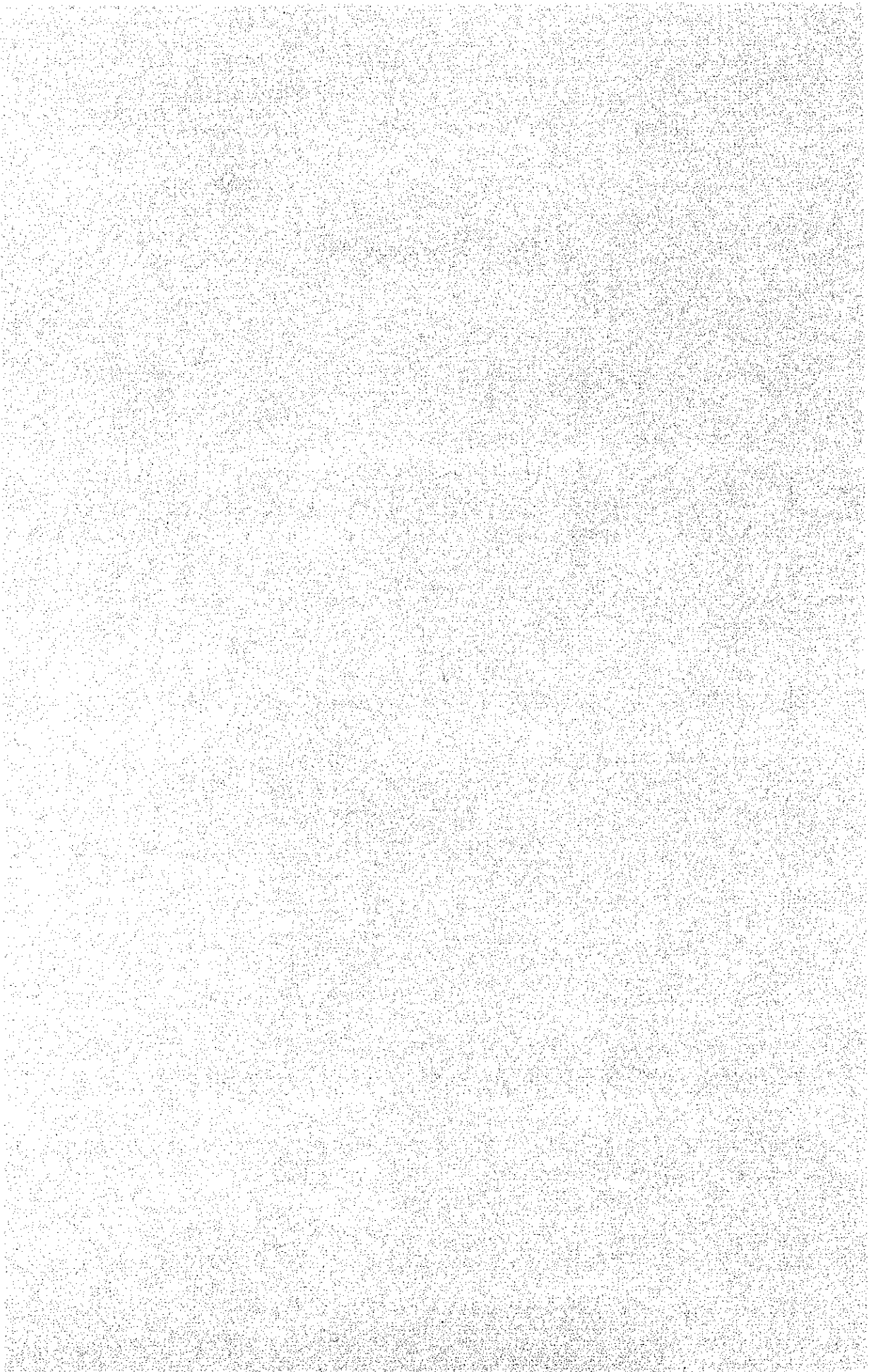


CHAPTER 3 BASIC CONCEPT

- 3-1 Purpose**
- 3-2 Services**
- 3-3 Coverage**
- 3-4 Organization**
- 3-5 Allocation of Duties**
- 3-6 Hospital Facilities**
- 3-7 Others**



CHAPTER 3 BASIC CONCEPT

The survey team visited hospitals and other medical institutions in La Paz and Cochabamba as well as hospitals in Trinidad. The team observed their management, facilities and medical instruments in detail and were briefed by related officials.

The draft prepared by Prof. Hanawa based on the findings of a field survey, was discussed by the team members and later consultations were made with Bolivian officials. As a result, the following basic concept of the hospital emerged.

3-1 Purpose

The hospital aims at treating and preventing the diseases of infants and children, who will form Bolivia's next generation, and protecting the health of their mothers.

This maternal and children's hospital does not aim to provide rare or specialized medical care but to deliver primary care to maternity and child in the community.

3-2 Services

The hospital will carry out the following services:

- (1) Medical care for infants and children (15-year-olds and younger)
- (2) Medical care for maternity
- (3) Medical care against gynecological diseases
- (4) Public health services for maternity and child.

3-3 Coverage

The hospital will serve about 50,000 inhabitants in Trinidad and its surrounding area for the time being. As the population of this area increases and inhabitants in remote communities are included, the population served is estimated to increase to 100,000 in the near future. As for public health services for maternity and child, it is intended that the entire Beni State (with a population of 200,000) will be covered.

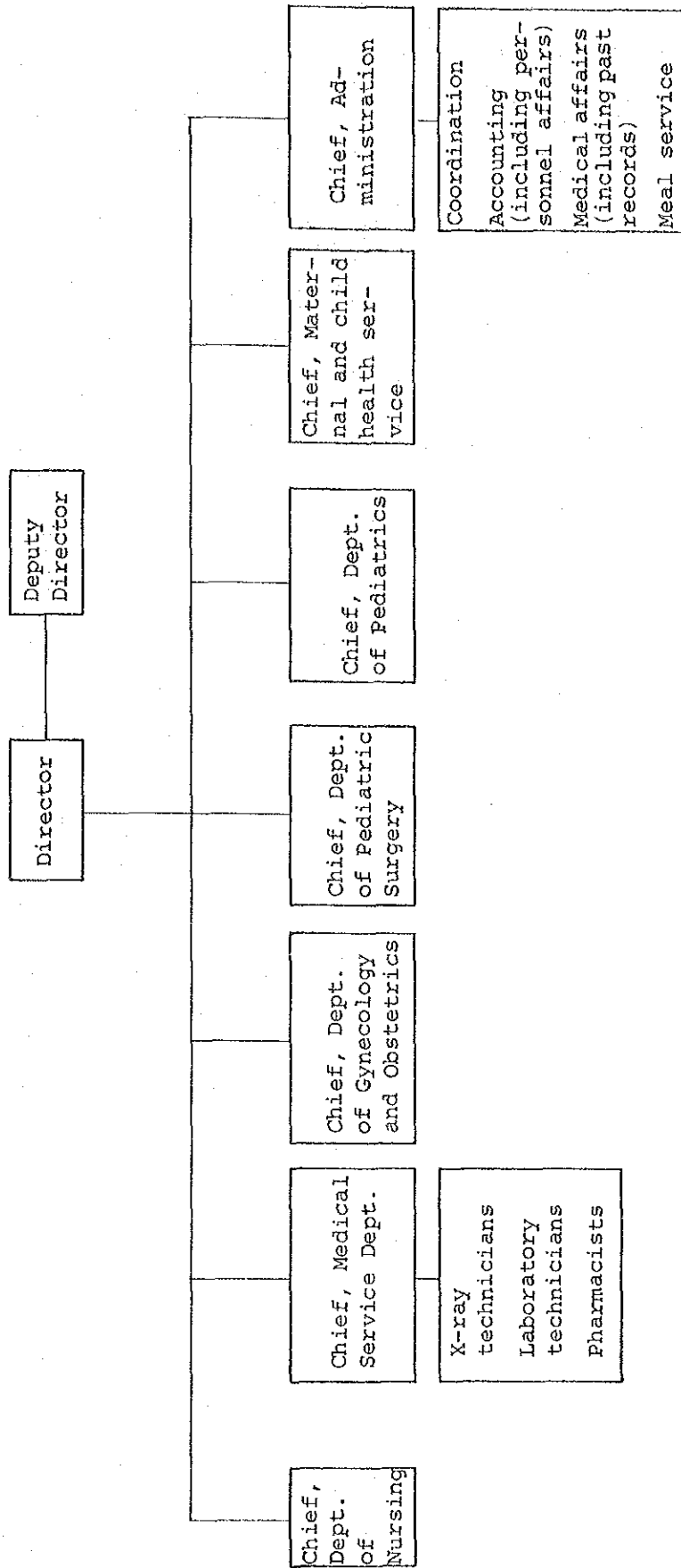
3-4 Organization

To accomplish its tasks, the hospital will be provided with the following departments and sections.

- (1) Administration
- (2) Maternal and child health service
- (3) Department of pediatrics
- (4) Department of pediatric surgery
- (5) Department of gynecology and obstetric
- (6) Department of medical service
- (7) Department of nursing

The organization chart of the hospital and the number of medical personnel are given below:

(1) Organizational Chart of Trinidad Maternity Hospital (Draft)



* Anesthetists may either belong to the Department of Gynecology and Obstetrics or may be placed under the direct supervision of the Director (or the Deputy Director).

* When departments of orthopedic surgeon, otorhinolaryngologist, ophthalmologist and other special doctors are to be established, they will be placed under the direct supervision of the Director (or the Deputy Director).

