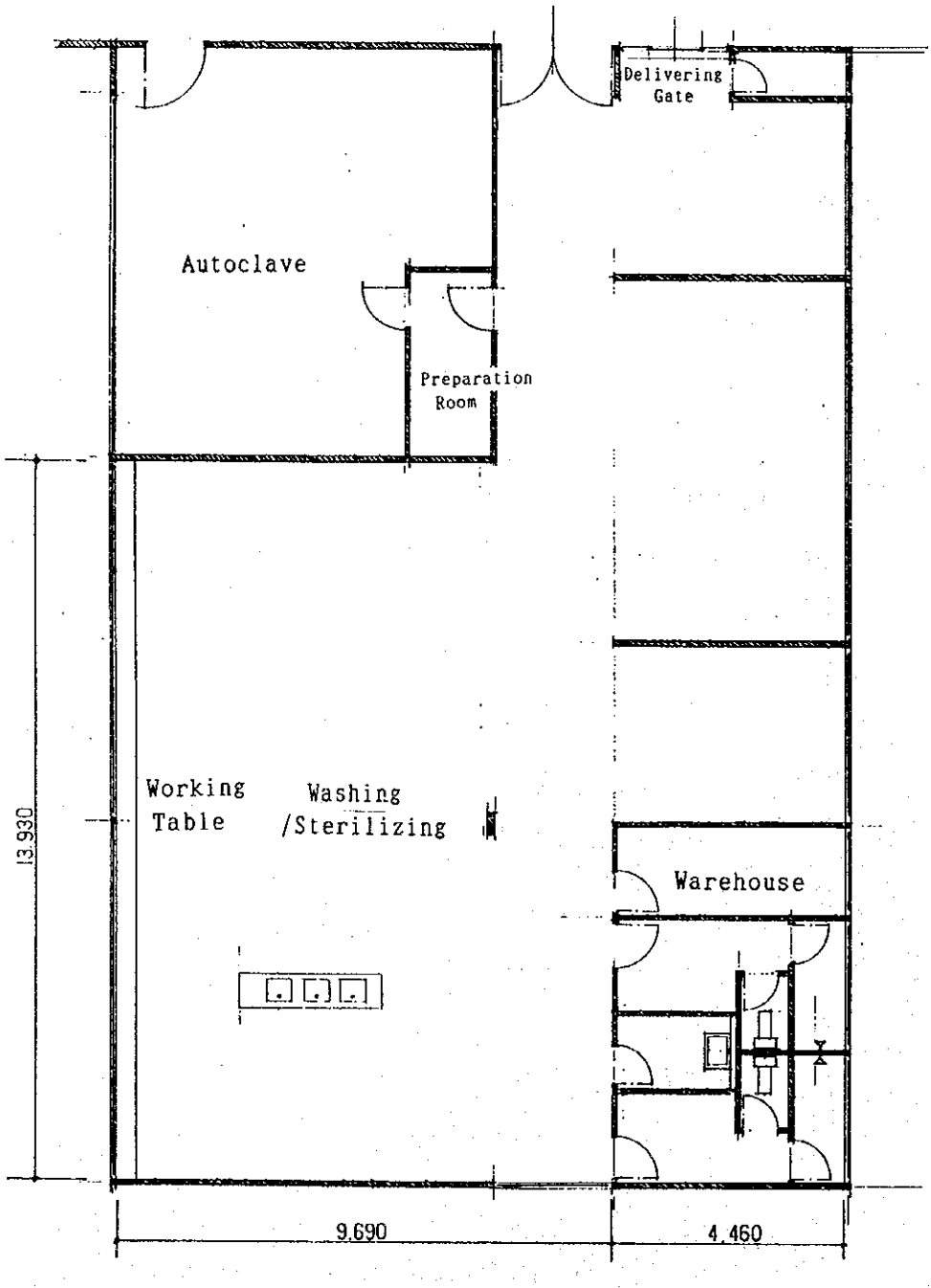
Kilimanjaro Christian Medical Centre X-ray Room



