2.2 Casuality Department

2.2.1 Casualty patient

° 250 patients/24 hrs., both emergency patients and out-of-operating hour patients.

° Emergency patients ratio by degree

Tertiary care level

(with danger in cardio-pulmonary function and continuous observation necessary in I.C.U.) ..... 1∿2%

Secondary care level

(admission or observation necessary) 5%

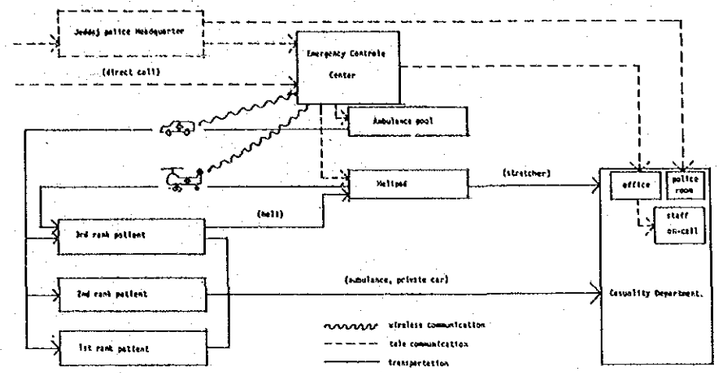
Primary care level

(Can go back home after treatment.) ..... 93%∿94%

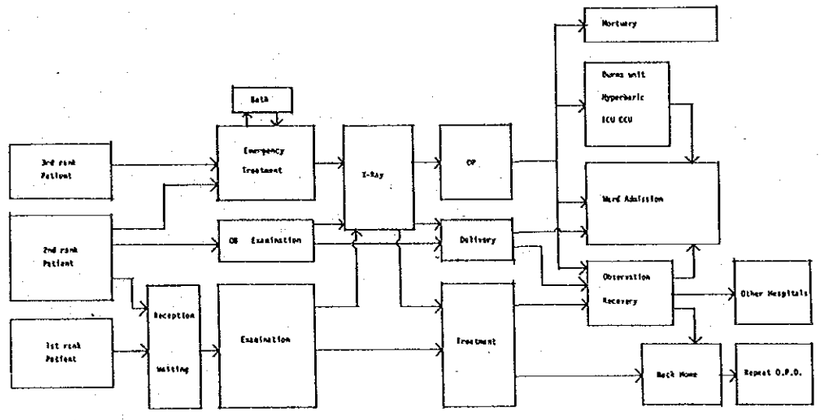
2.2.2 Outside network

° Emergency control center will be planned next to ambulance pool with direct call from/to police headquarters, casualty office and helipad and with wireless call from/to helicopter and ambulance.

° Emergency control center will accommodate on call driver's room (4 drivers), recreation, office and operator room (2 wireless + 2 tel. operator).



2.2.3 Inside net work and space



2.2.4 Space and operational system

° Emergency surgery case -- 24 hrs. operation

  2 line-up of emergency treatment → x-ray → OP

° Emergency obstetrics case -- 24 hours. operation

  1 line-up of examination → delivery/minor OP with flexible relation with emergency surgery

° Laboratory service -- 24 hrs. operation with emergency auto-analizer, ultrasonic diagnostic apparatus etc.

° Pharmacy service -- 24 hrs. operation

° Blood bank -- 24 hrs. operation

  Small blood refrigerator and donors' space with blood test labo. Labo tests will cover typing (incl. RH test) and cross-matching.

° Office and reception -- 24 hrs. operation

° Police room for formalities

° Waiting space -- sufficient space for relatives and patients

° Small reception room next to police room will be considered to control the relatives of ambulatory patients coming directly into ambulatory treatment room.

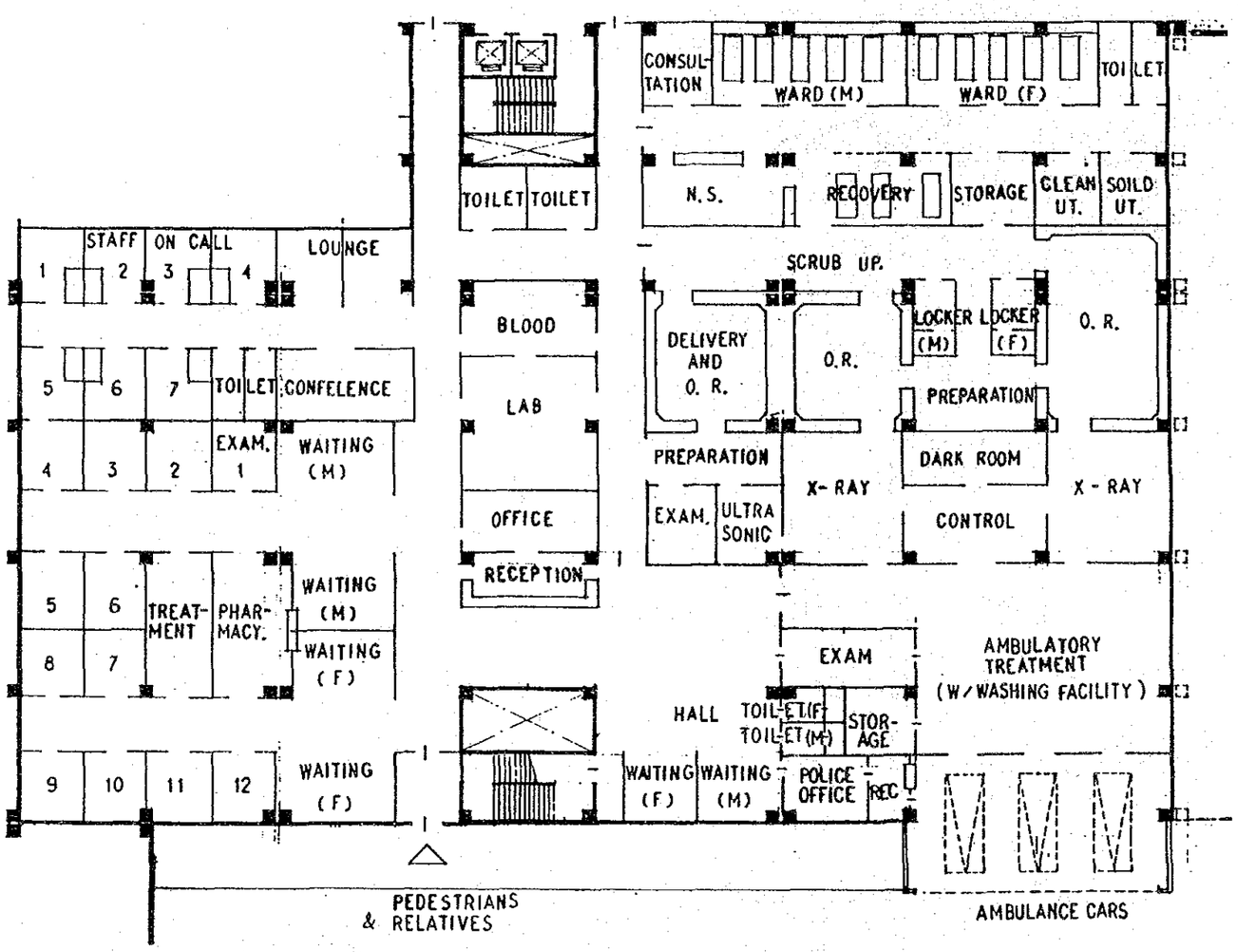
° Washing facilities of patients will be installed within the ambulatory treatment room.

° WC will be planned in waiting hall considering the voimitting of patients and relatives.

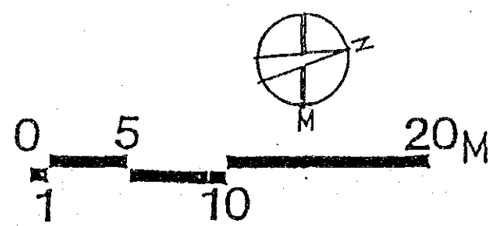
° Ambulance service -- ambulance pool for 10 cars in front of casualty dept. Ambulance platform for 2∿3 cars covered against rainwater and sand storm.

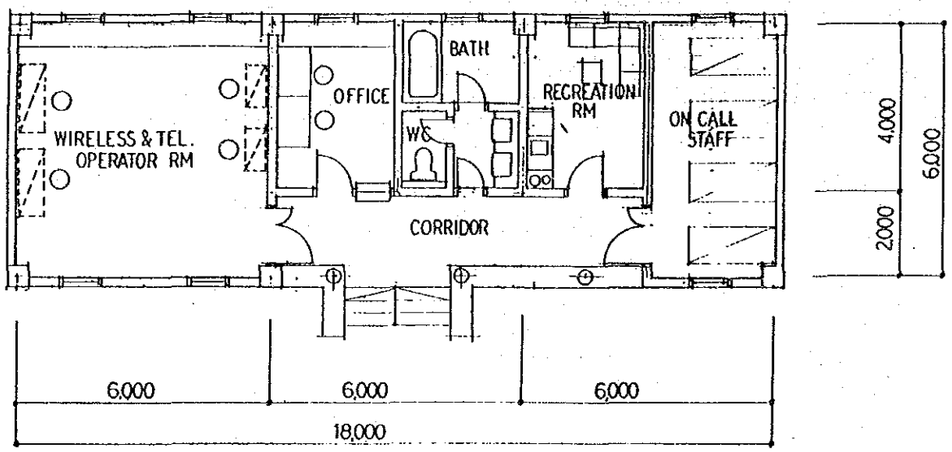
° Helicopter service -- used mainly for emergency service heli-pad (for 1 heli) located on the roof of north wing building with wireless communication with emergency control center. Relating regulations shall be surveyed.

° Education/training -- conference room also considered in casualty dept.

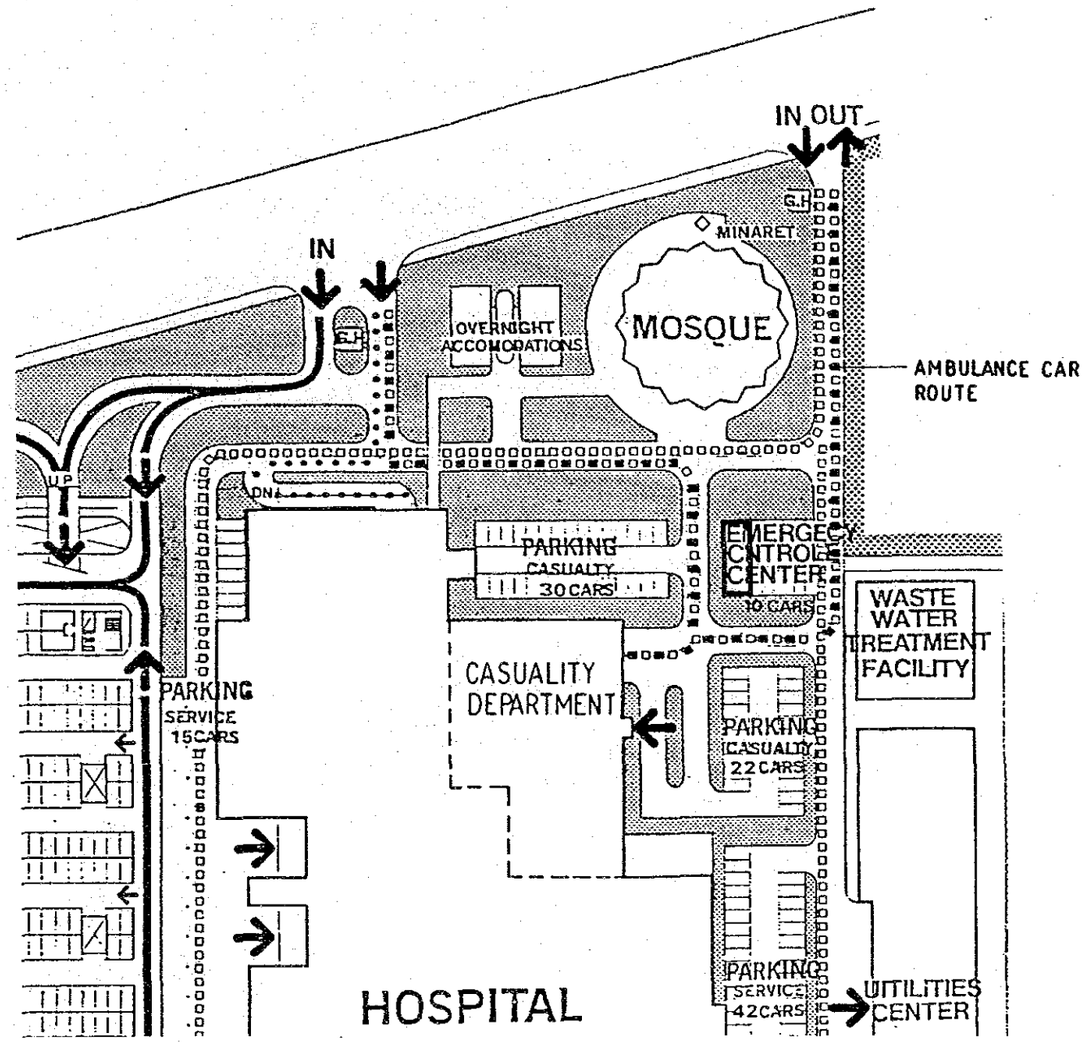


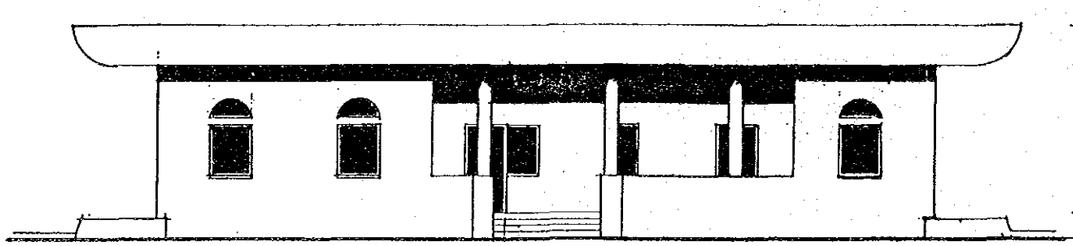
CASUALITY PLAN



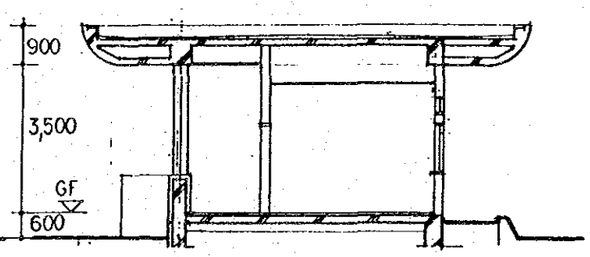


PLAN





ELEVATION EAST



SECTION

EMERGENCY CONTROLE CENTER

2.3 Delivery and Baby Nursery

2.3.1 Delivery department

- 10 deliveries/day
- 3 delivery rooms (3.5 deliveries/day.room)
- 6 labor rooms (3 delivery rooms x 2)

  All one-room type considering the accompaniment of husband or relatives.

- 1 delivery room will be facilitated for the Cesarian section.
- 1 labor room will be facilitated for labor/delivery table.
- Changing rooms for husbands or relatives who will accompany with pregnant woman will be planned in the waiting area before the clean zone entrance.
- Separation of Delivery zone and Baby Nursery zone will be made clearly and the coming in route and going-out route of mothers and new-born baby will be separated.

2.3.2 Baby nursing department

- Classification of new-born babies

  Normal baby -- 85%

  Abnormal baby -- 15% (Premature case -- 10%)
  (Infectious case -- 2.5%)
  (Extreme premature case -- 2.5%)

- 8 incubators (10 cases/day x 10% x 7 days/incubator x 1.1 = ∿8)
- 4 isolation baby beds (10 cases/day x 2.5% x 14 days/bed x 1.1 = ∿4)
- 2 NICU + 6 intermediate beds (10 cases/day x 2.5% x 30 days/bed x 1.1 = ∿8 → 2 N.I.C.U. + 6 intermediate beds)
- 30 baby cots (10 cases/day x 85% x 3 days x 1.1 = ∿30)

  20 cots will be accommodated in baby nursery room.
  Considering the rooming-in system will start from second day after birth.

- Staff rooms will be considered for following staffs.

  Delivery -- 3 doctors (OB-Gynaecologist)

  Baby nursing -- 3 doctors (Pediatrist)

  Each group consists of 1 senior, 1 junior and 1 student doctor.

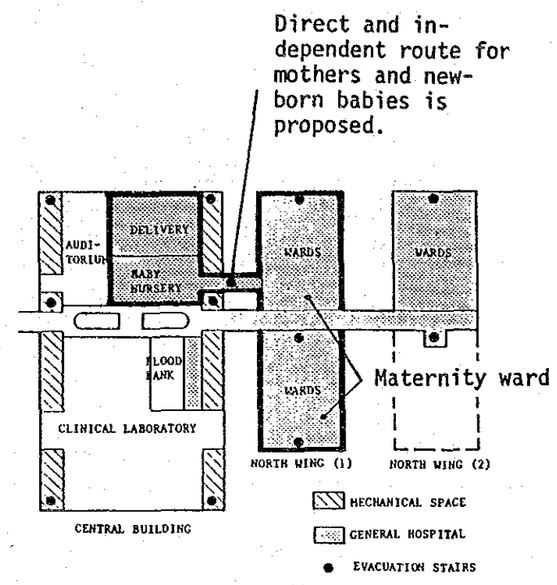
  Nursing staffs and midwives

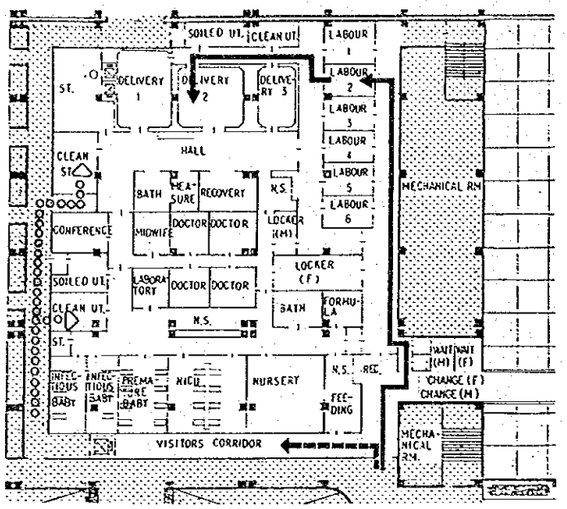
- Education/training

  Conference room will be considered.

2.3.3. Independent route with maternity ward

Independent route with maternity ward is proposed.



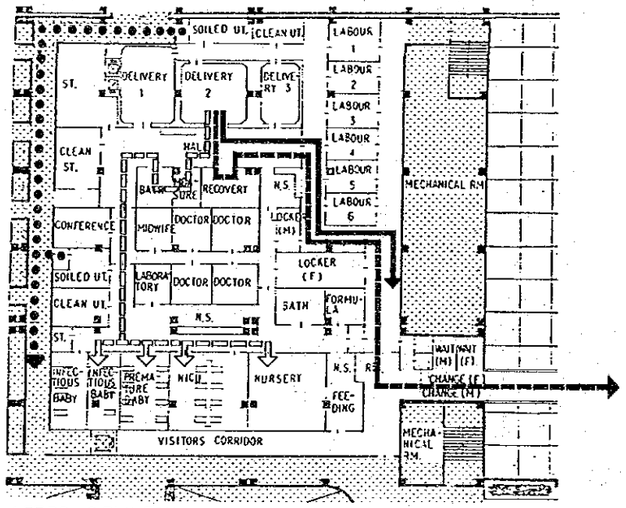


BEFORE DELIVERY

MOTHER (INCL. HUSBAND ETC.)

VISITOR

CLEAN UTILITIES



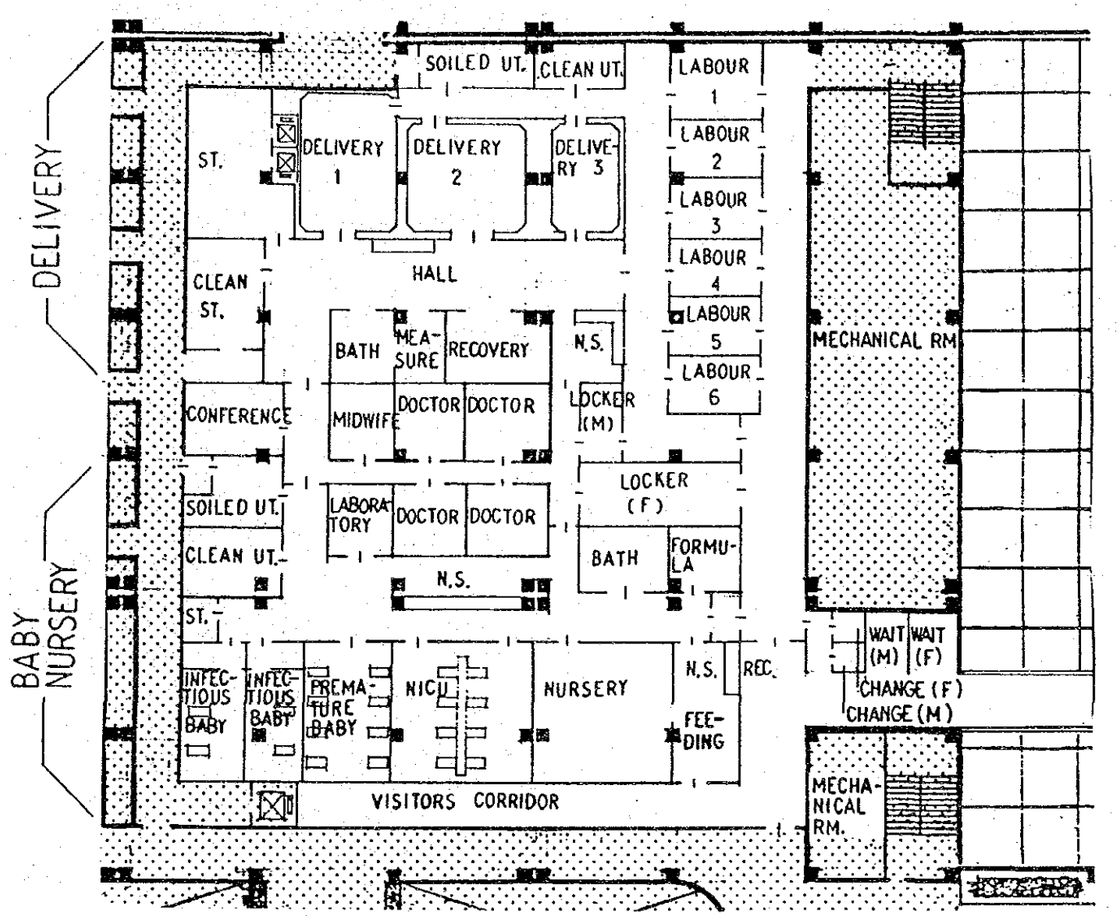
AFTER DELIVERY

HUSBAND ETC.