2) Nurses

	Night duty nurses		Number of night shifts per month	Required number of nurses	Chief nurse	Total
	Early night	Midnight				
	A	B	C	D		
Pediatric Ward (Dept. of Pediatrics and Dept. of Pediatric Surgery)	3	3	12	15	1	16
Deliveries, operations, newborns	2	2	10	12	1	13
Gynecological and obstetric Ward	2	2	10	12	1	13*
Outpatient Service (Pediatrics, Dept. of Pediatric Surgery and obstetrics/gynecology)						5
Chief, Dept. of Nursing						1
Total						48

Note 1: $(A+B) \times 30$ Aggregate total of nurses required a month

$$\frac{(A+B) \times 30}{C} = D \dots \text{Number of nurses required}$$

Note 2: The appropriate number of night shifts worked by nurses in Japan is recommended to be eight times a month.

Note 3: * ---- indicates that about half of them are midwives.

Note 4: The calculation has been made on the assumption that all nurses will be qualified nurses.

3) Other Medical Technicians

X-ray technicians (3)

Laboratory technicians (4)

Pharmacist (1)

Public health nurse (Maternal and Child Health Service) (2)

Case worker (1)

Nutritionist (1)

Total: 12 persons

4) Workers

Messengers, helpers, etc., in wards and outpatient department: about 15 persons

(Pediatrics, gynecology and obstetrics, and outpatient service)

5) Administration (Allocation dependent on prevailing local conditions)

3-5 Allocation of Duties

(1) Administration

General hospital administration, personnel affairs, accounting, medical affairs (relevant to hospitalization and discharge), control of medical records and meal service, etc.

(2) Maternal and Child Health Service

With the cooperation of each medical care department and nurses and with the collaboration of the provincial and municipal public health and hygiene sectors, the following services will be carried out.

- a) Surveys on the health of maternity and child
- b) Maternity education
- c) Promotion of knowledge regarding child health
- d) Promotion to provide immunization for children
- e) Other medical and social services
- f) Control of medical periodicals, literature and other data

(3) Dept. of Pediatrics

Treatment of general pediatric diseases and those of newborns and prematures.

Note: Diseases associated with otorhinolaryngo-logy, dermatology and urology will be treated as much as possible. If necessary, the cooperation of from the general hospitals will be sought.)

(4) Dept. of Pediatric Surgery

General surgical diseases associated with this sector of surgery will be covered. Those in the sectors of cardiac surgery and neuro-surgery will not be covered for the time being.

Note: As far as possible, this department will treat diseases and burn injuries in the sectors of plastic surgery and orthopedic surgery. It is hoped that such as congenital anomalies of gastrointestinal tracts of newborns be operated on as far as possible.

(5) Dept. of Gynecology and Obstetrics

Matters relating to pregnancy and delivery will be dealt with. Gynecological diseases will be treated. Breast, uterine and other cancers will in principle not be treated.

(6) Clinical Laboratory

Hematological, biochemical, bacteriological, serological, and pathological examinations will be conducted as clinical laboratory. General tests will also be carried out on urine and feces.

(7) Radiology

Routine radiological examinations will be conducted.

(8) Pharmacy

General drugs will be prescribed.

(9) Dept. of Nursing

Nursing matters will be carried out.

3-6 Hospital Facilities

The hospital will be equipped with 75 beds. The distribution of beds and other facilities are as follows.

- (1) Pediatric Ward (Dept. of Pediatrics and Dept. of Pediatric Surgery) with 35 Beds

The existing pediatric hospital had 40 beds, but only 30 beds were usable as the hospital was under construction. On the day the team visited the hospital, there were 20 inpatients. According to data in 1979, 995 children were hospitalized in the year with an average period of hospitalization standing of 4.9 days. Consequently,

$$995 \times 4.9 \div 365 = 12.8 \text{ beds}$$

Considering the possible increase in the number of inpatients after the completion of a new building and also hospitalization for short periods, the required number of beds is set at 35. It is expected that the age ceiling for hospitalization will be raised to 14 and there will be a rise in the demand for pediatric surgery.

- (2) Gynecological and Obstetric Ward with 30 Beds

The required number of beds has been computed on the basis of the actual conditions of the existing general hospitals in 1980. Due to a shortage of beds, the average period of hospitalization for normal delivery is two days. This period should be four days to ensure protection of maternal health.

Type	Cases	Average period of hospitalization	Aggregate number of beds required
Normal delivery	1,179	4	4,716
Caesarean section	93	8	744
Abortion	494	2	988
Gynecological diseases	185	6	1,110
			Total 7,558

$$7,558 \div 365 = 20.7$$

Considering a future rise and an allowance for turnover,

$$20.7 \times 1.5 = 31.1$$

Consequently, the required number of beds is set at 30.

(3) Neonatal Room with 10 Beds

No newborns rooms were available at the existing general hospital and the pediatric hospital in Trinidad. For a future maternal and children's hospital, there will be a need for a room for premature babies and newborns with diseases.

According to the records of existing pediatric hospitals, 49 premature babies were born in February through September 1981. The number of premature babies may therefore be about 100 a year. This number also includes those who weigh 2,000 - 2,500 g at birth and who would not require prolonged hospitalization. On the other hand, there are mature newborns who require treatment because of diseases. Considering all these factors, it is assumed that 100 cases would be hospitalized for an average 25 days.

$$100 \times 25 \div 365 = 6.8$$

With an allowance for turnover taken into account, the required number of beds is set at 10.

3 incubators

The neonatal room, as referred to here, is a room in which newborns requiring treatment and premature babies will be treated. Normally delivered newborns will be accommodated in a newborn nursery.

(4) Outpatient Service

The outpatient service will have outpatient examination and treatment rooms in the Department of Pediatrics and outpatient examination, pelvic examination and treatment rooms in the Department of Gynecology and Obstetrics.

(5) Radiology

This department will have an x-ray room and a dark-room.

(6) Laboratory

The laboratory will consist of a general clinical laboratory and a bacteriological laboratory.

(7) Operation Theater

In addition to the operation theaters for pediatric surgery and gynecology, a recovery room, an operation instrument storeroom, etc., will be provided.

(8) Delivery Section

In addition to delivery rooms, a labor pains room, a recovery room, a newborn nursery, etc., will be provided.

(9) Maternal and Child Health Service

An auditorium for 40 - 50 persons to be used for medical education and training and an administration office for maternity and child health service will be prepared.

3-7 Others

(1) Blood Transfusion

In Trinidad, blood for emergencies and surgical operations is supplied by family members. Consequently, it will be necessary to set aside a place in the hospital where blood may be sampled, tested and stored. Instead of preparing an independent blood transfusion room, blood will be collected in the wards' treatment rooms and blood tests will be carried out in the laboratory. Tested blood will be stored at the nurse stations in the wards and operation theater.

(2) Medical Records

The clinical charts of outpatients will be kept on file at the receptionists' rooms of the Departments of Pediatrics, Department of Pediatric Surgery and Gynecology and Obstetrics. After about two years, the charts, x-ray films, etc., will be filed in the medical record room.

(3) Accommodation of Newborns with Mothers in the Same Rooms

It is desirable that normal newborns be left to the care of their mothers immediately after birth to build up their skinship. When mothers are tired or night surveillance and lactation is necessary, central surveillance is preferred. Babies may be infected if there are many visitors. For this hospital, therefore, the basic idea is to accommodate a newborn with its mother in the same room, but a central newborn nursery will also be prepared.

(4) Mortuary

There is a lack of pathologists in Trinidad. If autopsy were to be conducted, it would be necessary to incorporate a large refrigerator to keep corpses. This is not realistic and therefore no room will be set aside for autopsy. However a mortuary will be prepared.

(5) Accommodation

No accommodation will be constructed for physicians, nurses and administration workers within the hospital grounds. It is assumed that they will commute from nearby areas.

