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5. SANITARY AND PLUMBING SYSTEM

5.1 General

5.1.1 Design concepts

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

- (a) Reliability
- (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

5.1.2 Design criteria

A. Applicable codes and standards

Design and materials criteria will conform to the codes and standards already listed in 1.4, and when deemed necessary, to the American Standard National Plumbing Code as well.

B. Scope of work

1) Scope for planning

The present report mainly refers to the Cancer Center and its joint-use facilities with the General Hospital. The same basic design criteria and conditions are presumed to apply to the General Hospital and its attached facilities.

2) Capacity requirements

Capacity calculations are based on the space requirements of the present project plus its immediately planned extension.

C. Accommodation capacity

1) Hospital zone

In-patients	800 persons
Out-patients	3,000
Hospital personnel	2,000
Visitors	2,000

2) Housing zone

Residential population	1,700 persons (estimated)
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5.2 Systems

5.2.1 Steam generating system

The system will use flue tube-smoke tube boilers, which will be installed in the boiler room of the utilities center.

A. Steam supply

- (a) The system will consist of boilers, a steam header, a hot-well tank, vacuum pumps, water softening devices and piping.
- (b) The total steam load, inclusive of the planned extension of hospital facilities, is estimated to be a steam generation of 17 T/h. Five 5 T/h flue tube-smoke tube boilers (one is a standby) will be installed for the present project. The same models will be added as required in the future expansion (Appendix 5-1).
- (c) Boilers will be severally turned on or off in accordance with the steam loads of various equipment and devices.
- (d) Two of the five boilers will be connected to standby generators, as well as to commercial electricity.
- (e) Generated steam will be distributed via the steam header to the medical equipment, laundry, kitchen appliances, domestic water heaters, heat exchangers for room heating, and humidifiers (Figure 5-1).

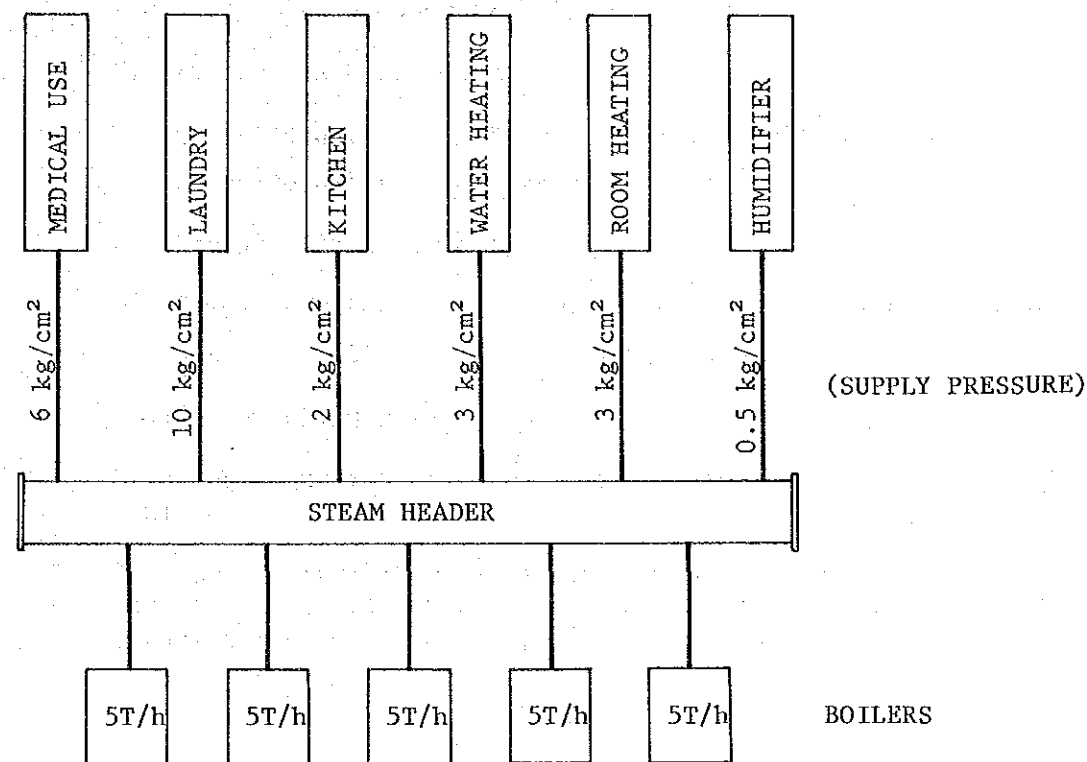


Figure 5-1 Steam Supply System

B. Fuel oil supply

Light oil will be stored in outdoor underground tanks to supply fuel to the boilers, generators and incinerators.

- (a) The system will consist of storage tanks, oil-gear pumps, service tanks and piping (Figure 5-2).
- (b) The storage capacity will be for one week, or 850 kℓ, requiring five 170 kℓ tanks.
- (c) Tanks will be installed underground away from the buildings.

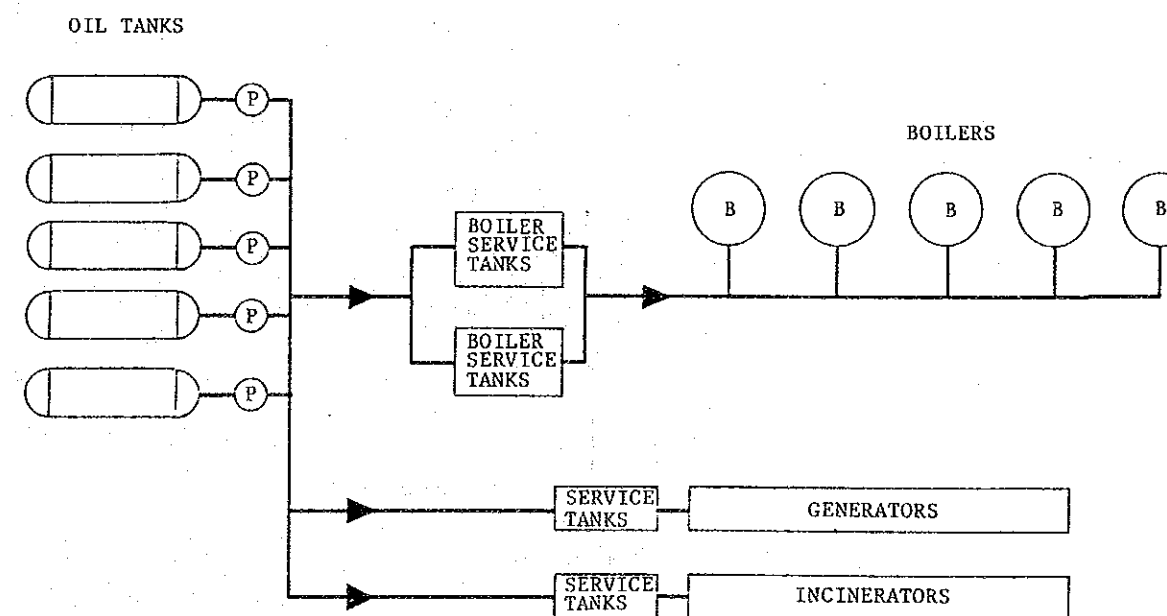


Figure 5-2 Fuel Oil Supply System

5.2.2 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, as shown in Appendix 5-2. However, a chloride sterilizing equipment will be provided for the drinking water system to prevent growth of germs and bacteria.

The system will be of an 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 5-3).

1) Water supply to hospital zone

Piping will be separately provided as follows:

- (a) Cancer Center facilities
- (b) General Hospital facilities
- (c) General Clinic
- (d) Cancer Center wards
- (e) General Hospital wards

2) Recycled water supply

Part of the waste water will be fully treated and recycled to be used for washing and other purposes. The piping system will be similar to the one above.

B. Estimated water requirements (Appendix 5-3)

1) Hospital

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

2) Residential houses

Households (daily per capita consumption)	280ℓ
A single hospital worker	150ℓ

3) Total daily requirement

a) Hospital	1,000 m ³
b) Residential Houses	380 m ³

C. Tank capacities (Appendix 5-4)

1) Storage tank capacity

Domestic water	2,910 m ³ (three days' reserve)
Recycled water	1,230 m ³ (ditto)

2) Elevated tank capacity

Domestic water	97 m ³ (approx. one-hour consumption)
Recycled water	41 m ³ (ditto)

D. Chilled drinking water

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

E. A chloride sterilizing equipment consists of a chemical solution tank and an injection pump. A chloride concentration within the elevated tank will be controlled at 1 ppm.

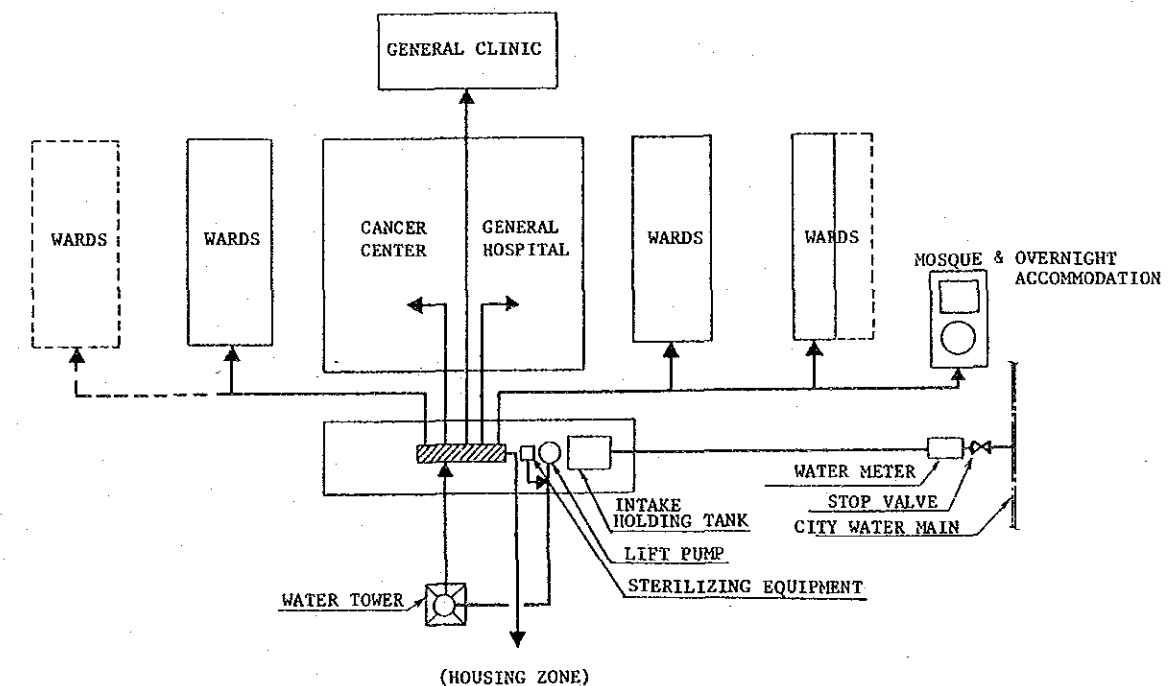


Figure 5-3 Domestic Water Supply System

5.2.3 Hot water supply (Appendix 5-4)

A. Supply system

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

1) Hospital zone

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.

2) Housing zone

Water will be severally heated by electrical appliances in the respective houses.

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. Hot water for washing in the kitchen will be reheated to 80°C by booster heaters.

2) Volume of supply

Assuming the daily per bed requirement of 200ℓ, the total daily consumption of the hospital will be 160,000ℓ, with maximum hourly consumption of 32,000ℓ.

C. Storage capacity

The hot water storage capacity for the hospital will be 32,000ℓ, requiring four 10,000ℓ tanks.

5.2.4 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 radioisotope room in case of radiation leakage accidents.

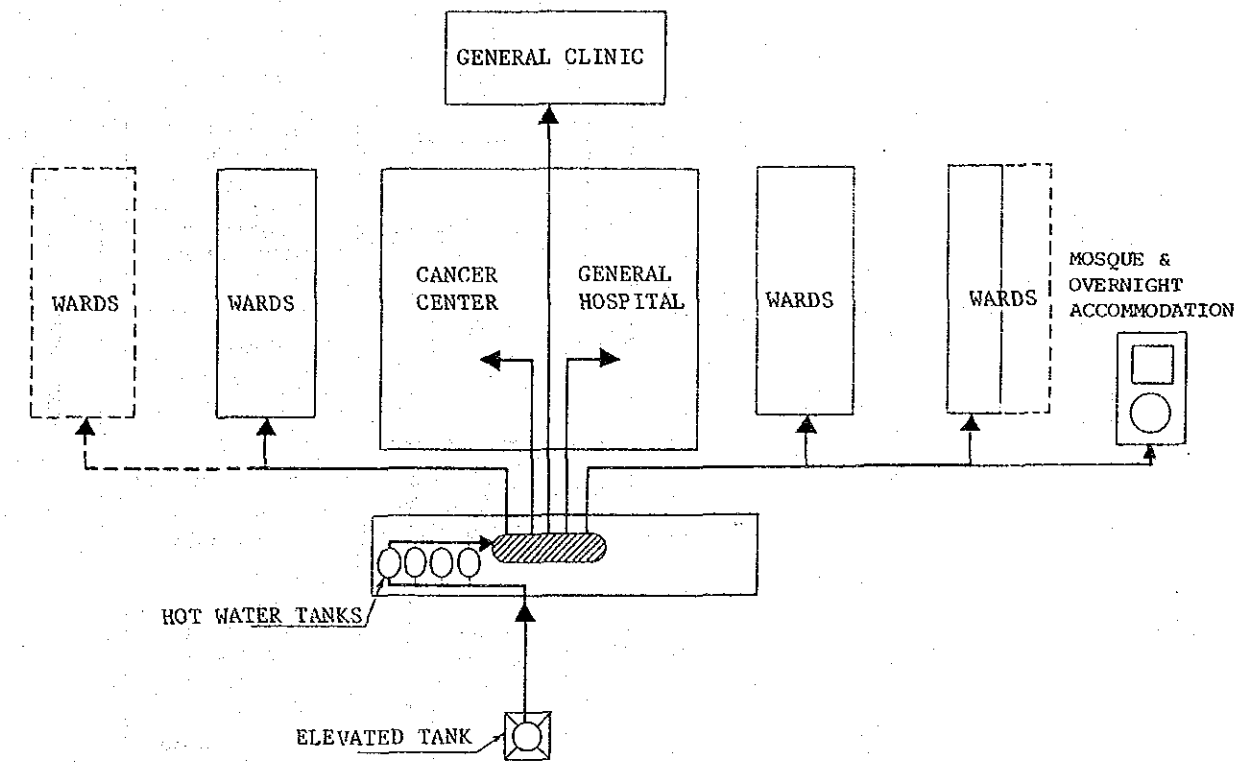


Figure 5-4 Hot Water Supply System

5.2.5 Drainage system

A. Drainage and vent system

1) Hospital zone

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 5-5. Part of the waste water will be recycled after tertiary treatment and used for rinsing and irrigation. Surplus drainage water and unrecycleable waste after secondary treatment will be stored in the drainage tank before disposal.

Vent piping will be, in principle, separately installed.

2) Housing zone

Household waste water will be collected in the general waste water treatment tank of the hospital and stored in the drainage tank before disposal.

B. Drainage volume

1) Hospital zone

Total waste water	approx. 1,000 m ³ /day
Recycled water	300 m ³ /day
Drainage volume	700 m ³ /day

2) Housing zone

Total waste water	380 m ³ /day
Recycled water	110 m ³ /day
Drainage volume	270 m ³ /day

C. Drainage tank capacity

The storage tank will be installed above ground and have a capacity of 3,000 m³, or approximately a three-day drainage volume.

