GENERAL HOSPITAL, ABUJA

BY

ODUMAH BASIL ELUOJO

B.Sc. (Hons.)

BEING A THESIS SUBMITTED TO THE

POSTGRADUATE SCHOOL

AHMADU BELLO UNIVERSITY, ZARIA

IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE AWARD OF

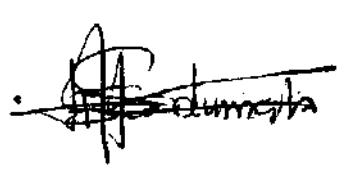
MASTER OF SCIENCE IN ARCHITECTURE

DEPARTMENT OF ARCHITECTURE
FACULTY OF ENVIRONMENTAL DESIGN
AHMADU BELLO UNIVERSITY
ZARIA - NIGERIA

JULY, 1988

DECLRATION

This is to declare that this thesis is an authentic work conducted by me within the regulations of the Postgraduate School of Ahmadu Bello University, Zaria. All directly quoted materials and secondary sources are duly acknowledged. This declaration is made on July 1988, by Odumah Basil Eluojo of the Department of Architecture, Ahmadu Bello University, Zaria.



08/09/1988

CERTIFICATION

This thesis report entitled: "General Hospital Abuja", by Odumah Basil, Eluojo meets the regulations governing the Award of the Degree of master of science in Architecture of Ahmadu Bello University, Zaria, and is approved for its contribution to knowledge and literary presentation.

Chairman: Supervisory-Committee	9/9/88 Date
Member: Supervisory Committee	09091988 Date
Member: Supervisory Committee	Date
Head: Department of Architecture	Date
Dean: Post Graduate School	Date

DEDICATION

Dedicated to God, for guidance and infinite mercies,

my parents, for love and support,

my brothers and sisters for encouragement.

ACKNOWLEDGEMENT

I wish to express my profound gratitude and sincere appreciation to all the people whose contributions made this work possible. I am especially grateful to the following:

My parents Mr. and Mrs. C. J. Odumah for their constant support, and my uncle Dr. G. Odumah for the professional advice and literature he gave me.

Mr. M. Abdulkarim and Arc Tulpule who were my Supervisors, for the assistance and encouragement they gave me. To all my friends: Oiji Amedu, Taiwo Adesanya, Ibrahim Bashir, Bolaji Soladoye and others.

I am very grateful to all, including those whom I have not been able to mention. The help you all rendered in various areas and forms is deeply appreciated.

ABSTRACT

A hospital is an integral part of a social and medical organisation, the function of which is to provide for the population, complete health care both curative and preventive and out-patient services reach out to the family and its home environment. From the modern point of view, the hospital is not only for treatment of the sick but a comprehensive system of preventive and curative medicine and also devoted to ambulatory and domiciliary cases.

The General hospital is one that is organised to deal with a variety of conditions of illness needing specialised skills or equipment that cannot economically be provided in the patients home or in small medical centres in the community. It brings together in a concentrated form most of the specialist services and it provides care for both impatient and out patients.

Hospital esthetics cannot be dealt with in the spirit of mere decorative embellishment. In good hospital architecture, the esthetic and the function unite to contribute to the well being of both patient and staff. The esthetic, then is also a function of the hospital. Base on this the contiguity approach is being adopted.

As a contribution to architecture, the design thesis is

concerned at improving the circulation pattern which is a very important factor in a hospital, by having various units working in conduction to accelerate the services needed with adequate provision for natural lighting and ventilation to reduce infestation and for maximum comfort.

The main sections of the hospital are classified into two, these are: OUTPATIENT DEPARTMENT and INPATIENT. Departments of the above include Medicine, Surgery, Orthopaedics, Obstetrics and Gynaecology, Pathology, Radiology and ENT (ear, nose and throat). On the macro level the master plan consist of the main hospital, auxilliary services, medical school, Doctors[1] residence, students' hostels, etc.