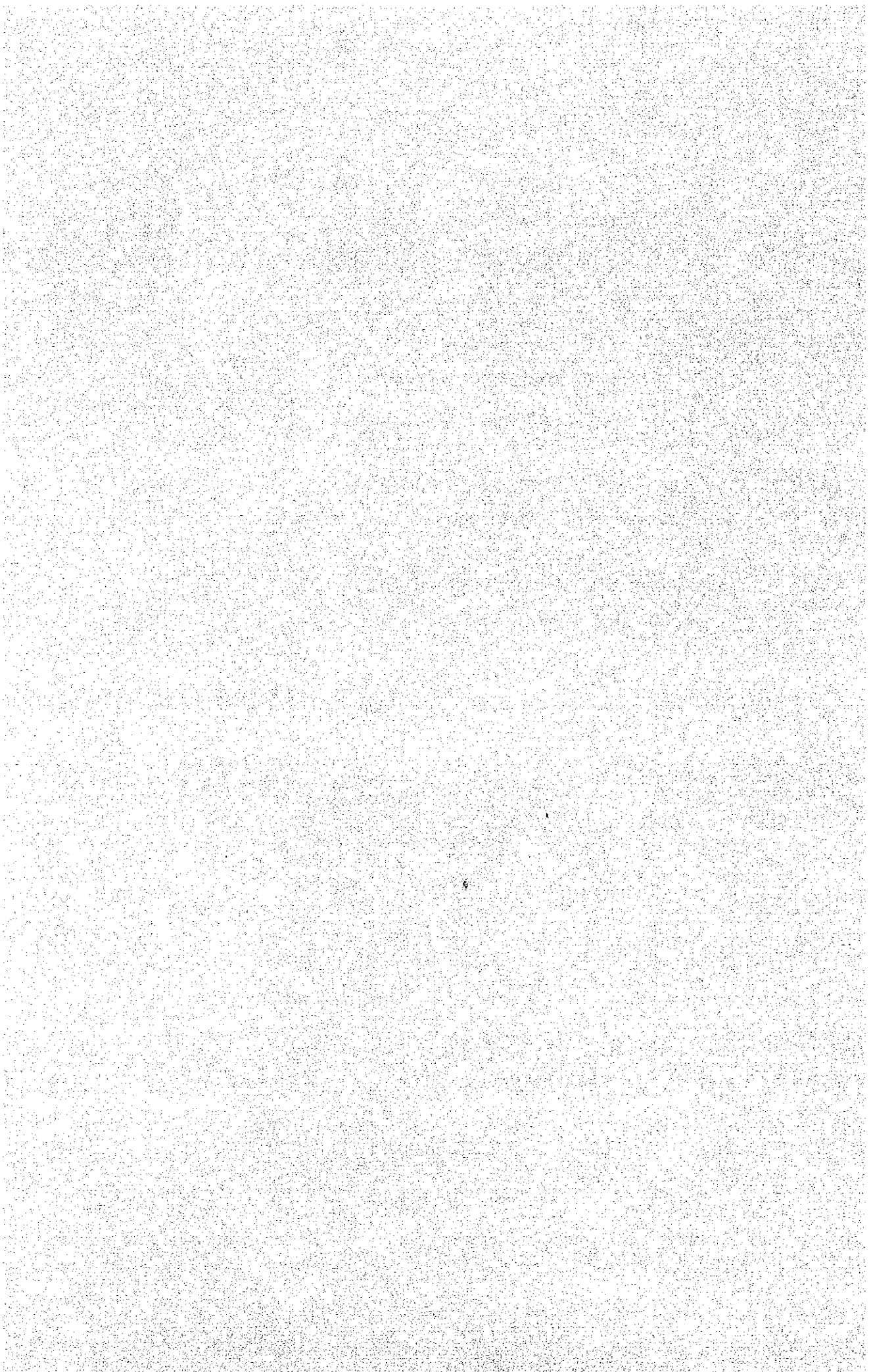
(6) Preparation of Milk

In addition to mothers milk, cow's milk will be supplied to premature babies and newborns. It will also be supplied to babies and infants in the pediatric ward. Generally, powdered milk is used. Therefore, a central milk preparation room (formula room) will be provided. Sterilized milk will be stored in the refrigerators at the nurse stations and heated whenever it is required.

With regard to the employment of a nutritionist to take charge of the central milk preparation room as well as the sterilization method and the frequency of milk preparation, it will be necessary to conduct further studies.

CHAPTER 4 BASIC DESIGN

- 4-1 Basic Principles**
- 4-2 Contents of Facilities**
- 4-3 Land Use and Deployment**
- 4-4 Planning**
- 4-5 Materials and Construction Method**
- 4-6 Structural Planning**
- 4-7 Service Facilities**
- 4-8 Medical Equipment Planning**
- 4-9 Architectural Drawings**



CHAPTER 4 BASIC DESIGN

4-1 Basic Principles

On the basis of the basic concept of this project and the contents of the basic design survey, the followings are to form the basic principles for the design.

- (1) The design is to take into consideration the natural conditions of Trinidad being situated in a wet lowland.
- (2) Since the site has sufficient space, the proposed hospital is to comprise single-story buildings. The movements of people and goods are to be on ground floor level only.
- (3) Sufficient space for future expansion is to be left in order to cope with changes in demand for regional medical services in the future.
- (4) Many parts of the planned buildings must be kept especially clean. Accordingly, the buildings are to be easy to clean, giving a feeling of cleanliness, with a sanitary area clearly separated.
- (5) In order to produce buildings which correspond with the climate and the life style in Trinidad, every effort is to be made to use locally obtainable materials and local methods of construction. This approach is advantageous from the viewpoint of the maintenance and preservation of the buildings.
- (6) It is to be planned in such a way for easy maintenance and control of the facilities after completion, reducing the burden of the Bolivian authorities in administering the facilities.
- (7) The proposed site is located in a future residential area adjacent to a future sports park a short distance from the urban area of Trinidad. Adequate consideration is, therefore, to be given to the harmony with the environment in designing the proposed hospital. Furthermore, existing vegetation is to be preserved as much as possible.
- (8) In view of the special nature of a maternal and children's hospital, every attempt is to be made to provide a favorable environment for both mothers and children.

4-2 Contents of Facilities

Trinidad Maternal and Children's Hospital is to consist of the following departments and sections:

Department	Section
Administration and management	General reception, General office, Cashier, Pharmacy, Director's office, Secretary's office, Matron's office, Business manager's office, Medical office, Medical record library, toilets, Hotwater service room, etc.
Maternal and Child Health Service	Maternal and child health service office, conference room.
Outpatient, Radiology and Laboratory	Pediatric outpatient reception, Pediatric consultation rooms, Treatment room, Obstetrics and gynecology outpatient reception, Obstetrics and gynecology consultation rooms, Pelvic examination room, Treatment room, X-ray room, X-ray control room, Dark room, Technicians' room, General laboratory, Bacteriology laboratory, Toilets, Storage, etc.
Operation and delivery	Operation rooms, Equipment storage, Recovery room, Delivery rooms, Labor room, Nurse station, Formula room, Bathroom, Suckle room, Newborn Nursery, Neonatal room, Linen storage, Central supply room, Washing room, Changing room, Conference room, Nurses' room, etc.
Pediatric ward	Sickrooms (6 beds, 5 beds, 2 beds, private rooms), Nurse station, Treatment room, Linen storage, Shower room, Soiled Utility, Night duty room, Play area, Toilets, Storage, etc.
Obstetric and gynecological ward	Sickrooms (5 beds, 2 beds, private rooms), Nurse station, Treatment room, Line storage, Shower room, Soiled Utility, Night Duty room, Day area, Toilets, Storage, etc.
Services	Cafeteria, Kitchen, Food storage, Formula room, Laundry, Machine room, Workshop, Hospital workers' room, Mortuary, Storage, Toilets, etc.

4-3 Land Use and Deployment

(1) Zoning and Wing Deployment

The proposed site for the construction of the hospital, located to the north of the urban area of Trinidad, is a narrow strip of flat land, measuring about 80 m east to west and about 220 m north to south.

The Avenida III extending north from the Circunvalacion along the land area reserved for a sports park will serve the proposed site.

The main entrance will be located on the south side of the site, i.e., close to the Circunvalacion, provided with an entrance turn and a car park.

The maternal and child health service will be located immediately to the approach west of the entrance turn to provide an independent approach so that healthy mothers and children can have direct access to this department. The administration and management department is also to be located close to the health guidance and outpatient departments.

The outpatient wing is to be located on the side of the road (east side of the site), close to the main approach. The operation and delivery department is to be on the north of the outpatient wing with the service wing to the north, maintaining sufficient space between the wings.

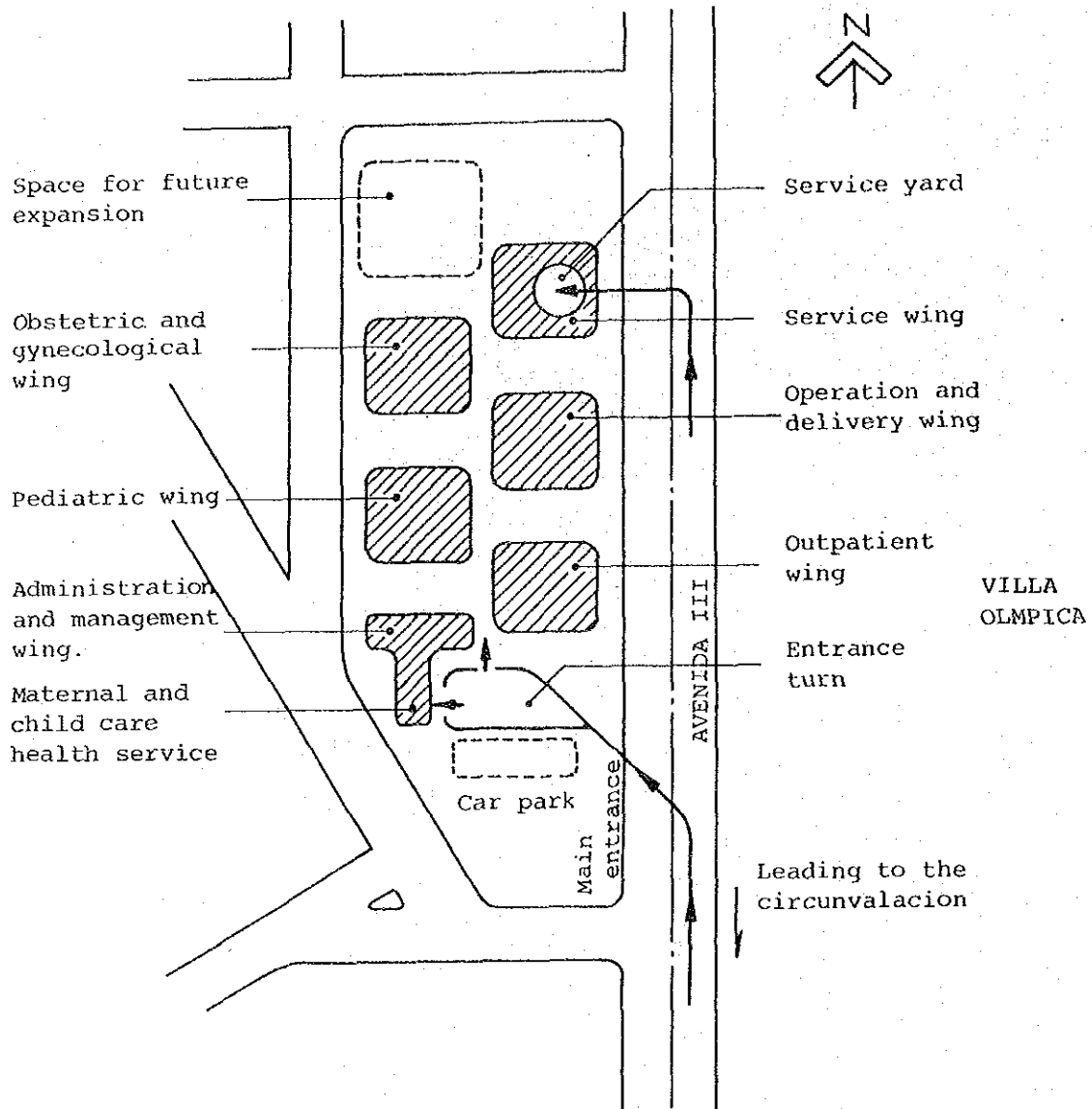
The service wing is to be provided with an independent entrance and a service yard so that service vehicles can have direct access to the wing.