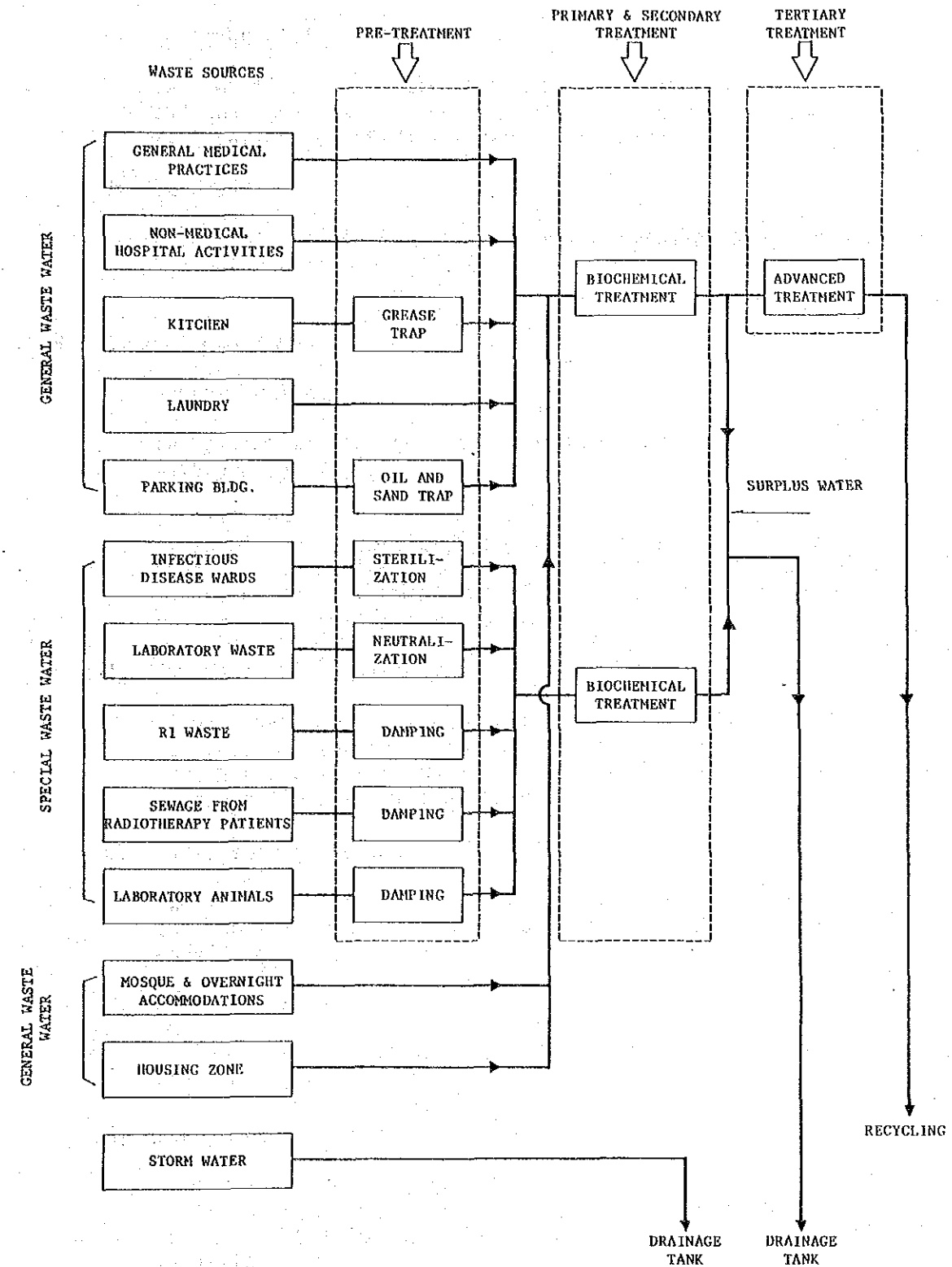


Figure 5-5 Waste Water Treatment System

5.2.6 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 rooms, delivery rooms, ICU and some other places.

5) Foam extinguishing system

Foam extinguishing system will be installed in the indoor parking areas.

6) Halon extinguishing system

The system will be installed to deal with halogenated substances in the power room, generator room, computer room, radioisotope room, cyclotron room, central control room and some others.

B. Water supply for fire-fighting

Storage tanks with a total capacity of 65 m³ will be installed to supply water to the fire-fighting devices of 2) to 5) as listed above (see Appendix 5-6).

5.2.7 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.

5.2.8 Swimming pool equipment

A. Swimming pools

Two swimming pools will be constructed, one in the hospital zone and the other in the housing zone. Water will be recycled after filtration and sterilization by chlorine.

B. Fountains

Fountains will be constructed in the hospital and housing zones and water will be recycled.

5.2.9 Medical gas supply system

A. System outline

The system will be centrally operated for greater efficiency in maintenance.

It will consist of oxygen supply equipment, N₂O supply equipment, N₂ supply equipment, vacuum pump equipment, compressed air supply equipment and other related devices, which will be housed in the manifold room of the warehouse and piped to the respective rooms in the hospital.

B. Oxygen supply equipment

Liquid oxygen will be stored in an outdoor tank (8,000ℓ = thirty-day reserve) and piped to the hospital after gasification. Oxygen gas cylinders will be installed as standby supply in case of the failures of the above system.

C. N₂O supply equipment

Two sets of nitrogen monoxide gas cylinders will be installed in the manifold room to ensure easy replacement. One set will consist of 15 cylinders.

D. N₂ supply equipment

Two sets, each consisting of 15 cylinders, will be installed for the same reason.

E. Vacuum pump equipment

Four 7.5 kW vacuum pumps for suction will be installed in the manifold room; three automatically operated and one as a standby in case of the former's failures. Two 1,000ℓ vacuum tanks will be installed.

F. Compressed air supply equipment

Three 15 kW air compressors will be installed in the manifold room; two for automatic alternate operation and the other as a standby in case of the former's failures.

5.2.10 Central vacuum cleaning system

A. System outline

The central vacuum cleaning system will be provided to attain higher efficiency in energy use and maintenance. The system will consist of cleaning outlets, piping, cyclone bug filters, turbo blowers and other related devices, which will be housed in the vacuum cleaning room of the utilities center. The hospital complex will be divided into three cleaning zones: the Cancer Center wards, joint-use facilities, and the General Hospital wards. In addition, movable vacuum cleaners will be provided separately for the animal laboratory, radioisotope laboratory, radioisotope therapy room, cyclotron room, and the special wards for infectious diseases.

B. Equipment

1) Capacity

Cleaning capacity per zone 2,000 m²/hour
 Cleaning capacity per operator 400 m²/hour

2) Outlets

Outlets will be provided in 10 to 15 m intervals. Vacuum measurement at inlet will be 700 to 1,000 mm Aq and suction velocity 2.0 to 2.3 m³/minute.

5.2.11 Laundry equipment

Linen supply will be centrally managed for laundry, sterilization, darning and storage. Equipment will be installed as required for central management.

A. Treatment capacity

Laundry output: 2.5 kg/bed x 550 beds = 1,375 kg/day (after planned extension, 2.5 kg/bed x 800 beds = 2,000 kg/day)

Treatment capacity. assuming six operating hours per day and six working days a week; 1,375 kg/day ÷ 6 hours = 230 kg/hour (after extension 300 kg/hour)

B. Equipment

Necessary laundry equipment will be as shown in Table 5-1.

Table 5-1

Side Loading Washer	Automatic Steam Hand Iron
Laundry Extractor	Scale
Drying Tumbler	Hand Ironing Board
Flatwork Ironer	Utility Canvas Truck
Utility Press	Sorter Transport Shelf
Mushroom Press	Sink

5.2.12 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. Daily requirements will be as follows:

Hospital personnel 2,000 persons x 3 times
 In-patients 800 persons (ordinary and special meals)

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 utensils will be sterilized and stored there also. Leftovers from the wards are collected for incineration.

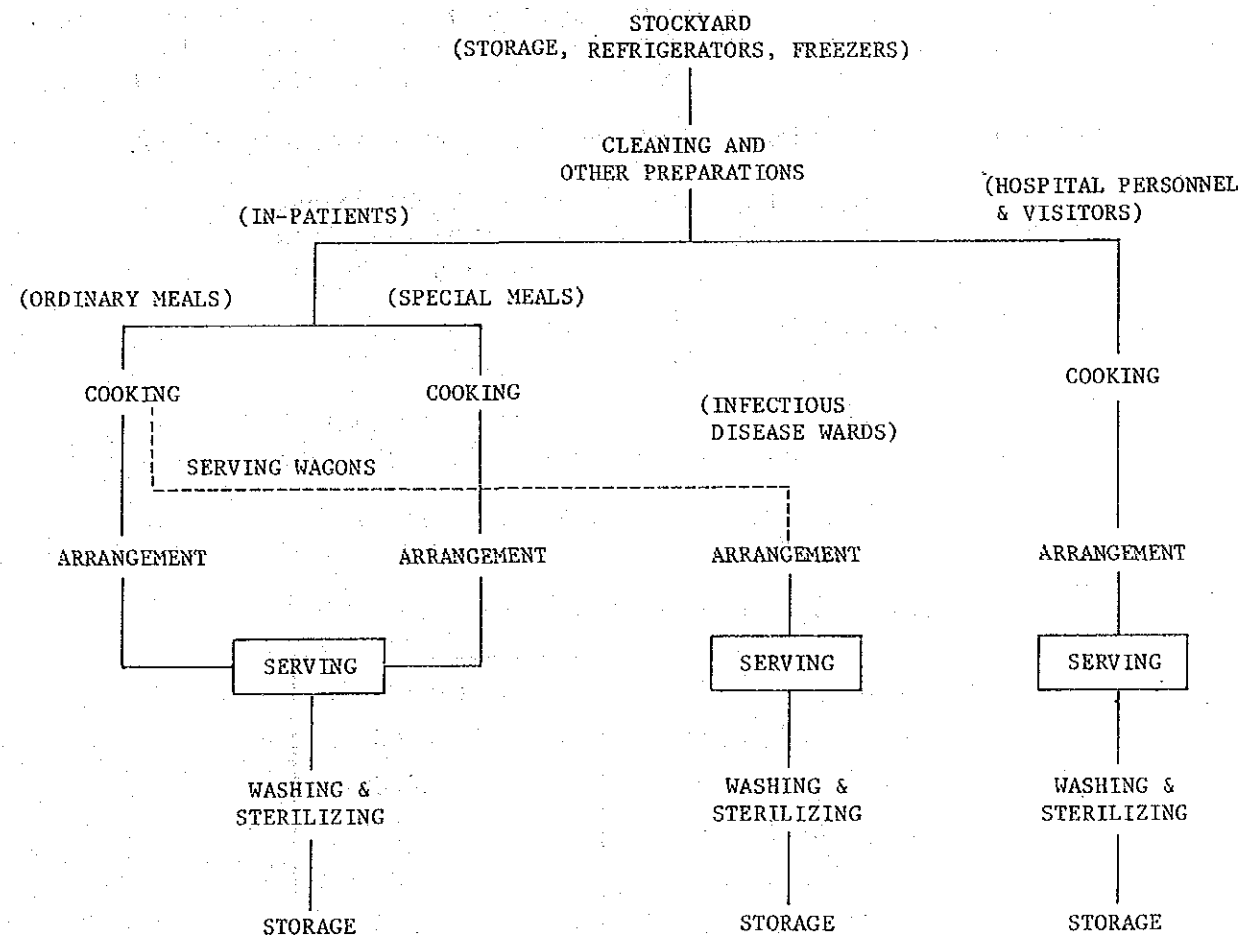


Figure 5-6 Meal Preparation System

B. Major Kitchen Equipment

Necessary kitchen equipment will be as shown below:

- Walk-in Refrigerator
- Walk-in Freezer
- Ice Maker
- Pan Rack
- Pan Sink
- Reach-in Refrigerator
- Reach-in Freezer
- Convection Oven
- Table
- Meat Slicer
- Meat Chopper
- Potato Peeler
- Sink
- Shelf
- Electric Soup Kettle
- Bracing Pan
- Electric Range
- Hearth Grill
- Cold Table
- Warming Table
- Cold Display Showcase
- Cabinet
- Tea Server
- Pulper
- Automatic Washing Machine
- Sterilizing Cabinet
- Warming Cabinet
- Toaster
- Hi-speed Mixer
- Compound Chopper

5.2.13 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.

A. System outline

Incinerators will use oil and be equipped with dust control devices.

B. Capacity

The capacity of two incinerators will be 14,400 kg/day for solid waste and 100 kg/day for liquid waste.

Solid waste	5000 kg/day x 3 sets
Liquid waste	100 kg/day x 2 sets

5.2.14 Waste water treatment plant

Waste water from the hospital is classified into general waste and special waste as already shown in Figure 5-6, and the two will have to be treated separately as shown below. Part of general waste water will be recycled for irrigation and other purposes.

A. Treatment and recycling of general waste water (Figure 5-7)

- (a) Waste water from the kitchen and the parking buildings will pass through a grease trap or an oil trap before primary treatment.
- (b) Waste water from (a) above and other sources will go through secondary biochemical treatment.
- (c) Part of the waste water from (b) above will go through tertiary treatment before recycling for irrigation.
- (d) The quality requirements of waste water after tertiary treatment will be as shown in Table 5-2.

Table 5-2 Quality Requirements of Recycled Water

Turbidity	Less than 20 degree
Color	Less than 30 degree
Odor	Not unpleasant smell
MBAS*	Less than 1 ppm
PH	5.8 to 8.6
BOD	Less than 10 ppm

* Methylene Blue Active Substances

(e) Recycled water will be used for flush toilets and irrigation of lawns and potted plants.

B. Treatment of special waste water (Figure 5-8)

1) Pre-treatment

- (a) Waste water from infectious disease wards will be stored in the tank for chlorine sterilization.
- (b) Acidic or alkaline waste water will be pooled in the neutralizing tank.
- (c) Waste water containing radioactive particles will be pooled in the radioisotope tank for damping.
- (d) Waste water from the animal laboratory will be pooled in the tank for pulverization and elimination, and when deemed necessary, go through the process (a) or (c) above.
- (e) Waste water which contains hazardous substances other than mentioned in (a) to (d) above will be treated accordingly.

2) Secondary treatment

Waste water after primary treatment will be collected and go through secondary biochemical treatment as shown in Figure 5-8.

5.2.15 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 a programmed timer.

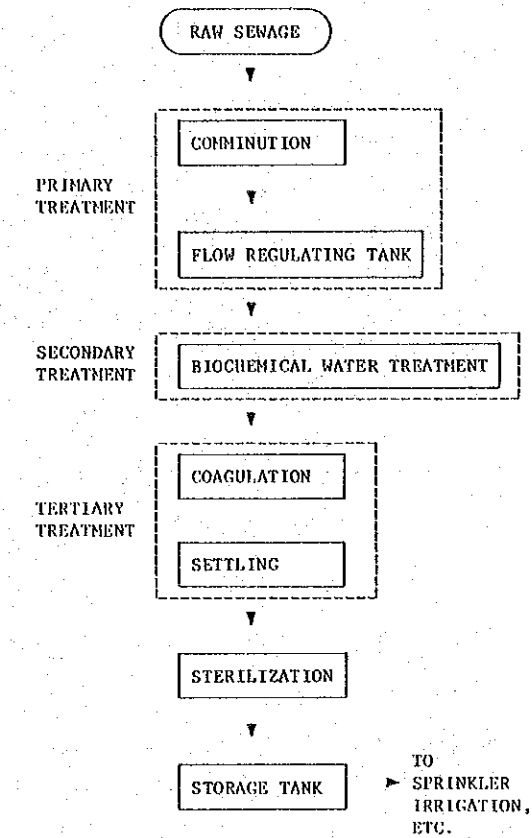


Figure 5-7 Waste Water Treatment System

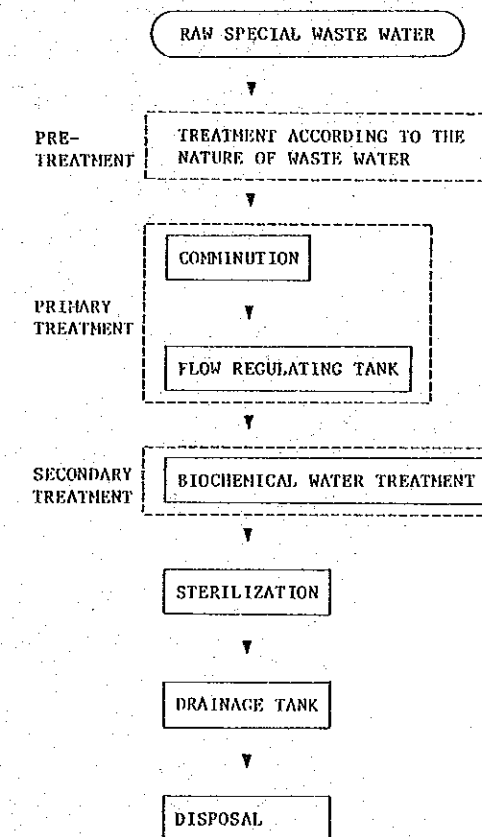


Figure 5-8 Special Waste Water Treatment System

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6. ELECTRICAL SYSTEM

6.1 General

6.1.1 Design concepts

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

- (a) Reliability
- (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

6.1.2 Design criteria

A. Applicable codes and standards

The design and materials criteria for this project will conform to the codes and standards already listed in 1.4, and when deemed necessary, to the British Standards (BS) and International Electrotechnical Commission (IEC) as well.

B. Scope of work

1) Scope for planning

The present report mainly refers to the Cancer Center and its joint-use facilities with the General Hospital. The same basic design criteria and conditions are presumed to apply to the General Hospital and its attached facilities.

2) Capacity requirements

Capacity calculations are based on the space requirements of the present project plus its immediately planned extensions.

3) Necessary electrical works

The electrical works are varied in accordance with the major functions of the respective rooms and spaces, as shown in Appendix 6-1.

6.2 Systems

6.2.1 Substations and power distribution

Considering the hospital functions, the electrical system for the present project must be reliable and safe to ensure stable supply of power. The power distribution system is shown in Figure 6-1 and Appendix 6-2.

A. System components

The system will comprise transformers, circuit-breakers, isolators, a variety of meters, conductors, cables and other related devices. (See Figure 6-2)

B. Load capacity requirements

Load capacities required by the respective facilities, inclusive of the immediate extension are estimated approximately as follows:

Cancer Center (incl. joint-use facilities)	9,000 kVA
General Hospital	6,000 kVA
Utilities Center (incl. water treatment plant)	19,500 kVA
Parking Building & General Clinic	9,000 kVA
Residential Houses	9,000 kVA
Mosque and Others	1,000 kVA
Total	53,500 kVA

C. Power intake

The electricity supplied by the local power company is 3-phase, 3-wire, 13.8 kV 60 Hz.