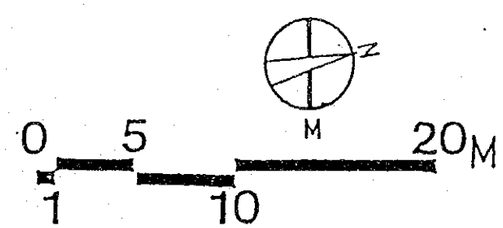
MOTHER

NEW BORN BABY

SOILED UTILITIES



DELIBERY AND BABY NURSERY PLAN



2.4 I.C.U. & C.C.U. Department

2.4.1 I.C.U.

- 12 I.C.U. beds

  3 I.C.U. beds for suspected case (- room air pressure)

  2 I.C.U. beds for highly infectible case (+ room air pressure)

  7 I.C.U. beds for usual case (semi-open type by movable partition)

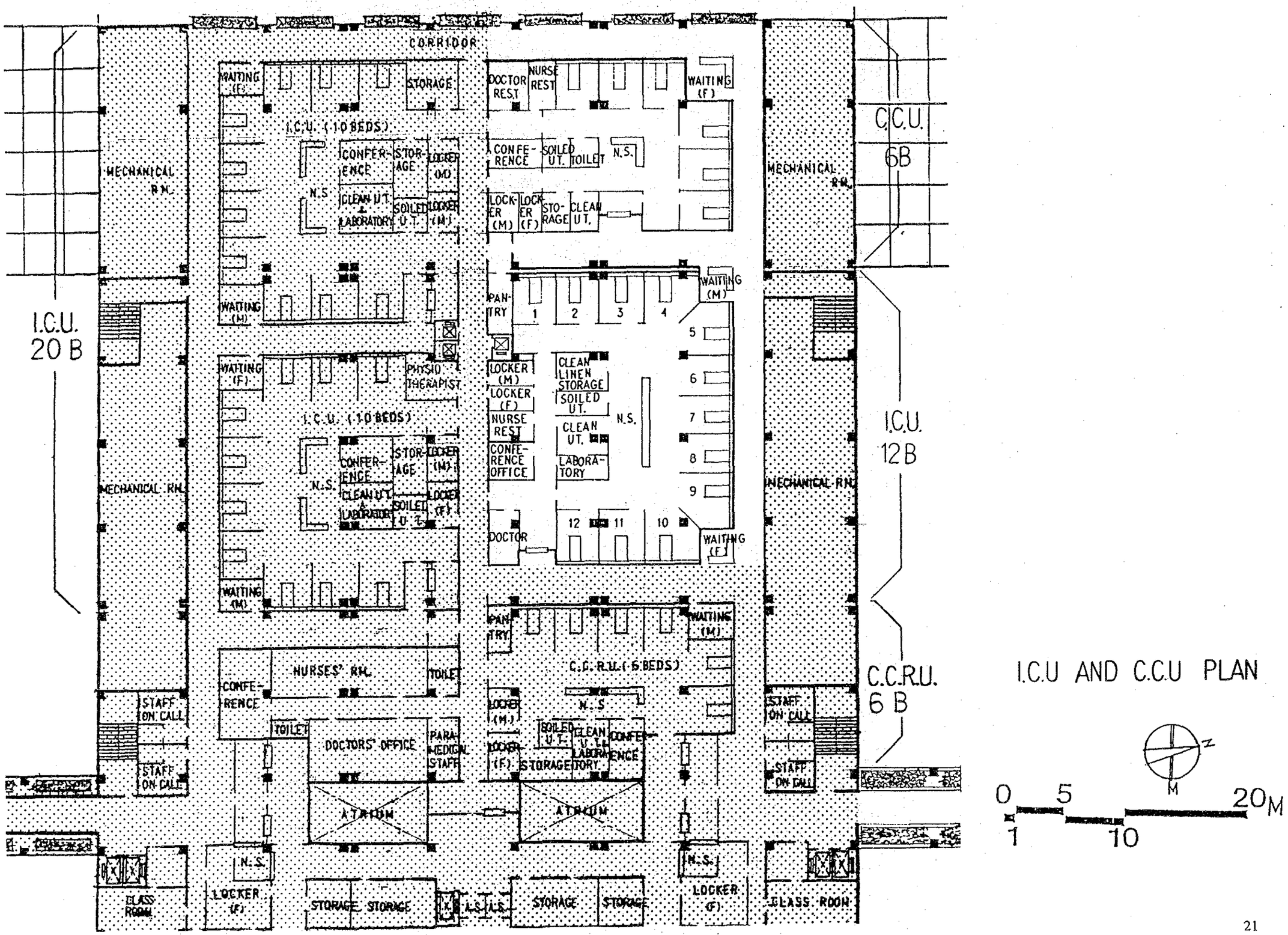
- No-food supply, only occasional liquid food supply will be considered.
- No toilet for patients -- bed pan system
- NS-I.C.U. beds pattern is same as in Cancer Center.
- Laboratory service by blood gas analyzer, electrolyte analyzer, etc.
- Blood bank branch, pharmacy branch will be considered by equipments.
- Movable X-ray will be allocated.
- Direct observation system for semi-open type I.C.U. beds and monitor TV system for closed type I.C.U. beds.
- Nurse on-call rooms for night duty.

2.4.2 C.C.U.

- 6 C.C.U. beds
- All private room-type to give privacy for patients
- Patient toilet will be planned.
- Normal food supply for patient
- Doctor on-call, nurse on-call rooms for night duty

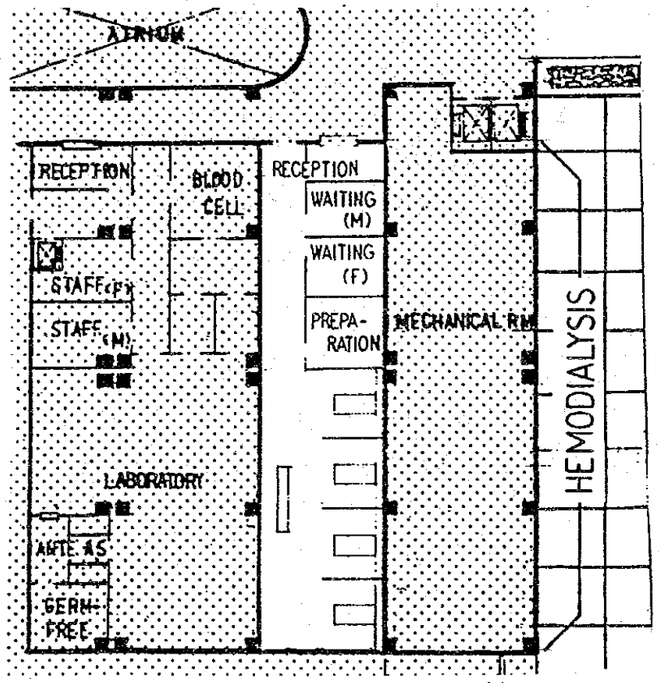
2.4.3. Others

- Conference room will be planned for each dept.
- Waiting area for relatives
- One room for physiotherapist for total I.C.U., C.C.U. and C.C.R.U. area will be provided.
- Patients communication system will be provided as follows;
  - for C.C.U. patients telephone system
  - for I.C.U. patients intercom. + TV

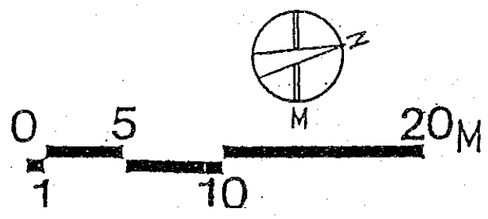

CORRIDOR
I.C.U. 20 B
C.C.U. 6B
I.C.U. 12B
C.C.R.U. 6 B
MECHANICAL RM.
WAITING (F)
STORAGE
I.C.U. (10 BEDS)
CONFER-ENCE
STOR-AGE
LOCKER (M)
N.S.
CLEAN U.T. & LABORATORY
SOILED U.T.
LOCKER (F)
WAITING (M)
PHYSIO THERAPIST
DOCTOR REST
NURSE REST
CONFE-RENCE
SOILED U.T.
TOILET
LOCK-ER (M)
LOCK-ER (F)
STO-RAGE
CLEAN U.T.
PAN-TRY
1 2 3 4 5 6 7 8 9 10 11 12
CLEAN LINEN STORAGE
NURSE REST
CONFE-RENCE OFFICE
LABORA-TORY
DOCTOR
C.C.R.U. (6 BEDS)
HURSES' RM.
TOILET
STAFF ON CALL
DOCTORS' OFFICE
PARA-MEDICAL STAFF
ATRIUM
GLASS ROOM
LOCKER (F)
STORAGE
A.S.
I.C.U AND C.C.U PLAN
0 5 M 20M
1 10

2.5 Hemodialysis Department

- 4 hemodialysis beds
- Service for both out-patients and in-patients
- Waiting rooms (by sex) for out-patients



HEMODIALYSIS PLAN



2.6 Wards

2.6.1 P.P.C. system

° P.P.C. (Progressive Patient Care) system is proposed for effective use of nursing staff and for adequate supply of services required by different case of patients.

° P.P.C. ward will be classified as follows:

Post I.C.U. Care Ward

Intermediate Care Ward

Self-care Ward

Special Ward (Maternity Ward, Pediatric Ward, Burns Unit and Isolation Ward)

2.6.2 Total number of bed

Phase I : 350 beds

Future extension: 150 beds

Total : 500 beds

2.6.3 Flexibility for future extension

For the re-organization in future, flexible planning of ward shall be considered.

2.6.4 Distribution of bed

1) Maternity ward

52 beds will be planned.

° No. of delivery: 10 cases/day

° Complicated delivery case will be 50% higher estimated than existing ratio in Jeddah (10%) → 15%.

° Calculation of no. of maternity beds.

Normal case: 10 cases/day x 85% x 3 days/bed x 1.1
= 28 beds

Complicated case: 10 cases/day x 15% x 14 days/bed x 1.1
= 24 beds

Total: 52 beds

° For all maternity ward, baby cot will be facilitated to enable rooming-in system from 2nd day after birth.

2) Pediatric ward

60 beds will be planned including 4 Pediatric I.C.U. beds and 4 Pediatric Post I.C.U. beds.

° In the year H1400 proportion of pediatric beds is ∿16.5% both in Jeddah area and whole country (excl. mental, isolation, TB, others)

° 350 beds x 16.5% = ∿60 beds

° Composition of pediatric ward

- Internal Medicine wing		
Infectious	1 bed room x 4	4 beds
Child/mother	1 bed room x 4	4 beds
General	3 bed room x 6	18 beds
	Sub-total	30 beds
- Surgical wing		
Child/mother	1 bed room x 4	4 beds
General	3 bed room x 6	18 beds
	Sub-total	22 beds
- Pediatric I.C.U.		
Pediatric I.C.U.	2 bed room x 2	4 beds
Pediatric Post I.C.U.	4 bed room x 1	4 beds
	Sub-total	8 beds
	Total	60 beds

3) Burns unit

8 beds will be planned.

4) Isolation ward

12 beds will be planned.

5) Other ward

Distribution of other wards' beds by nursing level will be planned as follows based on Japanese hospitals' case.

Post I.C.U. care : 6 beds (3%)

Intermediate care: 100 beds (46%)

Self-care : 112 beds (51%)

2.6.5 Patient ratio by sex

Male : Female - 2 : 1 (excl. pedia, obsterics case)

Male : Female - 1 : 1 (pedia case)

Allocation of bed by sex will be put as near as possible to the above ratio.

2.6.6 Nursing unit

Ward type	No. of bed by dept.	Nursing unit	Composition by sex			
			Male	Female	Common	Total
Maternity	52 beds	26 beds/NU	-	2 NU	-	2 NU
Pediatrics	52 beds	30/22 "	-	-	2 NU	2 NU
Pediatric ICU + Pediatric Post ICU	8 "	8 "			1 NU	1 NU
Self-care	112 "	28 "	2.5NU	1.5NU	-	4 NU
Intermediate care	100 "	25 "	2.5NU	1.5NU	-	4 NU
Post-ICU	6 "	6 "	-	-	1 NU	1 NU
Burns	8 "	8 "	-	-	1 NU	1 NU
Isolation (I)	6 "	6 "	-	-	1 NU	1 NU
Isolation (II)	6 "	6 "	-	-	1 NU	1 NU
Total	350 beds					17 NU

- In locating the different types of wards attention will be paid to put same ward group (by ward type or by sex) will be located in the same floor or in adjacent place.
- Within the ward, patients will be classified in 2~3 groups (surgical case, internal medicine case or other case) and the Nurse Station in surgical case side will be main Nurse Station and in internal-medicine case side will be sub-Nurse Station.

2.6.7 Other common conditions for ward planning

- Separation by sex will be planned with the priority of by floor, by wing and by half-side of wing.
- VIP room -- 1 VIP room for each wing, but for Pediatric, Post-I.C.U., Burns and Isolation wards, VIP will not be considered.
- Pray room -- for each ward
- Class room -- room with AV facilities will be planned in each ward for educational purpose.
- Chief doctor room with secretary room, doctor room and conference room will be planned for adequate ward group.
- Branch pharmacy (medicine cupboard) will be facilitated in each nurse station.
- Waiting rooms (by sex) for relatives or visitors will be considered.
- 2-bed room type will be planned using movable partition in 4-bed room type.

2.6.8 Individual conditions for the planning different ward type

1) Maternity ward

- Location in 2F -- nearest location to Delivery and Baby Nursery depts.
- Independent route to Delivery and Baby Nursery depts. is proposed.
- NS located in complicated case maternity ward side will be a main NS.
- Consultation rooms for mother and child health consultation will be provided.
- Formula and bathing rooms will be provided for possible rooming-in system.

2) Pediatrics ward

- Location in 6F (top floor) -- independence and future extension is considered.

2)-1 General Pediatric

- Surgical case and internal med. case will be separated by wing.
- Separation by sex has second priority and will be made by half-side of wing.
- Infectious cases/suspected cases will be allocated in the end of internal med. wing.

° Child/mother rooms will be introduced for both internal and surgical wings.

2)-2 Pediatric I.C.U. + Pediatric Post I.C.U.

° 4 Pediatric Post I.C.U. bed with semi-open type room will be provided.

° Whole Pediatric I.C.U. area will be planned as semi-clean zone with air cleanliness class 10,000.

° Visitor's balcony system will be introduced.

° Small laboratory for Pediatric I.C.U. will be considered.

3) Self-care ward

° Location -- in upper floors

° Internal med. case, surgical case (other cases - only in male ward) will be separated by wing.

° Smaller nurse station will be allocated.

° Larger day rooms, pray rooms will be considered.

4) Intermediate care ward

° Location -- in lower floors

° Internal med. case, surgical case (other cases - only in male ward) will be separated by wing.

° Main NS in surgical case side and NS in internal med. case side will be sub-NS.

5) Post-I.C.U. care ward and Burns unit

° Location in 3F -- closer relation to I.C.U., C.C.U. and OP depts.

° Post-I.C.U. ward and Burns unit will be separated clearly against cross-contamination.

° Whole Burns Unit will be planned as semi-clean zone with air cleanliness level class 10,000.

° 2 rooms in Burns Unit will have higher air cleanliness level class 100 with laminar flow system (Down flow + free access floor return type) for the non-contaminated burns patients.

° Both Post-I.C.U. ward and Burns unit will be private room type against contamination.

° Surgical treatment room with minor operation facilities, water treatment room and simple laboratory will be considered for burns unit.

° Treatment room will be provided for Post-I.C.U. ward.

6) Isolation ward

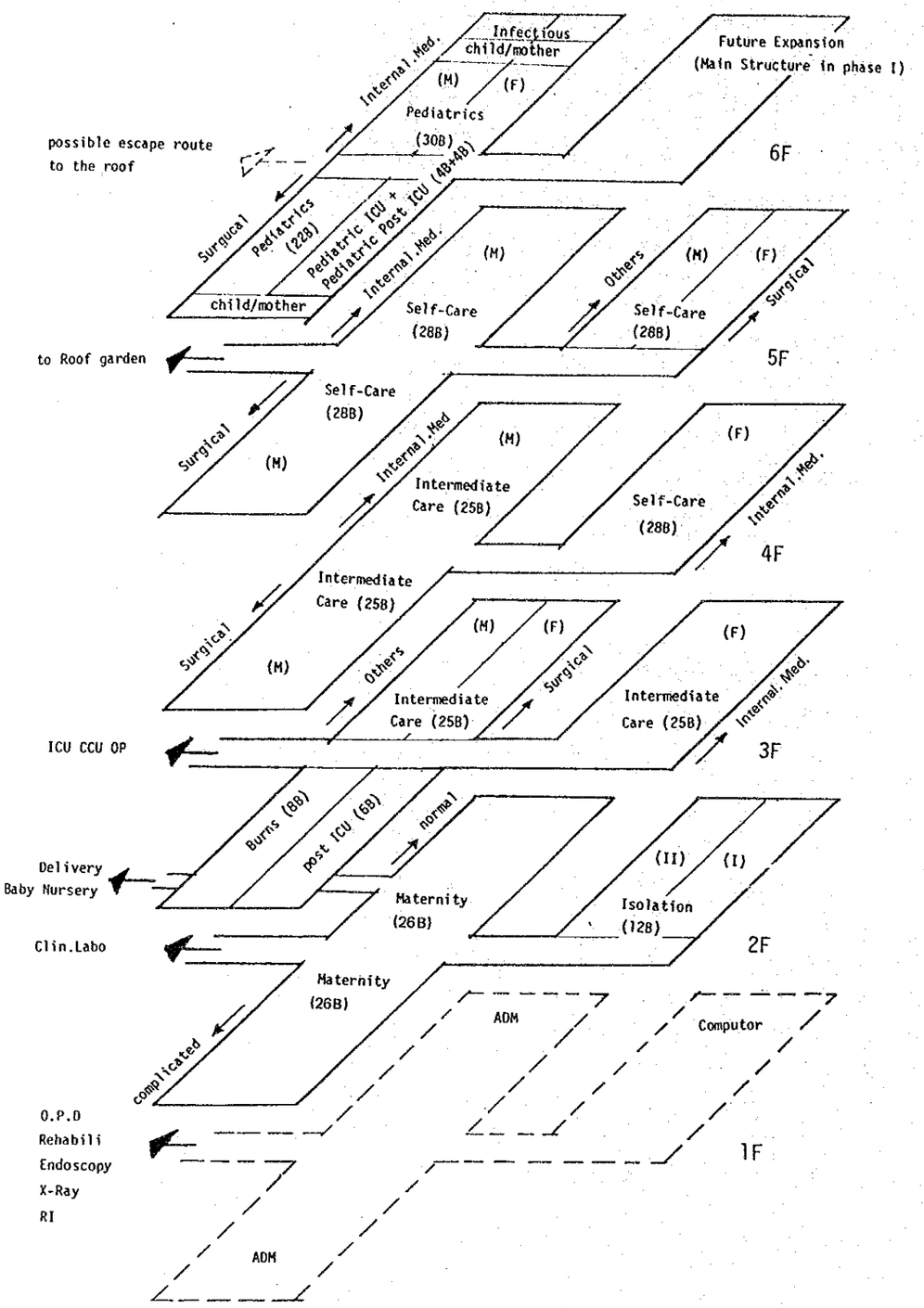
° Isolation Ward I

Suspected infectious disease case
Patients will stay in this ward for examination and after diagnosis they will be sent to other infectious hospitals, etc.

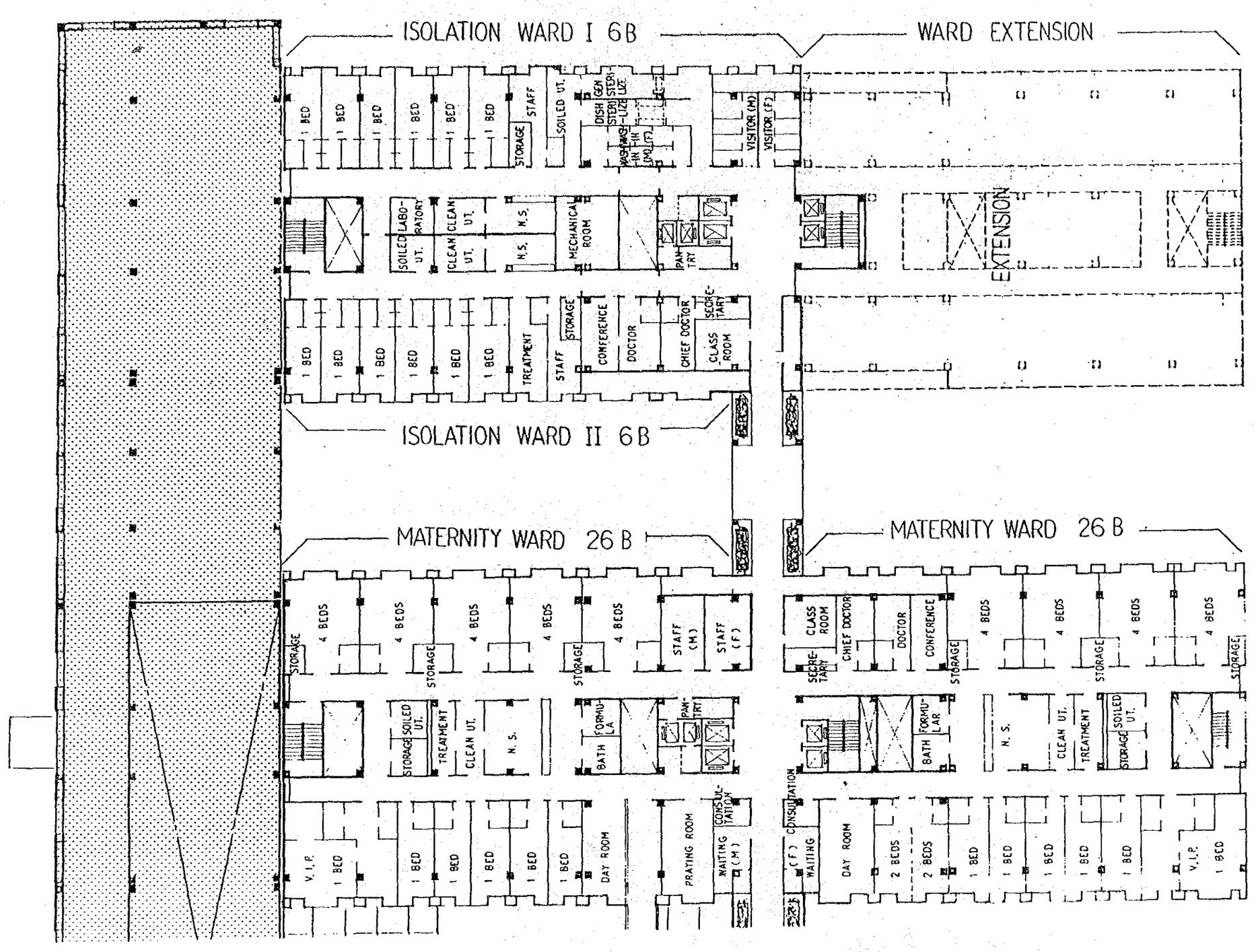
° Isolation Ward II

For other isolation cases.