The ward wing is to be located on the west side of the site, i.e., at a distance from the front road. This is because the ward wing requires a quiet environment, away from the dust caused by road traffic.

The pediatric ward is to be located to the north of the administration and management wing with sufficient space provided between the two. The obstetric and gynecological ward is to be located to the north of the pediatric ward. The pediatric ward and the obstetric and gynecological ward are to be located immediately to the west of the operation and delivery department.

Land space for future expansion is to be maintained to the north of the wards, or on the northwest of the site, so that it will be possible to expand the wards in response to an increase in demand for medical services.

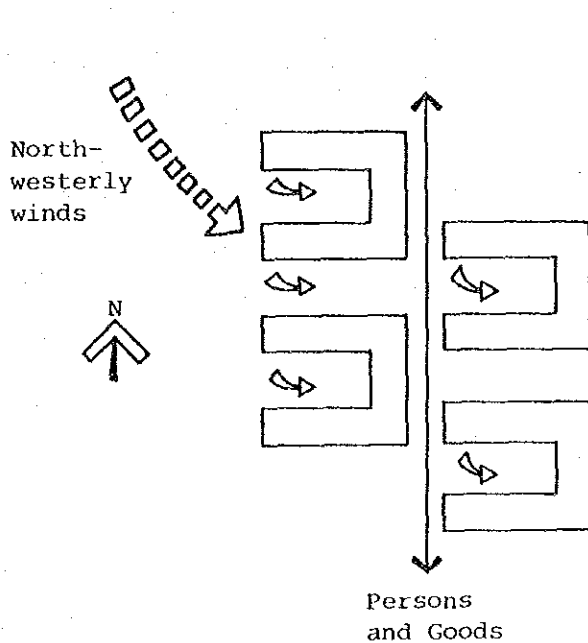
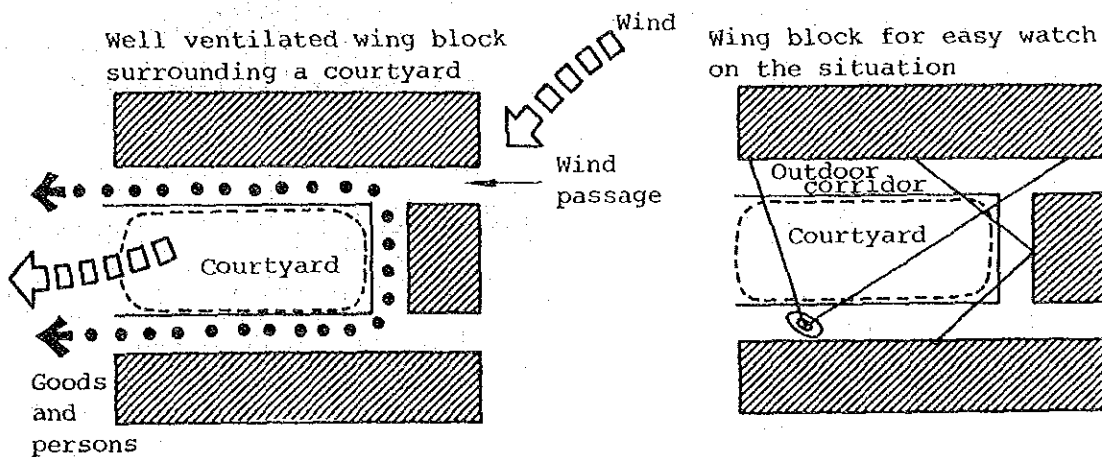
Although it is planned to construct roads under city planning, encircling the site, except for the Avenida III these roads are not expected to be constructed when the hospital buildings are completed. Accordingly, it is to be planned in such a way that the public, hospital staff, goods and others will have access to the site through the Avenida III.



(2) Wing Planning

The basic form of outpatient, obstetric and gynecological, pediatric, and obstetric and gynecological wings is a block, measuring 30 x 27 m, with a courtyard. The courtyard is surrounded by outdoor corridors, connecting rooms, on three sides. This arrangement creates a cool indoor environment by producing good ventilation and makes it easy to keep watch on the situation in the relevant wing.

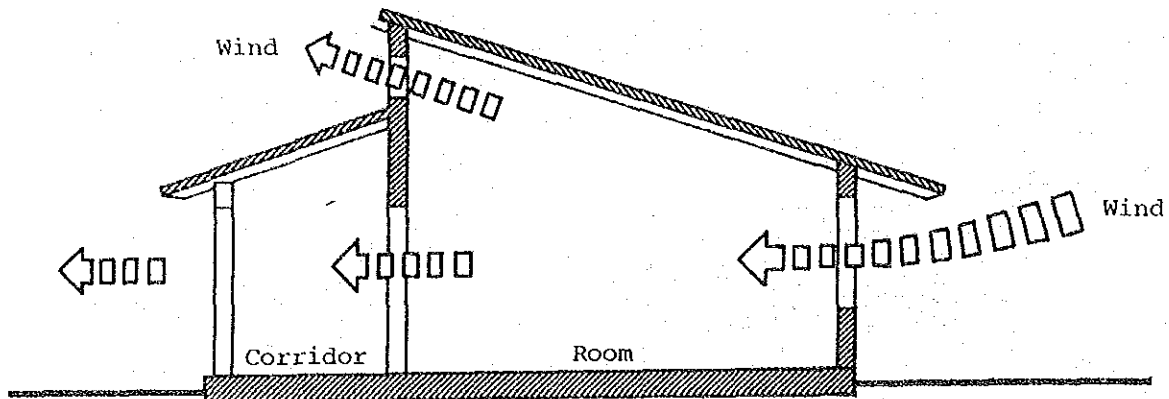
Those rooms facing the courtyard are also arranged in such a way that each room is provided with more than two wind passages for the purpose of ventilation.



Each wing encompasses the courtyard on three sides but the west is open so that north-westerly winds, which prevail in this area, can be led into the courtyard. Moreover, it is planned to avoid poorly ventilated space surrounded by buildings by locating wings alternately.

As the standard cross section below shows, the wing is designed to have good ventilation by providing upper windows in rooms, making use of the gap between the outdoor corridor and the roof. These windows are effective in releasing the warm air near the ceiling, thereby preventing room temperatures from rising.

Standard cross section



(3) Site preparation

The present ground requires a minimum of 30 cm of banking as a preventive measure against inundation during the wet season. Therefore, banking of 50 cm is to be carried out to ensure a reasonable safety margin. In view of the functions of the hospital, the floor level of buildings is to be 30 cm higher than the prepared ground, or altogether 80 cm higher than the present level. Accordingly, the amount of earth for banking cannot be supplied by moving earth within the site area. Moreover, if there are sections within the site, which are lower than the surrounding area, it will be very difficult to drain them. Therefore, it will be necessary to raise the level of the site higher than that of the surrounding area.

4-4 Planning

Since a maternal and children's hospital is used by both healthy persons, i.e., expectant women and newborns, and those with some disease, planning consideration should be given to various points. Furthermore, although the site is located in a tropical climate, air conditioning can be provided only for selected sections due to restricted power supply and running costs. Therefore, sufficient space is maintained between wings to utilize natural ventilation.

The characteristics of each department may be outlined as below.

(1) Administration and management department

It is to be planned to ensure that clerical work, e.g., medical, administrative and accounting, can be smoothly carried out. The Office is to be located at the base of the traffic line as it fills the role of the central reception.

(2) Maternal and child health service

A separate approach is to be provided for healthy expectant mothers. Emphasis is to be placed on the link with the administration and management department, providing a multi-purpose conference room.

(3) Outpatient department

In order to avoid in-hospital infection, a courtyard is to be placed between pediatrics and obstetrics/gynecology to separate them. The pediatric department is to be provided with a separate consultation room for cases of infectious diseases. In obstetrics and gynecology, an pelvic examination room is to be provided between consultation rooms. The radiography and laboratory sections are to be accommodated in the outpatient wing for easy access from both department. The radiography section is to be placed near pediatrics as it is mostly used in pediatric cases.

(4) Operation and delivery department

In order to raise the efficiency of nursing personnel, the nurse station is to be at the center of the operation section and of the delivery section. It is also to be planned in such a way that each section can fully perform its function and that it will be easy to control them. The delivery section is to include a newborn nursery and a neonatal room.

The central sterilized supply department is to be placed in such a position that it can supply equipment and materials mainly to operation and delivery sections, and also be conveniently located for distributing materials to various sections of the hospital.

(5) Pediatric Ward

The nurse station is to be placed in such a position that the entire ward can easily be watched with easy access to the linen room, the bedpan room (Soiled Utility), the shower room, etc.