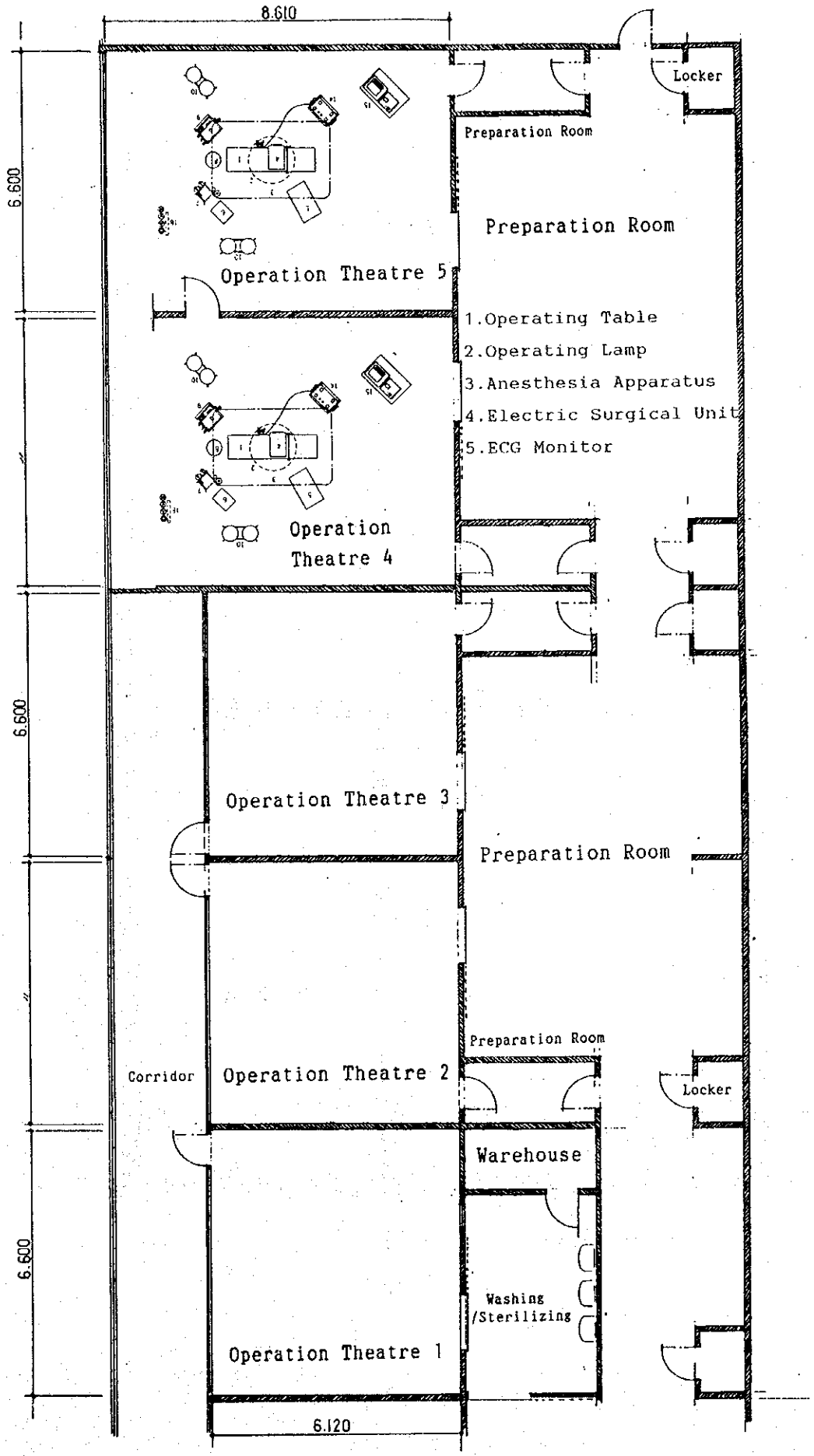
Kilimanjaro Christian Medical Centre Operation Theatre
Central Sterilized Supply Department