TABLE OF CONTENTS

Chapter		Page
	Title page	i
	Declaration	ii
	Certification	iii
	Dedication	iv
	Acknowledgement	v
	Abstract	vi
	Table of contents	viii
	List of Figures	xii
	List of tables	xiv
	List of plates	xv
	INTRODUCTION	1
	Chapter 1	
1.0	A Brief history of Hospital planning and development	4
1.1	Health care services in Nigeria	15
1.2	Proposed health care facilities in Abuja	17
1.3	Classification and categories of Hospital	23
1.4	Primary, secondary and tertiary care	24
1.5	Inter-department traffic in General Hospital ..	26

Chapter		Page
	Chapter 2	
2.0	Methods in patient capital	32
2.01	Intensive in-patient care unit	34
2.02	Intermediate care	35
2.03	Self-care	35
2.04	Long-term	36
2.05	Home care	37
2.10	The patient care units	37
2.11	Planning considerations	38
2.20	Nursing unit distribution by services	41
2.21	Medical nursing unit	41
2.22	Surgical nursing unit	42
2.23	Maternity or obstetrics nursing unit	42
2.24	Paediatric nursing unit	44
2.30	Design components of the nursing unit	31
	Chapter 3	
3.0	Diagnostic and therapeutic Departments	62
3.10	The out-patient Department	62
3.20	The surgical operating suite	67
3.30	The obstetrical Delivery suites	73
3.40	The Pathology Department..	75
3.50	Radiology Department	82
3.60	Physical Medicine	91
3.70	Pharmacy Department	94
3.80	Emergency Department	95

Chapter		Page
	Chapter 4	
4.0	Ancillary service units	104
4.10	Dietry	104
4.20	The central sterile supply Department	106
4.30	Central General Stores	197
4.40	Maintenance unit	107
4.50	Employee facilities	109
4.60	Laundry and Housekeeping	111
4.70	Administration	113
4.71	Admission Department	114
4.72	Public spaces	115
4.73	Medical Records	116
	Chapter 5	
5.00	Case study	118
5.10	York district Hospital, U.K.	118
5.20	Ajaokuta Medical Centre	129
5.30	Teaching hospital or khyber medical college, University of Peshawar, West Pakistan	147
5.40	Obafemi Awolowo University Teaching Hospital, Ife Nigeria	156
	Chapter 6	
6.00	The site	174
6.10	The territory and the city	174
6.20	The site and the central area	177

Chapter		Page
6.30	Traffic studies and access	179
6.40	Climate Studies	182
6.50	Geology and vegetation	188
6.60	Topography and drainage	189
	Chapter 7	
7.00	Design Methodology	194
7.10	Concepts	195
7.20	Design synthesis	201
7.30	Special design standard	206
7.40	Structure	209
7.50	Materials and Finishes	209
7.60	Schedule of accommodation	212
	Chapter 8	
8.00	Conclusions	239
8.10	Fire protection in Hospitals	239
8.20	Acoustics and sound control in Hospitals	240
8.30	Conclusion	244
	BIBLIOGRAPHY	244

Chapter Page

LIST OF FIGURES

1.1	Greco-Roman Latreia	9
1.2	Romano-Christian xenodochium at Osita, Italy ..	9
1.3	Hotel Dieu, Paris, France	10
1.4	Abbey at St. Gallen, Switzerland	11
1.5	Ospetale Maggiori di Milano designed by Filarettis	12
2.1	Plan shaptes of nursing units	40
2.2	Centralized nursery unit	46
2.3	Decentralized nursery unit	47
2.4	Nursing units Bedrooms layout	54
2.5	The Patients Bed side	56
3.1	Outpatient consulting/Examination room	66
3.2	Out-patient consulting/Examination room	66
3.3	Out-patient department flow pattern	68
3.4	Surgical Suite Flow Chart	71
3.5	Surgical suite operating team	72
3.6	Flow chart Delivery suite	76
3.7	Pathology department Flow Chart	77
3.8	Typical pathology laboratory	83
3.9	The X-ray machine	85
3.10	X-Ray department flow chart	87
3.11	Dressing rooms for Radiology	89
3.12	Physical therapy Department	93