° I and II will be separated by the half side of wing.

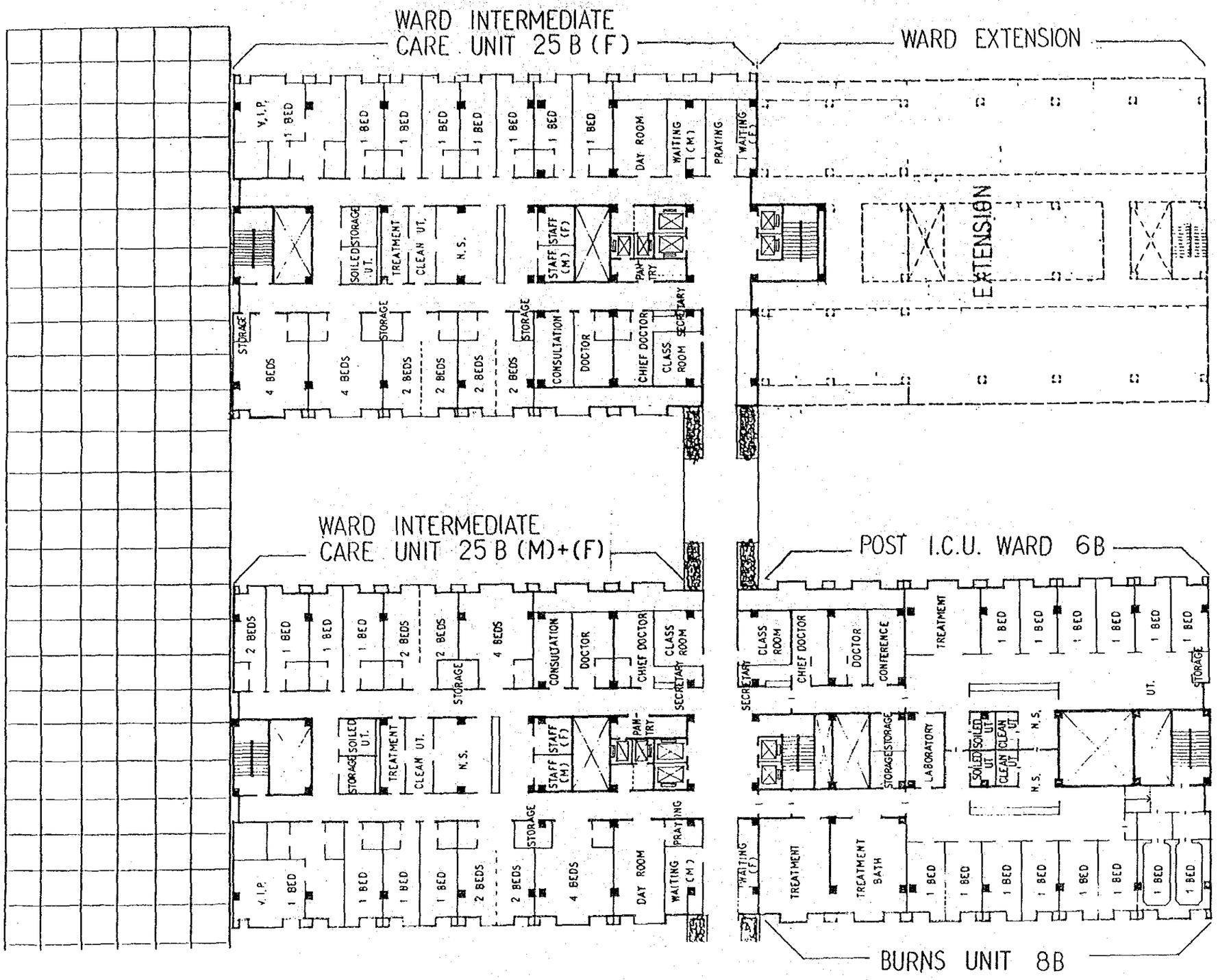


Ward Allocation Planning

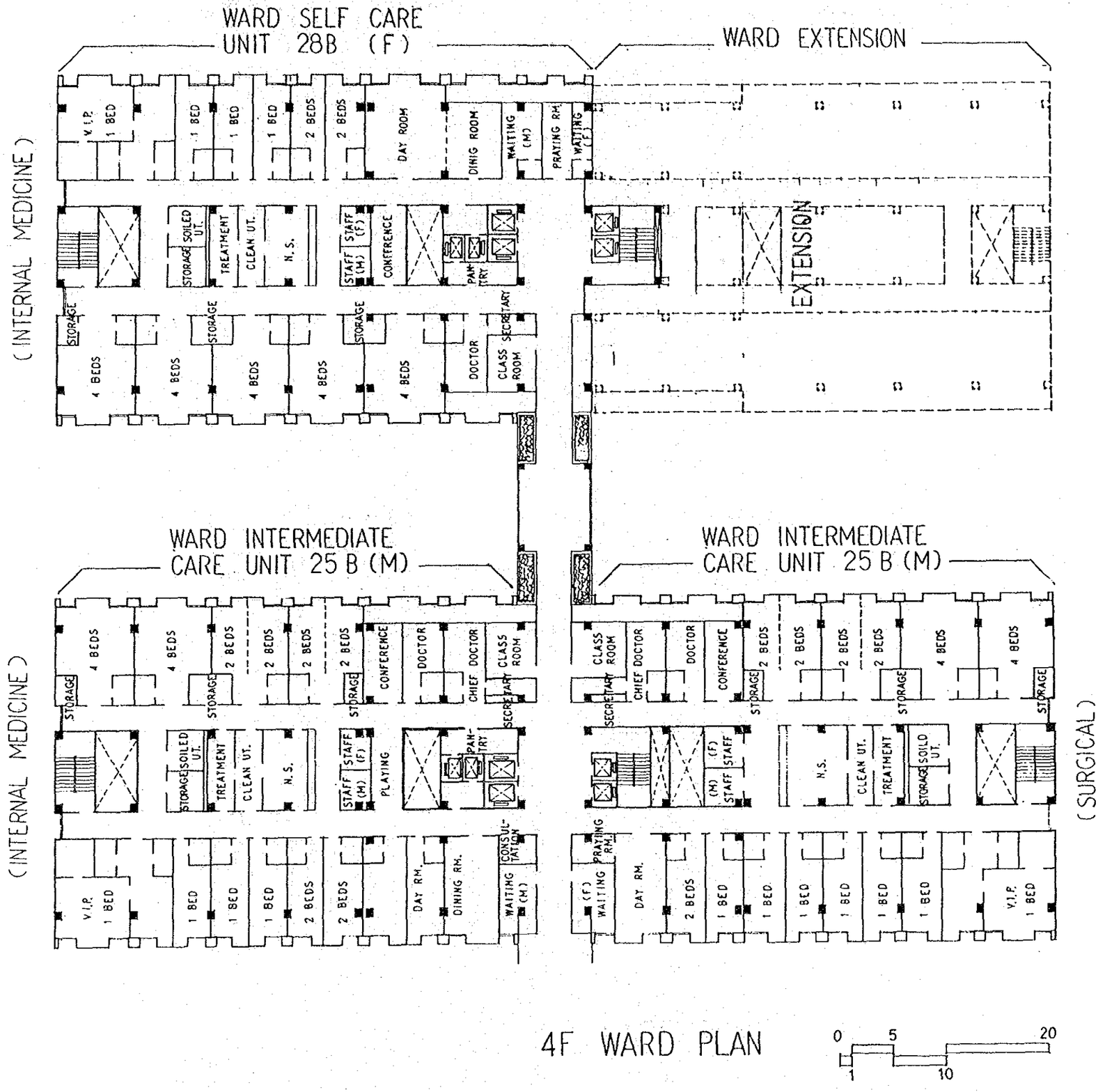


2F WARD PLAN

0 5 20
1 10

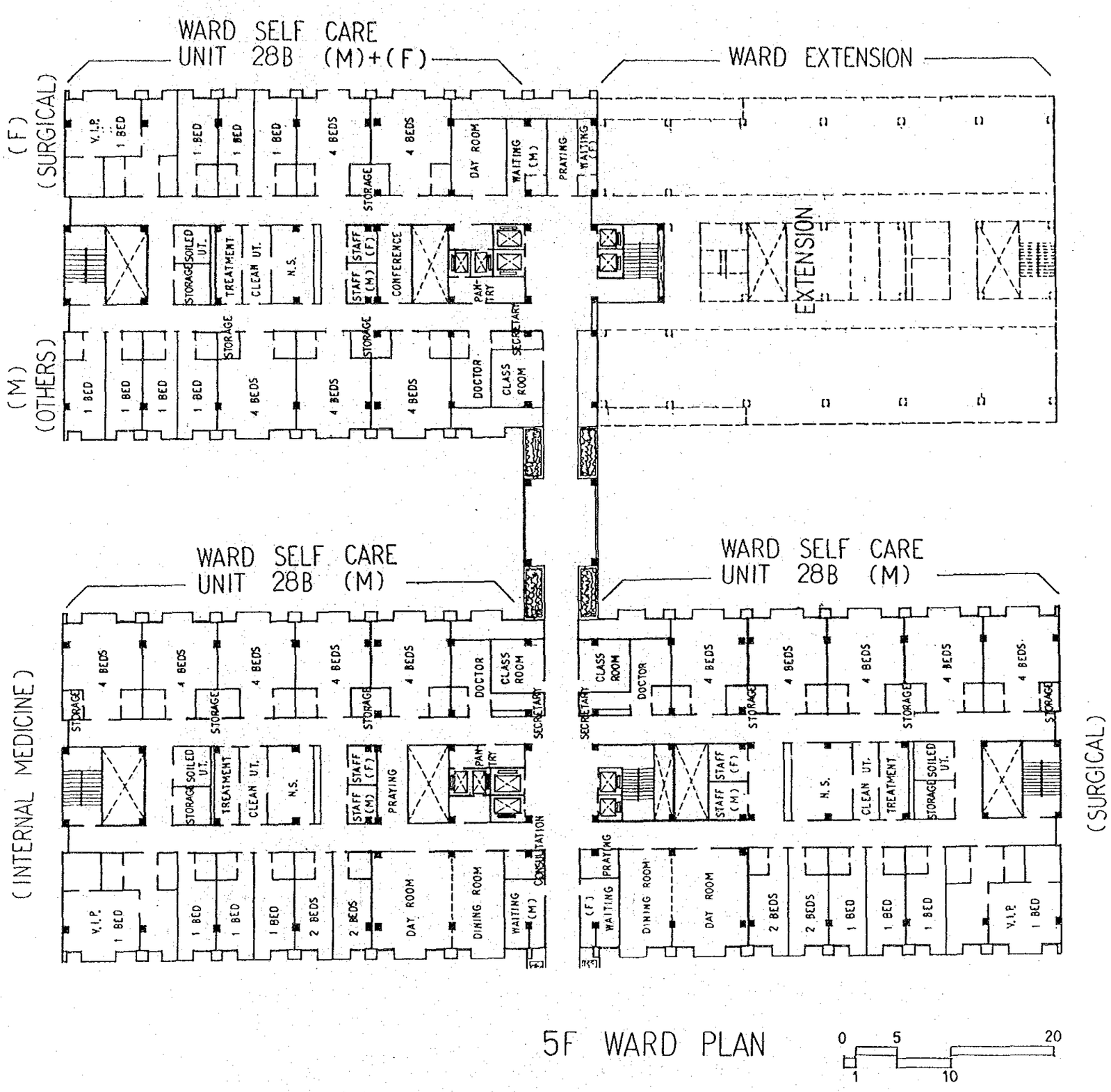

WARD INTERMEDIATE CARE UNIT 25 B (F)
WARD EXTENSION
EXTENSION
WARD INTERMEDIATE CARE UNIT 25 B (M)+(F)
POST I.C.U. WARD 6B
BURNS UNIT 8B
V.I.P.
1 BED
DAY ROOM
WAITING (M)
WAITING (F)
PRAYING
SOILED UT.
STORAGE
TREATMENT
CLEAN UT.
N.S.
STAFF (F)
STAFF (M)
PAN-TRY
4 BEDS
2 BEDS
CONSULTATION
DOCTOR
CHIEF DOCTOR
CLASS ROOM
SECRETARY
CONFERENCE
LABORATORY
BATH
UT.
0 5 20
1 10

3F WARD PLAN



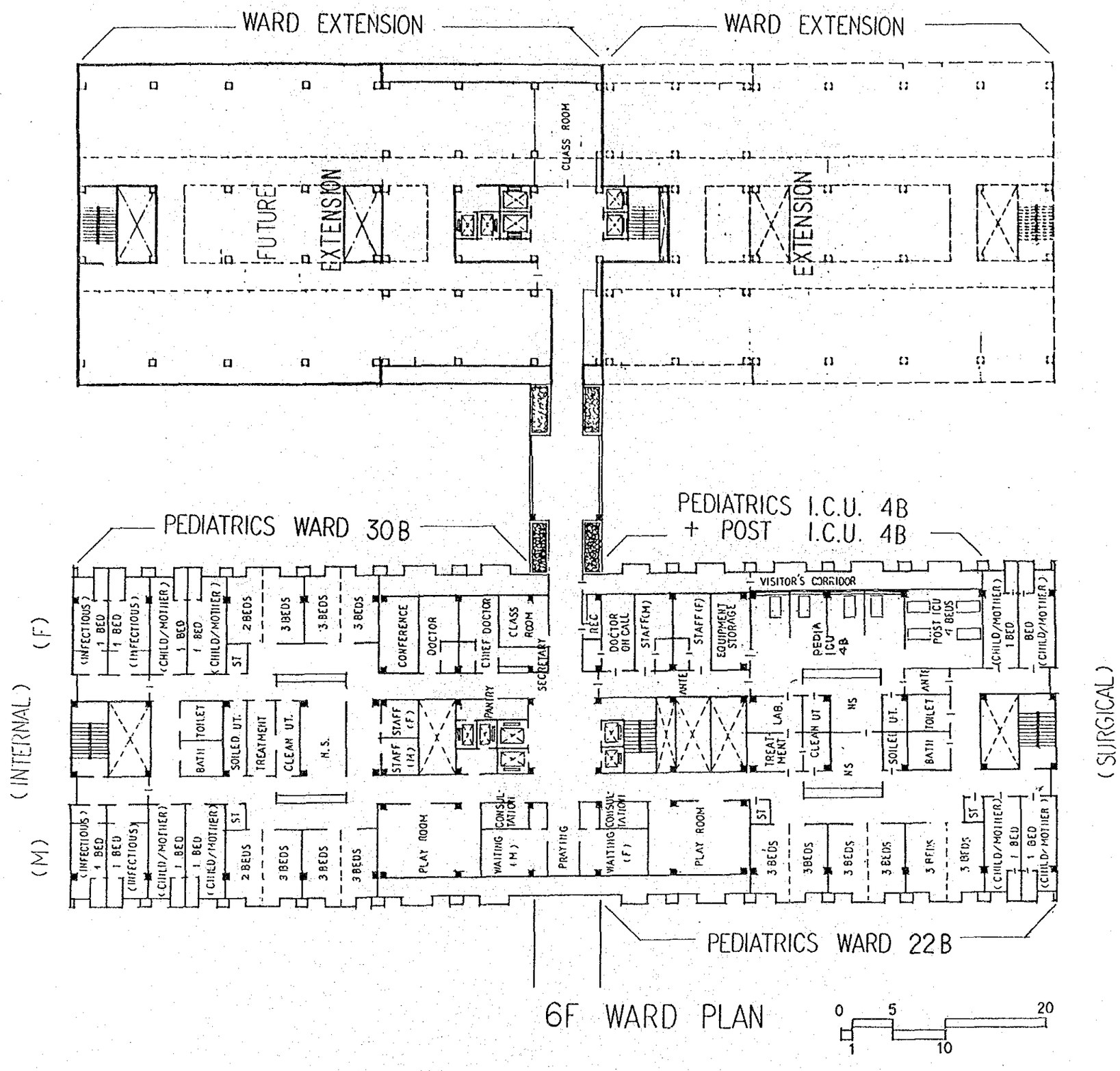
4F WARD PLAN

0 5 20
1 10



5F WARD PLAN

0 5 20
1 10


WARD EXTENSION
WARD EXTENSION
CLASS ROOM
FUTURE EXTENSION
EXTENSION
PEDIATRICS WARD 30B
PEDIATRICS I.C.U. 4B + POST I.C.U. 4B
VISITOR'S CORRIDOR
(INFECTIOUS) 1 BED
(CHILD/MOTHER) 1 BED
2 BEDS
3 BEDS
CONFERENCE
DOCTOR
CHIEF DOCTOR
CLASS ROOM
SECRETARY
REC
DOCTOR ON CALL
STAFF(M)
STAFF(F)
EQUIPMENT STORAGE
PEDIA ICU 4B
POST ICU 4 BEDS
BATH
TOILET
SOILED UT.
TREATMENT
CLEAN UT.
N.S.
STAFF (M)
STAFF (F)
PANTRY
ANTE
LAB.
NS
PLAY ROOM
WAITING (M)
CONSULTATION
PRAYING
WAITING (F)
PEDIATRICS WARD 22B
(INTERNAL)
(M)
(F)
(SURGICAL)
0 5 20
1 10

6F WARD PLAN

3. STRUCTURAL AND MECHANICAL/ELECTRICAL PLANNING

3. STRUCTURAL AND MECHANICAL/ELECTRICAL PLANNING

3.1 Structural System

3.1.1 General

Structure of the general hospital has been designed in conformity with the criteria for the National Cancer Centre for which a report has already been submitted. That is, basic items such as siting conditions, materials used, and design criteria (such as loads and seismic load) are the same. Therefore, unclear portions in the previous report will be clarified, also, the following items will be reviewed in this report:

① Reexamination of ground capacity at various foundation levels

② Consideration of sub-structure (Anti-earthquake, earth pressure-resistant water proofing)

③ Anti-earthquake treatment for the super-structure system and proposal

④ Sections of columns and beams at expansion joints and clearance

⑤ Heliport design conditions

3.1.2 Reexamination of ground capacity

Fig. 1 shows the results of a dynamic penetration test conducted in the central part of the site. Other test results also indicate values close to this curve. Static resistance values were calculated from these test results and the following values were obtained:

° At a depth of nearly 1.0 m below ground level:

Resistance value can be calculated from the following formula by taking account of low values at a depth of nearly 3.0 m:

qc = Rd/20 (coefficient of 1/20 means a safety factor of 4)

where, qc: Static resistance value

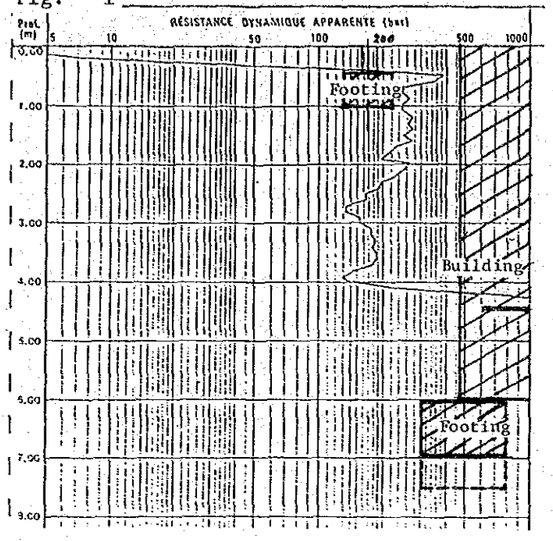
Rd: Dynamic resistance value

Since Rd = 130 bars, qc = 6.5 bars (= 66.3 t/m²)

° At a depth of 6 & 7 m below ground level:

Rd = 1,000 bars and thus qc = 50.0 bars (= 500 t/m²)

Fig. - 1



List-1

S.P.T. (N value)	Static cone resistance (q_c in bar)
< 4	< 20
4 – 10	20 – 40
10 – 30	40 – 120
30 – 50	120 – 200
> 50	> 200

From the above, the following values are considered to be appropriate as design resistance values:

Foundation for structure without sub-structure ..... 40 t/m²

Foundation for structure with sub-structure ..... 80 t/m²

Also, List-1 shows the relation between static cone resistance and the standard penetration test. From this, if Rd exceeds 200 bars, N-value will exceed 50. However, if a larger resistance value is needed (such as 100 to 150 t/m²), it becomes necessary to perform additional dynamic tests (ASTM2850) shown below.

1. To collect undisturbed samples and to perform triaxial compression tests.

2. Bore-holes are to be made at 5 places on the site.

3. Core samples are to be collected at the levels of 6.0, 7.0 and 8.0 m below GL in each bore-hole.

3.1.3 Sub-structure (B1 floor)

From the results of ground investigation, the underground portion approximately 1 m below ground level has a very low water permeability and permeation of rain water up to basement floor level during the rainy season is rarely expected. Thus, the employment of a water-proofing structure is not required. Therefore, the peripheral structure of the basement floor is only required to

be earthquake-proof and earth pressure-resistant. Also, water pressure will not act on the floor so that no stresses occur in the floor slab. Floor slab is only required to provide resistance against vibration created by cars. However, guttering is necessary for drainage at the entrance. Also, the inflow of water from the backfilled peripheral portion must be prevented.

3.1.4 Super-structure

Span modules of 7.0 m x 7.0 m and 7.0 m x 9.5 m are basically used. Though many cases of the structural system can be considered, only two cases are studied here, as indicated in List-2. 100% of the horizontal seismic force is borned by the frame in Case-I. In this case, stresses in the frame become considerably large, depending upon the horizontal force, so that both columns and beams become progressively larger on lower floors. However, this system is able to provide considerable flexibility to the interior spaces, and even the partitions can be changed later, so that it is able to functionally cope with future changes.