The sickrooms, surrounding the courtyard, are to be planned with flexibility so that they can accommodate inpatients of different ages and sex. An isolation ward is also to be considered for infectious cases. Sickrooms for serious cases are to be placed adjacent to the nurse station. A play area, which can be used for educational activities for hospitalized children, is to be provided which can be easily watched by nurses.

(6) Obstetric and Gynecological Ward

This ward is to be placed close to the delivery section and the newborn nursery. The nurse station is to be placed in such a position that watch can easily be kept with easy access to the linen, bedpan and shower rooms.

The sickrooms, surrounding the courtyard, are to be planned with flexibility so that they can respond to changes in the number of patients in obstetrics and gynecology.

A sickroom for serious cases is to be provided next to the nurse station. A day lounge is to be provided for inpatients and their families.

(7) Service Wing

The staff cafeteria is to be placed near the center of the hospital, away from any source of noise or smell.

The service approach is to lead to the service yard surrounded by the kitchen, the laundry and the machine room. The central formula room is to be attached to the kitchen and the food storage. A drying place is to be provided immediately outside the laundry out of sight from other sections. The service wing is to be provided with a mortuary.

The central corridor connecting these wings is to be of the open type with a roof only so that it will not interfere with ventilation in the wings.

4-5 Materials and Construction Method

(1) Materials

The natural conditions of Trinidad are to be taken into consideration in selecting both structural and finishing materials.

For materials used for structures, e.g., walls and columns, local products are to be used as much as possible. Since Trinidad produces quality bricks which are always available, they are to be used for structures, which is an advantage for repairs, renovation and expansion in the future.

Consideration in selecting finishing materials is to be given both to the damage to walls due to moisture originating in the floor and also to the soiling of walls and ceilings caused by fungi. Moreover, since the buildings are to house a hospital, strong materials which are dirt-free and easy to clean are to be selected. For instance, in those sections which tend to get soiled, e.g., public toilets for the outpatient department, terrazo blocks are to be used for the floor and tiles for walls so that the entire room can be washed with water. Similarly, those sections where a high degree of cleanliness is required, e.g., operation theaters, delivery rooms, are to be finished with such materials that the entire room can be washed with water or sterilized.

(2) Construction Method

a) Earth Work

Since the depth of excavation required for the construction of the proposed hospital is only 1.0 m, it can be carried out manually. However, since the surface soil is extremely susceptible to water, it is necessary to avoid earth work during the rainy season.

b) Forming

Brick laying is the method invariably used for building in Trinidad and concrete formwork is seldom used.

For forming, Ocho boards of 1 inch in thickness are used with nails and wires for tightening. For supports, logs of about 10 cm in diameter may be used.

c) Reinforcement

Reinforcing bars are not produced in Bolivia; they are imported from Argentina, Brazil, Chile, Japan, etc. Although several types of steel are imported, those corresponding to Japanese deformed bars, SD30 and SD24, are often used. Accordingly, these types will be used for the construction of the proposed hospital.

Since the bars to be used are small in diameter, the processing of steel bars can be carried out with adequate precision.

d) Concrete Work

Ordinary portland cement produced at Cochabamba is to be used. Sufficient attention should be paid to quality control during transportation and storage.

For aggregate, gravel for coarse aggregate is not produced locally. Therefore, hollow bricks crushed to a size of 3 cm are used. For fine aggregate (sand), extremely fine sand is available locally.

Although the strength of concrete with locally produced aggregates is said to be 160 kg/cm^2 , since the quality varies, some allowance for safety in mixing is necessary.

In order to obtain concrete of 210 kg/cm^2 to be used for general purposes, it will be necessary to use both coarse and fine aggregates transported from Cochabamba. Since this will increase the costs, decision on the use of these materials is to be made by taking account of the required strength.

Mixing is to be done by a mixer installed at the site with concreting being done manually. Accordingly, the rate of concreting is expected to be $10 \sim 12 \text{ m}^3$ per day.

e) Brick Work

Bricks are the only building material obtainable in Trinidad. They are available in many kinds and are of a good level of precision. Since almost all buildings are brick buildings, local bricklayers have a high technical level.

There are two kinds of bricks used for structures: those with small holes for columns (ladrillo 21 huecos) and those with six large holes for walls (ladrillo 6 huecos). The compression strength for design is 7 kg/cm^2 for the former and 5 kg/cm^2 for the latter.

The standards set by the Japan Architectural Institute are to be referred to in conducting structural computation.

f) Roofing Work

The roofing method widely used in Trinidad consists of laying reed as sheathing on the wooden framework and securing roof tiles with clay. This method is effective in increasing insulation.

Since timber is also to be used for the framework of the proposed hospital, completely dry materials are to be used to prevent future warping. Mara is recommended for this purpose.

The unglazed Spanish roof tiles have a water absorbing capacity because of their low burning degree and they become dark after several years. Therefore, some form of adaption is required before using them for the proposed hospital.

Asbestos cement slates or corrugated iron plates are also currently in use for roofing.

The use of clay on the sheathing may induce damage by insects, mice, bats, etc. It is, therefore, desirable to secure roofing with mortar.

g) Comparison of local finishing materials and those expected to be adopted for the Project

The table below compares local finishing materials and those expected to be adopted for the Project giving the reasons. It also describes those local materials to be adopted.

Part	Local finishing materials	Proposed finishing materials	Advantages of proposed methods and materials
Foundation	Brick foundation	Rubble concrete	Durable and less infiltration of water through the soil into the building
Floor slab	Concrete slab on grade	Concrete slab on grade	Local method
Roof tile	Spanish roof tiles with clay on sheathing	Spanish roof tiles with mortar on sheathing	Under the local method, the clay contains moisture and tiles are not secured, where as the proposed method has no such shortcomings.
Roof sheathing	Cane or bamboo with clay	Plywood 25mm thick	Durable and easy to repair.
Floor	Precast terrazo	Precast terrazo	Durable and suitable for the local cleaning method.
Wall	Plastering or mortar paint on brick base	Plastering with paint finish; tiles up to 1.2m above the floor level	Walls finished in mortar absorb moisture near the floor level, encouraging the growth of unhygienic fungi. The proposed method ensures the conservation of hygienic environment by tiling that section subjected to soiling for easy cleaning.
Ceiling	Plastering on diamond-mesh lath	Cement asbestos board with paint finish	Moisture resistant and hygienic.
Moisture-proofing	Asphalt pitch	Asphalt pitch	Prevention of infiltration of water into the wall due to capillarity, increasing durability.
Moisture-proofing of floor	None	Polystyrene film covering	Prevention of infiltration of water into the floor due to capillarity, increasing durability.

4-6 Structural Planning

(1) Frame Construction

The frame is to be constructed by brick masonry with girders running over openings to carry the vertical load. Spread foundations in reinforced concrete are to be adopted for the foundations. The floor is to be of reinforced concrete. The roof truss will comprise a wooden framework

This frame construction method corresponds to the local method. The reason for selecting this method is that it will be possible to ensure the quality of the building in the light of the materials available, construction techniques, construction period, etc. Few problems will arise after completion with regard to maintenance and control. As a result, it will lead to reduction in the costs of the structure.

Trinidad is distant from any seismic zone and there is virtually no record of earthquakes. Winds are also moderate. Therefore, the external horizontal forces to be considered are small, thus making it possible to adopt brick masonry.

Bolivia has no standards for structural design and there is no data about the method of calculation, strength of materials, etc. Accordingly, structural design for this project is to be based on the various standards set by the Japan Architectural Institute with local conditions taken into consideration.

(2) Design Load

a) Fixed Load

It is to be calculated for each material used.

b) Live load

As a rule, it is to be based on the Japanese Building Standards Law and its enforcement ordinance.

Unit: kg/m²

Section	Floor	Girder, wall, foundation
Consultation room	300	180
Sickroom	180	130
Office	300	180
Roof	90	65

c) Wind Load

It is to be designed on the basis of the Japanese Building Standards Law to withstand a velocity of 30 m/sec. Converted into wind pressure it is 60 kg/cm².

d) Seismic Force

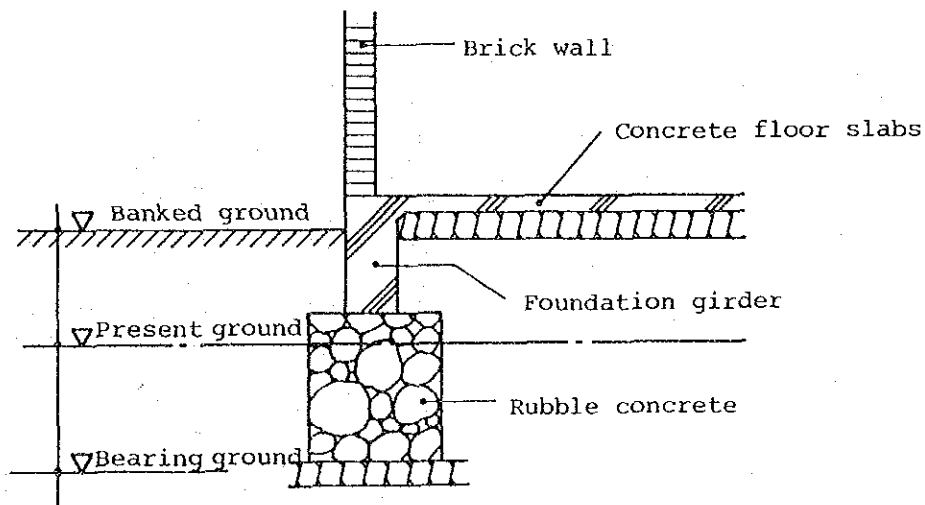
Not to be considered.

(3) Foundations Planning

On the basis of the results of the site investigation, the foundations of the building are to be planned as below.