Chapter		Page
3.12	Physical therapy Department	93
3.13	Occupational therapy room	95
3.14	Inter-realtionship of pharmacy department	97
3.15	Emergency suite Flow Chart	101
4.1	Central sterile supply unit work Flow Diagram ..	108
4.2	Flow of soiled and clean materials	110
4.3	Processing hospital linen	112
4.4	Typical laundary arrangement	114
5.1	York District Hospital case study	119
5.6	Proposed Ajaokuta Medical Centre case study	131
5.14	Teaching Hospital at Kyber Medical College, University of Peshwar case study	148
5.20	Obafemi Awolowo University Teaching Hospital, Ife, case study	158
6.1	Site location in national context and its contrality	175
6.2	The central Areas and the site	177
6.3	Traffic Network of Abuja	180
6.4	Mean monthly temperature, humidity and rainfall ..	185
6.5	Seasonal wind pattern and monthly sunshine in Abuja	187
6.6	Vegetation map of Nigeria	191
6.7	Topography of Central Area, Abuja	191
7.1	Site Analysis Showing access road, sound barrier, etc.	196
7.2	Site layout concept	198
7.3	Site Structure	198

Chapter Page

LIST OF TABLES

1.1 Medical Facilities Allocation in Abuja 20

1.2 Health projects under construction in Abuja 22

3.1 Laboratory test performed annually in a hospital of 150-200 beds 78

INTRODUCTION

The most popular terms when it comes to the priority needs of human being is "food and shelter". Quite rightly so but it should be understood that man needs food and shelter for the sole reason of staying healthy.

The World Health Organization defines "health as a state of complete physical, mental, and social well being and not merely the absence of disease or infirmity". Whatever the stage of development of a society, adequate health care is nowadays considered the right of every individual. If it were desirable for no other reason, good health care plays an important role in stimulating economic development. When suffering is reduced and the possibility of a longer and richer life unfolds, people face their future with more optimism and confidence. They become more capable of improving their condition, and their productivity rises. Thus the planner of medical facilities must consider man's innermost needs, the aspirations of people, social structures, values and attitudes towards human life.

The subject of health care is one which is being given increasing attention throughout the world, as developing nations realise the importance of preventive medicine as well as medical treatment. The effectiveness of such care is clearly apparent in

the rapidly falling birth rate in many parts of the world and the greater life.

Health care is more positive than the treatment of sick people. Ways of providing places where the sick can be looked after are the main essence of hospital, but real health care relies on a variety of other things, that although less productive of impressive buildings such as hospitals, are more fundamental. The most basic are the preventive and public health measures that may avoid the necessity of admitting a patient to hospital. The hospital should be the last resort and not the first line of defence for it is the most elaborate and costly way of combating sickness.

The most essential task of hospital planning is to find conditions under which human beings can work together at their best in the service of their fellow human beings who need help. In order to integrate the various departments of the hospital care system, arranging them to compliment and support each other so that they work as one, it is essential to understand thoroughly, the nature of circulation in hospital before attempting to device planning concept relating to it; the other secondary service - books written by hospital consultants, and primary sources through case studies of similar structures.

This thesis is specifically on a general hospital, and how it can eventually grow into a teaching hospital in future. A general hospital is one that is organised to deal with a variety

of conditions of illness needing specialised skills or equipment that cannot economically be provided in the patient's home or in a small medical centre in the community. It brings together in a concentrated form, most of the specialised services otherwise performed by a number of separate hospital with more limited functions - hospital for orthopaedic work or for mental illness - and it provides care for both inpatient and outpatients. Patients normally stay in a general hospital for a relatively short time, and the building is sometimes known as a general acute hospital. This implies illness of rapid onset and usually of short duration, to distinguish it from a hospital whose patient are for example, chronically ill and who are for this reason likely to be of longer stay. The general hospital usually supports a school of nursing and is known as a District General Hospital because it is based on a particular catchment area.

The first part of this thesis discusses the history of hospital planning and development and general information concerning the various categories of hospital. The preceeding chapters elaborate on the methods in hospital planning with a detailed study on the requirements of various departments and their inter-relationship with each other. The last chapters analyse the site condition and its features, and finally the methodology and design concept, followed by conclusion.