D. High-voltage distribution

Power supply for the premises will be as follows (See Figure 6-1):

- (a) The receiving substation is located in the warehouse and supplies power to the hospital and residential houses.
- (b) The power for the hospital facilities is distributed through the utilities center and the power room in the basement of the hospital building.
- (c) The parking building and the general clinic are supplied power via the power room on the ground floor of the parking building.
- (d) The parking building and the water treatment plant receive power supply via the utilities center.
- (e) The residential houses and the mosque are supplied 380/220 V electrical via outdoor transformer boxes installed in several appropriate places.
- (f) The power cables to the hospital buildings will pass through the trench.

E. Bus-connection diagram

- (a) The bus-connection circuit breakers will be of normal open type, and one or two circuits on the receiving end will be activated in case of power failures.
- (b) A generator system will be connected to the 13.8 kV network and to the control of the operation of the system and the number of generators.
- (c) The high-voltage (13.8 kV) distribution network will consist of the commercial power system and the emergency generator system, and the closure of bus-connection breakers installed next to the transformers will link the generators to the commercial power distribution system.
- (d) The transformers for the freezing and cooling devices transform the voltage from 13.8 kV to 6 kV, and the other transformers reduce the voltage of 380/220 V.

F. Low-voltage distribution

- (a) The secondary transformers supply electricity of 3-phase, 4-wire 380/220 V.
- (b) The motor power circuits will be fed via the distribution panels at 3-phase 380 V outlet load.

- (c) The lighting and convenience outlet circuits will be fed by a distribution panel for the lighting at a single phase, 220 V outlet load.
- (d) The convenience outlet circuits for the residential housing will be fed at a single phase 220 V - 100 V outlet load by tie-transformers where the voltage is dropped to 220 V - 100 V from 380 V.
- (e) The emergency lighting power source for the housing, the paramedical, the overnight accommodations, and the mosque will not be charged during normal conditions, but in emergency conditions, power will be supplied from the generator system and the transformer, located in the utilities center, after sensing a power failure in the high tension circuit.
- (f) Tie-transformers will be provided where other voltages are required.

G. Others

- (a) The monitoring devices of the main instruments and transformers and the activation and deactivation of circuit breakers will be of the direct current control type, using lead acid batteries.
- (b) Batteries and chargers will be stored in the battery room of the utilities center.
- (c) The operating rooms, the ICU, the CCU, the computers and the like which cannot afford power failures will be provided with uninterruptible power supply (UPS). UPS buses will be of the stationary type and their installation will be dispersed close to the receptacles.

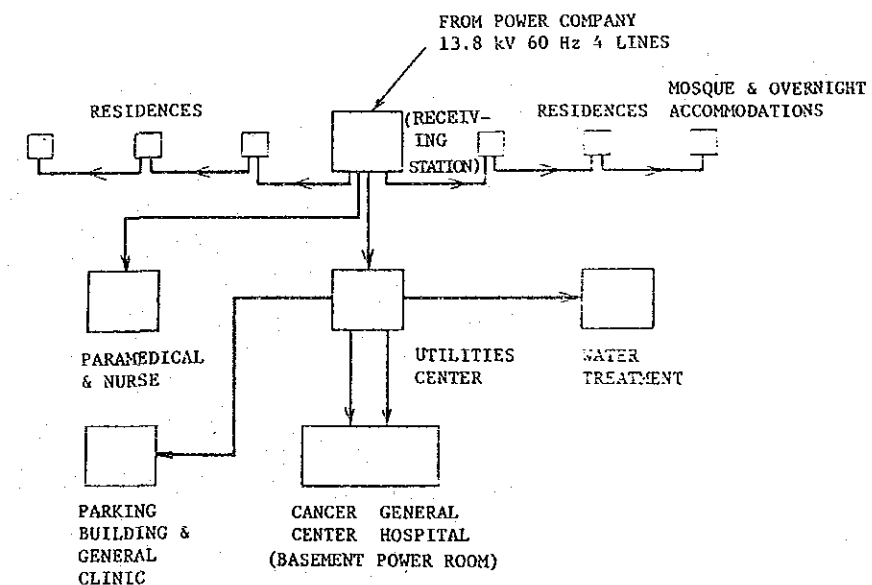


Figure 6-1 Power Distribution System

6.2.2 Emergency generator system

Standby generators will be installed to maintain basic minimum power supply to run the hospital in case of commercial power failures.

A. System components

The system will comprise generators, gas turbines, control panels, air-silencers and other related devices.

B. Load requirements

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 the operating rooms
- (b) Lighting, medical equipment and air-conditioning in the ICU and the CCU
- (c) Lighting, medical equipment and air-conditioning in the 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) Freezers and refrigerators
- (j) Sewage treatment facilities
- (k) Elevators
- (l) Computers
- (m) Emergency lighting for the corridors and stairs of residential housing
- (n) Requirements other than (a) to (m) above which are indispensable to carry on basic minimum hospital functions

C. Load capacities and other specifications

(a) Firm load of generators:

Air-conditioning and others	3,000 kVA x 2 units
Cancer Center and others	3,000 kVA x 1 unit
General Hospital and others	3,000 kVA x 1 unit

(b) Voltage 13.8 kV

(c) Frequency 60 Hz

(d) Automatic activation type

(e) Low noise type

(f) Installation in the utilities center

D. Type

Generators will be run by gas turbines.

E. Fuel

Light oil will be used for the generators as it is used for boilers as well. The underground storage tanks will be installed to secure a one-week continuous use.

- F. The number of operating generators will be controlled as follows (refer to Figure 6-2):
- The four generators will be controlled by the power stoppage signal from the breaker in the receiving circuit.
 - The four generators will be a rotation type started in sequence by each starting signal.
 - When the power stops in circuit A, two generators will be started.
 - When the power stops in circuit B or C, one generator will be started.
 - When the power stops in both circuits B and C, two generators will be started.
 - When the power stops in circuit A and in either circuit B or C, three generators will be started.
 - When the power stops in all three circuits A, B, and C, four generators will be started.
 - When the power stops in circuit D, generators will not be started and only the emergency lighting power will be supplied from the commercial power source.
 - The start-up of generators in (a) - (h), above, is automatically performed, but generators may be switched on manually in other necessary cases.

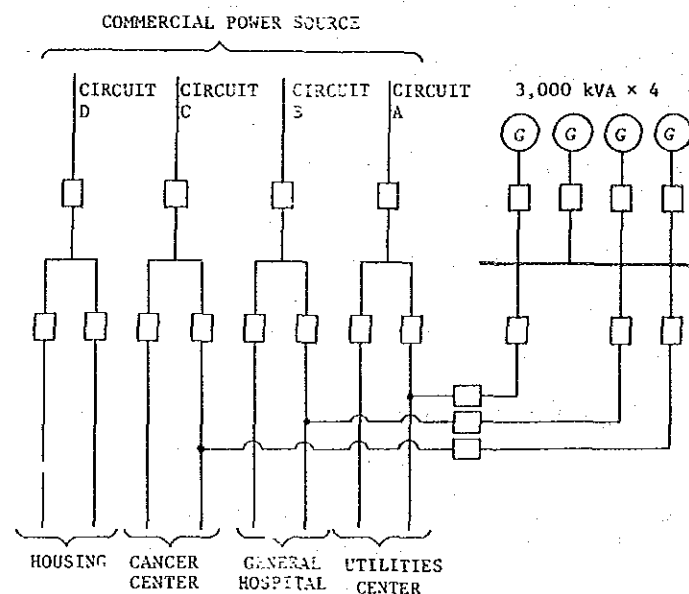


Figure 6-2 General Circuit

6.2.3 Automatic control systems

The devices in the power room and the mechanical equipment room will be monitored and remote-controlled from the central control room.

A. System components

The system will consist of a power-monitoring panel, a power-control panel, an elevator-control panel and converters (Figure 6-3).

B. Power-monitoring panel

- Monitoring will be done by a mimic panel with desk-type console.
- The panel will be equipped with remote-control switches for breakers and local switches with lamps to signal their positions.
- The panel will be equipped with meters to gauge voltage, current, wattage, watt-hours, and power factors of the respective circuits.
- The switching on and off breaker, the starting and stopping of generators, and the operating number and sequence of generators will be conducted from the power-monitoring CPU.
- The panel will be equipped with signals and alarms to indicate breakdowns of the generators.
- The panel will be equipped with signals and alarms to indicate breakdowns of the batteries.
- The monitoring panel will be housed in the central control room.

C. Power-control panel

The power-control panel will consist of a central processing unit (CPU), operator's terminal (OPT), annunciator (ANN), printer (PRT), cathode ray tube (CRT) and other related devices.

- The CPU will scan the operating conditions of the electric equipment, signal alarms when necessary, and control the power supply by a programmed schedule.
- The OPT will be able to program or reprogram its information storing, remote control and objects of output measurement.
- The ANN will signal malfunctions of the electrical equipment by blinkers and alarms.

- (d) The PRT will automatically print out the operating conditions of the electrical equipment when the alarms are set off.
- (e) The CRT will be provided with the function of graphically displaying the information on the mechanical and electrical equipment and devices.
- (f) The power-control panel will switch on and off, monitor, measure, and record the operation of the various electrical equipment, as shown in Table 6-1.

Table 6-1 Central Control Functions

	Switch On and Off	Monitoring	Measurement	Recording
Power Instruments and Trnasformers	○	○	○	○
Smoke Exhaust Device	-	○	-	○
Air-conditioning	○	○	○	○
Plumbing	○	○	○	○

D. Elevator control panel

- (a) The panel will be equipped with signal lamps to indicate the positions of the respective elevator boxes.
- (b) The panel will be equipped with interphones connected to each elevator box.
- (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.

E. Others

- (a) The monitoring devices will be DC-controlled with lead acid batteries.
- (b) The activation and deactivation of circuit breakers will be done both at the central monitoring panel and at the respective local panels.

- (c) The system will include interlocks and control circuits between various electrical devices.
- (d) Medical gas leakage alarms will be built into the plumbing system.

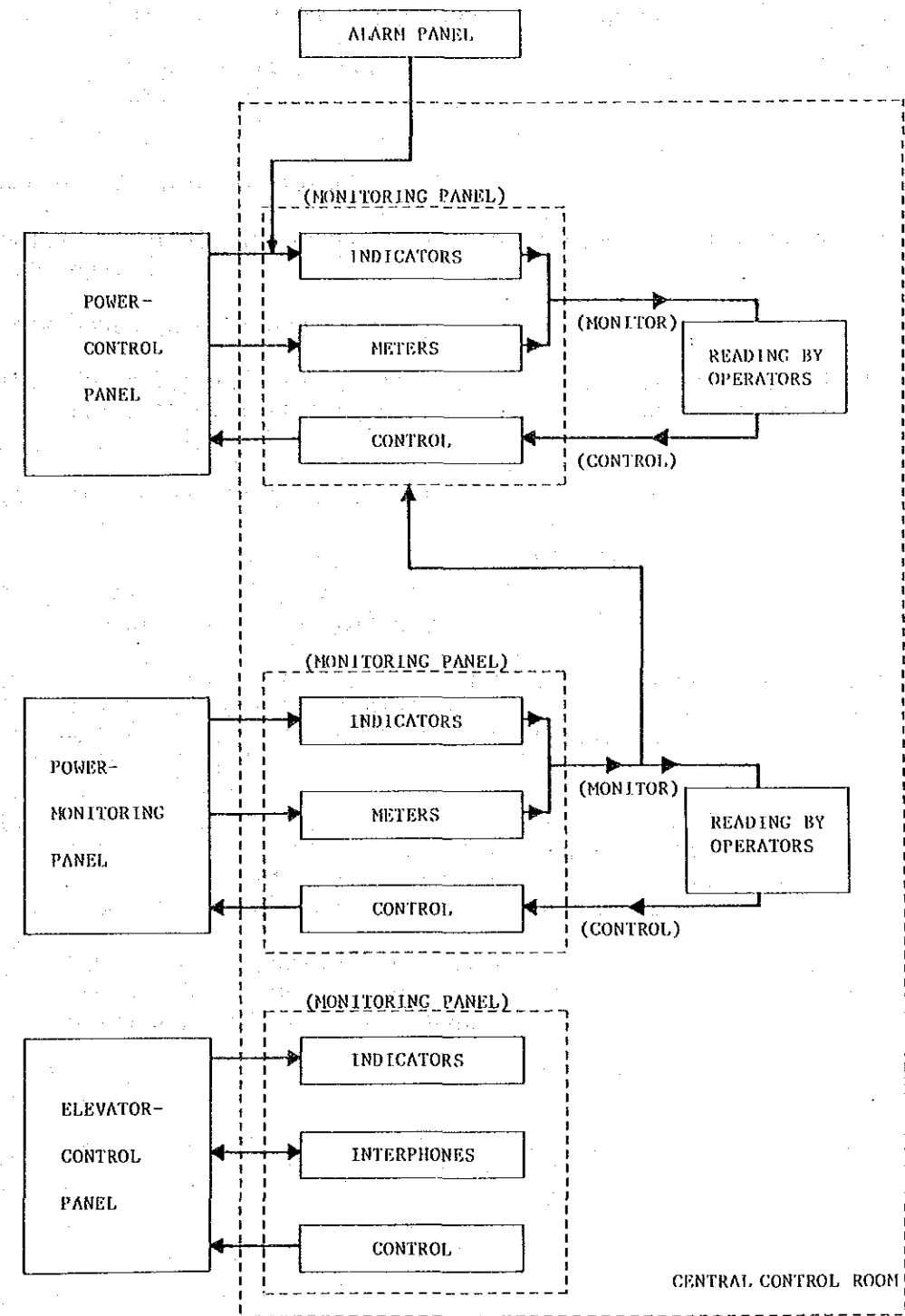


Figure 6-3 Flow Chart of Central Control System

6.2.4 Lighting system

For greater energy efficiency, the lighting system will mostly use, 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 6-2.

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 the 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 and then switched onto the generators after the voltage is stabilized.

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

2) Emergency exit 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 marker lights

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

- (a) Obstruction marker lights will be installed at the helipad and on top of the water supply tower.
- (b) Lights will be attached to signals to indicate filament disconnection.

6.2.5 Telephone and intercom system

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

A. Telephones (See Figure 6-4)

- (a) The telephone cables will be let in at the main distributing frame (MDF) installed near the public road and then extended separately to hospital buildings and residential houses.
- (b) The number of circuits will be as follows:

E.P.A.B.X. circuits	200 circuits
The residential houses' public telephone circuits	100 circuits
- (c) The telephones for EBAX circuit will be distributed to the telephone outlets within the hospital and the houses from the MDF through the hospital main panel via the electronic switchboard.
- (d) The telephone wiring for the residential houses' public telephone circuits will be connected to the public telephone outlets located in the corridor of each residential house from the MDF via the terminal board for residential houses.
- (e) Public telephones will be installed in necessary locations of the hospital, such as lobbies and halls, and in the corridors of each floor of the residential houses.

Table 6-2 Lighting Levels and Fixtures

Rooms	Lighting Level (lx)	Type of Light-ing Fixtures	Remarks
Consulting and Examination Rooms	400	Fluorescent lamps, recessed and covered	
Laboratories	400	Ditto	
X-ray Rooms	200	Ditto	With light-adjusting control
Operating Rooms	1,000	Ditto	With shadowless lamps
ICU, CCU, CCRU	1,000	Ditto	With light-adjusting control
Delivery Rooms	400	Ditto	With shadowless lamps
Nurseries	400	Ditto	
Research Rooms	500	Ditto	
Treatment Rooms	400	Ditto	
Doctors' Offices	300	Ditto	
Nurses Stations	400	Ditto	
Wards	200	Ditto	With all-night lamps
Pharmacy	400	Ditto	
Pantry	200	Ditto	
Corridors	Out-patient Dept. 200 In-patient Dept. 100	Ditto	
Lavatories	100	Ditto	
Entrance Halls and Lobbies	200	Ditto	

Rooms	Lighting Level (lx)	Type of Light-ing Fixtures	Remarks
Administration	400	Ditto	
Dining Hall	300	Ditto	
Kitchen	400	Fluorescent lamps, surface-attached and covered	With sterilizing lamps
Conference Rooms	400	Fluorescent lamps, flush and covered	
Mechanical Equipment Room	100	Ditto	
Parking Bldgs. A & B	50	Ditto	
Residences	Living room 200 Bedroom 100	Incandescent lamps	Overnight accommodations will be the same.
Outdoor	5	High-pressure sodium lighting, pole-top	
Mosque	150	Metal halided lamps, pole-top	
Tennis and Squash Courts	150	Mercury vapor lamps, Metal halided lamps, pole-top	Outdoor lighting
Swimming Pools	50	Ditto	Ditto

B. Electronic private automatic branch exchanger (EPABX)

An EPABX will be installed for external and internal calls.

(a) The EPABX system comprises the switchboard, telephone repeaters, power supply devices, night-time transfer switchboard, receivers, and other related devices.

(b) The number of EPABX circuits will be as follows:

Internal circuits	1,500/2,000
External circuits (city line)	100/200
Pocket buzzers	150/200

(c) The system will perform the following major functions.

- paging calls
- selected extensions connectable to external circuits
- night-time transfer
- automatic call-back transfer
- call forwarding
- call pick-up

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

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

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

(g) A storage battery with a one-hour capacity will be provided for the switchboard to supply power in case of a power black-out, but after the emergency generator starts, power will be supplied by the generator.

C. Intercom system

(a) The system consists of intra-departmental communication subsystems, an X-ray room subsystem and an operating room subsystem.

(b) Intercom devices will be provided separately for each department and are of reciprocal communication type. Inter-departmental communication will be done by internal telephone extensions.

(c) 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.