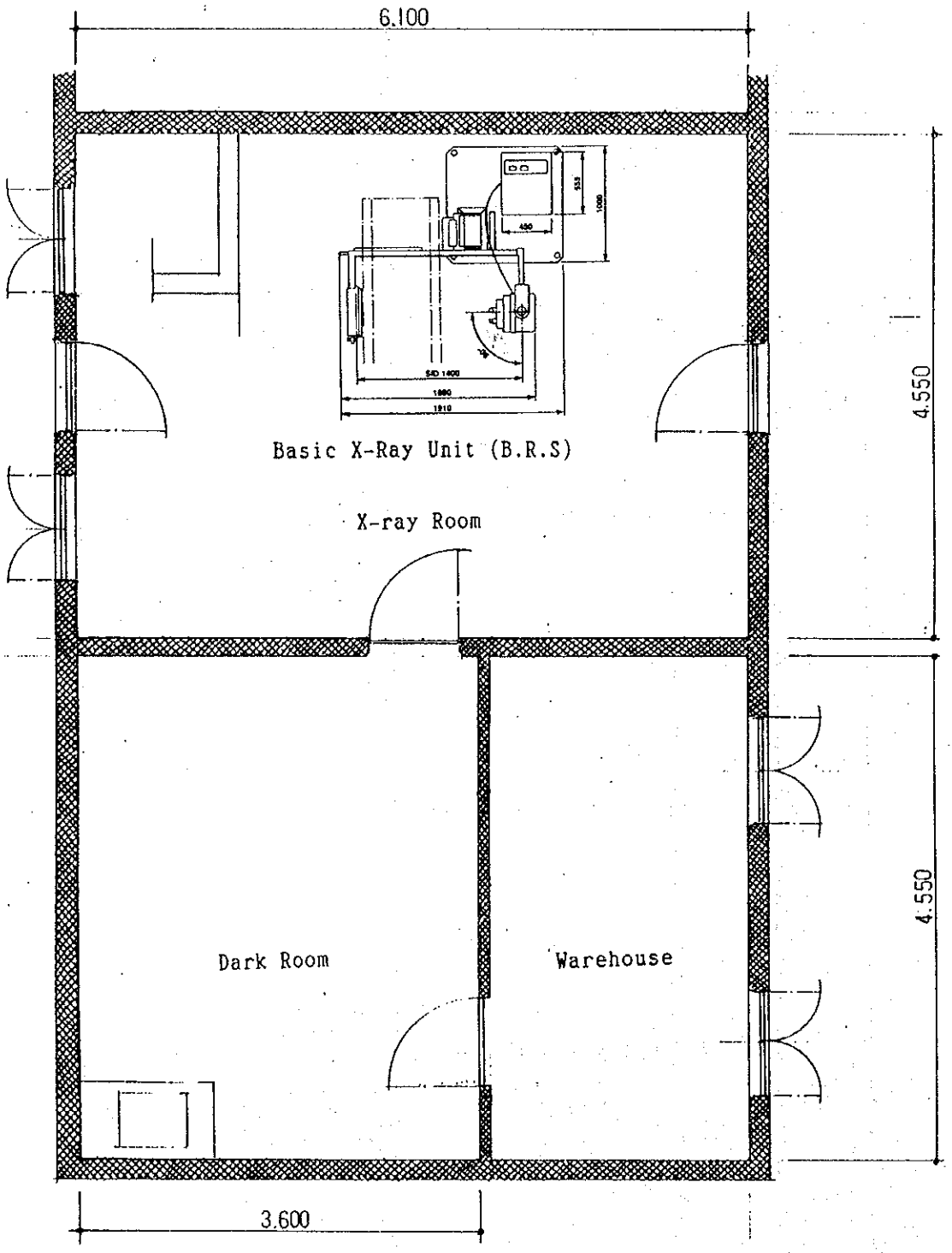
Bugando Medical Centre X-ray Room