On the other hand, in Case-II, horizontal seismic forces are all borne by shear walls rationally arranged (8 walls in each direction of X and Y), and the vertical loads are borne by the frame. Floors of this system will be made of hollow slabs or waffle slabs, the depth of beams will be maintained to a minimum in order to utilize the ceiling space as much as possible, and a uniform height is employed for all stories. Also, these shear walls will not be overturned by the horizontal force of this degree (base shear is 0.06) during earthquake. Also, the planning can be made without great loss of the flexibility as a result of the arrangement of such shear walls. This system can be applied also to the structure of the central building and others.

3.1.5 Sections at expansion joints and clearance

From the data made available up to now, it has been clarified that the displacement of a building due to temperature change between the inside and outside of the building greatly varies, depending upon the roof finishing materials and the length of expansion (List 3). As the expansion length becomes larger, the amount of lateral displacement of the building increases, and the amount of lateral displacement increases as the floor level becomes higher. Also, stresses in columns and beams increase as the expansion length becomes larger.

These values can be reduced by using insulation layer on the roof. Thus, the use of insulation layer is of great advantage.

List 3

Lateral displacement due to heat differences (25°C)

Roof Condition	Distance of Expansion			Evaluation
	28 m	56 m	98 m	
(1) Shelter roof (P.C. board)	0.735 [Beam: 12.6 tm Column: 13.3 tm]	1.42 [Beam: 17.1 tm Column: 18.8 tm]	2.27 [Beam: 22.7 tm Column: 33.0 tm]	Δ
(2) Heat Insulation layer between above slab	0.225 [Beam: 8.5 tm Column: 2.8 tm]	0.433 [Beam: 10.5 tm Column: 7.0 tm]	0.701 [Beam: 12.5 tm Column: 10.9 tm]	○

unit: cm
[ ]: stress

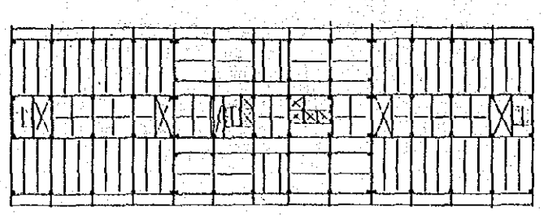
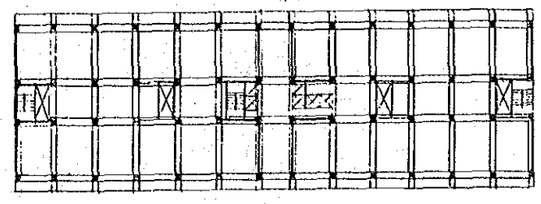
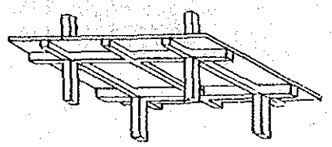
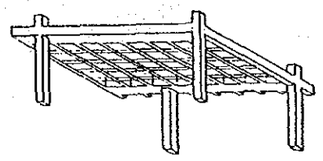
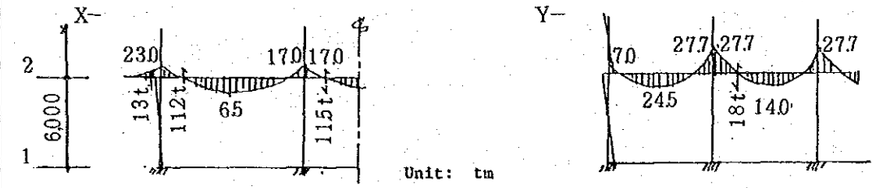
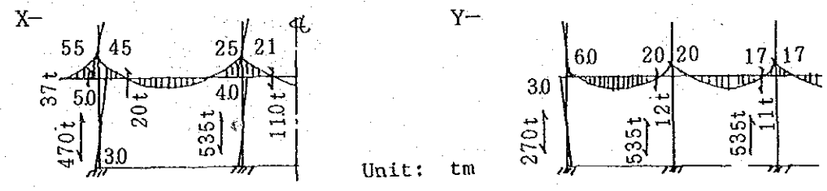
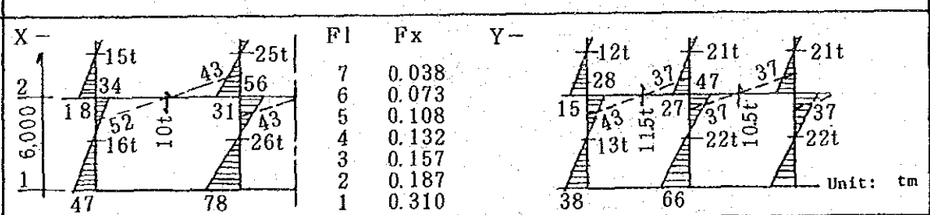
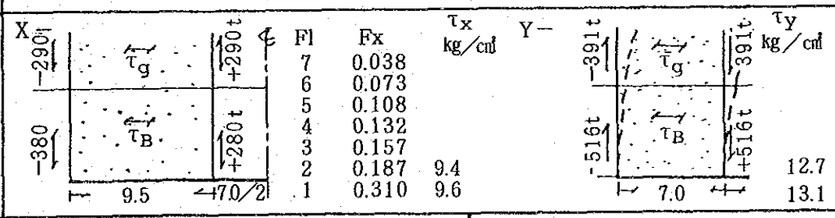
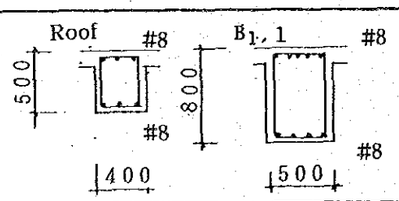
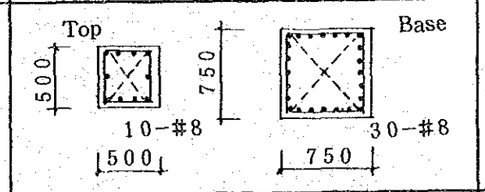
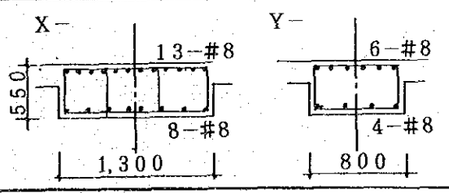
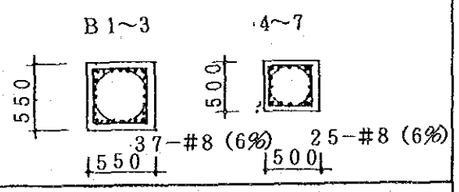
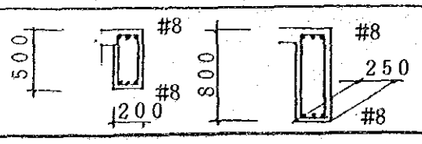
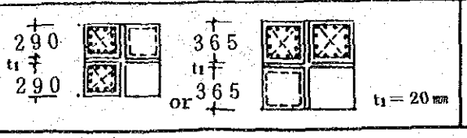
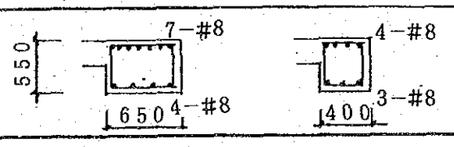
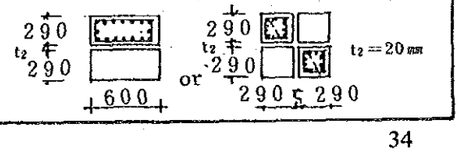
Also, concrete itself continues to contract for almost one year after concrete placement. This contraction occurs uniformly in each storey and the quantity of the contraction can be approximately estimated by $5 \times 10^{4} \times$(length of building).
Actual quantity of contraction is shown in List-4.

List 4

Distance of Expansion Joint		
28 m	56 m	98 m
- 1.12	- 2.24	- 3.92

(unit: cm)

STRUCTURAL SYSTEM (LIST-2)

			Case - I	Case - II
	System / Description			
Load (kg/m^2)	Dead Load		1120 (Incl. Main Str. Member)	1120
	Imposed Load		General Room 200 - 300; Special Room 300 - 500	200 - 300
Slab-System			Beam + Slab (t=150) 	Hollow Slab Sys. (t=300) 
Permanent Stress Diagonals				
Seismic Condition	Base Shear		0.06 (25 gal: 0.2 x 25/100 x 1.5)	0.06
	Shear force Rate	Frame	100%	0%
		Wall	0%	100%
	Seismic Stress Diagonals			
Section	General		Beam  Column 	Beam  Column 
	Expansion		 	 

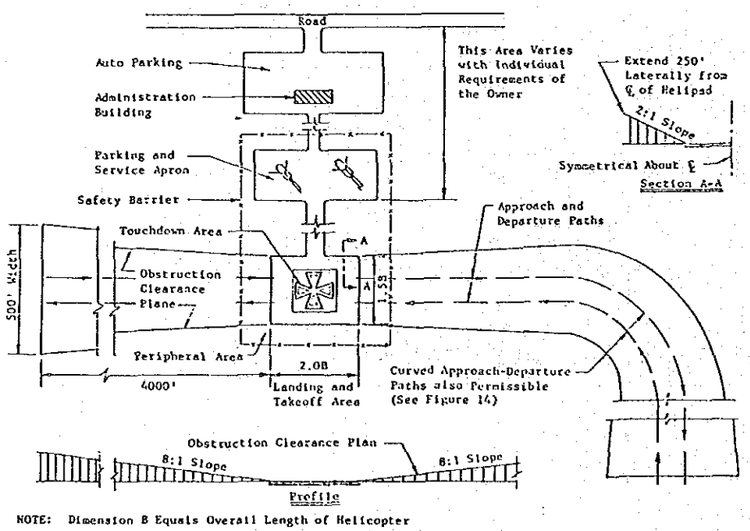
Change in length of building is the sum of displacement and contraction shown in the two Lists indicated above for one year after the placement of concrete and, thereafter, only the change due to temperature difference (about 25°C) occurs. Therefore, it is better to use insulating materials which show little displacement and to place expansion joints while maintaining an expansion length of 30 to 50 m without obstructing the buildings functions. Also, it is desired to provide expansion joints on the centres of columns and to give a clearance of about 20 mm in each direction. (+0.433-2.24≒-1.8 cm for 56 m of expansion length.) A column with an expansion joint may have a section similar to that of an ordinary column and can be created by increasing the amount of reinforcement so as to resist axial force.

3.1.6 Heliport design conditions

Heliport design conditions conforming to the standard of FAA (Federal Aviation Administration, Department of Transportation) are outlined below.

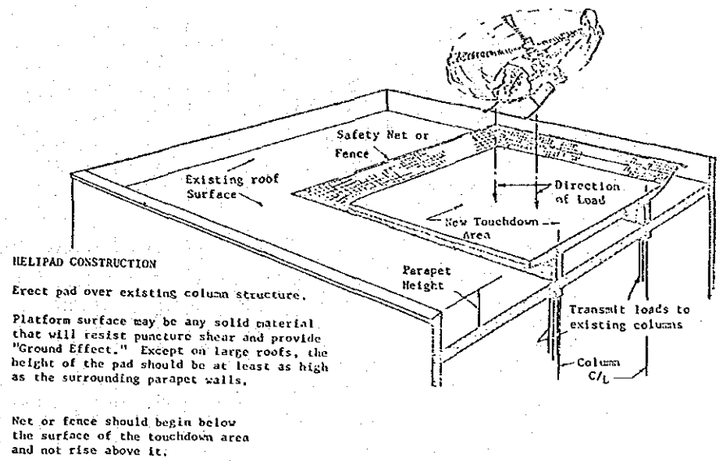
a. Types: There are two types; landing pad of the same height as roof, and elevating type landing pad.

b. Size: Size of helipad is shown in Fig. ___ .
From the figure shown below, size of pad is determined by the kind of helicopter, so that the heliport can be designed only after determining the kind of helicopter.



NOTE: Dimension B Equals Overall Length of Helicopter

c. Helipad construction



HELIPAD CONSTRUCTION

Erect pad over existing column structure.

Platform surface may be any solid material that will resist puncture shear and provide "Ground Effect." Except on large roofs, the height of the pad should be at least as high as the surrounding parapet walls.

Net or fence should begin below the surface of the touchdown area and not rise above it.

d. Design loadings: The heliport design must base its design on the loading and landing characteristics of the helicopter that will utilize the heliport.
The maximum gross weight and the maximum static gear load for each type of helicopter can obtain from each maker's catalogue (List-).
But, in designing, designer shall take into consideration dynamic (or impact) loading of helicopter for heli-pad, and landing surface should be designed to support a concentrated load equal to 75% of the gross weight of the helicopter at each main landing gear, (W x 3/4) x 3 ; dynamic load, W ; heliweight).
Usually, the slab of heli-pad has more than 200 mm in thickness.

Appendix 1

Characteristics of Helicopter

Manufacturer	Type	Main Rotor Dia.		Overall Length		Body Length		Height		Front Wheel Spacing		Rear Wheel Spacing		Wheel Spacing Between Front & Rear		Maximum Cargo Capacity		Hoist	Number of Seats		Fuel Capacity		
		M	FT IN	M	FT IN	M	FT IN	M	FT IN	M	FT IN	M	FT IN	M	FT IN	KG	LB		CREW	PASS.	LITRES	U.S. GAL.	IMP. GAL.
(1)	(2)	(5)		(4)		(5)		(6)		(7)		(8)		(9)		(10)		(11)	(12)		(13)		
AMD/BRANDLY	B-2	7,21	23 8	8,53	28 0			2,14	7 0	1,72	5 7			*	*	726	1 600	1	1	1	114	30	24,9
	B-2B	7,25	23 9	8,53	28 0			2,10	6 9	1,77	5 8			*	*	760	1 670	1	1	1	117	31	25,8
	105	8,7	28 6	10,58	32 11	7,44	24 5	2,45	8 0			3,85	6 10	2,14	7 0	1 310	2 900	1	1	4	162	43	55,8
AMD/CIMEA	RP-440	11,71	38 5	14,73	48 4			3,96	13 0			4,19	13 9			2 336	5 150	2	1	2-3	288	76	63,3
AERITALIA	AC-12	8,50	27 11	8,30	27 3	7,55	24 9	3,10	10 2	2,00	6 7			3,50	11 6	820	1 810	1					
	AC-14	9,60	31 6	10,00	32 10	8,13	26 8	3,10	10 2	2,00	6 7			3,50	11 6	1 350	2 980	1					
AGUSTA	A101G	20,4	66 11	24,6	80 6	19,2	62 8	6,56	21 6	0,44	1 5	4,40	14 5	5,24	17 2	12 900	28 400	3	2-3	36	2 160	570	474,6
	102	14,50	47 4	17,92	58 10	12,73	41 11	3,25	10 7	2,45	8 0			*	*	3 900	8 600	1					
	103	7,40	24 3			6,13	20 1	2,23	7 4	1,54	5 1			*	*	460	1 010	1					
	104	7,95	26 1	9,30	30 6	6,35	20 10	2,35	7 11	1,64	5 5			*	*	640	1 410	1					
	115	11,33	37 2	13,30	43 8	9,90	32 6	2,94	9 8	2,29	7 6			*	*	1 390	3 060	1					
BELL	47J	11,33	37 2	13,24	43 5	9,88	32 5	2,84	9 4			2,28	7 6	2,92#	9 7#	1 270	2 800	1					
	47G	11,27	37 0	13,10	43 0			2,83	9 4	2,29	7 6			*	*	1 340	2 950	1	1	2	227	60	49,9
	47J-2	11,27	37 0	13,10	43 0			2,90	9 6	2,14	7 0			*	*	1 340	2 950	1	1	3	180	47,5	39,5
	47G-2	10,72	35 2	12,63	41 5	9,27	30 5	2,87	9 5	2,28	7 6	2,28	7 6	3,08#	10 1#	1 130	2 500	1					
	47G-3B-2	11,30	37 1	13,15	43 2	9,90	32 6	2,84	9 4	2,28	7 6	2,28	7 6	*	*	1 340	2 950	1	1	2	216	57	47,5
	47G-4A	11,30	37 1	13,15	43 2	9,90	32 6	2,84	9 4	2,28	7 6	2,28	7 6	*	*	1 340	2 950	1	1	2	216	57	47,5
	47G-5	11,30	37 1	13,15	43 2	9,90	32 6	2,84	9 4	2,28	7 6	2,28	7 6	*	*	1 340	2 950	1	1	2	216	57	47,5
	204	13,41	44 0	16,15	53 0	13,00	42 8	3,43	11 3			2,54	8 4	3,30#	10 10#	3 270	7 200	1					
	204B	14,61	48 0	17,40	57 0	12,98	42 7	4,42	14 6			2,59	8 5	*	*	3 860	8 500	1	1	9	625	165	137,4
	205A	14,61	48 0	17,41	57 1	12,77	41 11	4,42	14 5	2,75	9 0	2,75	9 0	*	*	2 150	4 750	1	1	14	815	215	179,0
	205A-1	14,63	48 0	17,40	57 1	12,65	41 6	4,39	14 5									1	1	14	814	215	179,0
	206	10,21	33 6	11,28	37 0	8,28	27 2	2,64	8 8			1,77	5 10	*	*	1 310	2 890	1					
	206A	10,20	33 4	11,80	39 1	9,50	31 2	2,93	9 6	1,95	6 4	1,95	6 4	*	*	760	1 675	1	1	4	288	76	63,3
	212	14,61	48 0	17,41	57 1	12,77	41 11	4,00	13 1	2,65	8 8	2,65	8 8	*	*	2 260	5 000	2	1	15	815	215	179,9
BOEING-VERTOL	107	14,63	48 4	24,89	81 8	13,59	44 7	5,13	16 10			4,24	13 11	7,55	24 9	7 550	16 550	2					
	107 II	15,22	50 0	25,50	83 5			5,13	16 10			4,42	14 5	7,62	25 0	8 610	19 000	2	2	25	1 360	360	299,8
DAMAN	L25-2	14,63	48 0	19,18	62 11	11,58	38 0	4,90	16 1	2,28	7 6			2,97	7 9	2 360	5 200	1					
FAIRCHILD	F-28A	9,75	32 0	8,90	29 4	8,56	28 1	2,75	9 0	2,10	6 7	2,10	6 7	*	*	975	2 150	1	1	2	114	30	24,9
FAIRCHILD-HILLER	12-C	10,67	35 0	12,34	40 6	8,97	29 5	2,97	9 9			2,33	7 8	*	*	1 130	2 500	1					
	UH-12E, E4	10,80	35 5	14,30	40 8			2,99	9 10	2,16	7 1			* 2,28	* 7 6	1 270	2 800	1	1	3	174	46	38,3
	FH-1100	10,80	35 5	12,60	41 4	8,56	28 5	2,80	9 2	2,20	7 3	2,20	7 3	*	*	1 247	2 750	1	1	4	255	69	57,5
FIAT	7002	12,00	39 4	14,91	48 11	6,55	21 6	2,98	9 10					*	*	1 440	3 180	1					
GAZELLE	G-100	7,82	25 8	9,14	30 0	7,06	23 2	2,29	7 6	1,83	6 0	1,83	6 0	*	*	399	880	1	1	0	13	3,5	2,9