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

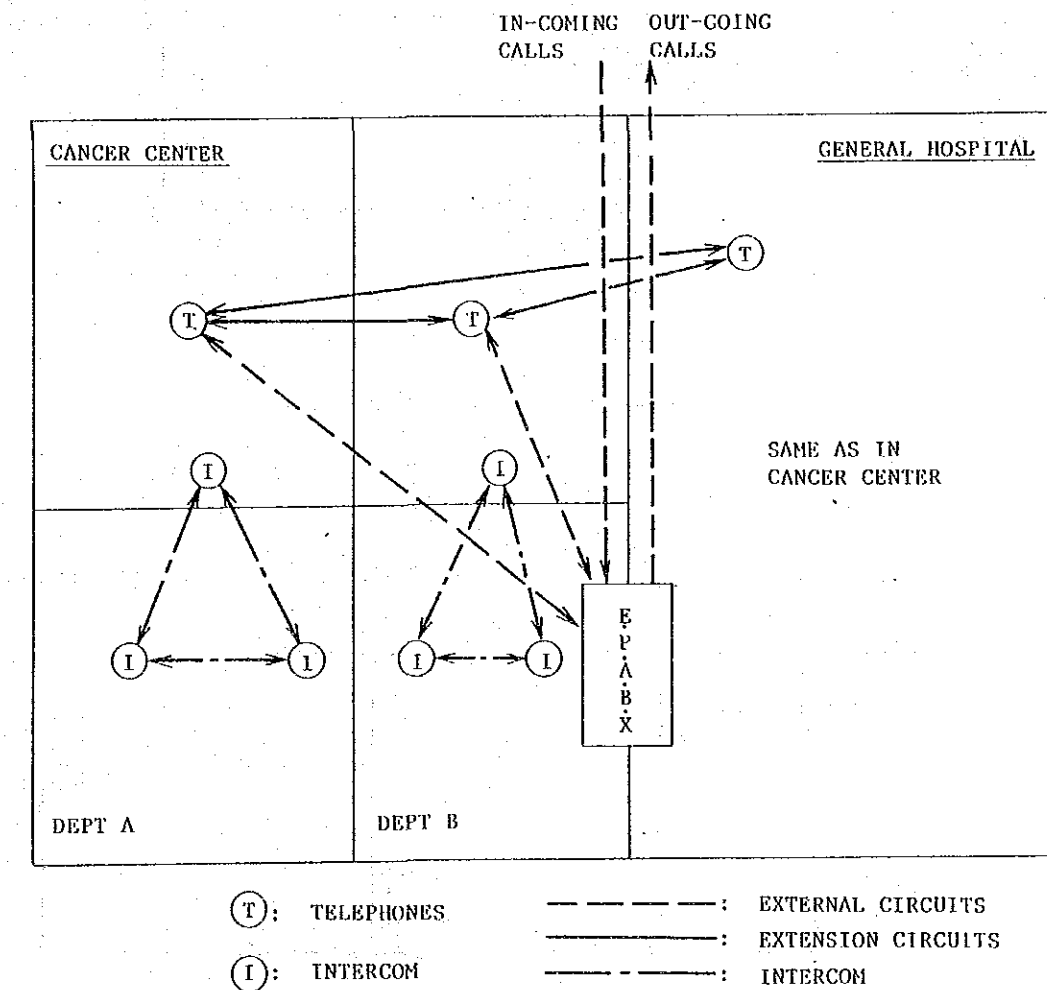


Figure 6-4 Telephone and Intercom Communication Diagram

6.2.6 Paging system

Paging of doctors and other hospital personnel will be by the use of pocket buzzers.

A. System components

The system consists of a paging controller, transmitters, antennas, receivers (pocket buzzers), chargers and other related devices (Figure 6-5).

B. 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.
- (d) The paging controller will be installed in the telephone switchboard room and have 200 circuits.
- (e) Four circuits are usable simultaneously.

C. Receivers

Receivers are of pocket buzzer type and batteries are rechargeable.

D. Chargers

The Cancer Center will be provided with a 100-outlet charger and nurse stations each with a single-outlet charger.

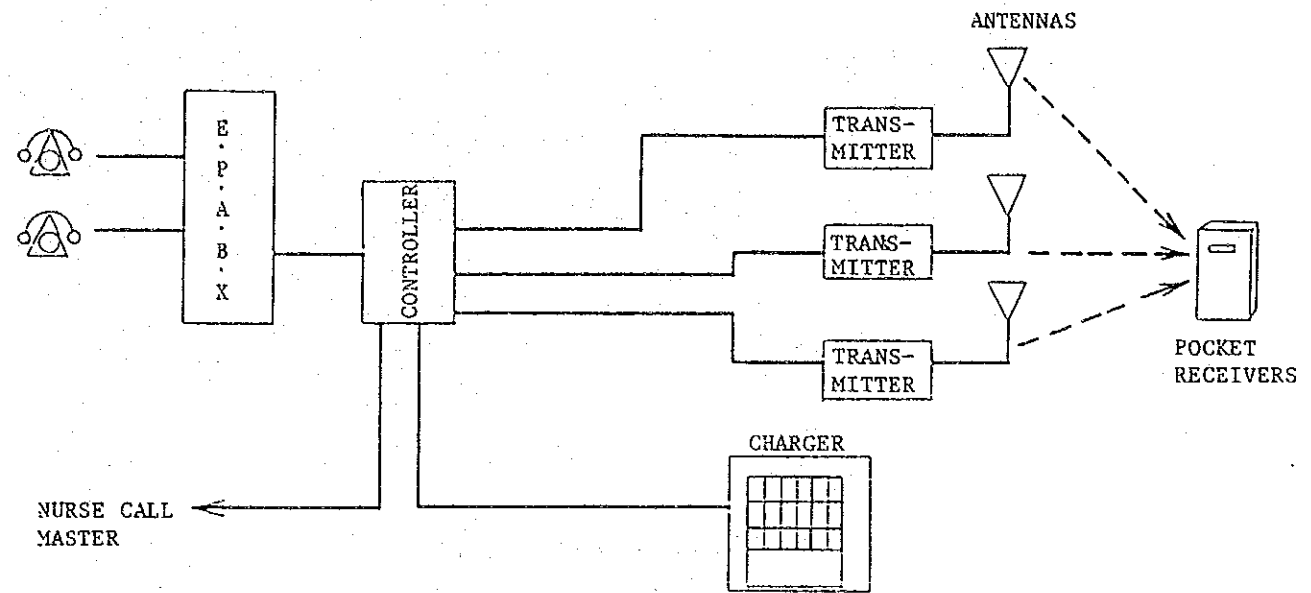


Figure 6-5 Paging System

6.2.7 Nurse-call system

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

A. General wards

1) System components

The system will consist of a master instrument in each nurses station, bed-side extensions, and signalling lights in the corridors (Figure 6-6).

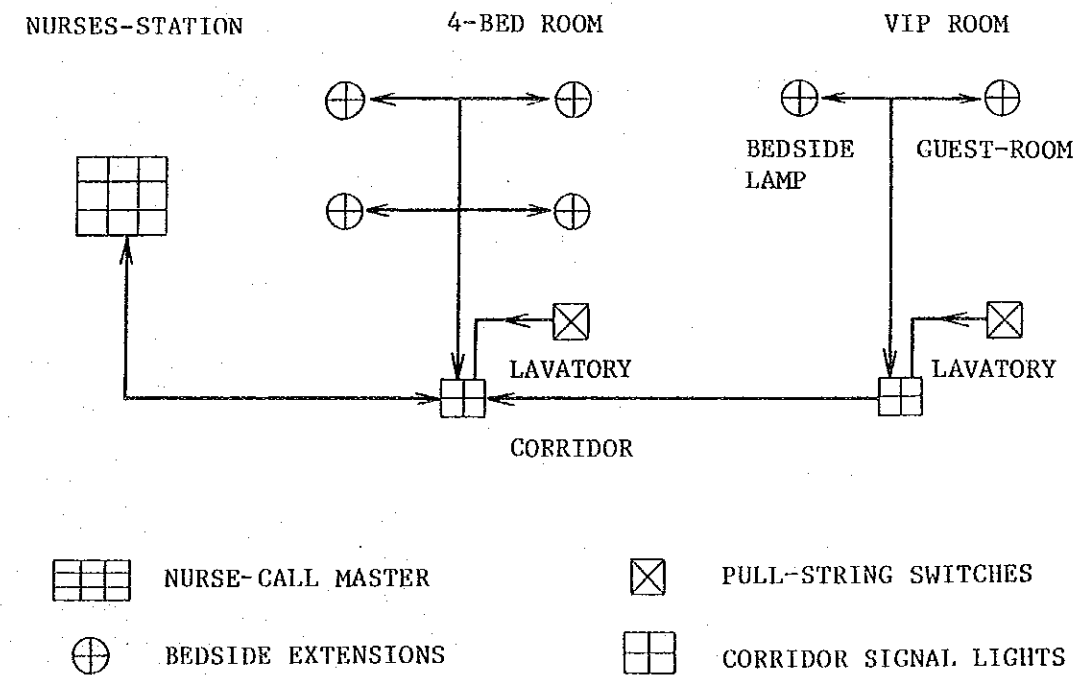


Figure 6-6 Nurse Call System (General Wards)

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 is transferable to the paging system in case no one is available in the nurse stations.
- (d) A 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 consists of a 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. ICU and CCU

1) System components

The system consists of a master instrument and bed-side extensions (Figure 6-7).

- (a) A 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.

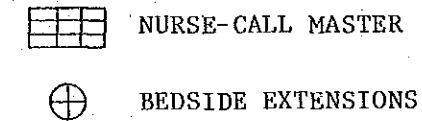
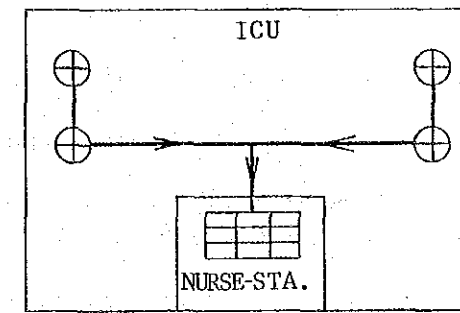


Figure 6-7 Nurse-Call System (ICU, CCU)

6.2.8 Sound reinforcement systems

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

A. Public address system

The system will cover the entire hospital buildings for operational announcements and paging (Figure 6-8).

- The system will consist of amplifiers, repeaters, speakers, attenuators, and other related devices.
- Amplifiers will be provided at the security and safety center, auditorium and dining hall.
- The amplifier installed in the security and safety center can select the floor or the building to restrict broadcasts, depending on the nature of the announcements, and disconnect other on-going announcements in case of emergency calls.
- The amplifier of the security and safety center can broadcast through the repeater installed in the administration office as well as through its own microphone.
- The amplifier for the security and safety center will be provided with a Ni-Cd battery for operation during a power blackout. It will have a capacity of 5 microphone input circuits, 100 output circuits and 2,000 W.

B. Auditorium sound system

- The system will consist of an amplifier, cassette tape-recorders, a wireless receiver, a wireless antenna, speakers and other related devices (Figure 6-9).
- Two tape-recorders will be provided, one for recording and the other for replaying.
- The amplifier will have a capacity of five microphone input circuits, 10 output circuits, and 200 W.

C. Out-patient address system

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

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

D. Mosque sound system

- The system will consist of an amplifier, speakers, wireless receivers, wireless antennas and other related devices.
- Speakers for the main prayer hall are of the column type.
- The amplifying device will be provided with an equalizer.
- The amplifier will have a capacity of three microphone input circuits, 10 output circuits, and 150 W.

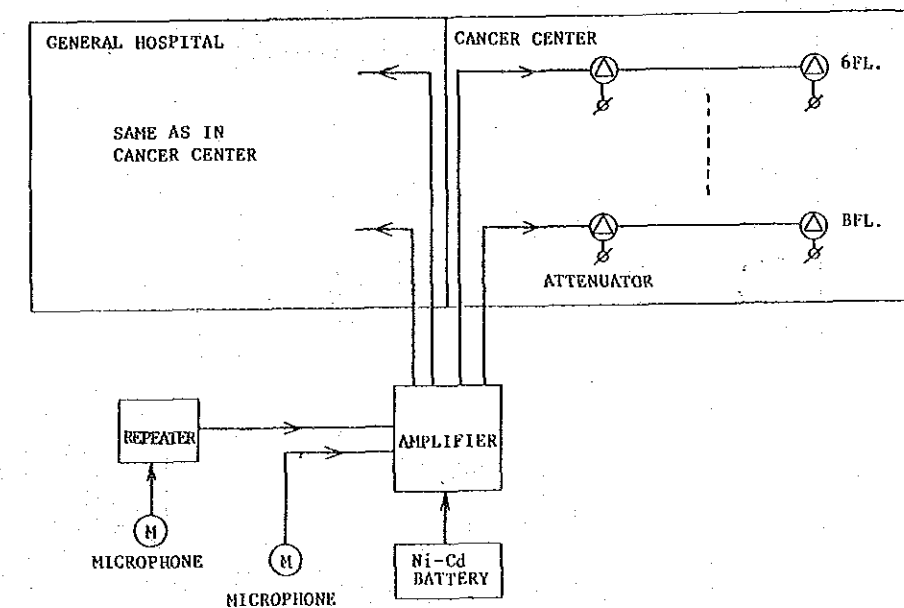


Figure 6-8 Public Address System

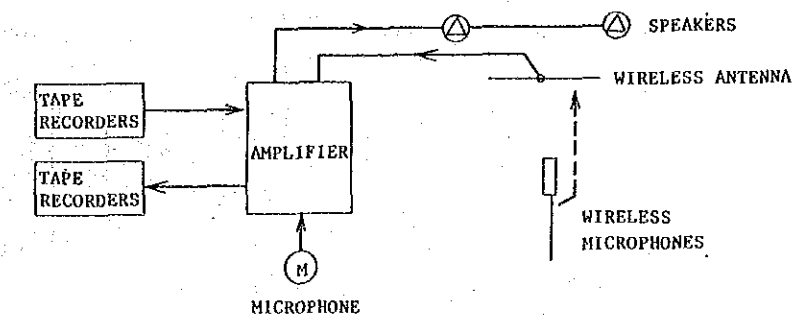


Figure 6-9 Auditorium Sound System

6.2.9 Ready sign system for pharmacy

The pharmacy will be provided with a signaling device to indicate the readiness of prepared medicines. The ready sign system will consist of a signal board and an operating panel (Figure 6-10).

- (a) The signal board will be attached to the wall and plugged in individually to signal windows.
- (b) The board will have a built-in speaker for out-patient address.
- (c) The operating panel will be of a desk-top type with individual switches for signal windows.
- (d) The number of circuits per system will be 200, as shown in Table 6-3.

Table 6-3 Number of Circuits per System

	Signal board	Operating panel
Male	200 windows	200 windows
Female	200 windows	200 windows

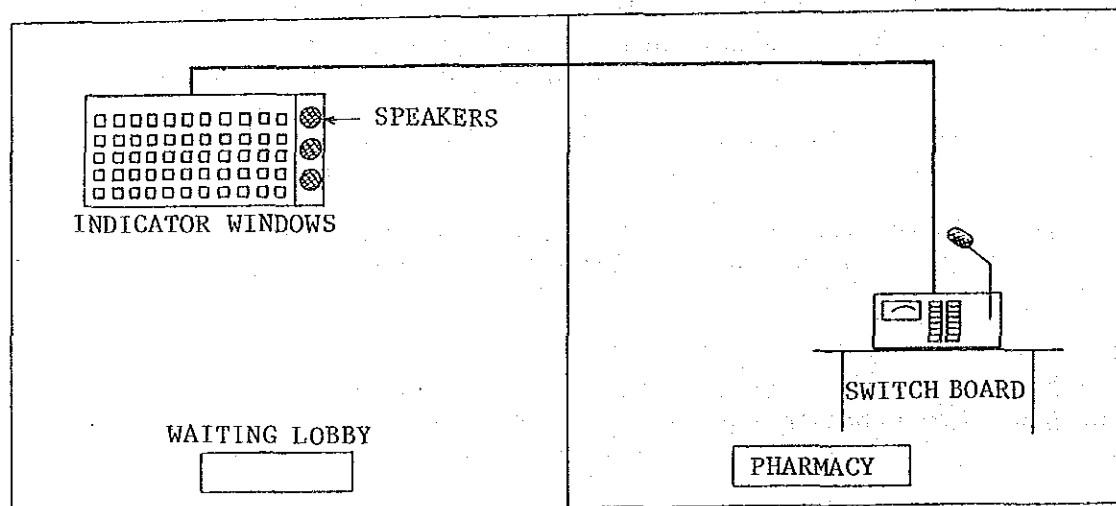


Figure 6-10 Ready Sign System for Pharmacy

6.2.10 Television and radio systems

The hospital complex will be provided with a CCTV system, a TV studio, an MATV system, and a radio system (Figure 6-11).

A. CCTV system

CCTV equipment will be provided in some departments, as will be an auditorium for medical discussion.

- (a) The system consists of a TV color camera, a monitor TV, a television studio, an operation table, and an editing equipment.
- (b) TV cameras for medical diagnosis will be installed in the surgical department and endoscopy section.