The bearing capacity of the building is to be in the solid clay stratum 80 cm below the present ground level with a bearing capacity of 8.0 ton/m².

Continuous girders are to be placed under brick walls to form the foundations. Rubble concrete is to be used between the foundations and the bearing ground, which leads the load from the roof and walls directly to the ground through foundation girders. It also checks infiltration of water through the soil into the building.



4-7 Service Facilities

(1) Heavy Electrical Facilities

Bolivia relies on imports for almost all equipment and materials for electrical work except for PVC wiring conduits. Since there are no Bolivian specifications, those equipment and materials imported are often to the specifications of producing countries.

As regards work standards, there are state standards for distribution work by power companies, but none for general buildings. Consequently, some methods adopted cause safety problems. In view of such circumstances, this project is to be carried out on the basic lines outlined below.

1. Japanese standards and specifications are to be adopted for safety.
2. Japanese equipment and materials produced to the Japanese standards and specifications are mainly to be used.
3. As regards consumables, e.g., fluorescent lamps, tungsten lamps, those available locally are to be used as far as possible.
4. Facilities which require low maintenance costs are to be selected.

a) Power Trunk Line

A transformer of 6,600V/380V - 220V is to be installed in the building to supply power to each wing via 3-phase 4-line.

b) Power Generator

An emergency power generator is to be installed to supply power for lighting in operation theaters, delivery rooms, recovery rooms and neonatal rooms and to outlets, the air conditioning unit, culture equipment, refrigerators, laboratory equipment such as the drug and blood storage, refrigerators for food, water supply and drainage facilities.

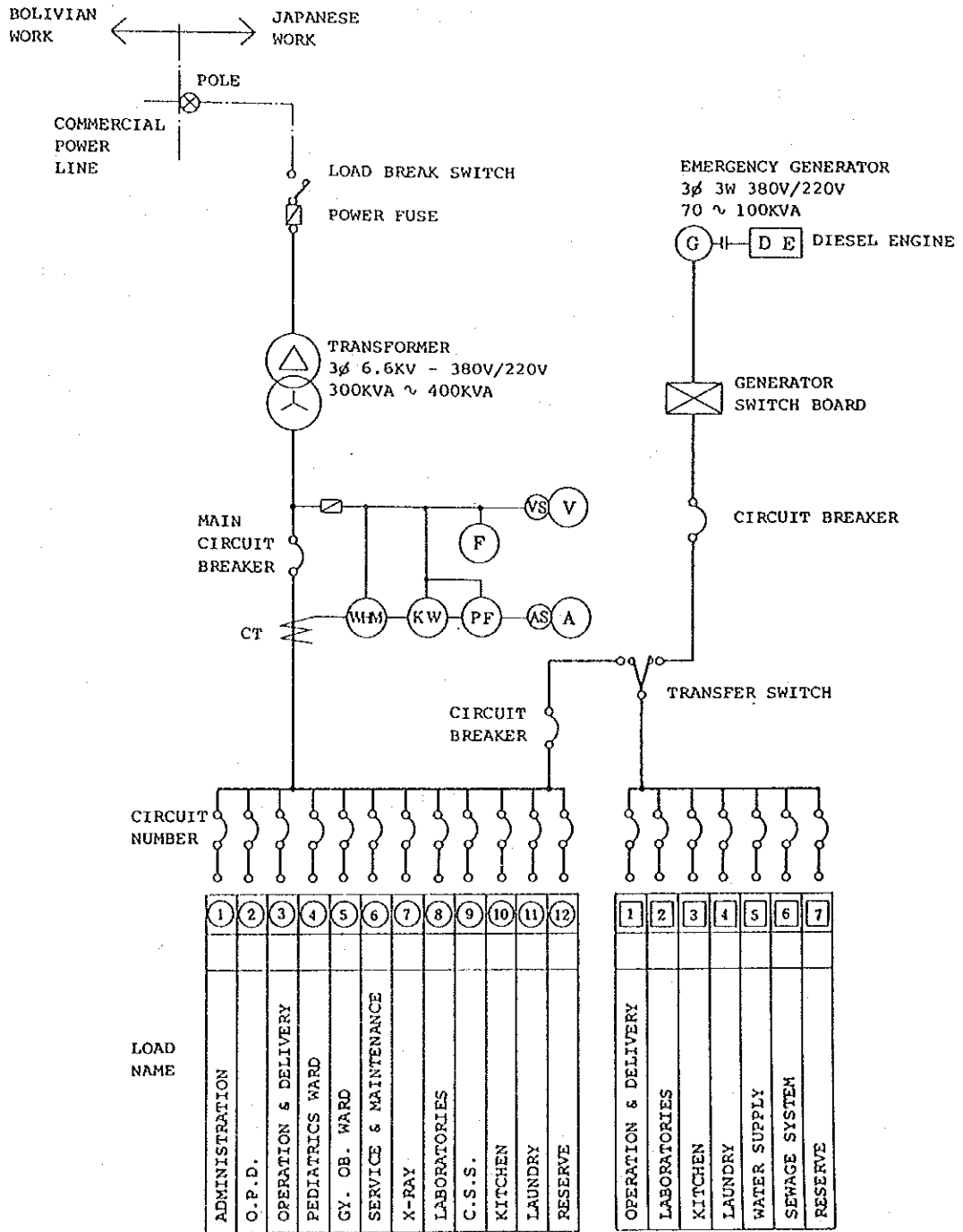
c) Lighting Facilities

Fluorescent lamps are to be used mainly for lighting. Attempts are to be made to reduce power costs by installing individual switches.

Normally, illumination is to be provided at the following levels:

- 400 lux: operation theaters, delivery rooms
- 300 lux: office, laboratory, consultation rooms, treatment rooms, nurse stations, conference rooms
- 100 lux: Sickrooms, corridor

POWER SERVICE SYSTEM



d) Electric Outlets

Electric outlets (1-phase 220V) are to be installed as required, including on laboratory tables.

e) Roadside lamps

Roadside lamps are to be installed in the site area, which can serve as light traps.

(2) Light Electrical Facilities

a) Telephone Facilities

A telephone exchange is to be installed in the administration wing to serve about 40 units installed at main points. Waiting rooms and lobbies are to be provided with piping for public telephones.

b) Public Address System

A public address system is to be provided for calling outpatients and for internal communication.

c) Nurse Call System

A nurse call system is to be provided with the main unit installed at the nurse stations and an intercom unit in each sickroom based on a system of one channel-one room.

d) Inter-phone system

An inter-phone system is to be installed, linking the main entrance and the service entrance to the nurse stations and the night duty rooms for night-time communications.

(3) Water Supply and Drainage Facilities

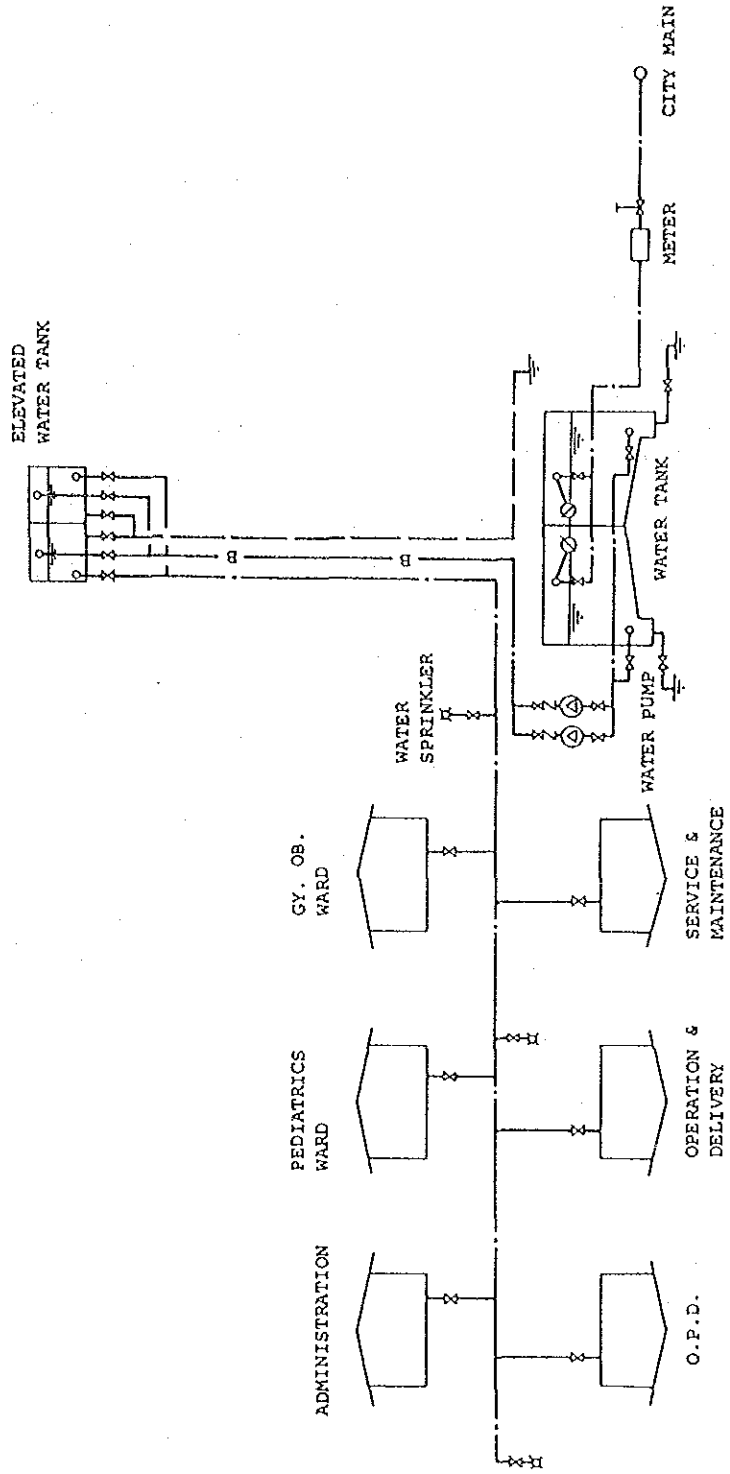
a) Water Supply System

City water is led into a tank with a capacity of one day's supply installed in the site area. Water is then pumped up to an elevated tank (capacity: one hour supply) to be supplied to various points by gravity. PVC pipes are to be used for piping.

b) Hot Water Supply

A gas water heater is to be installed in the kitchen. Copper pipes are to be used for piping.