(1)	(2)	(3)		(4)		(5)		(6)		(7)		(8)		(9)		(10)		(11)	(12)		(13)		
HUGHES	269A	7,62	25 0	8,65	28 4	6,79	22 3	2,41	7 11	1,98	6 6	1,98	6 6	*	*	700	1 550	1					
	269 & 300	7,61	25 0	8,54	28 0	6,80	22 0	2,44	8 0	1,98	6 6	1,98	6 6	*	*	758	1 670	1	1	2	95	25	20,8
	500 EXEC.	8,05	26 4	9,20	30 4	7,01	23 0	2,50	8 2	1,85	6 10	1,85	6 10	*	*	1 155	2 550	1	2	3	242	64	53,5
KAMAN	K-600	14,33	47 0	14,33	47 0	7,67	25 2	4,75	15 7	2,11	6 11	2,54	8 4	2,49	8 2	4 400	7 500	1					
	K-700	14,33	47 0	17,80	58 7	12,75	41 11	4,00	13 4	1,91	6 3	2,54	8 4			3 800	8 400	2	4	8	2 540	678	564,5
KAWASAKI BELL	47G3B-1K4	11,32	37 2	13,30	43 8	8,99	29 6	2,88	9 5	2,29	7 6	2,29	7 6	*	*	1 293	2 850	1	1	3	208	55	45,8
LOCKHEED-CALIF.	L-286	10,67	35 0	13,00	42 8	9,90	32 6	2,88	9 5	1,20	3 11	1,20	3 11	*	*	2 135	4 700	1	2	3	288	78	64,9
MESSERSCHMITT-BOLKOW	BOLKOW BO-105	9,80	32 2	11,90	39 2	8,55	28 1	2,98	9 9	2,40	7 11	2,40	7 11	*	*	2 000	4 410	2	1-2	3-5	570	150	124,9
OMEGA	SB-12	11,89	39 0	14,46	47 5	11,73	38 6	3,96	13 0	1,14	3 9	3,58	11 9	3,05	10 0	1 970	4 350	2					
OMNIPOL	MC-2	8,80	28 10	10,47	34 6	7,40	24 4	2,55	8 5			2,02	6 8	1,96	6 5	700	1 550	1					
	MC-3	11,60	38 1	13,40	43 11	9,60	31 6	3,40	11 2	1,00	3 3	2,50	8 2	2,64	8 8	1 550	3 410	1					
SCHEUTZOW	MODEL B	8,25	27 0	9,50	31 2	7,21	23 8	2,60	8 6	2,14	7 0	2,14	7 0	*	*	705	1 550	1	1	1	85	22	18,3
SIAI-MARCHETTI/ SILVERCRAFT	SH-4	9,03	29 7	10,47	34 4	7,65	25 1	2,98	9 9	1,74	5 8	1,74	5 8	*	*	862	1 900	1	1	2	110	29	24,1
SIKORSKY	S-55	16,18	53 0	19,00	62 4			4,66	15 4			3,35	11 0	3,20	10 6	3 260	7 200	1	2	7-10	700	185	154,0
	S-55A	16,15	53 0	18,98	62 3	12,85	42 2	4,65	15 3	1,42	4 8	3,35	11 0	3,20	10 6	3 400	7 500	1					
	S-56	21,95	72 0	25,24	82 10	19,80	64 11	6,55	21 6			6,02	19 9	11,25	36 11	14 060	31 000	2					
	S-58	17,07	56 0	20,06	65 10	14,38	47 2	4,85	15 11			3,66	12 0	8,61	28 3	5 910	13 000	1	2	16	1 070	283	235,6
	S-61	18,90	62 0	22,14	72 8	18,16	59 7	5,13	16 10			3,96	13 0	7,16	23 6	8 630	19 000	2					
	S-61L	18,90	62 0	22,10	72 7	22,12	72 7	5,11	16 10			3,96	13 0	7,17	23 6	8 610	18 950	2	3	28	1 550	410	341,4
	S-61N	18,90	62 0	21,90	72 0	18,00	59 4	5,60	18 5	4,27	14 0	ø	ø	7,30	23 11	8 610	18 950	2	3	26-28	1 552	410	341,4
	S-61R	18,90	62 0	22,20	73 0	17,80	57 4	5,55	18 3	4,06	13 4	ø	ø	5,19	17 1	10 000	22 050	2	3	30	2 559	676	562,9
	S-62	16,15	53 0	18,97	62 3	13,59	44 7	4,88	16 10			3,35	11 0	5,43	17 10	3 400	7 500	1					
	S-62A	16,15	53 0	19,00	62 4	13,58	44 7	4,87	16 0			3,66	12 0	5,49	18 0	3 400	7 500	1	1-2	10	709	187	155,7
	S-62C	16,15	53 0	18,97	62 3	13,59	44 7	4,87	16 0	3,68	12 2	ø	ø	5,20	17 0	3 760	8 300	1	2	10	1 225	324	269,8
SIKORSKY-WESER	S-64, WS-64	21,95	72 0	26,66	87 6	21,28	69 10	7,42	24 4			6,02	19 9	7,45	24 5	17 240	38 000	2					
SUD-AVIATION	ALOUETTE II	10,02	33 6	12,05	39 6	9,70	31 10	2,75	9 0			2,08# 2,50#	6 10# 7 7#	3,06# 2,87#	10 0# 9 5#	1 500	3 310	1					
	ALOUETTE III	11,00	36 1	12,82	42 1	10,18	33 5	2,97	9 9			2,59	8 6	3,40	11 1	2 100	4 630	1					
	DJINN 1221	11,00	36 1	11,00	36 1	5,31	17 5	2,62	8 7			1,93	6 4	2,10	6 11	760	1 660	1					
VERTOL	42/44	13,41	44 0	26,21	86 4	16,00	52 6	4,70	15 5			4,57	14 4	7,48	24 6	6 820	15 000	1			1 135	300	248,8
	YHC-1B	17,98	59 0	29,72	97 6	15,24	50 0	5,59	18 4			3,15	10 4	6,40	21 0	14 970	33 000	2					
WESTLAND	WASP	10,14	32 3	12,29	40 4	9,29	30 6	2,94	9 8	2,64	8 8	2,64	8 8	2,77	9 1	2 490	5 500	1					
	WESSEX 31	17,07	56 0	20,06	65 10	15,29	50 2	4,85	15 11			3,66	12 0	8,58	28 2	6 120	13 500	1					
	WESSEX 60 SERIES 1	17,06	56 0	20,09	65 10	15,1	49 7	4,93	16 2	4,06	13 4	ø	ø	ø	ø	6 169	13 600	2	1	17	1 410	372	309,8
	WHIRLWIND 1/2	16,15	53 0	18,90	62 0	12,90	42 4	4,77	15 8	1,42	4 8	3,43	11 3	3,84	12 7	3 630	8 000	1					
	WHIRLWIND 3	16,15	53 0	18,90	62 0	13,46	44 2	4,77	15 8	1,42	4 8	3,43	11 3	3,84	12 7	3 630	8 000	1					

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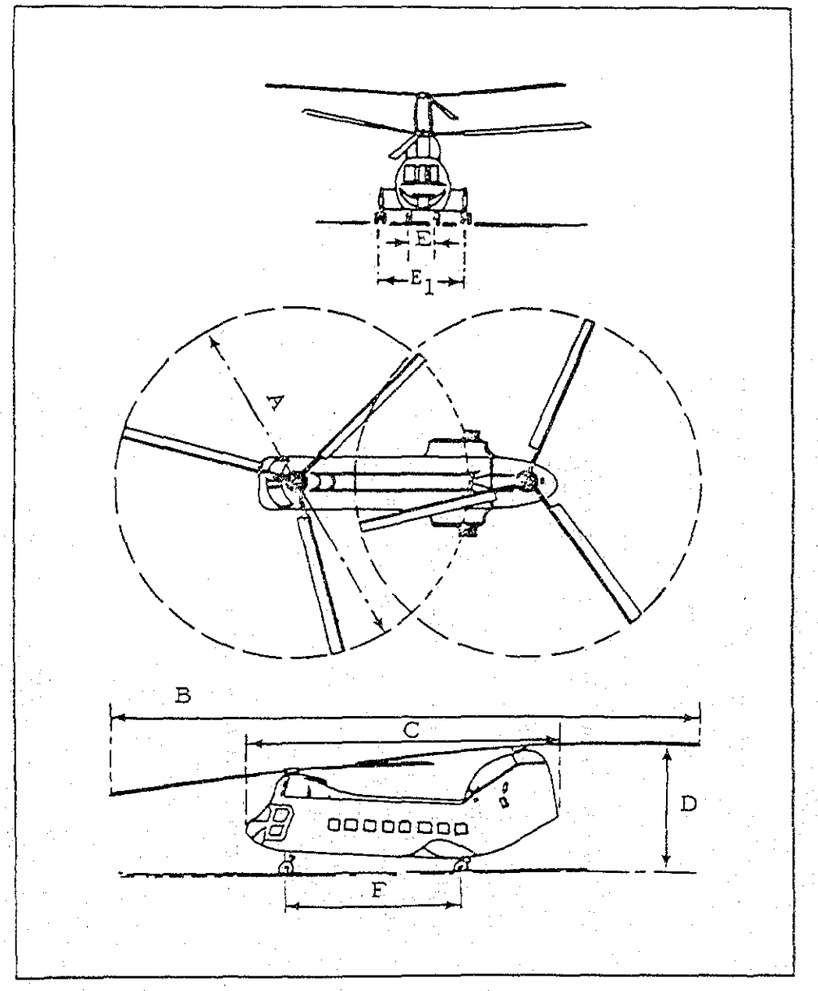
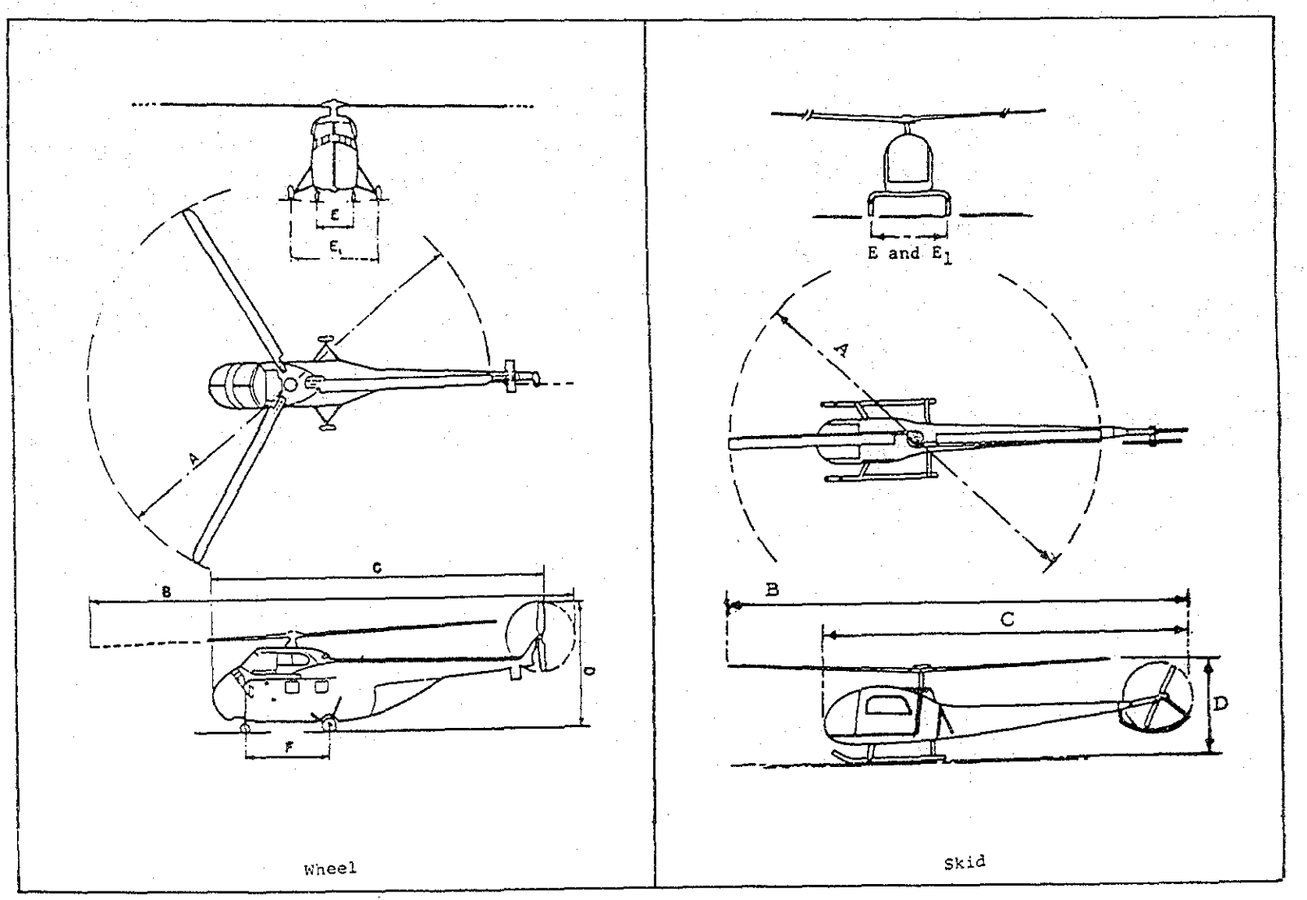


HELICOPTER CONFIGURATION (MULTI-ROTOR)



HELICOPTER CONFIGURATION (SINGLE ROTOR)

3.2 Airconditioning and Ventilating System

3.2.1 General

3.2.1.1 Design concept

The air-conditioning and ventilating systems for the proposed General Hospital will be so designed as to satisfy all the basic requirements for an efficient and comfortable environment for users of the facilities as well as the Cancer Center and the joint-use facilities. Major requirements are as follows:

(a) Reliability of equipment and stand-by capacity

(b) Technical and operational efficiency

(c) Energy efficiency

(d) Easy maintenance and operation; minimization of mishandling

(e) Safety

(f) Non-polluting

(g) Flexibility for future expansion and renovation

(h) Economy

(i) Sufficient protection from sand and salination hazards

(j) Water use efficiency

(k) Sufficient protection from air- and water-borne contamination

3.2.1.2 Design criteria

A. Applicable codes and standards

Design and materials criteria will conform to the codes and highest international standards already listed in 1.4.

B. Capacity requirements

Capacity calculations are based on the space requirements of the present project and extension in near future.

C. Outdoor meteorological conditions

Summer: Dry bulb temperature ... 41°C
Relative humidity 42%

Winter: Dry bulb temperature ... 13°C
Relative humidity 60%

D. Indoor temperature and humidity standards

(As shown in Table 3-2-1.)

Table 3-2-1 Indoor Temperature and Humidity Standards

Room Designations	Summer		Winter	
	Dry Bulb Temperature (°C)	Relative Humidity (%)	Dry Bulb Temperature (°C)	Relative Humidity (%)
Wards (General)	26 to 27	45 to 50	22 to 23	40 to 45
Wards (Burns)	26 to 27	45 to 50	22 to 23	40 to 45
Wards (Isolation)	26 to 27	45 to 50	22 to 23	40 to 45
Examination Rooms & Treatment	26 to 27	45 to 50	21 to 22	40 to 45
Waiting Lobby	26 to 27	45 to 50	20 to 21	40 to 45
Operating Rooms	23 to 26	45 to 50	23 to 26	50 to 60
I.C.U.,C.C.U.	23 to 26	45 to 50	23 to 26	50 to 55
Recovery Rooms	25 to 27	45 to 50	24 to 26	50 to 55
Delivery Rooms	24 to 26	45 to 50	24 to 26	50 to 55
Labour Rooms	24 to 26	50 to 60	22 to 24	50 to 60
Bathing Rooms	25 to 28	45 to 50	25 to 27	50 to 60
Formular Rooms	25 to 27	45 to 50	25 to 27	50 to 60
Nurseries	26 to 28	50 to 60	25 to 27	50 to 60
Laboratories	26 to 28	45 to 50	21 to 22	40 to 50
X-ray Rooms	26 to 28	45 to 50	23 to 24	40 to 45
Hemodialysis Rooms	26 to 28	45 to 50	21 to 22	40 to 50
Clean Utility	26 to 28	45 to 50	22 to 23	40 to 45
Pharmacy	26 to 28	50 to 60	21 to 22	40 to 45
Storage	26 to 30	50 to 60	--	--

Notes: 1) Rooms not designated in the table will employ standards for the designated ones with similar functions.
2) Temperature and humidity are freely controllable in operating rooms.

E. Ventilation and pressure balance

(As shown in Table 3-2-2.)

Table 3-2-2 Ventilation and Pressure Balance Standards

Room Designations	Minimum Outside Air Change (times/hr.)	Minimum Total Air Change (times/hr.)	Pressure Balance
Bioclean Rooms	15	200	P
Operating Rooms (General)	5	25	P
Operating Rooms (General, all outside air)	25	25	P
Operating Rooms (Septic)	5	25	N
Delivery Rooms	5	25	P
Nurseries	5	15	P
Recovery Rooms	6	15	P
ICU.CCU	6	6	P
Wards	2	4	E
Ward Corridors	4	4	E
Isolation Bedrooms (Infectious disease)	12	12	N
Ante Rooms to Isolation Bedrooms	6	6	N
Treatment Rooms	6	12	E
X-ray TV	6	6	E
X-ray Rooms (Treatment)	6	6	E
Physical Therapy Rooms	4	4	N
Soiled Utility	4	12	N
Clean Utility	4	12	P
Laboratories (General)	6	6 ∿ 15	N

Notes: 1) P = Positive, N = Negative, E = Equal

2) Rooms not designated in the table will employ standards for the designated ones with similar functions.

F. Air cleanliness control

Standards of air cleanliness will be as shown below.

Table 3-2-3 Air Cleanliness Standards

Room Designations	Air Cleanliness Level
Operating Rooms (Bioclean)	Class 100
Operating Rooms (General)	10,000
Operating Rooms (Septic)	10,000
Wards (Burns)	100 - 10,000
C.C.U., I.C.U.	1,000 - 100,000
Delivery Rooms	10,000
Recovery Rooms	10,000 - 100,000
Clean Utility	10,000 - 100,000

Notes: 1) Classes of air cleanliness respectively indicate the number of small particles (larger than 0.5μ) per liter of air.

2) Rooms not designated in the table will employ standards of designated ones with similar functions.

G. Air-conditioning zones

Rooms and spaces in the hospital will be classified by the hours of air-conditioning as shown in Table 3-2-4.

Table 3-2-4 Zoning by Air-conditioning Hours

Zones by Hours of Air-conditioning	Room Designations
All-day Zone (24 hours)	Wards, Delivery, Nurseries, C.C.U, I.C.U., Storage, Locker Rooms, Casualty
Day-time Zone	Office, Out-patient Department, Hemodialysis

Note: Rooms not designated in the table will employ standards of designated ones with similar functions.

3.2.2 Systems

3.2.2.1 Chilled water and cooling water supply system

A. Chilled water for air-conditioning will be supplied from the utilities center through the trench. (Figure 3-2-1)

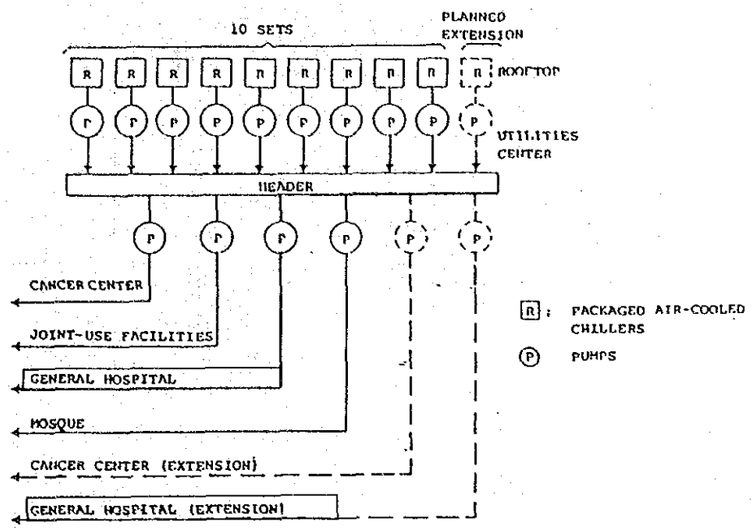


Figure 3-2-1

B. Cooling water for freezers and refrigerators will be also supplied from the utilities center through the trench. (Figure 3-2-2)

Freezers and refrigerators will be of water-cooled model.

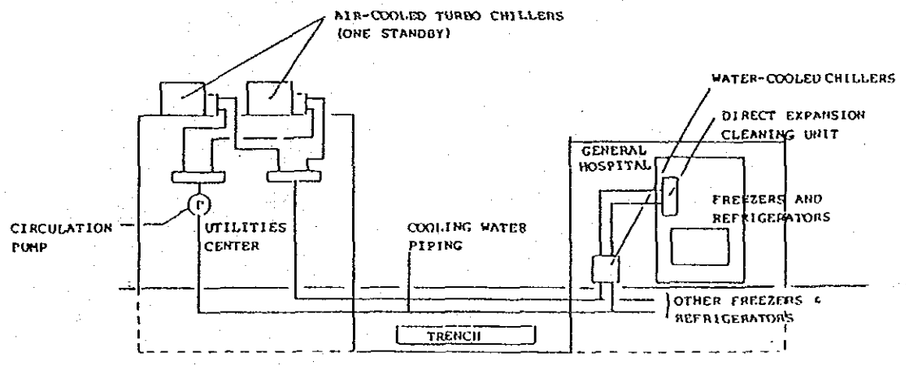


Figure 3-2-2 Cooling Water Supply System

3.2.2.2 Air-conditioning piping

Chilled water for cooling will be piped from the chilled-water pumps of the utilities center via the trench to the respective conditioners in the hospital buildings. Steam or electric heater will also be utilized for heating. Circulating cooling water for freezers and refrigerators will be piped from the cooling-water pumps of the utilities center via the same trench to be fed into the condensers of the respective units.

Piping system will be as follows:

(a) Pipe works will consist of headers and chilled-water pumps, as shown in Figure 3-2-3.

(b) Three of the chilled-water pumps for air-conditioning will be connected to the emergency generator system as well as to the commercial power system. All pumps for circulating cooling water to freezers and refrigerators will be connected to the emergency generator system as well.

(c) Supply and return piping will be provided to feed chilled water to the air handling units and the fan coil units.

(d) Steam for humidifying will be supplied from the steam header in the utilities center to the respective air handling units by the piping through the trench.

3.2.2.3 Air handling system

A. Diagnosis & therapy departments (Figure 3-2-4)

Air-conditioning for the examination rooms and the like will be done via low-speed ducts, which convey temperature- and humidity-controlled air supplied by the air handling unit in the mechanical room. Devices for the system are a sand trap filter, an air handling unit, and roll filters (AF 170%) and where necessary, a VAV unit and a total heat exchanger as well.

B. Administration offices

Same as in A.

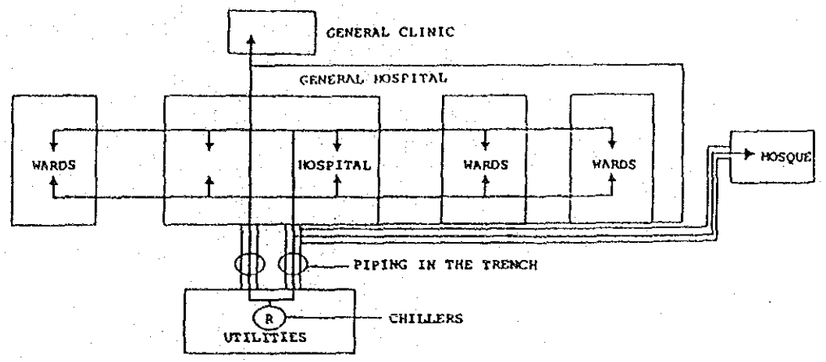


Figure 3-2-3 Chilled Water Piping System

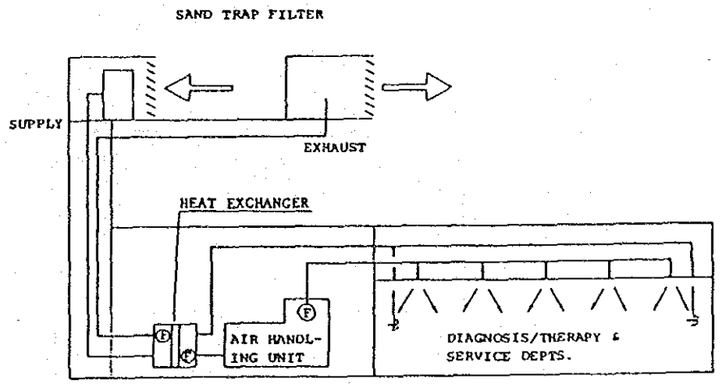


Figure 3-2-4 Air-conditioning Duct System for General Diagnosis/Therapy and Service Departments

c. Wards (Figure 3-2-5)

Air-conditioning for wards will be done by fresh air supplied from the outside air conditioner installed in the penthouse of the ward building. Room temperature will be controlled by the fan coil units. The system will consist of fan coil units, a sand trap filter, an air handling unit and a total heat exchanger.

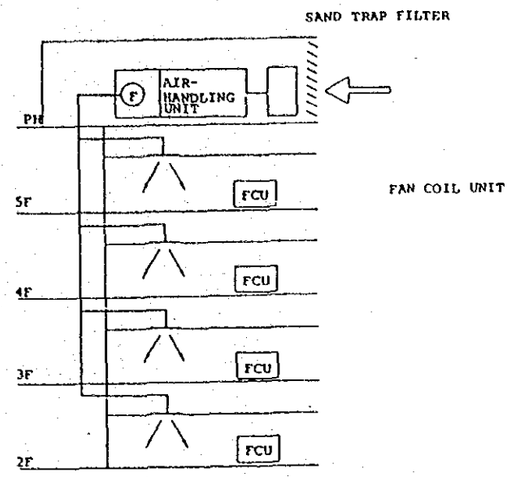


Figure 3-2-5 Air-conditioning Duct System for General Wards

D. Bioclean rooms (Figure 3-2-6)

Air cleanliness:

The cross flow laminar flow pattern will be employed to maintain the air cleanliness level of class 100 uniformly in the rooms.