Chapter 1

1.0 A BRIEF HISTORY OF HOSPITAL PLANNING AND DEVELOPMENT

The provision of care and shelter for the sick is a fundamental requirement of community life, and arrangements to satisfy this requirement have been present in some form throughout history. Based as they are on elemental human needs, such arrangements have always been closely linked to the economic and social conditions of the time. Studies have shown that man from the beginning has shown the desire for a healthy body and mind ranks high among the fundamental instincts, along with the desire for food and warmth, shelter and protection. Saving this basic urge, the hospital shaped by various aspects of life and culture, has developed over the centuries a significant place and form in human society, the determination, of which have changed as various aspects of life and culture become dominant.

In early times temples were probably the earliest institutions concerned with the care of the sick. Medicine and healing were linked with the gods, and hence such hospital forms as existed closely resembled the forms of the temple. Later, in classical antiquity, the rational processes of thought were reflected in the plan form, which gradually achieved a character

of its own new order and clarity become evident, clear patterns of circulation were delineated and attention was paid to functional groupings.

This clarity was lost during the medieval christian era, together with classical logic, and hospital buildings again became indistinguishable from general medieval architectural forms. Concepts of rational planning and logical sequences of function disappeared. Not until the late 18th and early 19th centuries was the problem of hospital planning treated on a function and scientific basis. Then the "pavillion" type plan evolved, segregating patients into small groups and securing natural light and ventilation.

1.0.1 Early Times

Archeology has shown that there was a surprising degree of medical knowledge in very early periods. Trephining (boring a hole in the skull to remove pressure on the brain was widely and successfully practised in Nedithic times; plastic surgery was known in India in ancient Hindu societies (this art was developed to cover up amputation of the nose - the contemporary punishment for adultery.)

Primitive man could comprehend pain brought about by his own actions, or those of others, but inward pain had no visible cause and was thought to be caused by a supernatural force, that

is, a displeased god or an evil spirit. This is one of the reasons for the presence of medicine men in primitive societies, who first form a link between the people and the gods, and secondly claim the powers of healing, and of exorcing evil spirit. The temples of enshrining these gods became centres for healing, with the priest as medical consultants".

1.0.2 Greece

The Greeks demonstrated a concept of enlightened medical care unequalled even today in many parts of the world. As early as the 6th century BC (before christian era) they have established medical schools, and in the 4th century BCE the Hippocratic collection of medical writings was being complied. The temples of many deities proliferated the sites of the temples were usually along side mineral waters or warm healing springs. In addition to the temples there were "latreia" or medical clinics in which Greek physicians who were free citizens, held consultations and treated patients Fig. 1-1 shows a 3rd century B.C. Greco-Roman "latireia" excavated at Pompeii. The "latreia" were essentially private institutions but the state financed similar institutions to care for citizens recognised for dedicated service.

1.0.3 Rome

Separate institutions for the care and shelter of the sick

first appeared in Rome. These were temples to Aesulapius and latreia for private physicians and their more wealthy patrician patients. The temple of Aesauthapius was on a small island in the Tiber, located there as a divine portent sick man worn out and dying slaves were dispatched to this island and left there. The Emperor Claudius, appalled by this vicious practice, decreed that all slaves who recovered were henceforth free men. This resulted in the temples development into an infirmary for the sick, poor and hence a forerunner in society of the hospital as it is known today. These infirmaries were termed "valetudinaria". Military "valetudinaria" were built at the frontiers and civilian "valetudinaria" were built for the use of imperial civil servants and the families stationed in provincial capitals. The "valetudinaria" took the form of a porticoed court into which opened rooms for the sick, and as such a distinct architectural form was beginning to emerge.

1.0.4 Christianity

As christianity started getting a strong foothold in the minds of men, new concepts of charity and care for the poor and sick asserted themselves in the community.