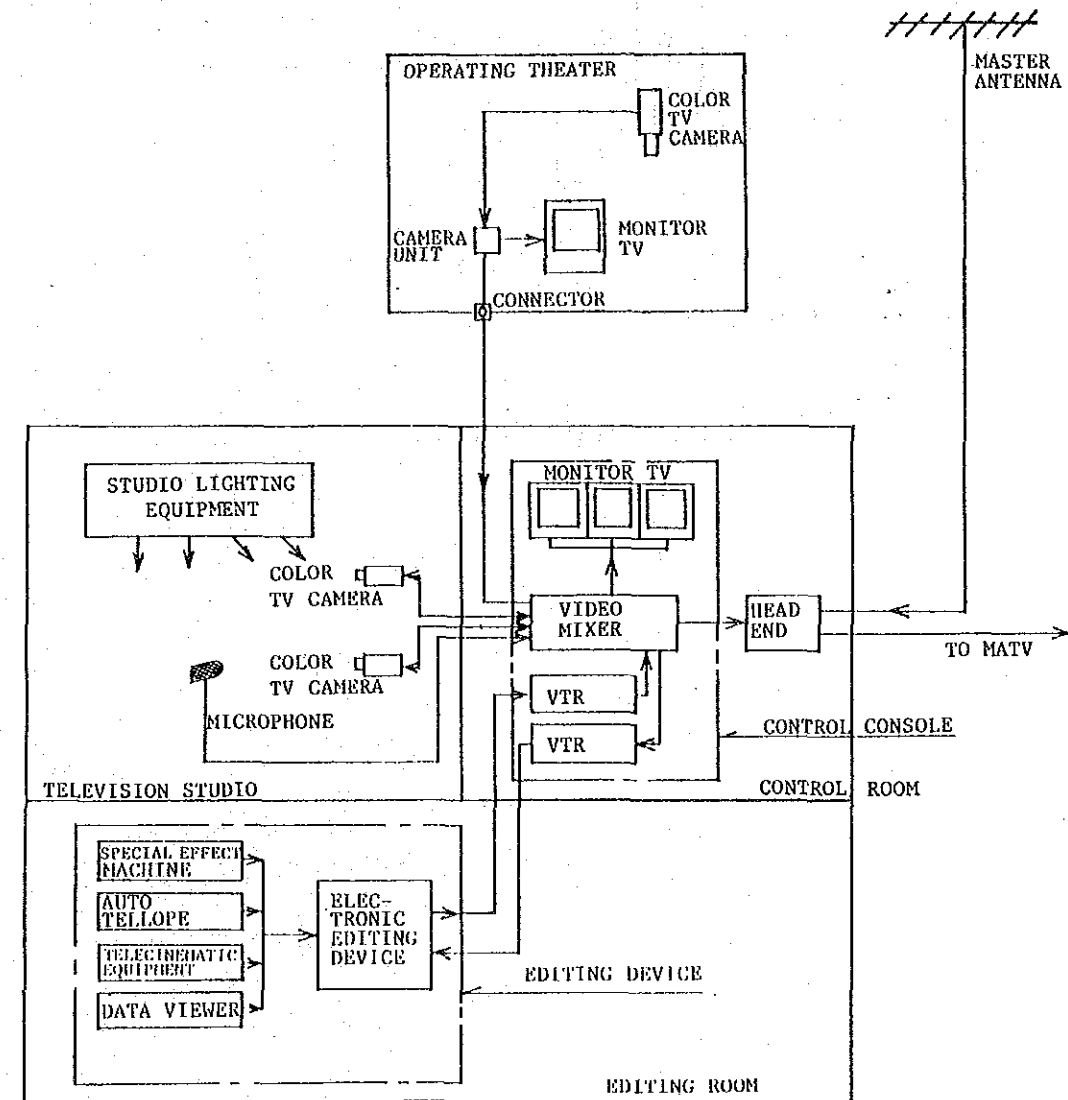


Figure 6-11 CCTV System

B. TV studio

The TV studio consists of a studio, a control room, and an editing room.

- (a) Inside the studio, programs will be taken and transmitted by TV camera and microphone, with studio lighting provided by border lights, spot lights and suspension lights.
- (b) Inside the control room, the picture and sound will be adjusted and recorded by viewing through a monitor TV at the control console consisting of video mixer, sound mixer, and remote control unit.
- (c) Inside the editing room, the program will be edited and recorded on a video tape by an electronic editing device which will receive the picture from the special effect machine, telecinematic equipment, auto telope and data viewer.
- (d) The completed program and tape will be transmitted to each television receiver set through a head-end equipment.

C. MATV system

An MATV system will be provided to receive general TV broadcasts.

The system consists of a master antenna, an amplifier, a head-end equipment and matching coupler.

- (a) TV outlets are provided in wards, the dining hall, lounges, the security and safety center and other necessary places.
- (b) TV transmitted from the hospital TV system will be converted by the head-end equipment, then mixed, amplified, and transmitted to each outlet.
- (c) The TV antenna will be installed on the roof of Ward buildings.
- (d) A TV antenna will be installed at each housing unit building and an outlet will be provided in each unit.

D. Radio system

The system will be one that transmits sound signals amplified for each channel at the amplifier rack in the radio room to each earphone set with a channel selector.

An earphone set with a channel selector will be provided for each bed in the ward. The channel selector will have three radio channels and one BGM channel which can be selected by a push button.

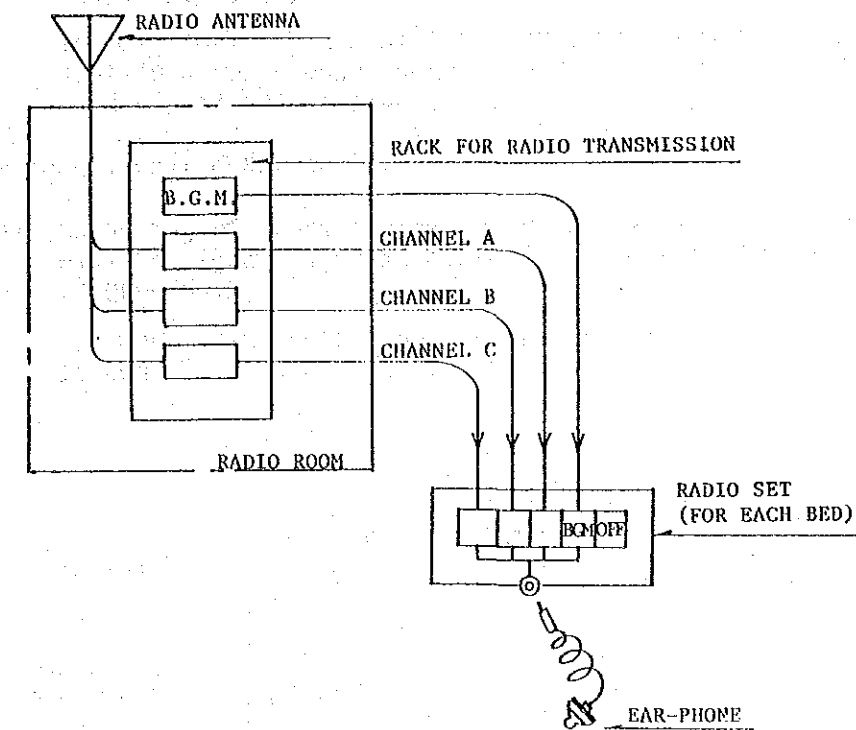


Figure 6-12 Radio System

6.2.11 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.

- (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 several other places.
- (b) Operating rooms will be provided with operating timers as well as normal secondary clocks.
- (c) Master clocks will be of quartz oscillation type and installed in the security and safety center.
- (d) Master clocks will be provided with an Ni-Cd battery for operation during a power blackout. 100 circuits will be provided for secondary clocks which are distributed into separate zone and floor.

6.2.12 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 are 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 6-13).
- (b) The CCTV rack will be for 50 circuits incorporating a remote control equipment to operate the VTR recording, the automatic program switching, the rotating camera and the zooming-up.
- (c) Location of the devices are as follows:

CCTV Rack security and safety center
 TV cameras entrances, clinical labs., nurseries, pharmacy and vicinity of VIP wards

B. Trespass alarm system

- (a) Trespassers 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 6-14).
- (b) The monitoring panel will be for 100 circuits, which will contain a spare power source, and will indicate a disconnection and signal an alarm.

C. Emergency exit alarm system

- (a) Unlocking of doors to the emergency exits during the night will be signalled by an alarm in the monitoring panel (Figure 6-13).
- (b) The monitoring panel and trespassing alarm signal system will be contained in one panel.

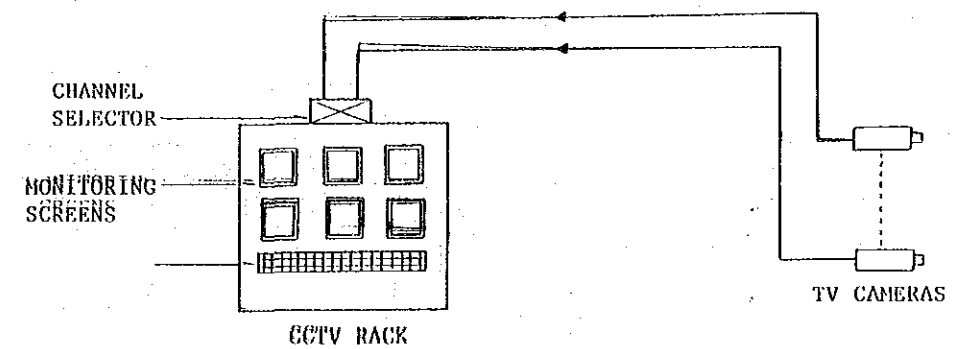


Figure 6-13 CCTV System for Security Monitoring

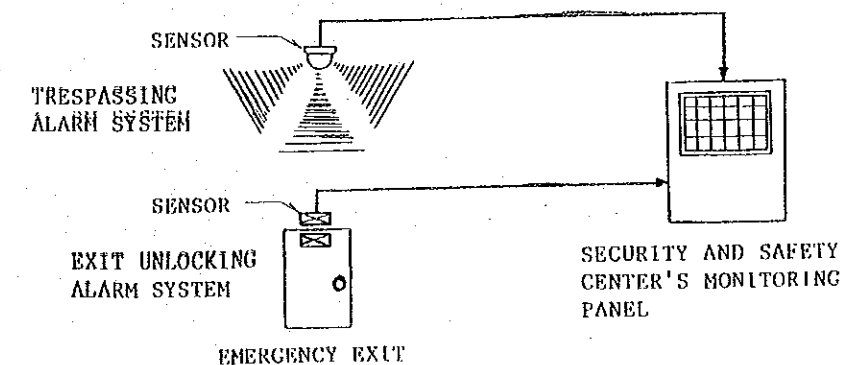


Figure 6-14 Security System

6.2.13 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.

- The system will consist of an alarm panel, detectors, emergency phones, and other related devices (Figure 6-15).
- 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.
- The type of detectors will be selected according to the functions of the hospital facilities as follows:

Fire detectors boiler room, kitchen, parking
(thermal type) building

Smoke detectors other rooms

- Emergency telephones will be provided separately from the ordinary telephone system.
- The alarm panel will be for 1,300 circuits and will be provided with an Ni-Cd battery for operating two circuits during a power blackout.
- Each nurse station will be provided with an alarm display panel for its floor and a sub alarm panel will be provided in the administration office.

B. Fire protection and smoke exhaust systems

The system will consist of devices shown in Figure 6-16.

- Smoke detectors will be linked to fire protection doors, shutters and dampers which are closed to localize fires.
- The opening of smoke exhaust vents and exhaust fans will be activated by a signal from the switch box.
- The smoke exhaust system and fire alarm system will be contained in the same panel.
- All circuit wiring will be of heat resistant wires.

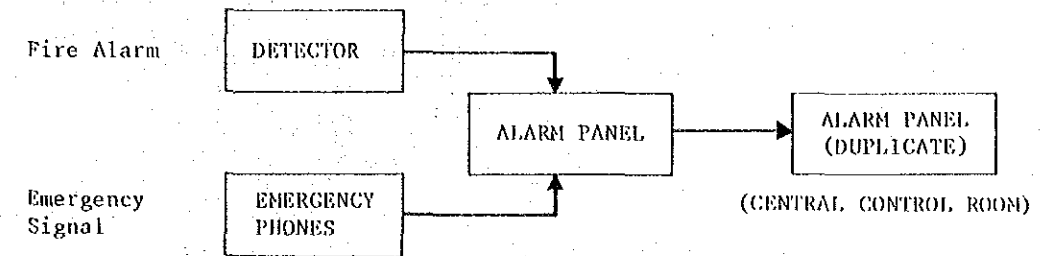


Figure 6-15 Fire Alarm System

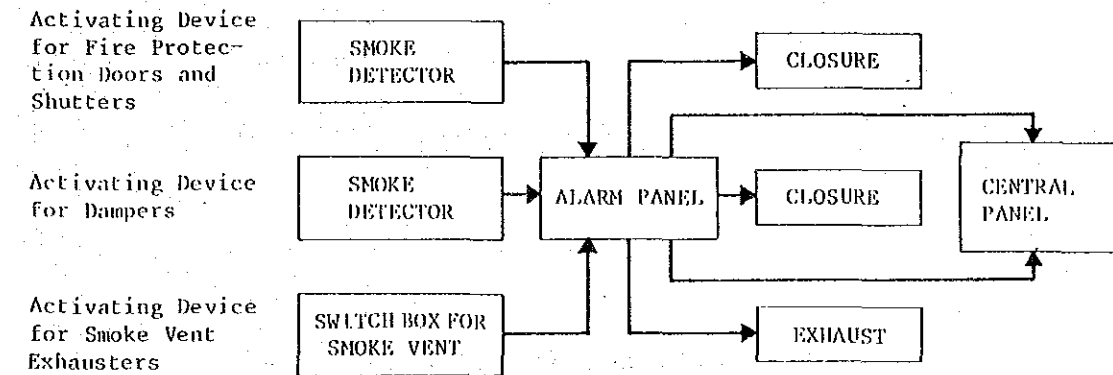


Figure 6-16 Fire Protection and Smoke Vent and Evacuation System

6.2.14 Grounding systems for medical equipment

Grounding devices will be provided for medical equipment to prevent electric shock accidents.

A. General medical rooms

- (a) Protective grounding devices¹ will be provided for general medical rooms (Figure 6-17).
- (b) Isoelectric grounding devices² will be provided for the thoracic operating room, ICU, CCU, heart catheter room and some others (Figure 6-18).

B. Non-grounding power system for special medical rooms (Figure 6-19)

Special rooms such as operating rooms, the ICU, the CCU, and the heart catheter room and some others will be provided with a non-grounding type power source via medical isolating transformers.

6.2.15 Lightning protection system

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

- (a) Devices will conform to NFPA.
- (b) Devices will be installed for the Cancer Center, the General Hospital, parking building B, the water tower, the utilities center, the residential houses, the Mosque and others.
- (c) Air terminals of more than 300 mm in height will have devices installed at 6-meter intervals.
- (d) 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.

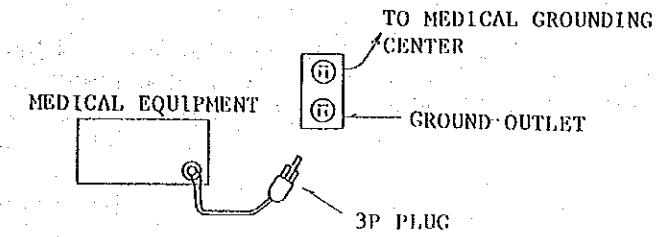


Figure 6-17 Protective Grounding System

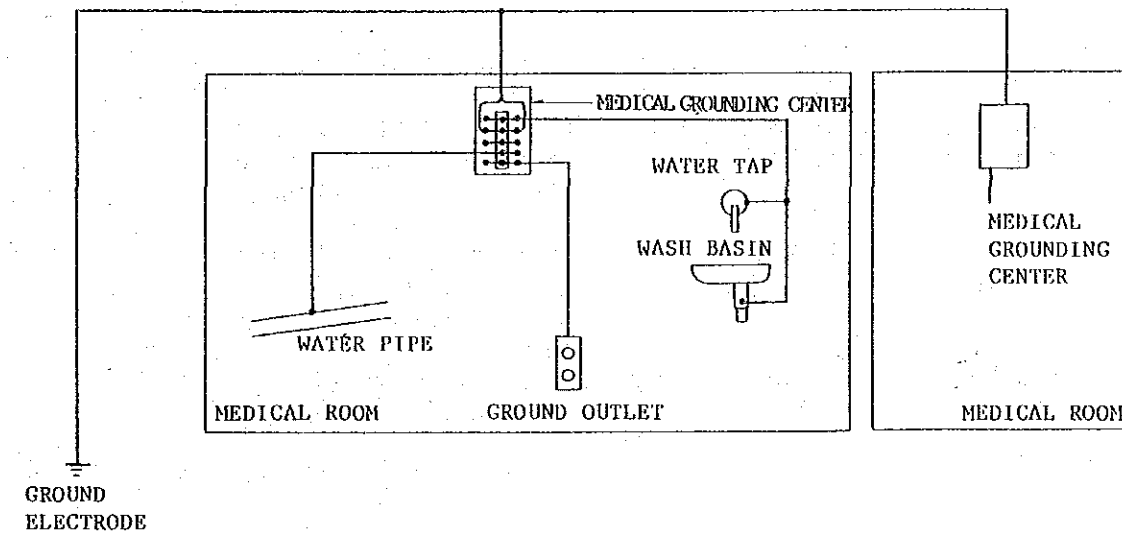


Figure 6-18 Isoelectric Grounding System

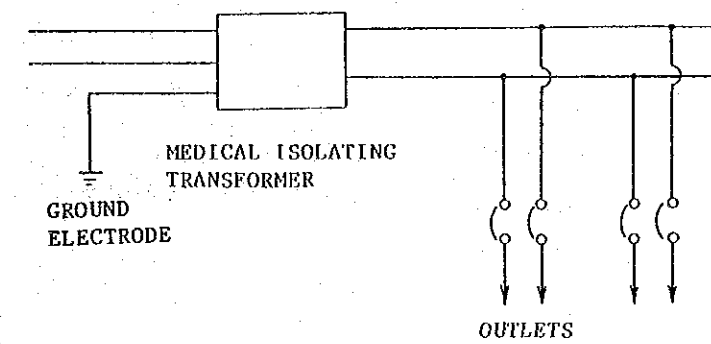


Figure 6-19 Non-grounding System

6.2.16 Traffic control system

Traffic control signals will be provided to ensure safe movement of men and motor vehicles inside the parking building. The system will comprise a control panel, vehicle sensors, traffic signals, and other related devices (Figure 6-20).