Temperature control:

The required temperature will be maintained by electric heater and a constant air volume supplier to enable minor temperature adjustments in the individual rooms.

Humidity control:

Dry steam is used for humidifying.

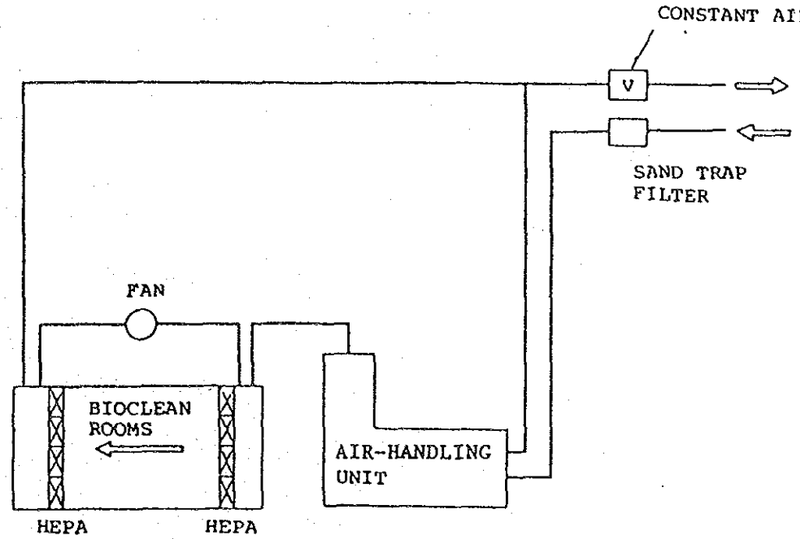


Figure 3-2-6 Air-conditioning Duct System for Bioclean Rooms

E. Operating rooms, I.C.U., C.C.U, burns wards and new-born nurseries (Figure 3-2-7)

Air cleanliness:

The conventional flow pattern will be employed to clean the air of floating particles and prevent the suppuration of wounds and incisions.

Temperature and humidity control:

Same as in bioclean rooms.

F. Other rooms

Rooms not specified above will employ either one of the systems already described in A. to E. according to their functions.

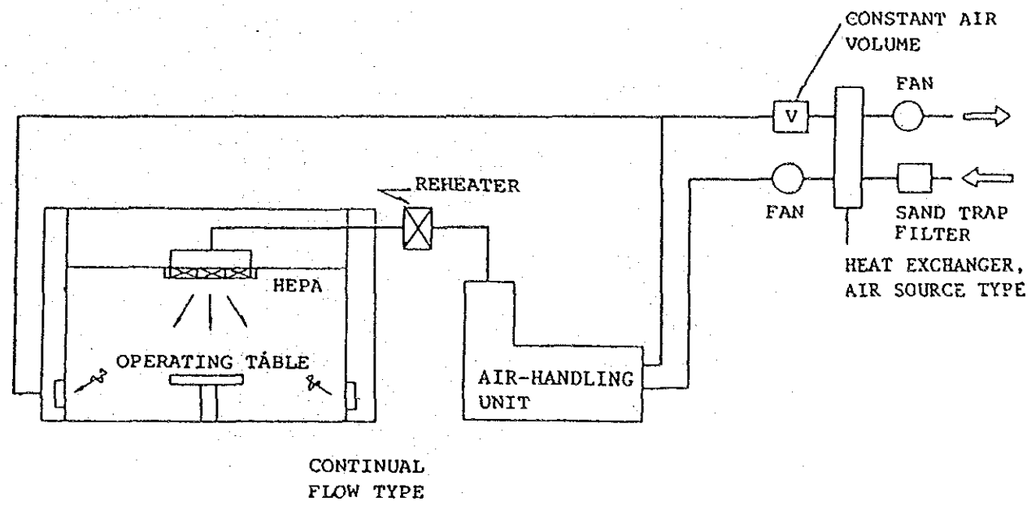


Figure 3-2-7 Air-conditioning Duct System for Operating Rooms

3.2.2.4 Ventilating system

(a) The ventilating system will consist of exhaust fans and low-speed air ducts, and where necessary, hoods, charcoal filters, and HEPA filters as well (Figure 3-2-8).

(b) Lavatories, soil handling rooms and the like will be provided with effective ventilating devices.

(c) Bathrooms, shower rooms and the like will be provided with effective humidity exhausters.

(d) The frequency of air changes will be as shown in Table 3-2-5.

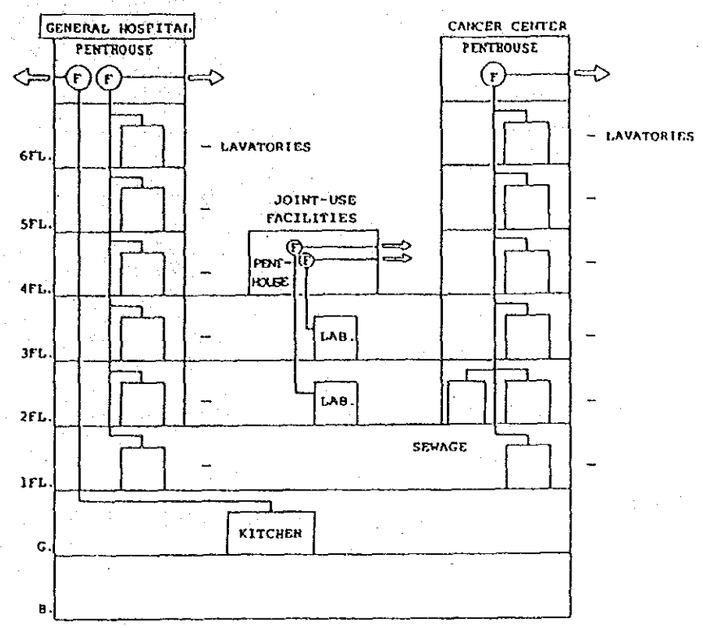


Figure 3-2-8 Ventilating System

Table 3-2-5 Air Changes by Room

Rooms	Minimum Outside Air Change (times/hr.)	Minimum Total Air Change (times/hr.)	Pressure Balance
Lavatories	Variable	10	Negative
Bedpan Store Rooms	Variable	10	- ditto -
Bathrooms	Variable	10	- ditto -

3.2.2.5 Smoke exhausting system

Smoke exhausters will be provided to ensure safe emergency escape during fires (Figure 3-2-9).

(a) The smoke exhausting system will consist of smoke vents, high-speed ducts, and exhaust fans.

(b) Exhaust fans will be installed in the mechanical rooms of the penthouses to be connected via high-speed ducts to the respective vents arranged by each smoke exhausting zone.

(c) Exhaust fans will be connected to the emergency generator system as well as to the commercial power system.

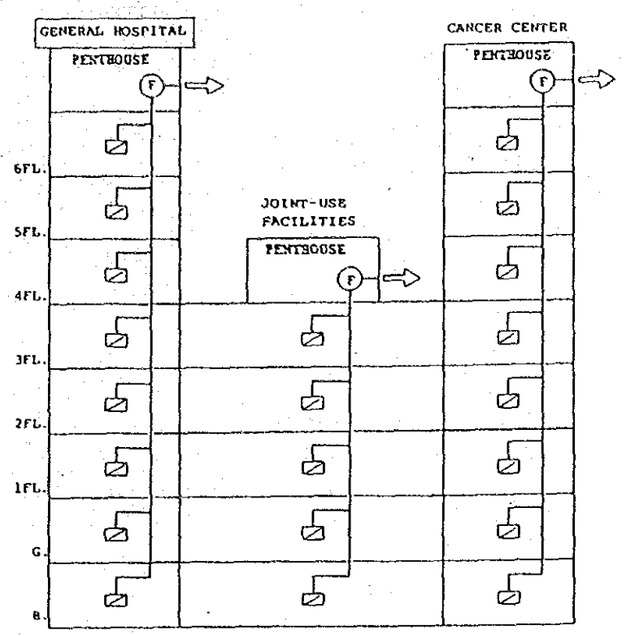


Figure 3-2-9 Smoke Exhausting System

3.3 PLUMBING SYSTEM

3.3.1 General

3.3.1.1 Design concept

The plumbing system for the proposed General Hospital will be so designed as to satisfy all the basic requirements for an efficient and comfortable environment for users of the facilities as well as the Cancer Center and the joint-use facilities. Major requirements are as follows:

(a) Reliability of equipment and stand-by capacity

(b) Technical and operational efficiency

(c) Energy efficiency

(d) Easy maintenance and operation; minimization of mishandling

(e) Safety

(f) Non-polluting

(g) Flexibility for future expansion and renovation

(h) Economy

(i) Sufficient protection from sand and salination hazards

(j) Water use efficiency

(k) Sufficient protection from air- and water-borne contamination

A. Applicable codes and standards

Design and materials criteria will conform to the codes and highest international standards already listed in 1.4.

B. Capacity requirements

Capacity calculations are based on the space requirements of the present project and extension in near future.

C. Accommodation capacity

In-patients	500 persons (initially 350)
Out-patients	2,000
Emergency patients	250
Hospital personnel	2,000 (Cancer Center plus General Hospital)
Visitors	2,000 (Cancer Center plus General Hospital)

3.3.2 Systems

3.3.2.1 Steam supply system

Steam will be supplied from the utilities center through the trench.

(a) Generated steam will be distributed via the steam header to the medical equipment, domestic water heaters, heat exchangers for room heating, and humidifiers (Figure 3-3-1).

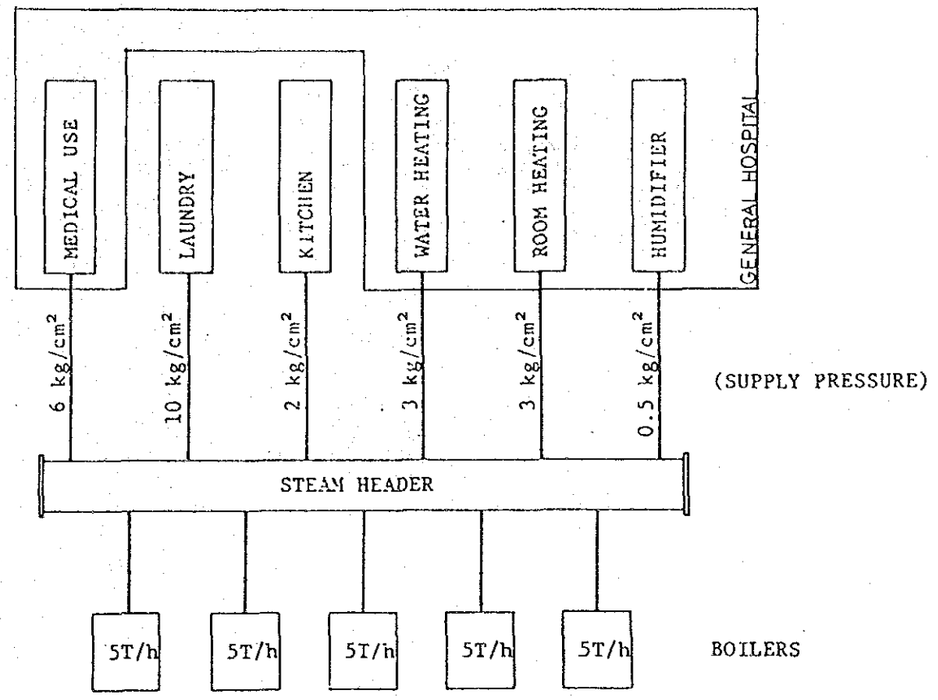


Figure 3-3-1 Steam Supply System

3.3.2.2 Domestic water and recycled water supply

A. Domestic water supply system

Domestic water will be supplied from the city water main. The quality of water available therefrom is adequate, requiring no additional local treatment for the hospital complex.

The system will be of elevated tank type. Water is pumped up from the intake storage tank to the elevated tank in the water tower and then distributed separately to the hospital and housing zones. The pipeline supplying the hospital will pass through the same trench with electricity and telephone cables and then connect to various supply outlets (Figure 3-3-2).

1) Water supply to hospital zone

Piping will be separately provided as follows:

(a) General Hospital facilities

(b) General Hospital wards

2) Recycled water supply

Recycled water will be supplied from the utilities center through the trench and it will be used for flash toilets and for irrigation of lawns and pottered plant. The piping system will be similar to the one above.

B. Estimated water requirements

In-patients (daily per capita consumption)	400ℓ
Out-patients (ditto)	120ℓ
Hospital personnel (ditto)	140ℓ
Visitors (ditto)	60ℓ

C. Chilled drinking water

Drinking fountains will be installed in appropriate places in the premise.

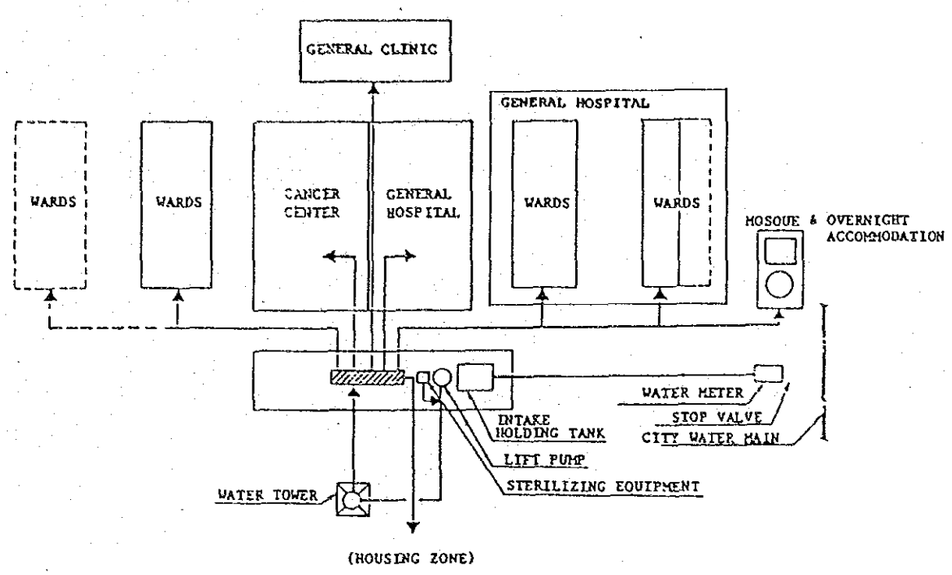


Figure 3-3-2 Domestic Water Supply System

3.3.2.3 Hot water supply

A. Supply system

The system is to supply hot water for various medical equipment, drinking, washing and other purposes. Water from the elevated tank will be heated in the hot-water storage tanks (equipped with steam coils).

Hot water for drinking will be separately heated by electric appliances. Hot water for medical equipment and for washing and heating will be heated by steam and centrally supplied (Figure 3-3-3).

B. Temperature and volume of hot water supply

1) Temperature

The centrally supplied water for the hospital will be heated to about 60°C and mixed with cold water when used.

2) Volume of supply

Assuming the daily per bed requirement of 200ℓ.

3.3.2.4 Plumbing fixtures

(a) Lavatories, wash basins, sinks, and service sinks will conform to HASS. Both eastern- and western-style lavatories will be provided.

(b) Shower sets, hose bibbs, and drains will conform to HASS or the NPC of practice.

(c) Emergency shower sets for rinsing will be specially provided in the laboratory rooms in case of emergency if necessary.

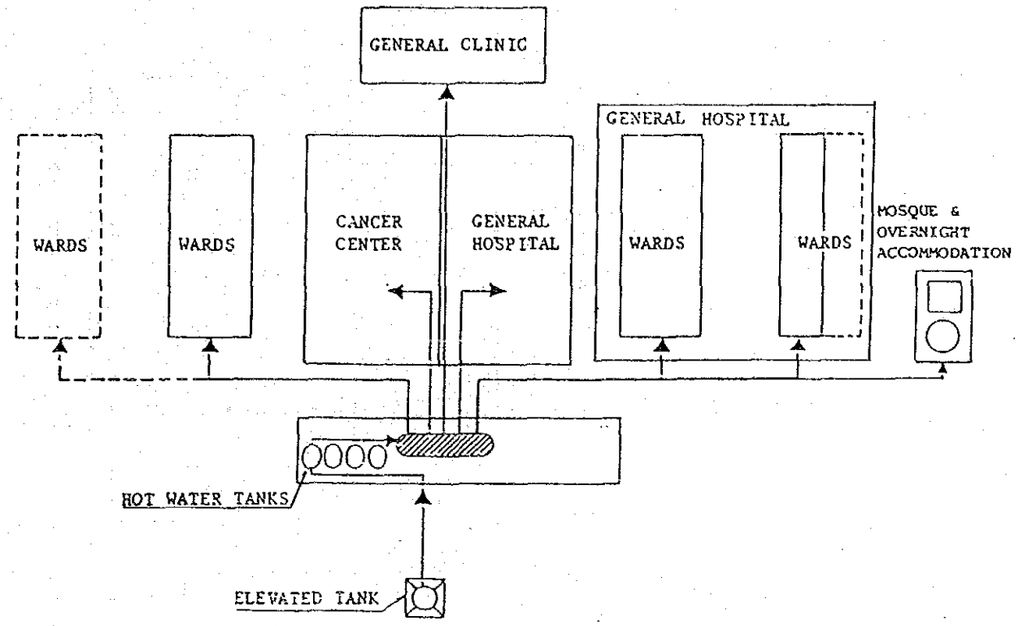


Figure 3-3-3 Hot Water Supply System

3.3.2.5 Drainage system

A. Drainage and vent system

The drainage system will separately treat wastes from general medical practices, special medical practices and non-medical hospital activities, and storm water. Sewage and waste water will be collected and treated as shown in Figure 3-3-4.

Vent piping will be, in principle, separately installed (Figure 3-3-4).

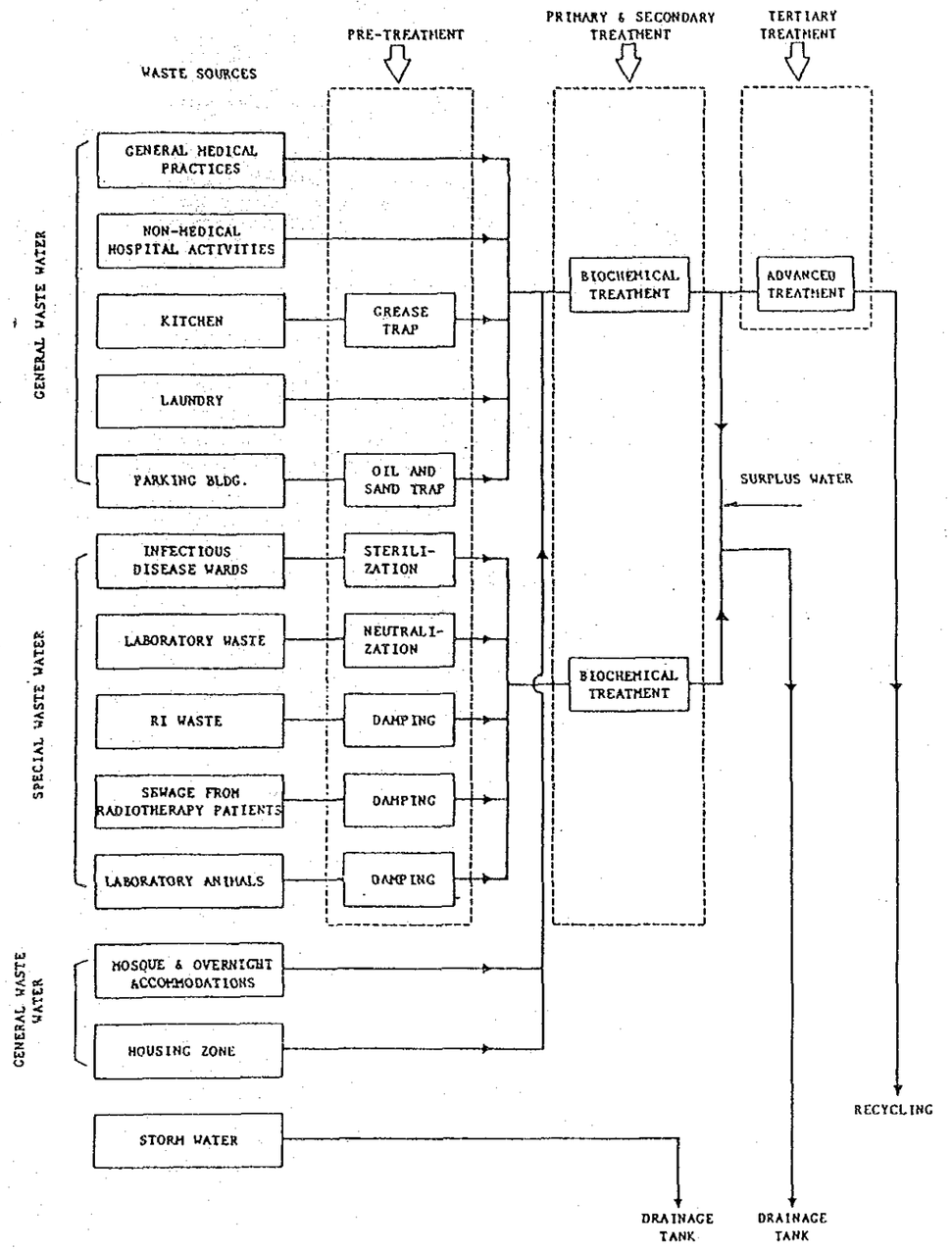


Figure 3-3-4 Waste Water Treatment System

3.3.2.6 Fire protection system

A. Fire extinguishing system

The system will consist of the following devices.

1) Hand extinguishers

Hand extinguishers will be installed in appropriate places in the buildings.

2) Indoor fire hydrants

Fire hydrants will be installed in the areas where sprinklers are not provided.

3) Outdoor fire hydrants

Fire hydrants will be installed in appropriate places around the buildings to enable fire fighting from without.

4) Sprinkler extinguishing system

Sprinklers will be installed to cover the entire hospital floors except X-ray rooms, operating theaters, delivery rooms, I.C.U. and some other places.

5) Halon extinguishing system

The system will be installed to deal with halogenated substances in the necessary rooms.

B. Water supply for fire-fighting

Water for fire-fightings will be supplied from the utilities center through the trench.