The Roman Empire being more prosperous was more active in the founding of such charitable institutions. An example of early area-wide planning was the edict of the council of Nicea in 325 C.E. (Christian Era), which decreed that each town should

have a separate place called an "xenodochium" for sick and ill travellers. Many xenododia were founded by the early fathers due to the increasing number of pilgrims to the holy land. An example, founded by St. Basil near Caesarea and called "Basiliade" in his honour was constructed between 369 and 372. Described as "a city in itself", it had pavillions for the sick, a hospice for pilgrims and travellers, an infirmary, a leper hospital and work-shops for rehabilitating the disabled and unemployed. Other examples are listed below.

- Romano-christian xenodium, built in 2098 C.E. at Ostia in 1875 (Fig. 1.2).
- Twimanin in central Syra (Fig. 1.3).
- Hotel Dieu in Lyans (first in France).
- The Abbey at St. Gallen in Switzerland (Fig. 1.4).

1.0.5 The Rennaisance

The look of classical Greek and Roman thought which the Renaissance re-established was reflected in the plan form of the hospitals built in Italy in the 15th century. The most notable examples were Brunelleschis aspedale Innocenti, Florence, 1419; ospedale della scala, sienna, 1440; and ospetale maggiori di Milano designed by Filaretti (Fig. 1.5) in the 1456 and partially completed in 1465. Filarettis design reflects the rational mind of the Renaissance, man, but is overlaid by a dominating christian belief. The plan is basically cruciform, with large

Figure 1.1 Greco-Roman Iatreia.

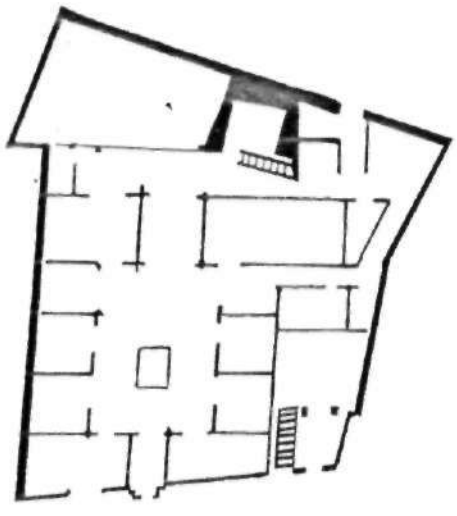


Figure 1.2 Romano-Christian Xenodochium at Ostia, Italy.

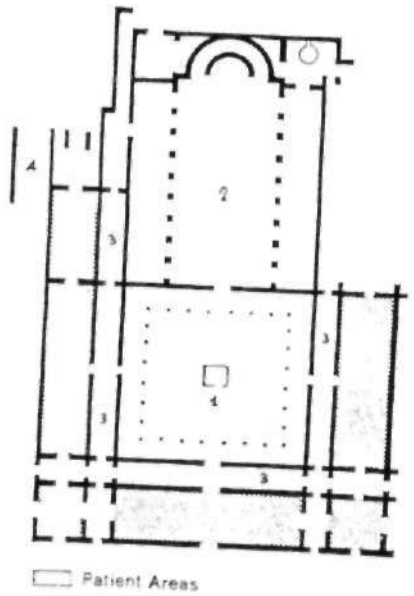
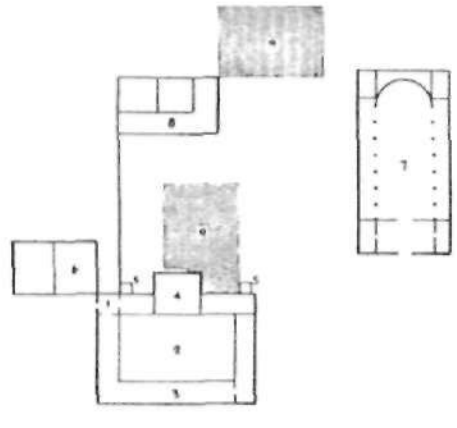


Figure Sixth Century Xenodochium at Turmanin Syria.