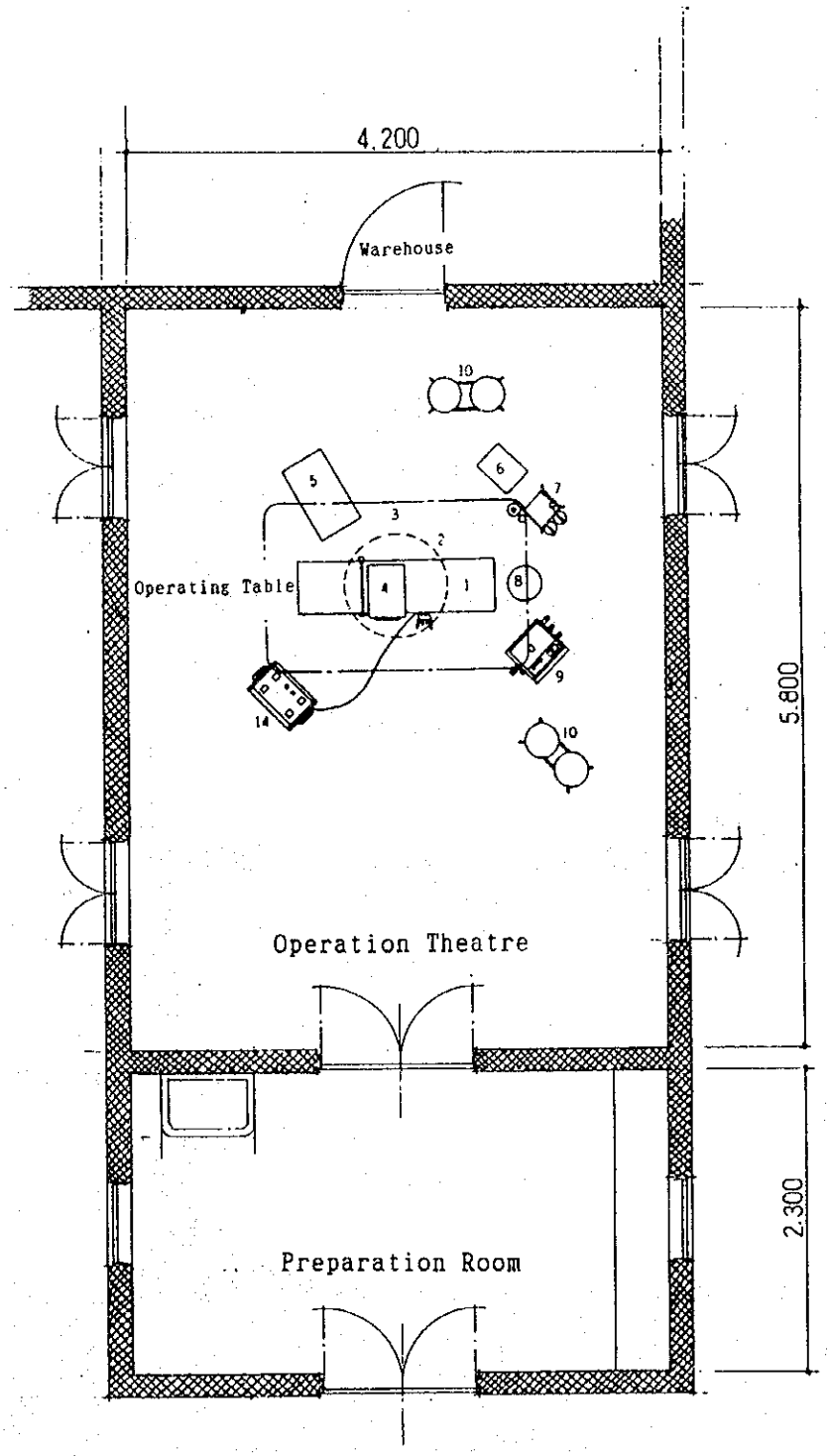
Bugando Medical Centre Central Sterilized Supply Department