- (a) Vehicle sensors and traffic signals will be installed at each crossroad and intersection.
- (b) Infrared ray beam light sensors will be employed.
- (c) Each signal will be equipped with lights and an alarm buzzer.
- (d) The control panel will be for 20 circuits and will be provided with a spare power source to supply power until the emergency generator starts operation.

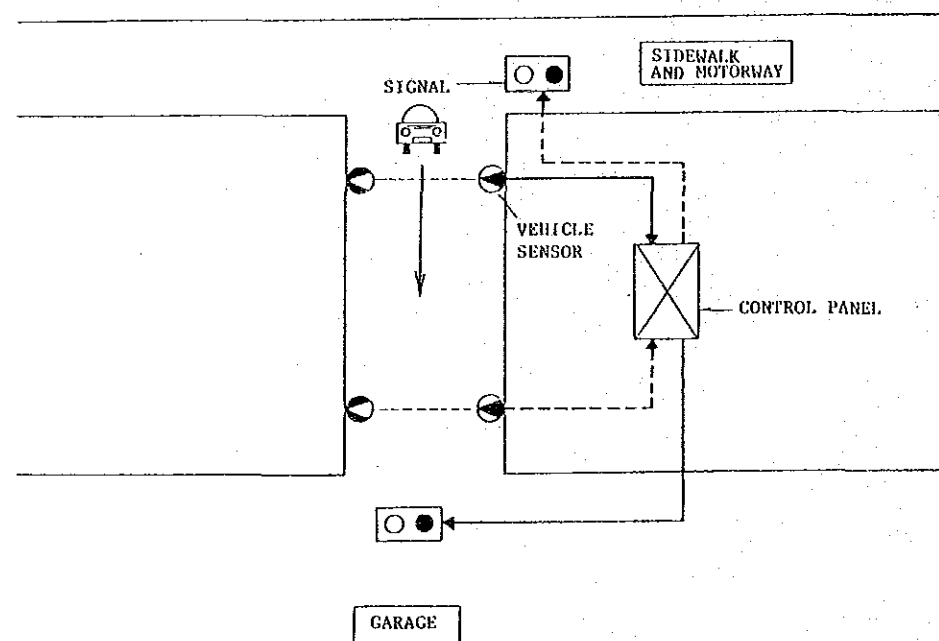


Figure 6-20 Traffic Control System

6.2.17 External electrical equipment

The external electrical equipment will comprise the intake piping and wirings of the power and telephone cables in the outer trenches of the premise, the outdoor lights, the traffic control signals, and the fountain control.

A. Power intake

To be installed as indicated in 6.2.1.

B. Telephone intake

To be installed as indicated in 6.2.5.

C. Outdoor lights

1) General lighting

Lights will be installed in appropriate places in the premise to ensure the safety of outdoor works and prevent vandalism.

(a) The 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.

2) Special lighting

Special lights will be provided in the outdoor recreational zone to enable tennis and squash games and swimming after dark. The lighting fixtures will mix mercury vapor lamps and metal-halide lights.

D. Traffic control signals

Motor traffic in the premise will be controlled through signals and vehicle sensors installed in every crossroad and intersection.

E. Fountain control

The discharge volume and shape of the fountain will be controlled by a scheduled timer.

7.	MEDICAL EQUIPMENT
7.1	General
7.2	List of Equipment

7. MEDICAL EQUIPMENT

7.1 General

The medical equipment for the proposed Cancer Center and its joint-use medical departments with the General Hospital will be selected to conform to the medical standards in cancer and general medical practices.

The medical equipment were selected with the following considerations:

1. Equipment necessary for general purposes plus those necessary for higher level diagnosis, therapy and research;
2. Future medical progress;
3. Flexibility to use the equipment for extra detail application when required;
4. Equipment of the highest standard in the market; when the standards of foreign and Japanese equipment were equivalent, the Japanese equipment was selected;
5. Inclusion only of equipment costing more than one million yen.

7.2 List of Equipment

- | | |
|--------------------------|-------------------------------|
| (1) ORTHOPEDICS | (18) BIOCHEMICAL, SEROLOGICAL |
| (2) OPHTHALMOLOGICAL | (19) PATHOLOGICAL |
| (3) UROLOGICAL | (20) BACTERIOLOGICAL |
| (4) GYNECOLOGY | (21) VIROLOGICAL |
| (5) DERMATOLOGICAL | (22) EMERGENCY EXAMINATION |
| (6) OUT-PATIENT MEDICINE | (23) HEMATOLOGICAL |
| (7) OUT-PATIENT SURGERY | (24) BLOOD BANK |
| (8) CHEMOTHERAPY CENTER | (25) CLEANING & STERILIZING |
| (9) ENDOSCOPY | (26) BED CENTER |
| (10) PHYSIOLOGY | (27) PHARMACY |
| (11) REHABILITATION | (28) AUTOPSY & MORGUE |
| (12) RADIODIAGNOSIS | (29) RESEARCH |
| (13) RADIOISOTOPE | (30) RESEARCH (ANIMAL) |
| (14) I.C.U. | (31) C.C.R.U. |
| (15) SURGICAL DEPT. | (32) HYPERBARIC |
| (16) C.S.S.D. | (33) GENERAL CLINIC |
| (17) RADIOTHERAPY | (34) COMMON EQUIPMENT |

Equipment	Quantity
(1) ORTHOPEDICS	
1) Intermittence Traction Apparatus	1 set
2) Plaster Bandage Table	1 set
3) Pinch Meter	1 set
4) Plaster Cutter	1 set
5) Mobile C-ARM X-ray TV	1 set
(2) OPHTHALMOLOGICAL	
1) Light Coagulation	1 set
2) Electric Tonometer	2 sets
3) Slit-Lamp Microscope	3 sets
4) Fundus Camera	2 sets
5) Perimeter	3 sets
6) Anomaloscope	1 set
7) Electro Retinography Scope	1 set
8) Synoptophore	1 set
9) Refracting Unit	2 sets
10) Refractometer	2 sets
11) Infrared Videopupillography	1 set
12) Echo-Oculometer	1 set
13) Ophthalmic Ultrasonoscope	1 set
14) Ophthalmometer	1 set
15) Binocular Indirect Ophthalmoscope	1 set
16) Surgical Laser System	1 set

Equipment	Quantity
(3) UROLOGY	
1) Cystoscope Table	2 sets
2) Urological Unit	2 sets
3) Urological Sterilized Water Supply Apparatus	2 sets
4) Cysto-Urethroscope	2 sets
5) Resectoscope	2 sets
6) Optical Urethrotome	2 sets
7) Cold Light Supply	4 sets
8) Urodynamic System	1 set
9) Biopsy and Grasping Forceps	4 sets
10) Nephroscope	2 sets
11) Lithotriptoscope	2 sets
12) Ultrasonic Diagnostic Apparatus	1 set
13) Electro Surgical Unit	2 sets
(4) GYNECOLOGY	
1) Gynecological Examining Table	3 sets
2) Gynecological Examining Unit	3 sets
3) Stereo Camera Colposcope	1 set
4) Fiber Light	4 sets
5) Kymographic Insufflation Apparatus	4 sets
6) Cryosurgery Unit	2 sets
7) Ultrasonic Diagnostic Apparatus	1 set

Equipment	Quantity
(5) DERMATOLOGICAL	
1) Soft X-ray	1 set
2) Skin Grinder	1 set
3) Cryosurgery Unit	1 set
(6) OUT-PATIENT MEDICINE	
1) Ultrasonic Diagnostic Apparatus	1 set
(7) OUT-PATIENT SURGERY	
1) Ultrasonic Diagnostic Apparatus	1 set
(8) CHEMOTHERAPY CENTER	
1) Hyperthermia System	1 set
(9) ENDOSCOPY	
1) Duodenofiberscope	5 sets
2) Small Intestinal Fiberscope	3 sets
3) Esophagofiberscope	3 sets
4) Gastrointestinal Fiberscope	5 sets
5) Colonofiberscope	5 sets
6) Bronchofiberscope	5 sets
7) Sigmoidofiberscope	3 sets
8) Choledochofiberscope	2 sets
9) Laparoscope	3 sets
10) Sigmoidoscope	4 sets
11) Thoracoscope	2 sets
12) Panendoscope	3 sets
13) Mediastinoscope	2 sets

Equipment	Quantity
14) Endoscopic Light Supply	12 sets
15) Endoscopic Table	10 sets
16) Laryngoscope	2 sets
17) Rino-Laryngofiberscope	2 sets
18) Water Sterilizer	2 sets
19) Operating Table	1 set
20) Shadowless Light	1 set
21) Electric Surgical Unit	1 set
22) Ventilator	2 sets
23) Anesthesia Machine	2 sets
24) Electro Surgical Unit	3 sets
25) Endoscope	2 sets
26) Automatic Washing Apparatus	2 sets
27) Universal Forceps	4 sets
28) Cabinet for Gastro-Camera	3 sets
29) Surgical Laser System	1 set
30) Multi-Purpose Radiography TV	2 sets
31) E.N.T. Treatment Chair	1 set
(10) PHYSIOLOGY	
1) 6-Channel Recording Electrocardiograph	2 sets
2) Pulmonary Function Computer System	1 set
3) Phonocardiograph	1 set
4) Electroencephalograph	1 set
5) Electromyograph	1 set
6) Treadmill	1 set

Equipment	Quantity
7) Breathing Gas Analyzer	1 set
8) 3-Channel Electrocardiograph	1 set
9) Non-Invasive Evaluation of Arterial Function	2 sets
10) ECG Ambulatory Monitoring System	1 set
11) Topography System	1 set
12) Signal Processor	1 set
13) Ultrasonic Diagnostic Apparatus	2 sets
14) Ultrasonic Diagnostic Apparatus	1 set
15) Residual Volumemeter Apparatus	1 set
16) Medical Thermograph	1 set
17) Co-Oximeter	1 set
18) Blood Gas Analyzer	1 set
19) CO Analyzer	1 set
(11) REHABILITATION	
1) Rolling Traction Microwave Therapy Unit	2 sets
2) Hubbard Tank	1 set
3) Whirlpool Bath	3 sets
4) Whirlpool Bath	3 sets
5) Ultraviolet Water Sterilizer	1 set
6) Hydrocollator Heating Unit	4 sets
7) Paraffin Bath	2 sets
8) Cryoforcec	2 sets
9) Electric Tilt Table	2 sets
10) Universal Physical Therapy Bed	2 sets

Equipment	Quantity
11) Overhead Frame	2 sets
12) Intermittence Traction Apparatus	2 sets
13) Staircase	2 sets
14) Treadmill	2 sets
15) Ergometer	2 sets
16) Weight Balance Analyzer	2 sets
17) Ultrashortwave Apparatus	2 sets
18) Microwave Generator	4 sets
19) Low Frequency Generator	2 sets
20) Ultrasonic Therapy Apparatus	2 sets
21) Polarized Light Goniometer	2 sets
22) Biomedical Telemeter	2 sets
(12) RADIODIAGNOSIS	
1) Chest Radiography	1 set
2) Bone Radiography	1 set
3) Tomography	1 set
4) Mammography	1 set
5) Urography	1 set
6) Multi-Purpose Radiography TV	2 sets
7) Universal Radiography	1 set
8) Cardio Vascular Radiography	1 set
9) General Vascular Radiography	1 set
10) Cranial Computed Tomography	1 set
11) Whole Body Computed Tomography	1 set
12) Gynecological Radiography	1 set

Equipment	Quantity
13) Neuro Radiography	1 set
14) Automatic Developer	3 sets
(13) RADIOISOTOPE	
1) Scintillation Camera	1 set
2) Gamma Ray Camera	1 set
3) Nuclear Medicine Computer System	1 set
4) Radioimmunoassay System	1 set
5) RI Monitoring System	1 set
6) Hand Foot Clothes Monitor	1 set
7) Curie Meter	1 set
8) Fire-Resistant Lead Refrigerator	1 set
9) Dynamic Function Measurement	1 set
10) RI Renography	1 set
11) Measurement Thyroid Uptake Rate	1 set
12) Draft Chamber	1 set
13) Liquid Scintillation Counter	1 set
14) Waveheight Analyzer Apparatus	1 set
15) Positron C.T.	1 set
(14) I.C.U.	
1) I.C.U. Patient Monitor	2 sets
2) Ventilator	12 sets
3) Monitoring & Resuscitating Apparatus	2 sets
4) 3-Channel Electrocardiograph	2 sets
5) Closed Chest Heart Massager	2 sets
6) Autoanalyzer	2 sets

Equipment	Quantity
7) Electroencephalograph	2 sets
8) Blood Gas Analyzer	2 sets
9) Na, K Analyzer	2 sets
10) Automatic Pulse Output Recorder	4 sets
11) Co-Oximeter	2 sets
12) Mobile X-ray Unit	2 sets
13) Respiratory Function Recording Apparatus	2 sets
14) Automatic Circulatory Blood Volume Measurement Apparatus	2 sets
15) Anesthesia Machine	4 sets
16) Electric Surgical Unit	2 sets
17) Osmometer	2 sets
18) Hemodialysis Apparatus	2 sets
19) Hypo-Hyper Thermia Unit	2 sets
20) Bronchofiberscope	2 sets
(15) SURGICAL DEPT.	
1) Detachable Operating Table	20 sets
2) Shadowless Light	20 sets
3) Electric Surgical Unit	22 sets
4) Ventilator	2 sets
5) Cryosurgery Unit	3 sets
6) Anesthesia Machine	22 sets
7) Surgical Scrub Station	20 sets
8) Operating Microscope	2 sets
9) Operating Microscope	2 sets
10) Operating Microscope	2 sets

Equipment	Quantity
11) Surgical Laser System	2 sets
12) Pump-Oxygenator	2 sets
13) Blood-Loss Digital Scale	15 sets
14) Automatic Formalin Sterilizer	1 set
15) Ceiling Pendant System	20 sets
16) Washer Sterilizer	2 sets
17) Monitoring & Resuscitating Apparatus	2 sets
18) Multiple Recording & Monitoring Apparatus	5 sets
19) Automatic Pulse Output Recorder	3 sets
20) Breathing Gas Analyzer	5 sets
21) Arthroscope	1 set
22) Hypo-Hyper Thermia Unit	2 sets
23) Instrumentation for Vitrectomy	2 sets
24) Phaco-Emulsifier Aspirator	1 set
25) Stereotaxic Instrument	1 set
26) Mobile X-ray Unit	10 sets
27) Mobile C-ARM X-ray TV	2 sets
28) Plaster Bandage Table	1 set
29) Patient Monitor	8 sets
30) Electroencephalograph	1 set
31) Automatic Circulatory Blood Volume Measurement Apparatus	1 set
32) P. O ₂ Monitor	1 set
33) Operating Cystoscope	2 sets
34) Stereo Camera Colposcope	1 set
35) Hysteroscope	2 sets
36) Operating Ultrasonic Diagnostic Apparatus	1 set

Equipment	Quantity
37) Intracranial Pressure Recording Apparatus	1 set
38) Cavitron Ultrasonic Surgical Aspirator	2 sets
39) Ultrasonic Cleaner	2 sets
40) Hatchway System	2 sets
41) System Dryer	2 sets
42) Tube Dryer	2 sets
43) Craniotome	1 set
44) Air Drill	1 set
45) Air Driver	1 set
46) Urological Sterilized Water Supplying	1 set
(16) C.S.S.D.	
1) High-Pressure Steam Sterilizing Apparatus	5 sets
2) Ethylene Oxide Gas Sterilizer	1 set
3) Washer Sterilizer	1 set
4) Automatic Ultrasonic Washing Apparatus	1 set
5) Ultrasonic Cleaner	1 set
6) Tube Dryer	1 set
7) Gas Aerator	1 set
8) System Dryer	1 set
(17) RADIOTHERAPY	
1) Co60 Instrument	1 set
2) Linear Accelerator	1 set
3) Linear Accelerator	1 set
4) Betatron Apparatus	1 set
5) Remote After-Loading Instrument	1 set