WATER SUPPLY SYSTEM



c) Drainage and Ventilation Facilities

Drainage facilities consist of two systems: sanitary drainage and rain water drainage systems. Sanitary sewage is sterilized after being treated for BOD and SS in an aeration type septic tank provided in the site area and is then discharged into the side ditch.

Oil is to be extracted from the kitchen drainage.

As for sewer treatment and waste treatment, no particular treatment method has been established in Trinidad. Therefore, Japanese methods of treatment are to be modified according to the local customs in order to establish a system of treatment which may be maintained easily.

PVC pipes are to be used for indoor piping and vitrified clay pipes or concrete pipes for outdoor piping.

d) Kitchen Facilities

Catering facilities are to be installed for serving inpatients, their families and hospital staff.

e) Laundry Facilities

Laundry facilities are to be provided to wash sheets, pillow covers, pajamas for patients, linen, whites for doctors and nurses, diapers, etc. in the hospital.

f) Gas Supply

Propane gas is to be supplied individually to various equipment in the kitchen, the laundry and the laboratory from tanks installed outside.

(4) Air Conditioning System

Although air conditioning is not to be provided, ventilation is to be improved by means of ceiling fans and opened windows to ensure coolness.

However, air conditioning is to be provided for operation theaters, delivery, recovery, neonatal rooms, X-ray room and the laboratories by means of wind type coolers and separate type coolers. In addition, air supply and exhaust facilities with air filters are to be provided.

(5) Ventilation Facilities

As a rule, ventilation in toilets is to be based on natural ventilation according to the local construction method. However, mechanical ventilation with fans is to be provided for the laboratory where special exhaust air is produced and those sections which produce strong smells, the kitchen and the laundry.

(6) Special Facilities

a) Lightning Arresters

An arrester is to be installed on the elevated water tank.

b) Oxygen Supply Facilities

An oxygen supply system is to be provided in the wards and the operation and delivery wing.

4-8 Medical Equipment Planning

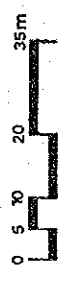
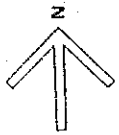
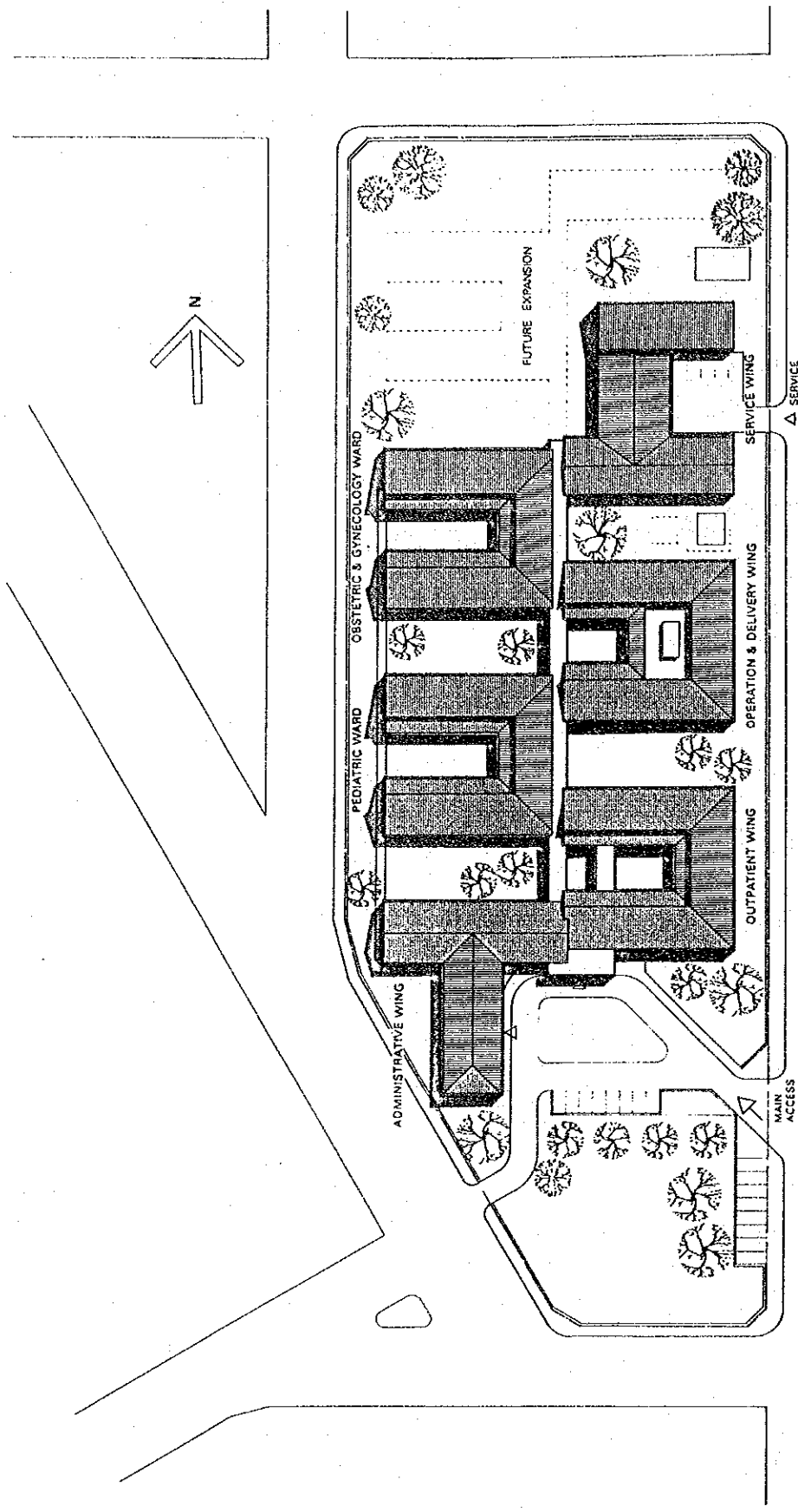
This survey revealed that almost all medical equipment currently in use are beyond their service years and few in number. Some remain out of order because of a lack of maintenance services. This is largely due to the local climatic conditions of high temperatures and humidity. Hospital facilities for operating medical equipment, e.g., power, water, were also found to be inadequate.

The proposed maternity hospital is intended to provide primary care for mother and child in the community rather than to provide specialized medical services. Accordingly, the selection of equipment is carried out in view of the above objective.

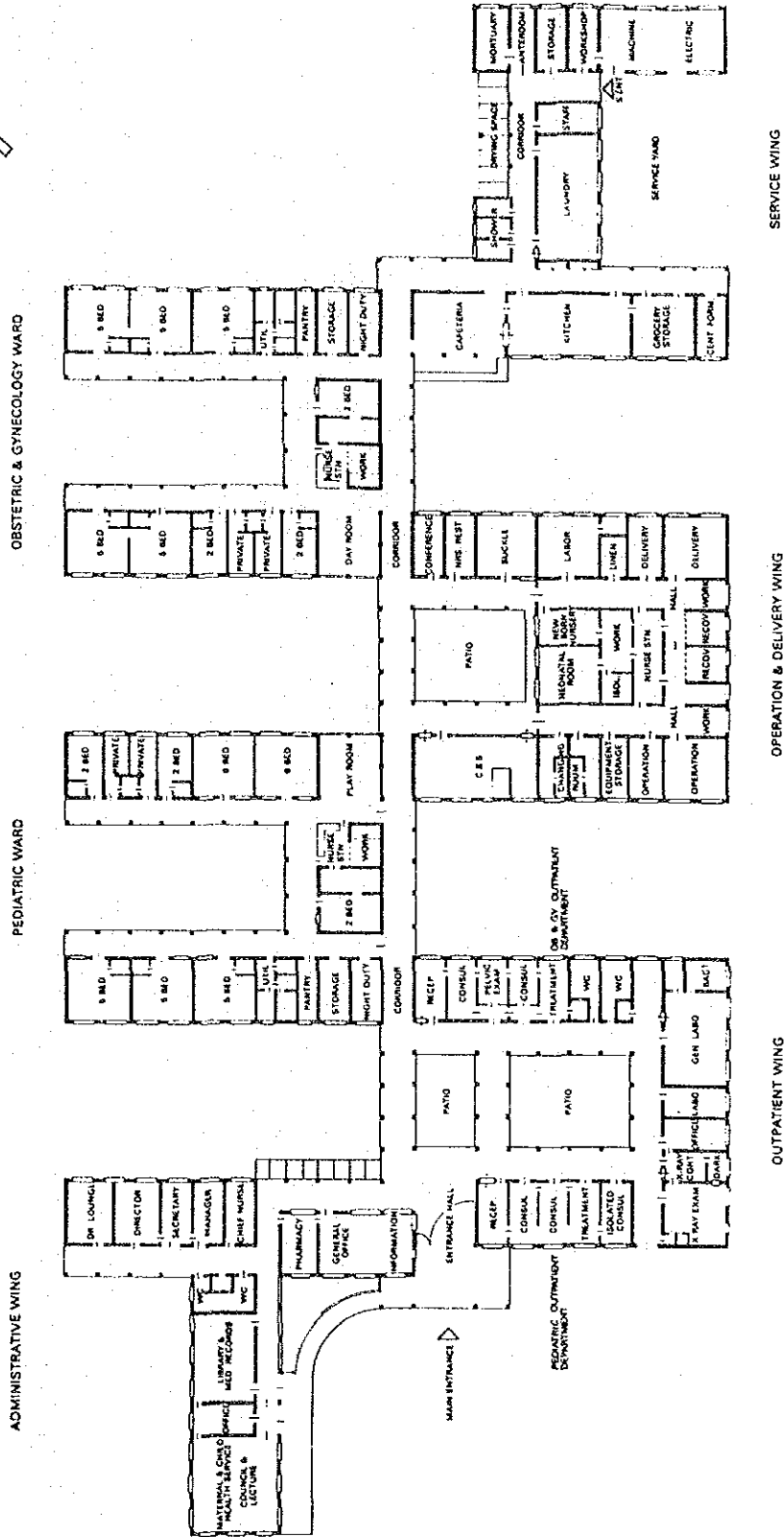
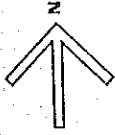
The equipment are to be selected in line with the basic lines: 1) they are strong and corrosion resistant; and 2) they are of a general level, which are easy to operate and to maintain.