3.3.2.7 Butane gas supply

Butane gas will be supplied mainly to laboratories and some other places where needed.

Supply will be piped centrally from the LPG cylinders housed at an appropriate distance from the hospital buildings.

3.3.2.8 Medical gas supply system

A. System outline

The system will be centrally operated.

It will consist of Oxygen supply equipment, N_2O supply equipment, N_2 supply equipment, vacuum pump equipment, compressed air supply equipment and other related devices, which will be supplied from the utilities center through the trench.

3.3.2.9 Central vacuum cleaning system

A. System outline

The central vacuum cleaning system will be provided from the utilities center through the trench. In addition, movable vacuum cleaners will be provided separately for special wards for infectious diseases.

3.3.2.10 Laundry equipment

Linen supply will be centrally managed for laundry, sterilization, darning and storage.

3.3.2.11 Kitchen equipment

A. Meal preparation system

The kitchen will feed hospital personnel and in-patients. Meals for in-patients are classified into ordinary meals and special meals. Ordinary meals will be served as à la carte.

Meal preparation and washing and sterilization of utensils will be centrally managed. Meals for in-patients and others will be prepared in the same kitchen and served. Meals for in-patients will be carried by heated wagons.

Meals for infectious disease wards will be brought into the wards and served there, and utensiles will be sterilized and stored there also. Leftovers from the wards will be collected for incineration (Figure 3-3-5).

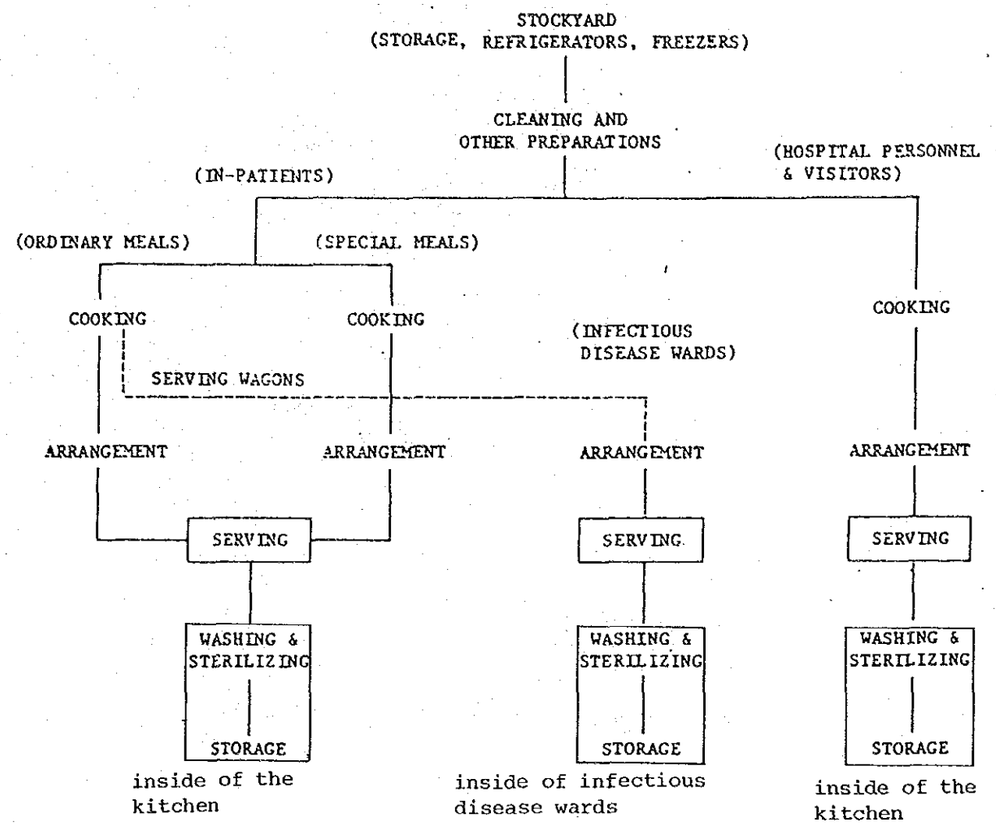


Figure 3-3-5 Meal Preparation System

3.3.2.12 Incinerators

To dispose burnable trash, kitchen garbage, dead laboratory animals and liquid waste, two incinerators, one for solid waste and the other for liquid waste, will be installed in the utilities center.

3.3.2.13 Waste water treatment plant

Waste Water from the hospital will be classified into general waste and special waste as already shown in Figure 3-3-4 and the two will have to be treated separately, and water treatment plant will be provided in the utilities center. The treatment system will be as shown in Figure 3-3-6.

3.3.2.14 Irrigation system

Trees and plants within the hospital premise will be irrigated with recycled water from the water treatment plant.

(a) The irrigation system will consist of lift pumps, underground piping and sprinklers.

(b) Sprinkler irrigation will be operated by the programmed timer.

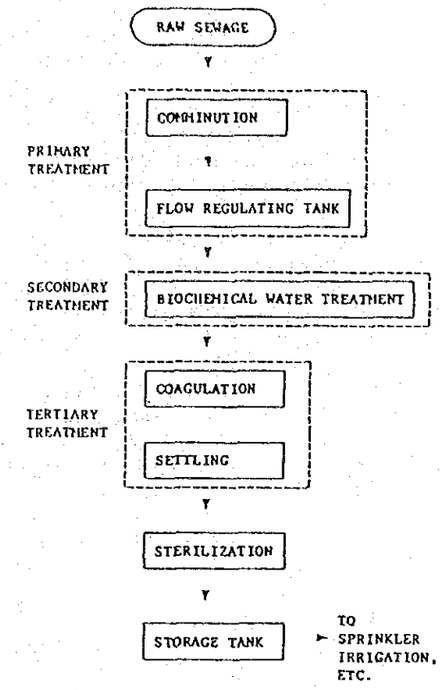


Figure 3-3-6 Waste Water Treatment System

3.4 Electrical System

3.4.1 General

3.4.1.1 Design concept

The electrical system for the proposed General Hospital will be so designed as to satisfy all the basic requirements of an efficient and comfortable environment for users of the facilities as well as the Cancer Center and the joint-use facility. Major requirements are as follows:

(a) Reliability of equipment and stand by capacity

(b) Technical and operational efficiency

(c) Energy efficiency

(d) Easy maintenance and operation; minimization of mishandling

(e) Safety

(f) Non-polluting

(g) Flexibility for future expansion and renovation

(h) Economy

(i) Sufficient protection from sand and salination hazards

(j) Water use efficiency

3.4.1.2 Design Criteria

A. Applicable codes and standards

Design and materials criteria will conform to the codes and highest international standards already listed in 1.4.

B. Capacity requirements

Capacity calculations are based on the space requirements of the present project and extension in near future.

C. Necessary electrical works

Electrical works are varied in accordance with major functions of the respective rooms and spaces, as shown in Table 3-4-3.

3.4.2 Systems

3.4.2.1 Power distribution system

1) Electrical power will be supplied from transformer room in the utilities center through the trench, also the basic minimum power will be supplied by the energency generator in case of commercial power's failure.

2) Motor power circuits will be fed via distribution panels at a 3-phase 380 V outlet load.

3) Lighting and convenience outlet circuits will be fed via distribution panels at a single-phase 220 V outlet load.

4) Operating rooms, I.C.U., C.C.U., computers and the like which cannot afford power failures will be provided with uninterruptible power supply (UPS). UPS buses will be of stationary type and their installation will be dispersed, respectively close to the receptacles.

5) Generators will supply approximately one-third of the total load capacity to the following facilities and requirements.

(a) Lighting, medical equipment and air-conditioning in operating rooms

(b) Lighting, medical equipment and air-conditioning in I.C.U. and C.C.U.

(c) Lighting, medical equipment and air-conditioning in delivery rooms and nurseries

(d) Important research and medical examination equipment

(e) Important equipment in the dark room

(f) Fire alarms and other emergency lighting devices

(g) Minimum lighting for routine hospital work

(h) Key devices for water supply and drainage

(i) Freezer and refrigerators

(j) Elevators

(k) Computers

(l) Requirements other than (a) to (k) above which are indispensable to carry on basic minimum hospital functions.

3.4.2.2 Automatic control systems

The devices relating to the power supply to the elevator and mechanical devices in the power room and the mechanical equipment room will be monitored and remote-controlled from the control room in the utilities center.

A. Power control panel

The power control panel will switch on and off, monitor, measure, and record the operation of the various electrical equipment, as shown in Table 3-4-1.

Table 3-4-1 Central Control Functions

	Switch On and Off	Monitoring	Measurement	Recording
Smoke Exhaust device	-	o	-	o
Air-conditioning	o	o	o	o
Plumbing	o	o	o	o

B. Elevator control panel

(a) The panel will be equipped with signal lamps to indicate the positions of the respective elevator cages.

(b) The panel will be equipped with interphones connected to each elevator cage.

(c) The panel will be able to control the elevator operation in case of fires.

(d) The panel will be able to control the elevator in case of earthquakes.

C. Others

(a) The system will include interlocks and control circuits between various electrical devices.

(b) Medical gas leakage alarms will be provided.

3.4.2.3 Lighting system

For greater energy efficiency, lighting mostly uses more efficient, longer-lasting fluorescent lamps.

A. System components

The system will comprise lighting power distribution panels, lighting fixtures, switches, convenience outlets and other related devices.

B. Lighting levels and fixtures

The lighting levels (lx) and fixtures will be provided according to the varying functions of the hospital facilities as shown in Table 3-4-2.

C. Lighting for operating rooms

(a) A shadowless lamp will be provided directly above each operating table.

(b) Other lighting fixtures will be positioned to surround the operating table.

(c) All lighting fixtures will be of sealed type used for clean rooms.

D. Lighting for wards

(a) Each bed will be provided with an overhead lamp.

(b) An all-night lamp will be provided above each entrance.

(c) All lights in the wards will be shaded to soften the glare.

E. Other types of lighting

1) Emergency lighting during blackouts

(a) Emergency lighting will be immediately fed power from lead acid batteries installed in the power room of the utilities center and then switched onto the generators after voltage is stabilized.

(b) All fixtures and wiring are heat-resistant.

2) Emergency exit marker lamps

(a) Emergency lamps will be provided at each exit and along escape routes in case of fires and other disasters.

(b) All lighting fixtures will have enclosed batteries.

3) Obstruction market lights

Obstruction marker lights will be provided as signal to airplanes flying nearby.

(a) Obstruction marker lights will be installed at the helipad.

(b) Lights will be attached to signals to indicate filament disconnection.

4) Outdoor lights

Lights will be installed at appropriate places on the premises to ensure safety of outdoor works and prevent vandalism.

(a) Lighting fixtures will be high-pressure sodium vapor lamps which are of greater efficiency and higher color temperature.

(b) Lights will be automatically switched on and off and some will be turned off by a timer after midnight.

Table 3-4-2 Lighting Levels and Fixture

Rooms	Lighting Level (lx)	Type of Lighting Fixtures	Remarks
Examination & Treatment Rooms	400	Fluorescent lamps, recessed and covered	
Laboratories	400	Ditto	
X-ray Room	200	Ditto	With light-adjusting control
Operating Rooms	1,000	Ditto	With shadowless lamps
ICU, CCU	1,000	Ditto	With light-adjusting control
Delivery Rooms	400	Ditto	With shadowless lamps
Nurseries	400	Ditto	
Research Rooms	500	Ditto	
Doctor's Office	300	Ditto	
Nurse Stations	400	Ditto	
Wards	200	Ditto	With all-night lamps
Pharmacy	400	Ditto	
Corridors	Out-patient Dept. 200 In-patient Dept. 100	Ditto	
Lavatories	100	Ditto	
Entrance Hall and Lobby	200	Ditto	
Offices	400	Ditto	
Conference Rooms	400	Fluorescent lamps, flush and covered	
Mechanical Equipment Room	100	Ditto	

3.4.2.4 Grounding systems for medical equipment

Grounding devices will be provided for all electrical points to prevent electric shock accidents.

A. General medical rooms

(a) Protective grounding devices[1] will be provided for general medical rooms (Figure 3-4-1).

(b) Isoelectric grounding devices[2] will be provided for the thoracic operating room, I.C.U., C.C.U., heart catheter room and some others (Figure 3-4-2).

B. Non-grounding power system for special medical rooms (Figure 3-4-3)

Special rooms such as operating rooms, I.C.U., C.C.U., and heart catheter room and some others will be provided with a nongrounding type power source via medical isolating transformers.

3.4.2.5 Lighting protection system

Buildings will be provided with lightning protection devices. The system will consist of air terminals, ground rods, rooftop main conductors and down conductors.

(a) Devices will conform to NFPA.

(b) Air terminals of more than 300 mm in height will have devices installed at 6-meter intervals.

(c) The protector angle of the terminal will be 63.3° or less for buildings lower than 15 m in height and 45° or less for buildings of 15 m or taller.

---

1. Protective grounding is to prevent electrical shocks on the skin (macro shocks) caused by inadequate isolation of medical equipment. The grounding terminal will be provided for each room.

2. Isoelectric grounding is to prevent direct electric shocks to the heart (micro shocks) caused by leakage current from the medical instrument inside the body. All outer casings of medical equipment and metallic fixtures and objects around the patient must be grounded via a medical grounding center.

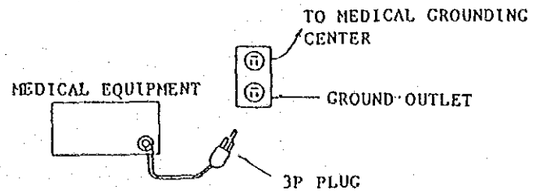


Figure 3-4-1 Protective Grounding System

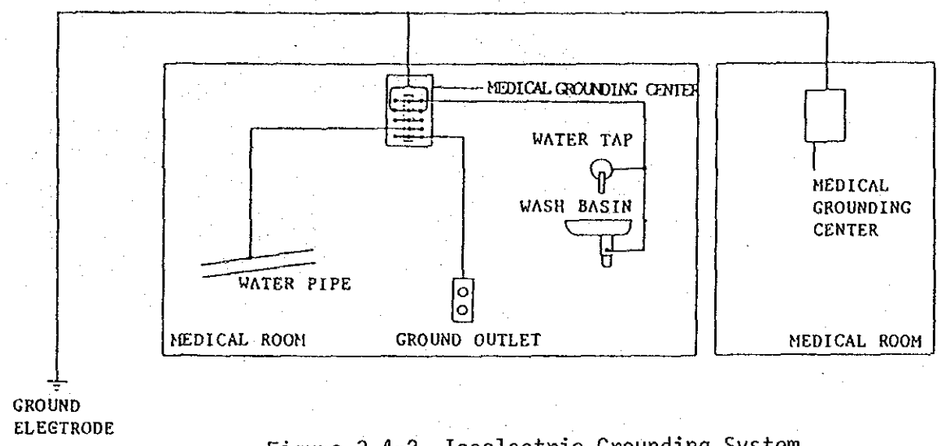


Figure 3-4-2 Isoelectric Grounding System

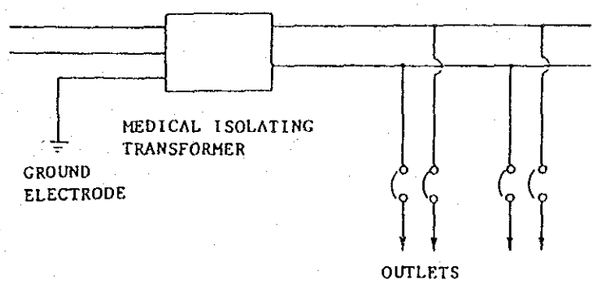


Figure 3-4-3 Non-grounding System

3.4.2.6 Telephone and intercom system

Communication within and without will be provided by telephones and intercom devices.

A. Telephones (See Figure 3-4-4)

(a) The telephone cable will be led in from the main distributing frame (MDF) and then extended to necessary terminals in the General Hospital through EPABX in the joint use facilities.

(b) The MDF will be provided in the joint-use facilities.

(c) Day-time incoming external calls will be connected via the exchanger to the respective telephone outlets.

(d) Night-time incoming calls will be connected via the night-time transfer switchboard installed in the administration office of the main hospital building.

(e) Direct connection with external circuits will be provided for office telephones of senior staff and for those in frequent use for hospital routine.

(f) Public telephones will be provided in appropriate places in the hospital buildings.

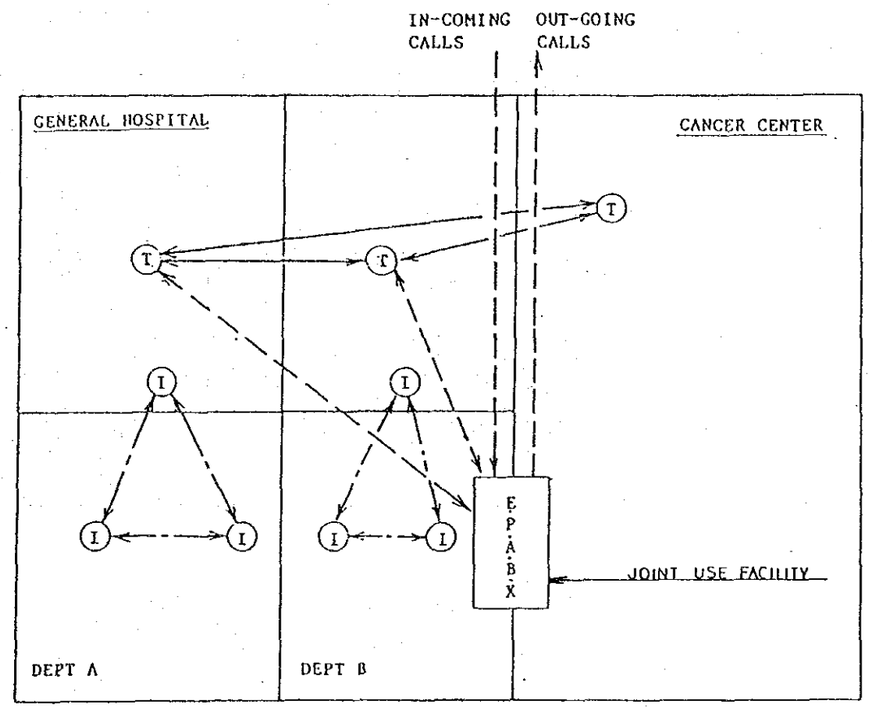


Figure 3-4-4 Telephone and Intercom Communication Diagram

B. Intercom system

The system will consist of intra-department communication subsystems, an X-ray room subsystem and an operating room subsystem.

(a) Intercom device for intra-general hospital is reciprocal communication type.
Inter-departmental communication will be done by internal telephone extensions.

(b) Intercom devices for X-ray rooms will consist of one master instrument in the equipment operating room with three extension outlets in the X-ray examination rooms.

(c) Intercom devices for operating rooms will consist of a master instrument in the nurse station with extensions in the operating rooms, and will be simultaneous communication type. The extensions in the operating rooms will be composed of wall-hung speakers and microphones with elbow-push buttons.

3.4.2.7 Paging system

Paging of doctors and other hospital personnel will be by the use of pocket buzzers.
The paging system will be provided as well as the joint-use facility. (Figure 3-4-5)

A. Paging controller

(a) Wireless transmission type

(b) Pocket buzzers will be activated by calls through EPABX and paged persons are expected to call back by telephones.

(c) The system will be directly linked with the nurse call system so that each nurse station can page as the need arises.

B. Receivers

Receivers will be of pocket buzzer type and batteries will be rechargeable.

C. Chargers

The General Hospital will be provided with a 100-outlet charger and each nurse station with a single-outlet charger.

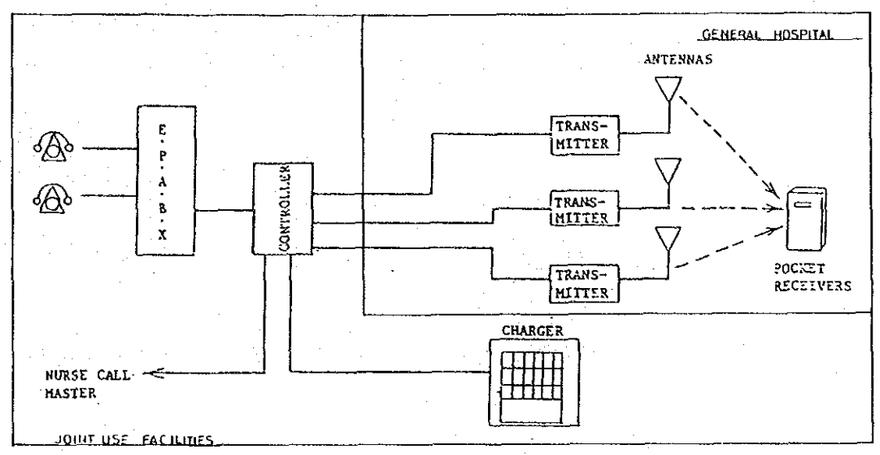


Figure 3-4-5 Paging System

3.4.2.8 Wireless equipment for ambulance car and helicopter

This wireless equipment will be provided for the communication between Command Center and ambulance cars and helicopters. It will consist of transmitter, receiver and antenna. (Figure 3-4-6)

(a) The transmitter and the receiver will be provided in Command Center.

(b) The antenna will be provided on the roof floor.

(c) For the back up system, intercom between the center and doctors will be provided.

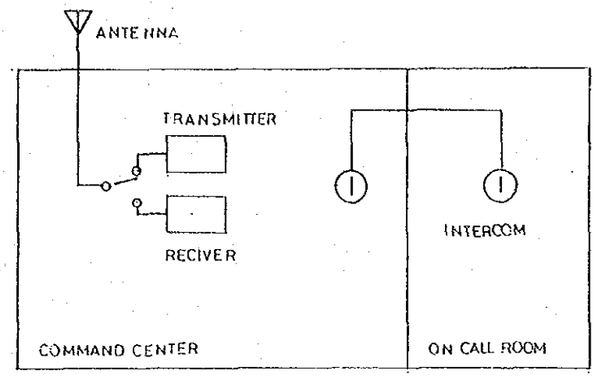


Figure 3-4-6 Wireless Equipment for Ambulance Car and Helicopter

3.4.2.9 Nurse system

The nurse call system for the signal and verbal communication between in-patients and nurses will consist of two types as follows:

A. General wards and VIP wards

1) System components

The system will consist of a master instrument in each nurse station, bed-side extensions, and signalling lights in the corridors (Figure 3-4-7).

2) Master instruments

(a) One channel per bed of simultaneous communication type.

(b) Master instrument boards will be equipped with alarms and signals to indicate breakdowns of bed-side extensions and emergency calls.