Equipment	Quantity
6) Therapy Simulator	1 set
7) Universal Manufacture Apparatus	1 set
8) Detachable Operating Table	1 set
9) Shadowless Light	1 set
10) Electric Surgical Unit	1 set
11) Ventilator	1 set
12) Mobile C-ARM X-ray TV	1 set
13) Anesthesia Machine	1 set
14) Surgical Scrub Station	1 set
15) Multiple Recording & Monitoring Apparatus	1 set
16) Dosimeter	5 sets
17) Scanning Phantom	1 set
18) Patient Monitor	1 set
19) Monitoring & Resuscitating Apparatus	1 set
20) Cyclotron Apparatus	1 set
21) Neutron Therapy Apparatus	2 sets
22) Hot Cell	10 sets
23) Draft Chamber	5 sets
24) Hand Foot Clothes Monitor	1 set
25) RI Monitoring System	1 set
26) Safety Cabinet	5 sets
27) Glove Box	5 sets
(18) BIOCHEMICAL & SEROLOGICAL	
1) Autoanalyzer	1 set
2) Autoanalyzer	1 set

Equipment	Quantity
3) Spectrophotometer	2 sets
4) Flame Photometer	1 set
5) Electrophoresis Apparatus	1 set
6) Osmometer	1 set
7) Mass analyzer	1 set
8) Titration Recorder	1 set
9) Latex Photometric Immuno Assay System	1 set
10) Two-wave Spectrophotometer	2 sets
11) Atomic Absorption Spectrophotometer	1 set
12) Densitometer	1 set
13) Amino Acid Analyzer	1 set
14) Liquid Chromatograph	1 set
15) Enzyme Reaction Speed Measuring Apparatus	1 set
16) Automated Reagin Test	1 set
17) Micro-Assay System	1 set
18) Auto-Serum Collector	1 set
19) Chloridometer	1 set
20) Draft Chamber	1 set
21) Co-Oxymeter	1 set
22) Gas Chromatograph	1 set
23) BUN Analyzer	1 set
24) Automatic Blood Grouping System	1 set
25) Blood Gas Analyzer	1 set
26) Glucose Analyzer	1 set

Equipment	Quantity
(19) PATHOLOGICAL	
1) Automatic Tissue Processor	2 sets
2) Auto-Stainer	2 sets
3) Automatic Microtome Knife Sharpener	1 set
4) Cytocentrifuge	1 set
5) Intestine Photographic	1 set
6) Frozen Section Apparatus	2 sets
7) Paraffin Oven	2 sets
8) Embedding Center	2 sets
9) Paraffin Table	1 set
10) Ultrasonic Cell Disintegration Apparatus	1 set
11) Transmission Electron Microscope	1 set
12) Scanning Electron Microscope	1 set
13) Draft Chamber	1 set
14) Automatic Developer	1 set
15) Critical Point Dryer	1 set
16) Ultra-Microtome	1 set
(20) BACTERIOLOGICAL	
1) Automatic Bacteriological Apparatus	1 set
2) Clean Bench	3 sets
3) Carbonic Acid Cell Cultivating Apparatus	1 set
4) Draft Chamber	1 set
(21) VIROLOGICAL	
1) Biophotometer	2 sets
2) Clean Bench	1 set

Equipment	Quantity
3) Carbonic Acid Cell Cultivating Apparatus	1 set
4) Draft Chamber	1 set
(22) EMERGENCY EXAMINATION	
1) Flame Photometer	1 set
2) Chloridometer	1 set
3) Osmometer	1 set
4) Autoanalyzer	1 set
5) BUN Analyzer	1 set
6) Blood Gas Analyzer	1 set
7) Glucose Analyzer	1 set
(23) HEMATOLOGICAL	
1) Automatic Blood Cell Counter	1 set
2) Automatic Blood Coagulation Test Instrument	1 set
3) Differential Counter for Myelogram	1 set
4) Automatic Blood Platelet Aggregometer	1 set
5) All Blood Oxygen Content Meter	1 set
6) Differential Counter	1 set
7) Cytofluorograf System	1 set
(24) BLOOD BANK	
1) Automatic Blood Coagulation Test Instrument	1 set
2) Automatic Blood Cell Counter	1 set
3) Automatic Blood Platelet Aggregometer	1 set
4) Micro-Assay System	1 set
5) Ultrasonic Cleaner	1 set

Equipment	Quantity
6) Co-Oximeter	1 set
7) Clean Bench	1 set
8) Blood Cell Separator	1 set
9) Cold Bench	2 sets
10) Programmable Freezer	1 set
11) Spectrophotometer	1 set
12) Automatic Blood Grouping System	1 set
(25) CLEANING & STERILIZING	
1) High-Pressure Steam Sterilizer	1 set
2) Automatic Washer	1 set
3) Automatic Pipet Washer	1 set
4) Constant Temperature Oven	1 set
5) Dry Heat Sterilizer	1 set
6) Ultrasonic Cleaner	1 set
7) High Purity Distilling Apparatus	1 set
(26) BED CENTER	
1) Bedding Sterilizing Unit	2 sets
(27) PHARMACY	
1) Tablet-Medicine Table	15 sets
2) Work Table	2 sets
3) Powder-Medicine Dispensary Table	3 sets
4) Pre-wrapping Medicine Dispensary Table	2 sets
5) Administration Table	2 sets
6) Dust Collector for Medicine Packing Machine	3 sets

Equipment	Quantity
7) Automatic Powder Divider	3 sets
8) Liquid-Medicine Dispensary Table	1 set
9) Ampule Cabinet	3 sets
10) Ointment-Medicine Dispensary Table	1 set
11) Powder Mixer	1 set
12) Clean Bench	2 sets
13) Laboratory Mill	1 set
14) Three Stone Roller Mill	1 set
15) Ampule Filler	1 set
16) High Pressure Steam Sterilizer	1 set
17) Bottle Washer	1 set
18) Laboratory Washer	1 set
19) High Purity Distilling Apparatus	1 set
20) Draft Chamber	1 set
(28) AUTOPSY, MORGUE	
1) Mortuary Refrigerator	1 set
2) Autopsy Table	1 set
3) Floor Scale	1 set
4) Shadowless Light	1 set
5) Intestine Photographic	1 set
(29) RESEARCH	
1) Programmable Freezer	2 sets
2) Liquid Scintillation Counter	1 set
3) Carbonic Acid Cell Cultivating Apparatus	1 set
4) Frozen Section Apparatus	1 set

Equipment	Quantity
5) Auto-Stainer	1 set
6) Embedding Center	1 set
7) Automatic Electrophoresis Apparatus	1 set
8) Two-Spectrophotometer	1 set
9) High Speed Liquid Chromatograph	1 set
10) High-Pressure Steam Sterilizer	1 set
11) Automatic Washing Apparatus	1 set
12) Gas Chromatograph	1 set
13) Preparative Ultracentrifuge	1 set
14) Ultra-Low Temperature Freezer	1 set
15) Draft Chamber	2 sets
16) Ice-Making Machine	1 set
17) Ultra-Microtome	1 set
18) Critical Point Dryer	1 set
19) Transmission Electron Microscope	1 set
20) Incinerator for RI Liquid Waste	1 set
(30) RESEARCH (ANIMAL)	
1) Automatic Rabbit Self-Running Feeding Apparatus	2 sets
2) Automatic Dog Self-Running Feeding Apparatus	2 sets
3) Automatic Rat Self-Running Feeding Apparatus	2 sets
4) Automatic Monkey Self-Running Feeding Apparatus	2 sets
5) Rack Washer	1 set
6) Clean Bench	1 set
7) Draft Chamber for Infection	1 set

Equipment	Quantity
8) High-Pressure Steam Sterilizer	1 set
9) Ultrasonic Cleaner	1 set
10) Laminar Flow Rack	6 sets
11) Rotary Cage Washer	1 set
12) Blood Gas Analyzer	1 set
13) Na, K Analyzer	1 set
14) Chloridometer	1 set
15) Calcium Analyzer	1 set
16) Densitometer	1 set
17) Co-Oximeter	1 set
(31) C.C.R.U.	
1) C.C.R.U. Patient Monitor	1 set
2) Ventilator	6 sets
3) 3-Channel Electrocardiograph	6 sets
4) Closed Chest Heart Massager	1 set
5) Residual Volumemeter	1 set
6) Osmometer	1 set
7) Blood Gas Analyzer	1 set
8) Autoanalyzer	1 set
9) Respiratory Function Recording Apparatus	1 set
10) Electroencephalograph	1 set
11) Na, K, Analyzer	1 set
12) Automatic Pulse Output Recorder	6 sets
13) Co-Oximeter	1 set
14) Ultrasonic Diagnostic Apparatus	1 set
15) Intra-Aortic Balloon Pump	1 set

Equipment	Quantity
16) Hypo-Hyper Thermia Unit	1 set
(32) HYPERBARIC	
1) Hyperbaric Oxygen Apparatus	1 set
2) Hyperbaric Oxygen Chamber	1 set
(33) GENERAL CLINIC	
<u>Gynecology, Obstetric</u>	
1) Gynecological Examining Table	2 sets
2) Gynecological Examining Unit	2 sets
3) Stereo Camera Colposcope	1 set
4) Fiber Light	2 sets
5) Kymographic Insufflation Apparatus	1 set
6) Ultrasonic Diagnostic Apparatus	1 set
<u>Dentistry</u>	
1) Dental Unit	2 sets
2) Dental Chair	2 sets
<u>Eye</u>	
1) Refracting Unit	2 sets
2) Diagnostic Unit	2 sets
<u>E.N.T.</u>	
1) E.N.T. Treatment Chair	3 sets
2) E.N.T. Treatment Unit	3 sets
<u>Orthopedic</u>	
1) Plaster Bandage Table	2 sets
2) Plaster Cutter	2 sets

Equipment	Quantity
3) Pinch Meter	2 sets
<u>Radiodiagnosis</u>	
1) Chest Radiography	2 sets
2) Universal Radiography TV	2 sets
3) Automatic Developer	2 sets
<u>Physiology</u>	
1) 6-Channel Recording Electrocardiograph	2 sets
2) Electroencephalograph	2 sets
3) Electromyograph	2 sets
<u>Laboratory</u>	
1) Automatic Urine Analyzer	3 sets
2) Automatic Blood Analyzer	3 sets
(34) COMMON EQUIPMENT	
1) Motorized Patient-Control Gatch Bed	56 sets
2) Quilted Spring Mattress	56 sets
3) Bedside Cabinet	56 sets
4) Overbed Table, Vanity	56 sets
5) High Grade Gatch Bed	144 sets
6) Quilted Spring Mattress	144 sets
7) Bedside Cabinet	144 sets
8) Overbed Table	144 sets
9) Hi-Lo Stretcher Trolley	30 sets
10) Bedpan Rack Stand	10 sets
11) Instrument Cabinet	120 sets
12) Truckcart	30 sets

Equipment	Quantity
13) Body Cleansing Cart	12 sets
14) Two Basin Stand	80 sets
15) Treatment Carriage	20 sets
16) Bedpan Washer and Sterilizer	9 sets
17) Ice Cube Machine	12 sets
18) Medication Cart	9 sets
19) Nurse Table	9 sets
20) Oxygen Tent	15 sets
21) Ultrasonic Nebulizer	20 sets
22) Electric Suction Unit	40 sets
23) Medicine Cabinet	40 sets
24) Freeze Dryer	5 sets
25) Hematocrit Centrifuge	5 sets
26) Centrifuge	10 sets
27) High Speed Centrifuge with Refrigerator	7 sets
28) Ultra-Low Temperature Freezer	5 sets
29) Constant Temperature Oven	10 sets
30) Automatic Dispenser	10 sets
31) Research Microscope with Photomicroscope	20 sets
32) Inverted Microscope with Photomicroscope	3 sets
33) Phase Contrast Microscope w/Photomicroscope	5 sets
34) Fluorescence Microscope w/Photomicroscope	5 sets
35) Advanced Equiscopic Fluorescence Microscope with Photomicroscope	2 sets
36) pH Meter	10 sets
37) Vacuum Drying Oven	5 sets

Equipment	Quantity
38) Incubator	10 sets
39) Low Temperature Incubator	5 sets
40) CO ₂ Incubator	3 sets
41) Chromato-chamber	5 sets
42) Blood Bank Refrigerator	10 sets
43) Water Bath	15 sets
44) Water Bath Incubator	5 sets
45) Shaker	5 sets
46) Laboratory Stirrer	10 sets
47) Slide Test Rotator	5 sets
48) Vacuum Pump	10 sets
49) Hot Air Sterilizer	5 sets
50) Fraction Collector	5 sets
51) Direct Reading Balance	5 sets
52) Unit Experiment Table	80 sets
53) Center Experiment Table	40 sets
54) Unit Sink.	15 sets
55) Deep Freezer	10 sets
56) Medicinal Refrigerator	5 sets
57) Film Loading Desk	5 sets
58) Film Illuminator	60 sets
59) Refrigerator	70 sets
60) Operating Chair	22 sets
61) Anesthesia Chair	22 sets
62) Negative Film Processor	1 set
63) Automatic Paper Processor	1 set

Equipment	Quantity
64) Automatic Processor	1 set
65) Enlarger	1 set
66) Film Processor	1 set
67) Slidefilm Copying Machine	1 set
68) Cinefilm Processor	1 set

- 8. MANAGEMENT AND OPERATING SYSTEM
 - 8.1 Administration
 - 8.1.1 General
 - 8.1.2 Organization
 - 8.2 Utilization of Computers
 - 8.2.1 Basic concept
 - 8.2.2 Utilization of computer system
 - 8.2.3 Computer system functions

8. MANAGEMENT AND OPERATING SYSTEM

8.1 Administration

8.1.1 General

- (a) To maintain the integrity of the medical profession and still provide for an efficient overall management of the combined Cancer Center and the General Hospital, we are proposing a dual-structured administrative organization — the Hospital Administration and the Medical Administration — to take care of the hospital management on the one hand, and the medical administration on the other.
- (b) A centralized information processing system, utilizing computers, and combining therapeutic, educational, research and management activities is planned for improved medical service and efficient hospital operation.

8.1.2 Organization

- (a) The Hospital Administration consists of four departments: the General Business, Services, Maintenance and the Computer Center. They will provide services in these areas to the combined institutions. The Medical Administration consists of eight departments as shown in the organizational chart (Figure 8-1). They will provide professional and technical medical services to the combined institutions.
- (b) The manpower control for the Cancer Center and the General Hospital will be the responsibility of the General Business Department of the Hospital Administration. This department will perform such functions as the employment of personnel and dispatching of service personnel where needed in both institutions.

The Public Care Service, Cancer Registry Information, Health Education, and Mass Screening will be under the supervision of the Hospital Administration.

A management team consisting of the Executive Director and the top administrators of the Cancer Center and the General Hospital will be responsible for the overall budget-making and management control of the Cancer Center Complex. The Hospital Audit will oversee the medical expenditures, and the Public Relations Department will keep the public informed about health and medical services available.

In the actual day-to-day operations, administration and medical conferences and meetings will have to be conducted within the two administrative structures and between them for necessary communication and for smooth and efficient operation, good morale, problem-solving, planning, and decision-making.

- (c) The Hospital Administration will be conducted by the following four departments. The general business department, consisting of the medical, the personnel, the general affairs, public welfare and financial affairs, and the legal and clerical sections, will provide the management for both the Cancer Center and the General Hospital, including the management and supply of labor and staff for both facilities.

The service department will provide meals and mail and laundry services purchasing, inventory management, bed center, house-keeping, porter, etc. services.

The engineering and maintenance department will provide maintenance services for buildings, mechanical and electrical equipment, medical equipment, and other facilities.

The computer center will maintain the computer system and provide program development and other necessary activities.

- (d) The Medical Administration will be conducted by the following four departments.

The medical staff department will provide medical services and administer personnel management, training and other necessary services for the medical and paramedical staff.

The nursing department will provide nursing services and administer personnel management, training and other necessary services for the nursing staff.

The medical service department will provide services, such as public health, education and training, medical history, and library.

The sub general business departments will provide administrative services for the individual requirements of the Cancer Center and the General Hospital.

The research unit will provide clinical research directly related to cancer diagnosis and therapy, especially chemotherapy and immunization therapy. For this purpose an animal experimental room and an animal raising rooms will be provided. A laboratory is planned for future construction. With future growth, the research unit may become an independent department along with others.