4-9 Architectural Drawings

- 1) Site Layout Plan
- 2) Floor Plan
- 3) Elevations & Sections
- 4) Perspective
- 5) Floor Area Summary



SITE LAYOUT PLAN
 HOSPITAL
 MATERNO INFANTIL
 TRINIDAD-BOLIVIA 1



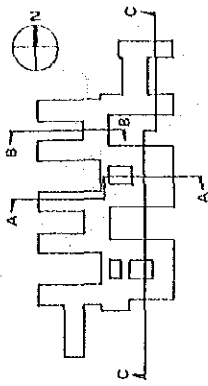
SERVICE WING

OPERATION & DELIVERY WING

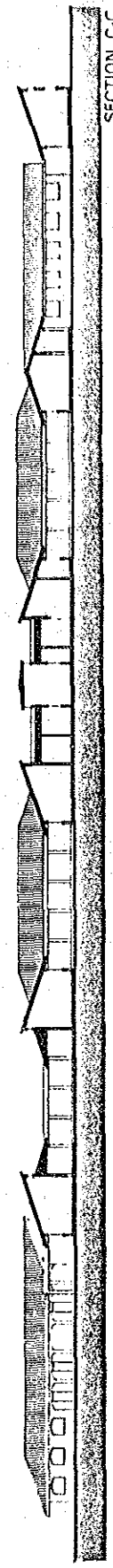
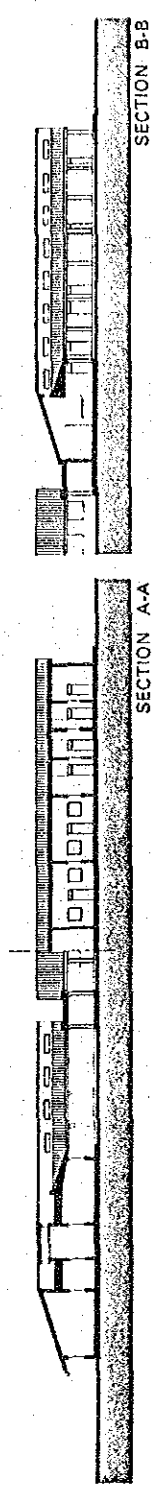
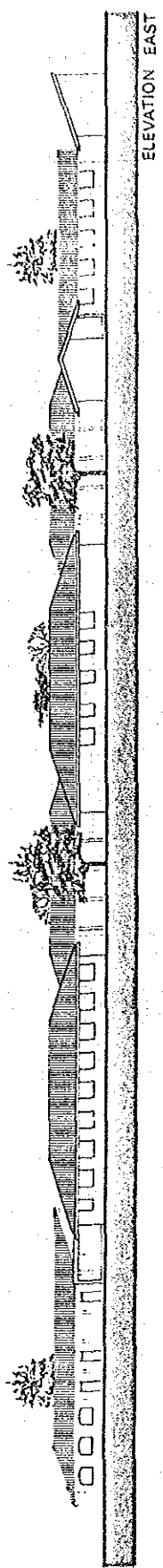
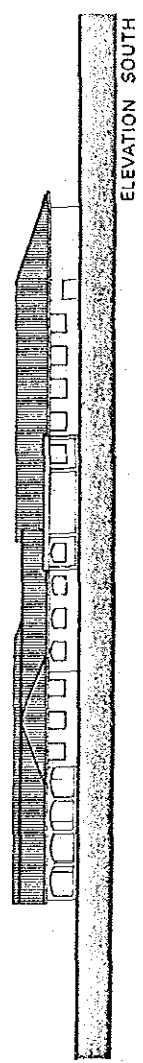
OUTPATIENT WING

FLOOR PLAN
HOSPITAL
MATERNO INFANTIL
TRINIDAD-BOLIVIA 2



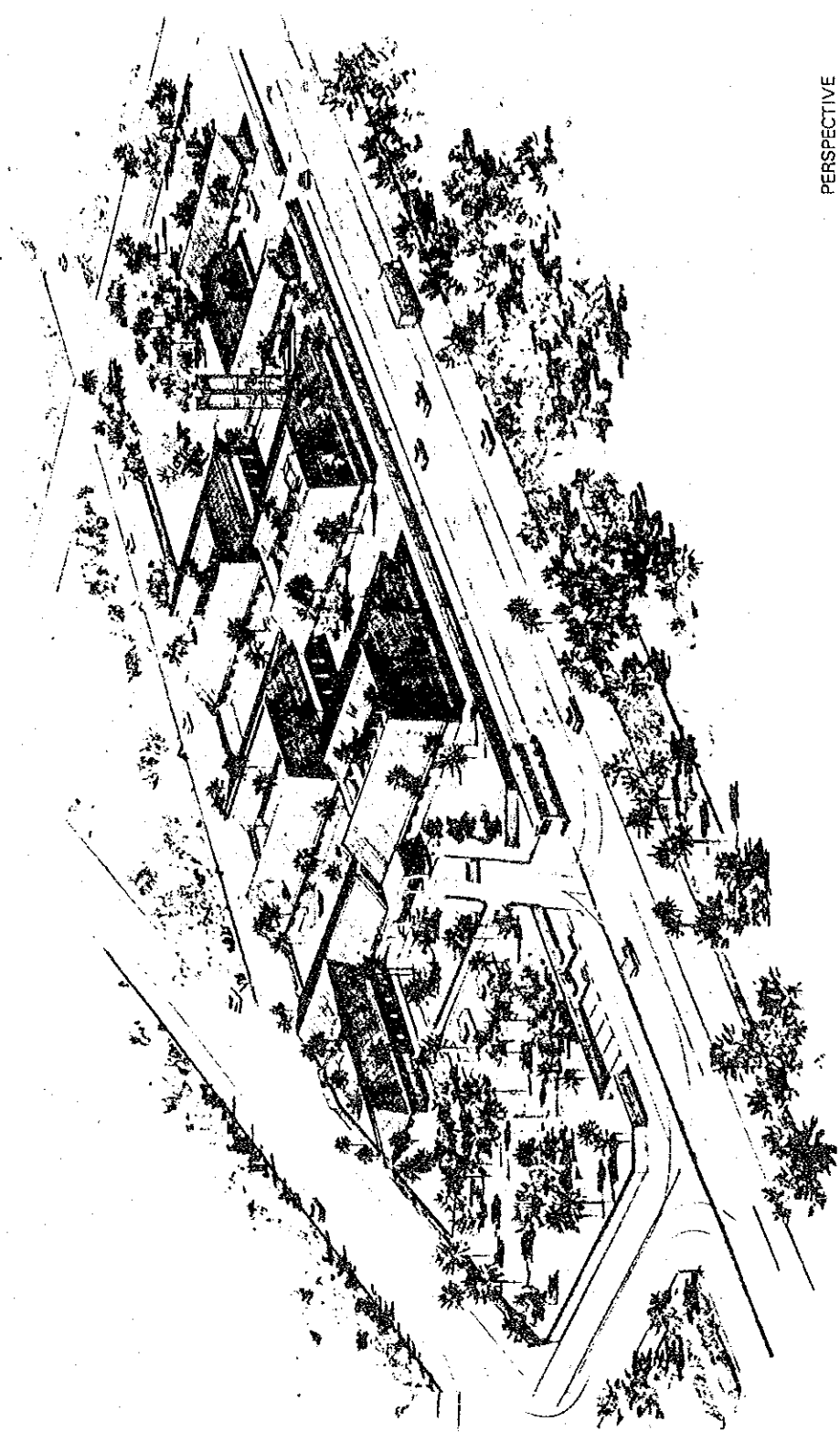


KEY PLAN



ELEVATIONS & SECTIONS
 HOSPITAL
 MATERNO INFANTIL
 TRINIDAD-BOLIVIA 3





PERSPECTIVE
HOSPITAL
MATERNO INFANTIL
TRINIDAD-BOLIVIA 4

5. Floor Area Summary

	floor area
Administration Wing	510 m ²
Outpatient Wing	540 m ²
Operation & Delivery Wing	710 m ²
Pediatric Ward	590 m ²
Obstetric and Gynecological Ward	590 m ²
Service Wing	550 m ²
Center Corridor & Hall, etc.	510 m ²
Total Floor Area	4,000 m ²