(c) The system will be transferable to the paging system in case no one is available in the nurse stations.

(d) The master instrument will be provided in each of the two nurse stations on the same floor, and one will be switched off to be taken over by the other during the night.

3) Extensions

(a) Each bed-side extension will consist of speaker, a microphone and a clasp button.

(b) Bathrooms and lavatories will be provided with pull-string switches.

4) Others

Night-time calls will be shown on corridor signal lights which correspond to individual in-patients.

B. I.C.U. and C.C.U.

1) System components

The system will consist of a master instrument and bed-side extensions (Figure 3-4-8).

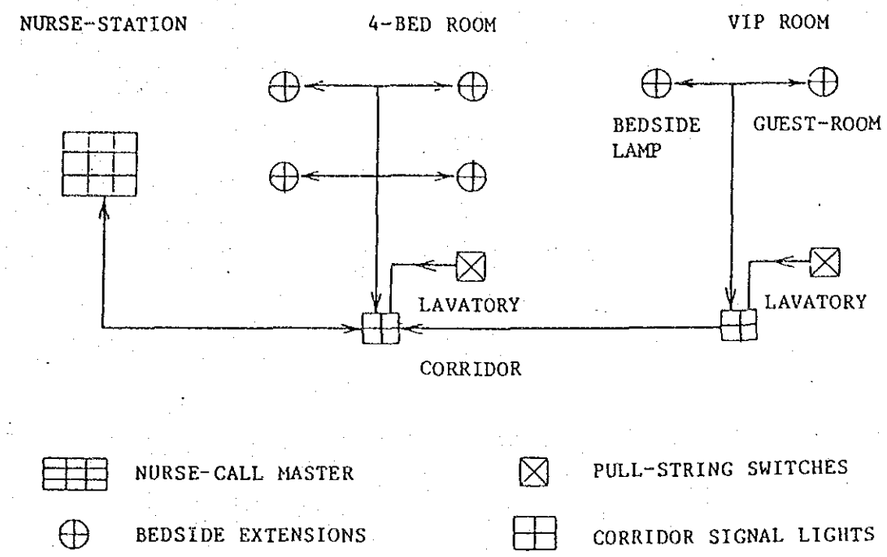


Figure 3-4-7 Nurse Call System (General and VIP Wards)

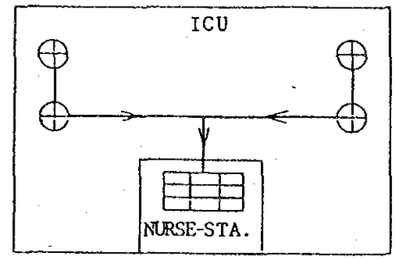


Figure 3-4-8 Nurse Call System (I.C.U., C.C.U.)

(a) The master instrument will be installed in the nurse station.

(b) Bed-side extensions will be activated by clasp buttons.

(c) Calls from extensions will be indicated by tone and light signals and verbal communication devices will not be provided.

3.4.2.10 Out-patient emergency call system

Emergency call equipment will be provided at the toilets in the out-patient department.

It will consist of alarm panel, corridor signal lights and emergency call buttons. (Figure 3-4-9)

(a) Alarm panel will be equipped at the reception counter in the out-patient department, and the alarm lamp will be equipped at every toilet.

(b) Corridor signal lights will be equipped in front of toilet rooms and will light on by the emergency call buttons.

(c) Emergency call buttons will be of the waterproof type and set on the wall.

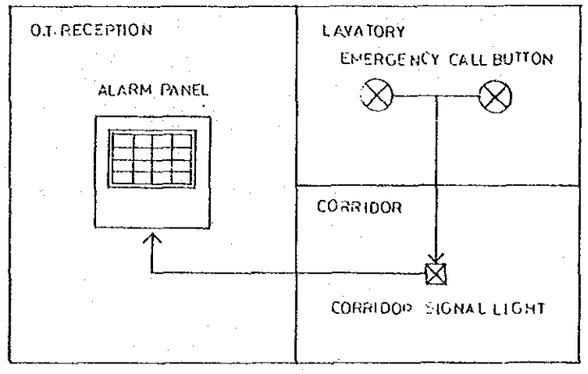


Figure 3-4-9 Out-patient Emergency Call System

3.4.2.11 T.V. interview equipment

T.V. interview equipment will be used for interview with infectious in-patients. (Figure 3-4-10)

(a) It will consist of T.V. camera, T.V. screen and intercom and these will be set in interview units.

(b) T.V. camera will be monochrome type.

(c) Interview units will be provided in bedrooms and in waiting rooms.

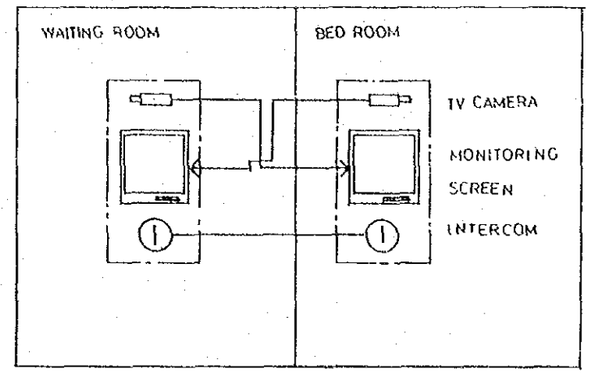


Figure 3-4-10 T.V. Interview Equipment

3.4.2.12 Television and radio systems

The hospital complex will be provided with a CCTV system, a MATV system and a Radio system.

A. CCTV system

CCTV devices will be provided in auditorium for technical examination and consultation.
The system will consist of color-TV cameras, monitoring screen and various apparatus in the TV broadcasting room of the joint-use facilities. (Figure 3-4-11)
This facility will be used by both the General Hospital and the cancer center.

(a) TV cameras for technical examination will be installed in the Surgical Department and the Endoscopy Section.

(b) The operation room will be equipped with telecinematic and VTR apparatuses cable-connected to TV cameras in operating room and the regular for video-tape recording.

B. MATV system

The system will be for general TV broadcasts and consist of a master antenna, amplifier, head-end device and matching coupler.

(a) TV outlets will be provided in wards, the dining hall, lounges, and elsewhere.

(b) Broadcasts are transduced by the head-end device, and then mixed and amplified before transmission to TV outlets.

(c) The TV antennas will be installed on the roof top of wards buildings.

(d) TV programs produced in the studio can be broadcast on MATV screens.

C. Radio system

Radio broadcasting devices will be installed as required.

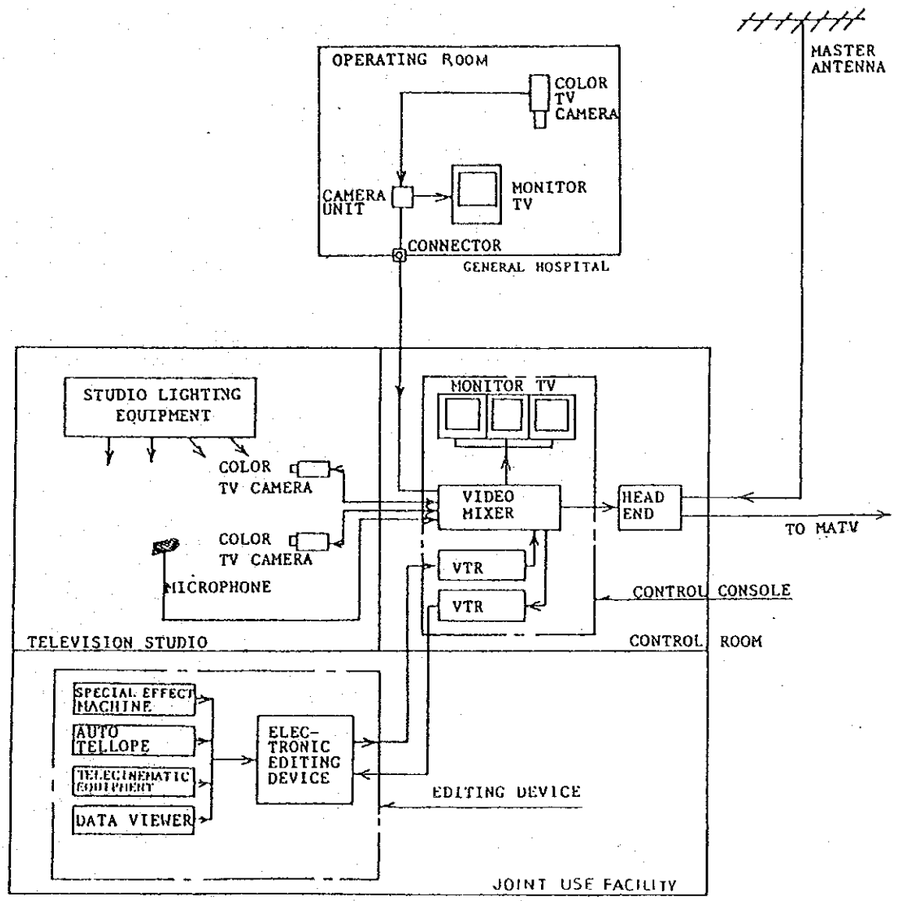


Figure 3-4-11 CCTV System

3.4.2.13 Sound reinforcement systems

Sound reinforcement will be provided by the public address system, the auditorium sound system and the out-patient address system.

A. Public address system

The system will cover the general hospital buildings for operational announcements and paging. (Figure 3-4-12)

(a) The system will consist of amplifiers, repeaters, speakers, attenuators, and other related devices.

(b) Amplifiers will be provided at the security and safety center, auditorium and dining hall.

(c) The amplifier installed in the security and safety center can select the floor or the building to restrict broadcasts, depending on the nature of announcements, and disconnect other on-going announcements in case of emergency calls. (The amplifier installed in the security and safety center of the joint use facilities)

B. Auditorium sound system

(a) The system will consist of an amplifier, cassette tape-recorders, a wireless receiver, a wireless antenna, speakers and other related devices. (Figure 3-4-13)

(b) Two tape-recorders will be provided, one for recording and the other for replaying.

C. Out-patient address system

The out-patient department will be provided with an address system for the waiting lobbies from the examination rooms.

(a) The system will consist of amplifiers, microphones in the respective examination rooms, speakers and other related devices.

(b) Microphones will be connected to the amplifier by the same circuit.

(c) Each microphone will be equipped with a light to signal the use by others.

(d) One amplifier can take up to six microphones.

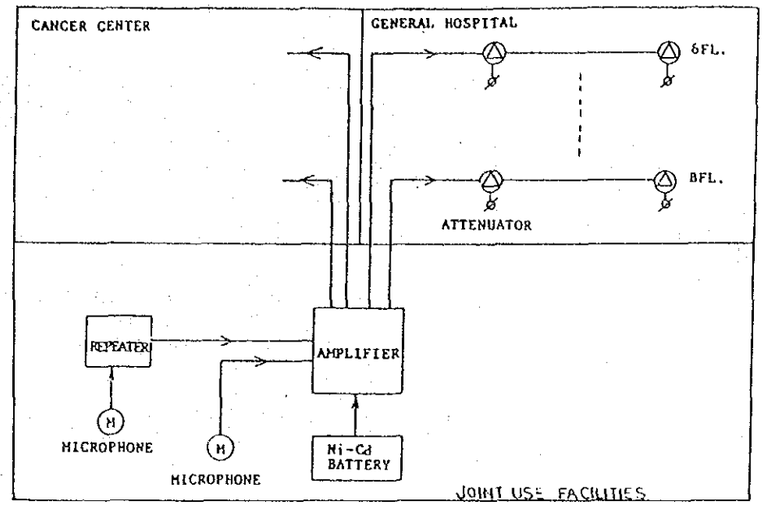


Figure 3-4-12 Public Address System

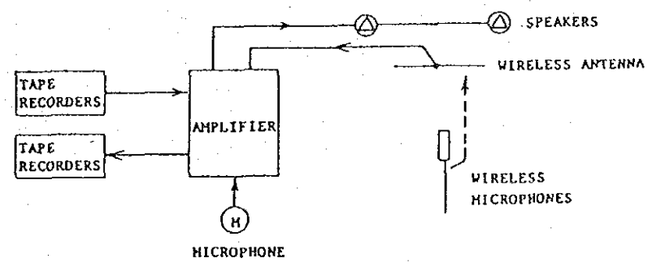


Figure 3-4-13 Auditorium Sound System

3.4.2.14 Electric clock system

Electric clocks will be provided in rooms important for hospital operation and places where people gather. The system will consist of the master and secondary clocks. (Master clock will be provided in the joint-use facilities)

(a) Clocks will be provided in laboratories, consulting and examination rooms, nurse stations, VIP wards, doctors' offices, operating rooms, delivery rooms, the dining hall, the auditorium and some other places.

(b) Operating rooms, I.C.U. and C.C.U. will be provided with operating timers as well as normal secondary clocks.

3.4.2.15 Fire safety system

Fire safety devices will be provided to protect hospital users from fire hazards.

A. Automatic fire alarm system

Fire alarms will be installed for early discovery and containment of fire.

(a) The system will consist of an alarm panel, detectors, emergency phones, and other related devices (Figure 3-4-14).

(b) The alarm panel, to be installed in the security and safety center, will be a miniature replica of the hospital layout and indicate the location of a fire occurrence by luminescent semiconductor diodes.

(c) The type of detectors will be selected according to the functions of the hospital facilities.

(d) Emergency telephones will be provided separately from the ordinary telephone system.

B. Fire protection and smoke exhaust systems

The system will consist of devices shown in Figure 3-4-15.

(a) Smoke detectors will be linked to fire protection doors, shutters and dampers which will be closed to localize fires.

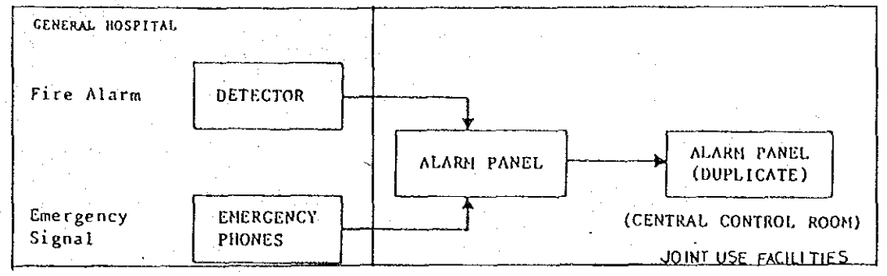


Figure 3-4-14 Fire Alarm System

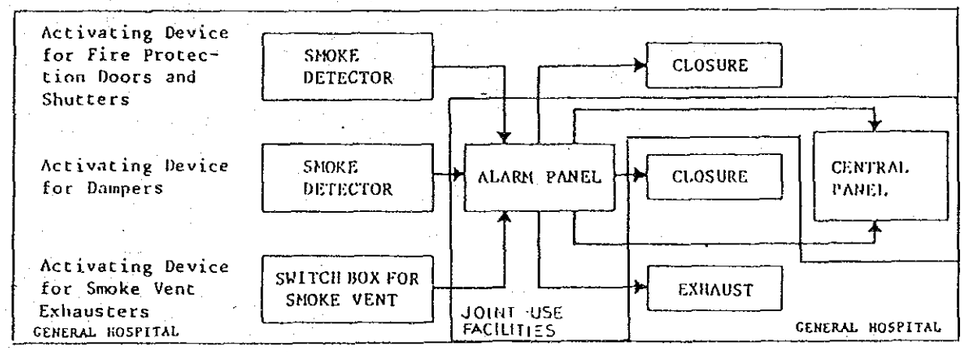


Figure 3-4-15 Fire Protection and Smoke Vent and Evacuation System

(b) The opening of smoke exhaust vents and exhaust fans will be activated by a signal from the switch box.

3.4.2.16 Security systems

Centrally monitored and managed security systems will be provided for crime prevention and policing.

A. Closed-circuit TV security system

Entrances and important sections of the hospital buildings will be monitored by TV cameras which will be centrally controlled from the security and safety center.

(a) The system will consist of TV cameras, a closed-circuit TV rack and other related devices. (Figure 3-4-16)

(b) The CCTV rack will incorporate automatic exchange switches for video-tape recording and replaying, and remote-control devices for changing camera angles and for zooming-up.

(c) Location of the devices will be as follows:

CCTV Rack ..... security and safety center

TV cameras ..... entrances, clinical labs., nurseries, pharmacy and vicinity of VIP wards

B. Tresspass alarm system

Tresspassers to laboratories and the documentation room during the night will be detected by microwave sensors and signalled by an alarm in the monitoring panel of the security and safety center. (Figure 3-4-17)

C. Emergency exit alarm system

Unlocking of doors to the emergency exists during the night will be signalled by an alarm in the monitoring panel. (Figure 3-4-17)

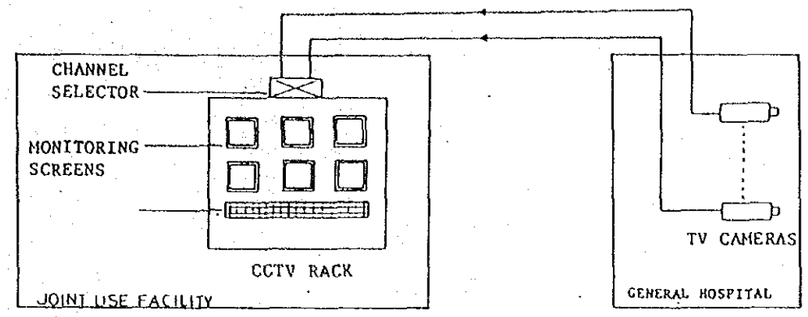


Figure 3-4-16 CCTV System for Security Monitoring

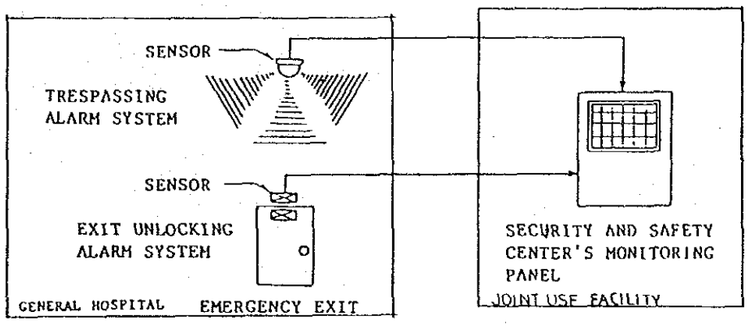


Figure 3-4-17 Security System

Table 3.4.3 Electrical Equipment by Room

Room Designations \ Equipment	Lighting Level (lx)	Percentage of Generators' Circuits (%)		Telephones	Intercom	Broadcasting	CCTv	Public Radio Sets	Public TV Sets	Electric Clocks	Nurse Calls	Grounding	Crime Prevention	Out-patient Emergency call	TV interview equipment (for infectious patient)	I.C.U., C.C.U. patient call system
		Lighting	Outlets													
Examination & Treatment Rooms	400	30	30	O	O					O		O				
Laboratories	400	30	30	O	O					O		O				
X-ray Rooms	200	30	30		O							O				
Operating Rooms	1,000	100	100		O		O			O		O				
I.C.U., C.C.U.	1,000	50	100	O			O				O	O				O
Delivery Rooms	400	100	100		O					O		O				
Nurseries	400	30	50		O		O					O				
Doctors' Offices	300	30	30	O	O					O						
Nurse Stations	400	100	100	O	O	O				O	O					
Wards	200	30	30					O	O		O	O			O	
Pharmacy	400	30	30	O	O					O						
Corridors																
Out-patient	200	30	0			O							O			
Wards	100															
Lavatories	100	10	0								O			O		
Entrance Hall and Waiting Lobby	200	30	0	O		O				O			O			
Offices	400	30	30	O	O	O			O	O						
Conference Rooms	400	10	0	O	O				O	O						

3.4.2.17 C.C.U. and I.C.U. Patient call system

A. For the C.C.U. patient

Telephones will be placed at C.C.U. patient's bed

B. For the I.C.U. patient

The nurse station, waiting room and I.C.U. will be interconnected with a calling/receiving telephone system and room will have a television camera and monitor.

(a) The system will be composed of an intercom, television camera and television monitor.

(b) The intercom system between the nursing station and I.C.U. will allow sending and receiving of calls at both ends.

(c) The television monitors will have a black and white screen.

(d) An intercom, television camera and television monitor will be placed at the nurse station, waiting room and I.C.U.

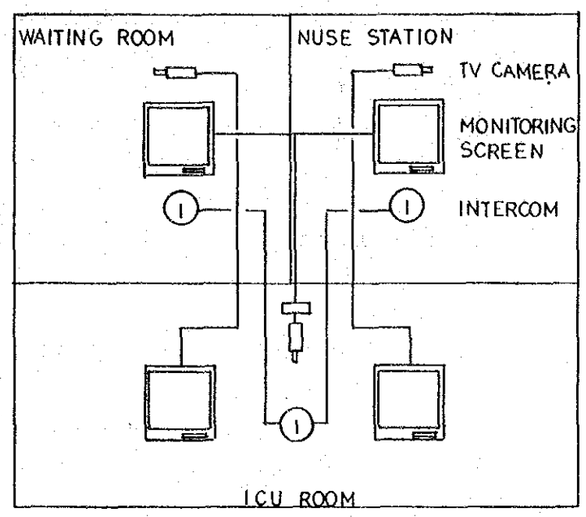


Figure 3-4-18 C.C.U. and I.C.U. Patient Call System

3.4.2.18 Central dictation system

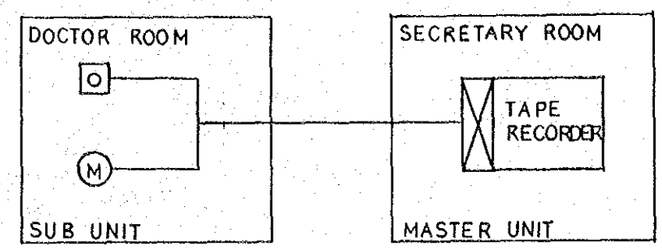
A dictation system will be placed to interconnect the doctor's room and the secretary's room so that the doctor can contact the secretary.

(a) The dictation system will consist of a master unit and a sub-unit.

(b) The master unit will be located in the secretary's room and the sub-unit will be located in the doctor's room.

(c) The sub-unit will have a microphone and an operation switch for communication to the master unit.

(d) The master unit will have a tape recorder.
The tape recorder can be controlled remotely by the sub-unit as well as directly at the master unit.



O OPERATION SWITCH FOR COMMUNICATION TO THE MASTER UNIT

M MICROPHONE

REMOTE CONTROLLER

Figure 3-4-19 Central Dictation System