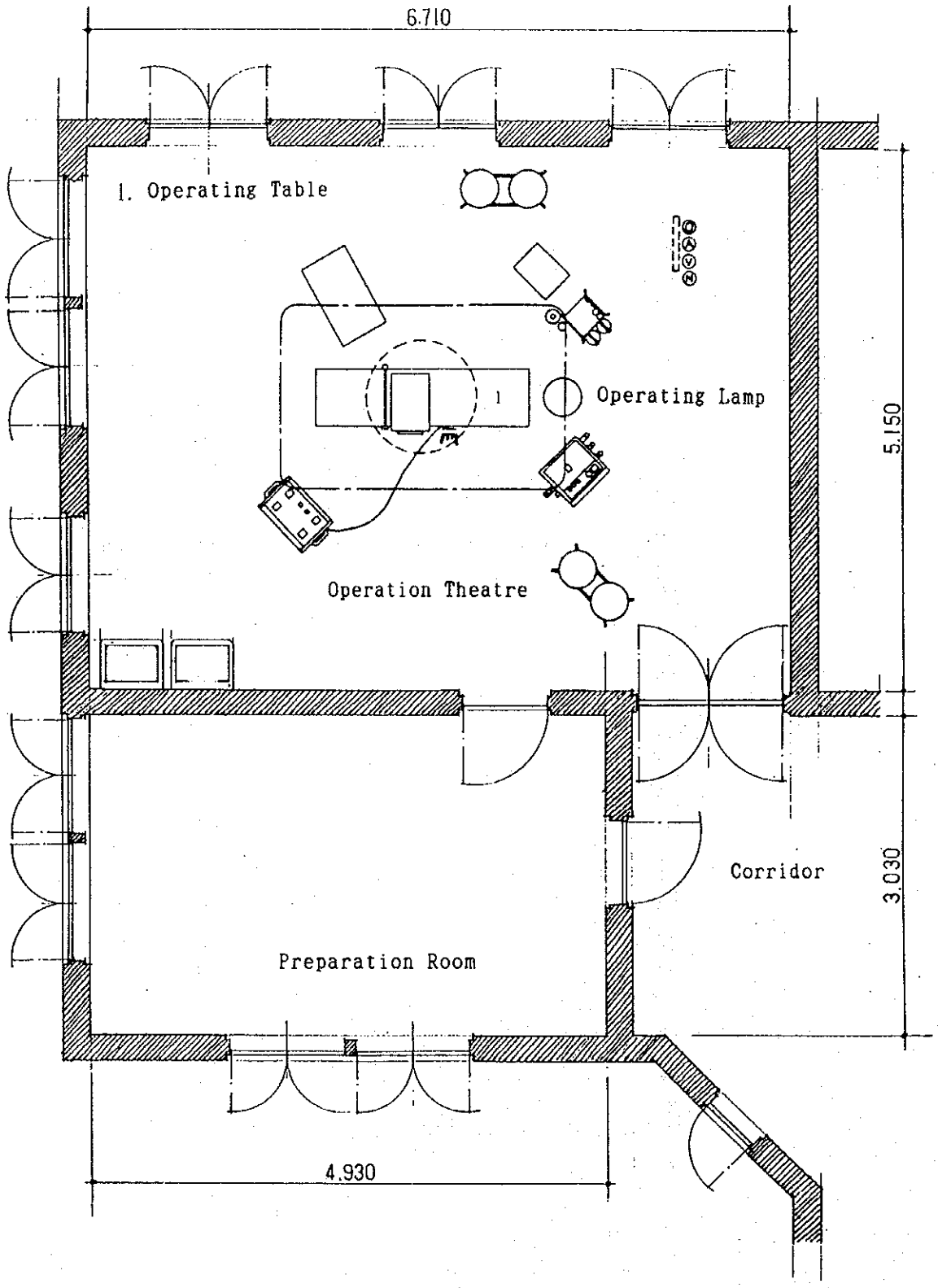
Bugando Medical Centre Operation Theatre