1 Entrance
2 Hall for sick
3 Portico and corridor
4 Service building
5 Stair
6 Mortuary
7 Basilica
8 Barns and stables
9 Pure water cistern

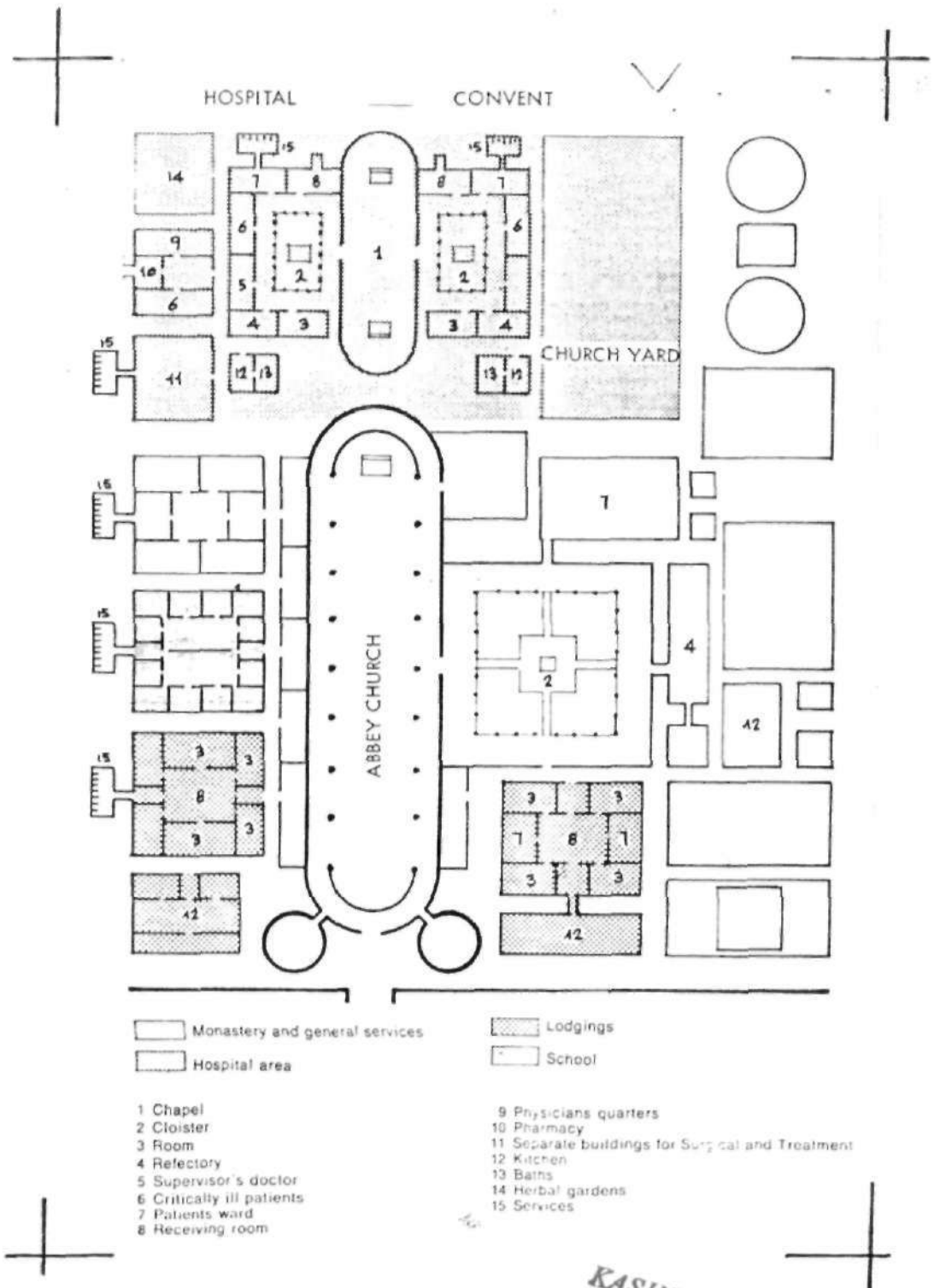


Figure Hotel Dieu, Paris, France, site plan.



Figure Hotel Dieu, Paris, France, patient ward.

FIG. 1.3



Abbey at St. Gallen, Switzerland.