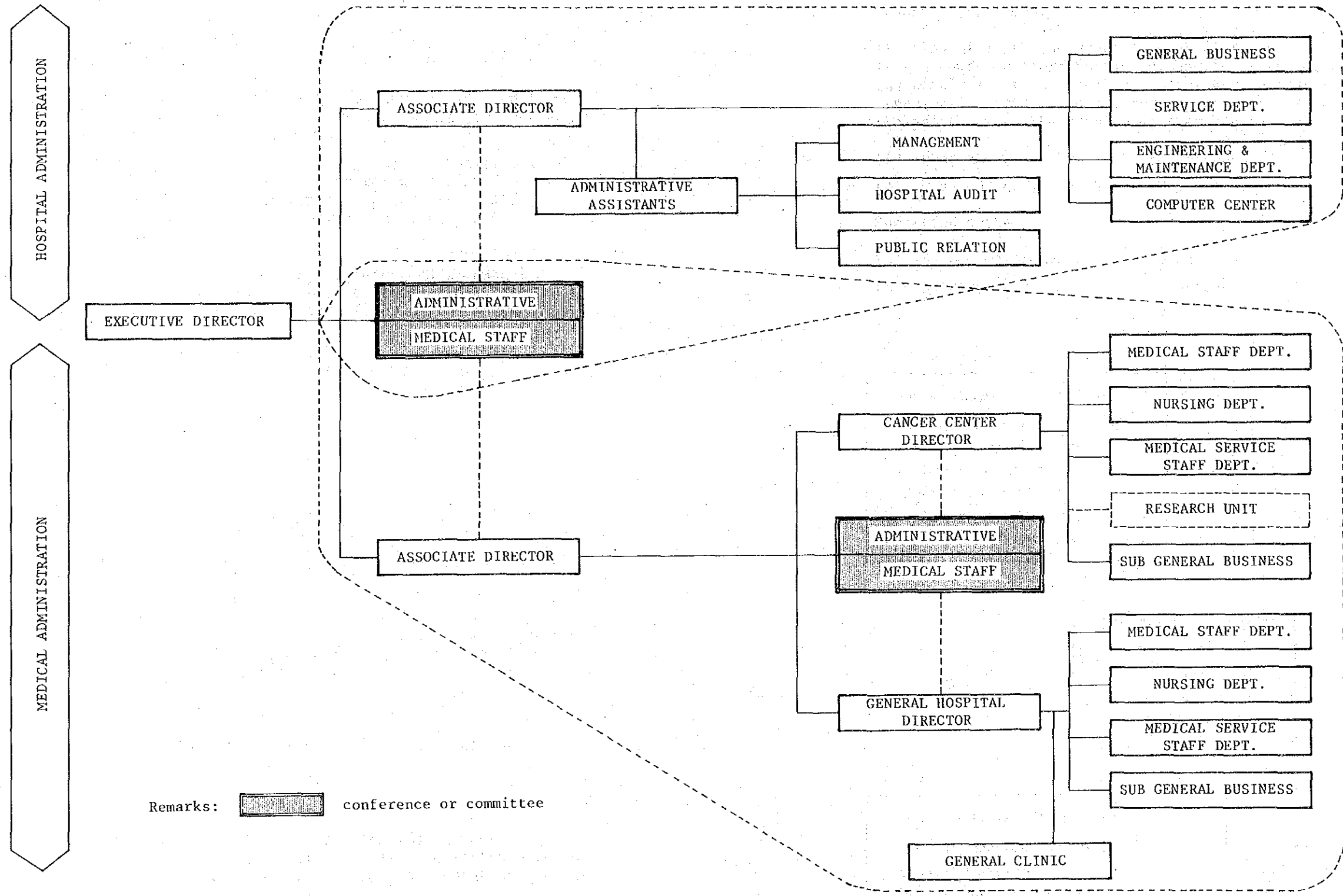


Figure 8-1 Organization Chart

8.2 Utilization of Computers

8.2.1 Basic concepts

- (a) The computer system will serve to increase the speed and efficiency of the general and medical administration and the provision of swift medical data.
- (b) Covering the Cancer Center, the joint-use facilities and the General Hospital, the system will provide a centralized medical information processing system, consolidating therapeutic, educational, research and management activities.
- (c) The system will function in the future as a medical information center for the entire Saudi Arabia. It will be located on the first floor of the North Wing.

E. Program development

It takes at least two years to develop the program. Therefore, if the computer operation is to function with the opening of the hospital, it is absolutely necessary to have the hospital organization determined and the key personnel selected at least two years before the opening of the hospital.

- (a) Programmers 50 persons
- (b) Development schedule 2 years

F. Operating system

- (a) System maintenance 90 persons
- (b) Operators 30 persons

8.2.2 Utilization of computer system (Figure 8-2)

The computer center will centrally manage the four systems below:

A. Patient diagnosis/therapy system

The system will undertake patient-care collations of diagnosis/therapy, medical histories, medications, clerical services, meal services, clinical records, etc.

B. Central diagnosis/therapy system

The system will order medical tests, X-ray examinations, collations of test results, etc.

C. Hospital administration system

The system will cover personnel and salary management, inventories of medicines, medical materials and instruments and other goods and supplies, and library and documentation services.

D. Research and training system

The system will serve clinical research, using patients' medical data and basic research, and have programs for medical language and computer education and training.

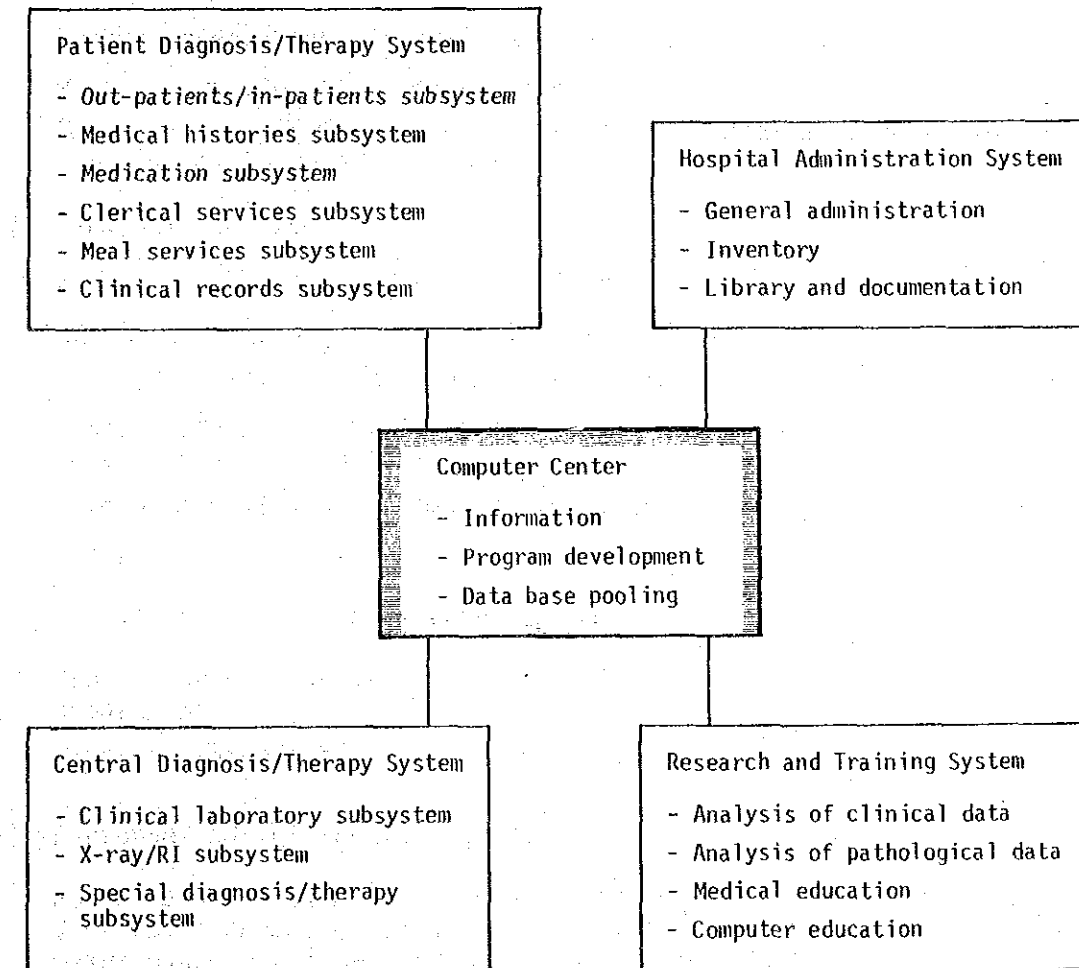


Figure 8-2 Computer System Functions

8.2.3 Computer system functions

The details of the functions provided by the computer system are listed below:

(a) Out-patients/in-patients subsystem

Record and change registration for out-patients;
Record and change registration for repeat patients;
Record and change registration for in-patients;
Record patient transfers among departments and wards;
Record, change and cancel registration for discharged patients;
Record change and cancel registration for medical insurance information (record, change, and cancel sickness record).

(b) Medical histories subsystem

Record, change, and cancel registration of sickness;
Input and change medical summary for discharged patients;
Receive diagnosis data from the central diagnosis department.

(c) Clerical service subsystem

Process medical accounting;
Process billing and collecting payments;
Process medical insurance payments;
Process appointments for repeat patients;
Process appointments for out-patients to specialized departments;
Process appointments for special examination;
Process appointments for X-ray/RI;
Process appointments for operation;
Process appointments for admission to hospital.

(d) Meal service subsystem

Process meal orders and changes;
Record and compile meal order data;
Provide data on meals such as food, diet, and nutrition;
Process purchase order and maintain stock control data.

(e) Medication subsystem

Process doctors' prescription orders;
Process medicine orders coming from satellite and central pharmacy;
Process procurement of medicine;
Maintain stock control data.

(f) Clinical records subsystem

Maintain ID records of patients;
Communicate with the mini-computer system at the central diagnosis department for medical data;
File and retrieve clinical records;
Supervise and maintain clinical record files.

(g) Clinical laboratory subsystem

Process orders for clinical examinations;
Maintain records of clinical examination orders;
Communicate with mini-computer attached to medical examination instruments to receive examination data.

(h) X-ray/RI subsystem

Process orders for X-ray/RI examinations;
Output work sheets for X-ray/RI examinations;
Maintain records of X-ray/RI examination orders;
Communicate with X-ray/RI computerized examination instruments to receive examination data;
Communicate with mini-computer for film filing system for filing and retrieving films.

(i) Special diagnosis/therapy subsystem

Process orders for examinations at the special diagnosis/therapy departments;
Maintain records of examination orders.

(j) Personnel administration subsystem

Record and maintain work schedules for all personnel, including doctors, paramedical technicians, nurses, service personnel, maintenance personnel and office personnel, in the respective departments;
Record and maintain contracts and salary system for all personnel.

(k) Inventory subsystem

Process orders for medical supplies and equipment;

Maintain stock control data for medical supplies and equipment;

Process orders for hospital operations and maintenance of consumable materials, spare parts, and equipment;

Maintain stock control data for hospital operations and maintenance of consumable materials, spare parts, and equipment.

(l) Computer Center

Online file data base maintenance system will process information, program development, and data base pooling.

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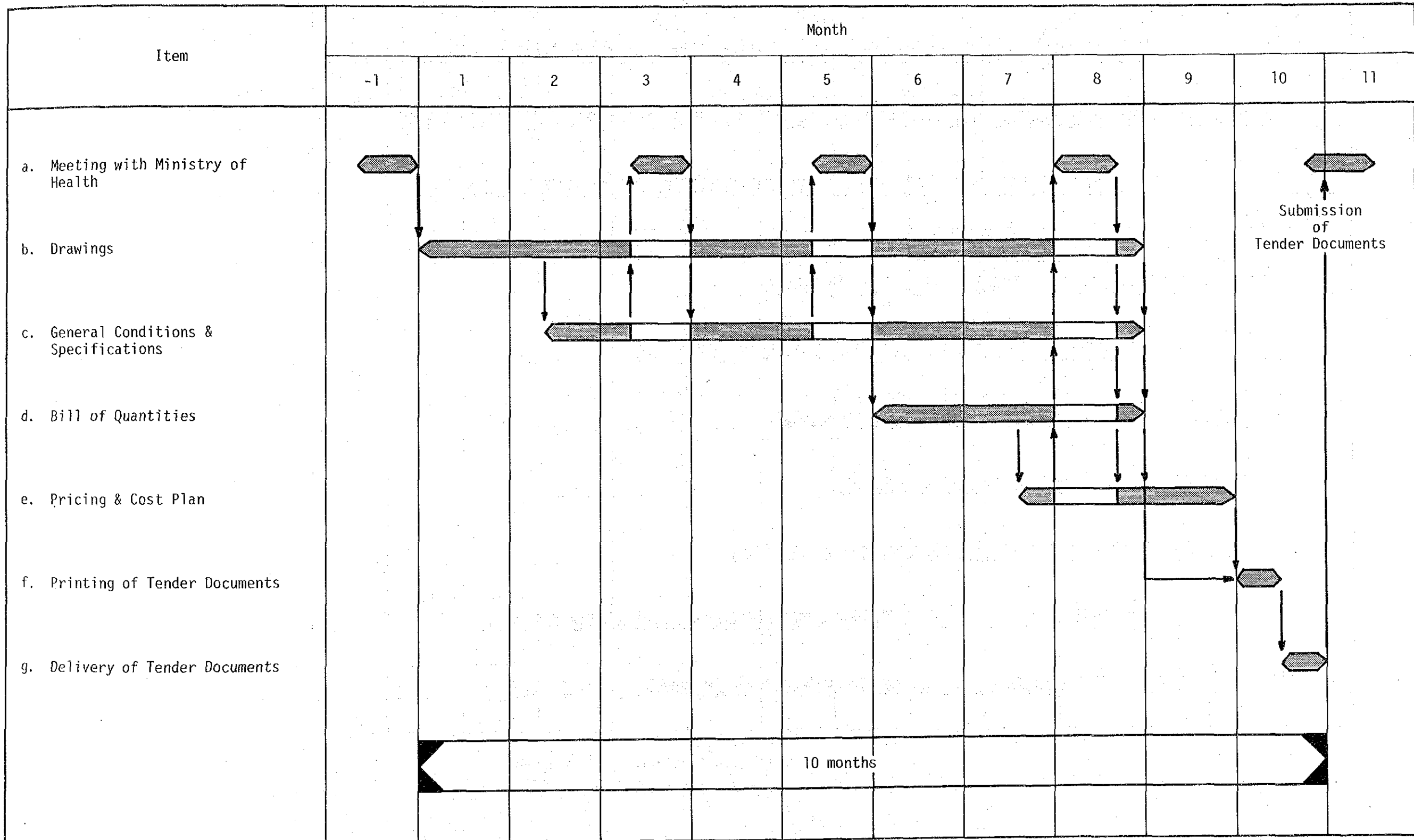
9. TENTATIVE PROJECT SCHEDULE

9.1 Entire Schedule

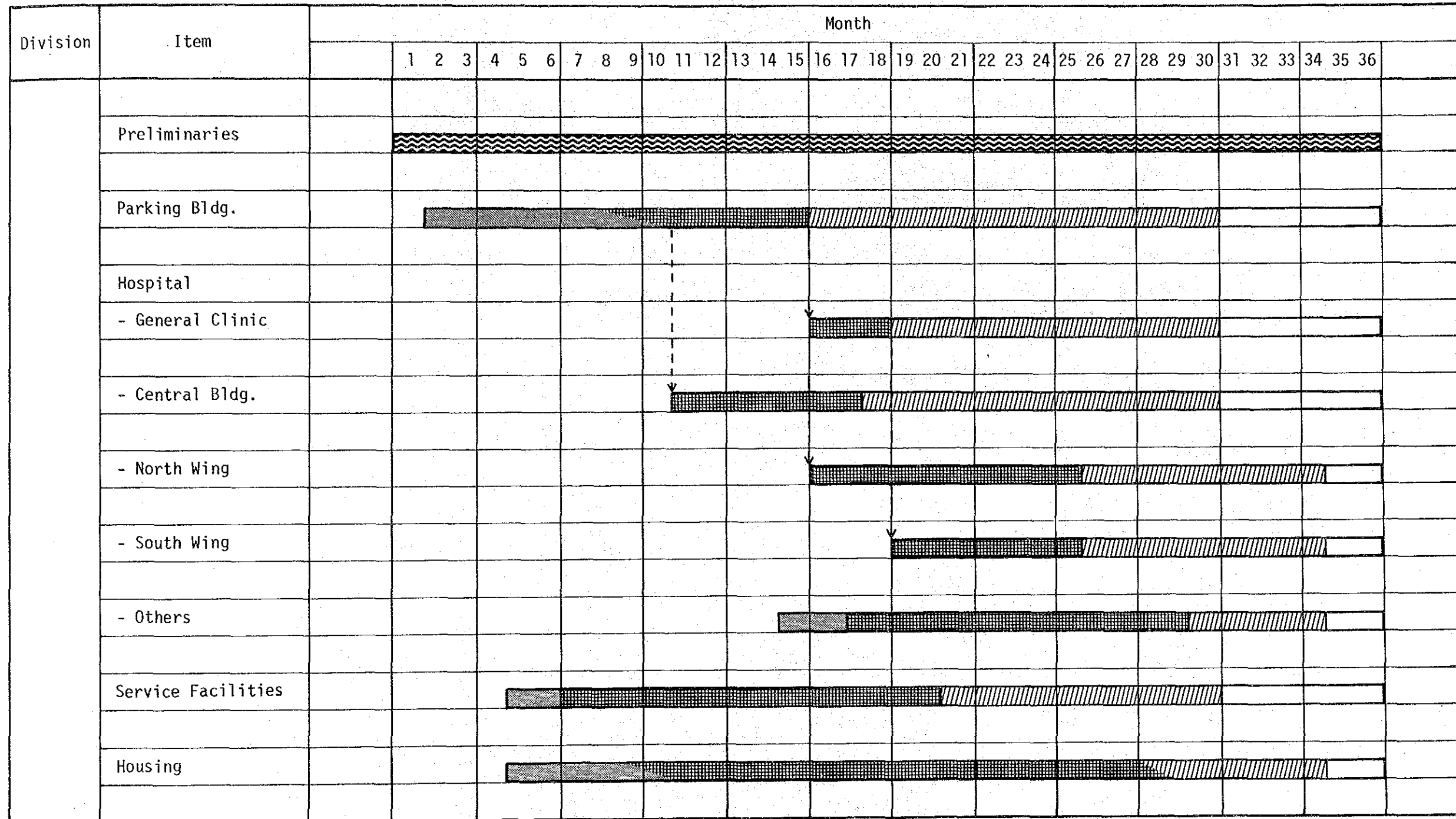
9.2 Detailed Design Schedule

9.3 Construction Schedule

9.2 Detailed Design Schedule



9.3 Construction Schedule



Legend:



Temporary Work
Excavation
Structural Work



Finishing & Utility
Testing & Cleaning