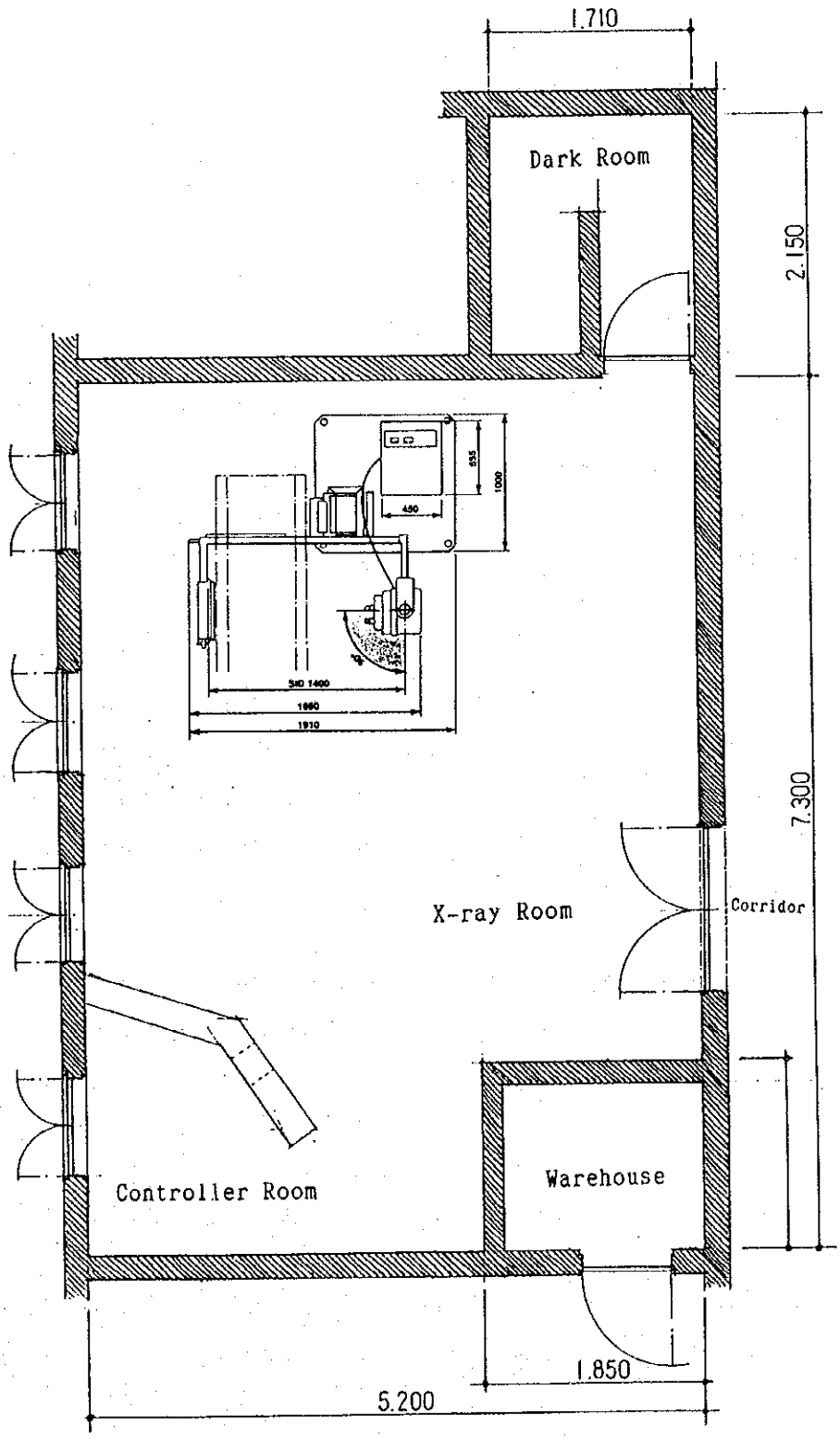
Mirembe Hospital X-ray Room



Mirembe Hospital Operation Theatre



Kibong'oto National Tuberculosis Hospital Operation Theatre



Kibong'oto National Tuberculosis Hospital X-ray Room

4-4 Project Implementation Programme

(1) Project Implementation System

This project is carried out by the following three bodies. The implementation mechanism is shown in the following chart.

1) Implementation Body

The implementation body of the project is the Ministry of Health, Tanzania and the proposed facility is the 6 Top Referral Hospitals (four consultant hospitals and two special hospitals).

The actual work of this project is implemented under the responsibility of the Ministry of Health and the Hospital Services department.

2) Consultant

In case that this project is implemented under the Japanese Government's Grant Aid, a Japanese consultant in conformity with a consultancy agreement to be concluded between the implementation body of Tanzania and the Consultant will render the following consulting services:

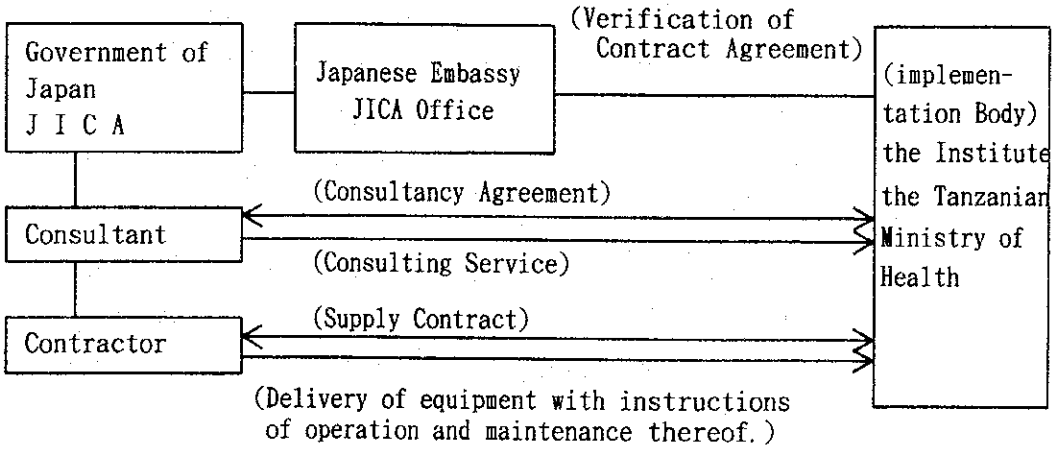
- Detailed Design- To execute a detailed design study and to prepare specifications of equipment and other technical documents.
- Tendering - To assist the selection of a contractor and to cooperate in concluding a contract.
- Procurement - To supervise procurement of the equipment and to inspect the equipment prior to shipment thereof.
- Installation - To inspect the equipment delivered to the hospitals concerned and to supervise installation works thereof.

3) Contractor

A Japanese contractor (trading firm) who has been selected by the tendering is responsible for the manufacture, delivery and installation of the equipment in conformity with the contract with

Tanzanian side. The Contractor conducts guidance on the operation of the equipment and its maintenance and then delivers them.

Fig. 3-10 Implementation flow chart



(2) Undertaking of Both Governments

Undertaking of the Governments of Japan and Tanzania are defined as follows:

1) Undertaking of the Government of Japan

To supply the equipment to the 6 Top Referral Hospitals, install thereof and train the Tanzanian personnel concerned in conformity with the procedures of the Japan's Grant Aid, which are summarized as follows:

1. The equipment shown in Table 3-44.
2. All the costs of sea and land transportation of the equipment to the proposed facility site.
3. Costs for installation of the equipment including dispatch of engineers, hiring local labor, tool and measuring instrument etc.
4. Costs for guidance on initial test, operation and maintenance of the equipment at the site.

2) Undertaking of the Government of Tanzania

1. Provision of space and utilities such as water, electricity, etc. for the installation of the equipment.
2. Provision of utilities such as electricity, gas, water, drainage etc. which are required for the installation of the equipment.
3. Provision of storage yard so that the equipment can be safely stored until the installation work is undertaken.
4. Assurance of smooth proceedings of unloading and customs clearance in Tanzania as well as prompt land transportation of the equipment to the site.
5. Exemption of Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Tanzania with respect to the supply of the products and services under the Japan's Grant Aid.
6. Bearing of charges for the Banking Arrangement (B/A) and Authorization to Pay (A/P).
7. Provision of licenses, approval and other authorizations required for the execution of the Japan's Grant Aid.
8. Bearing of charges for tax exemption procedures.
9. Bearing of costs other than the above-mentioned undertakings of Japanese and Tanzanian Government which are necessary for the procurement of equipment under the Project.
10. Bearing of the costs for proper and effective operation and maintenance of the equipment to be procured under the Project.
11. Regular report of operational conditions of the equipment after the installation thereof.

(3) Detail Design and Supervision

The consultant undertakes the detail design and the supervision of the project in conformity with the agreement to be concluded between the Tanzanian side and the consultant.

The detail design entails the determination of detail specifications of the equipment based on the Basic Design Study, and the preparation of tender documents which consists of specifications of the equipment, instruction to bidders and forms of contract etc..

The supervision is to ascertain whether the work of a contractor is executed in compliance with a supply contract and to secure the adequate implementation of the contract, furthermore to render guidance, advice and coordination based on a fair standpoint.

The supervision consists of the following works.

1) Administrative procedures necessary for the selection of a contractor. Execution of the tender and witness of a supply contract.
2) Examination of the specifications of equipment and other documents to be submitted by the contractor.
3) Examination of the quality and performance of the equipment to be supplied.
4) Supervision of supply schedule of the equipment and installation thereof.
5) Report of the progress of the project.
6) Witnessing of delivery of the equipment.

In addition to the above-mentioned work, the consultant reports the progress of the project, the payment procedures and the handing-over of the equipment etc. to the Japanese Government.

(4) Equipment Procurement Plan

1) Selection of a contractor and Method of Selection

A Contractor to procure the equipment will be selected from Japanese trading firms by means of competitive tendering. The type of contract will be a blanket purchasing contract specifying the kind of equipment in the contract. The contract will include those concerning manufacture, delivery, installation, initial tests of the equipment and technical guidance of operation and maintenance thereof.

2) Procurement of Equipment

The equipment for this project will be procured from Japan or a third countries (European countries etc.)