FIG. 1.4

KASHIM IBRAHIM LIBRARY

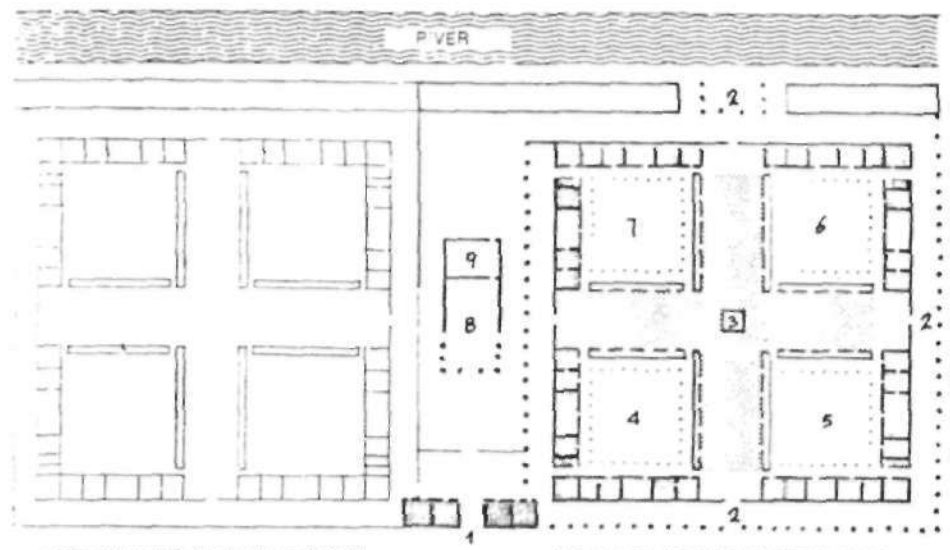


FIG. 1.5

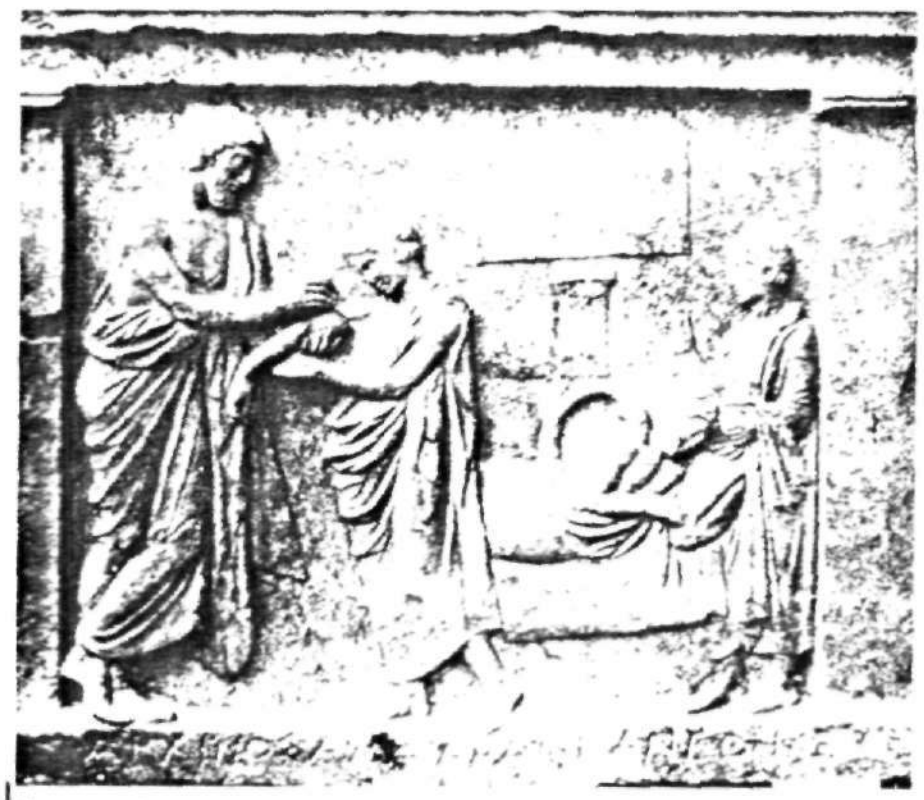


Figure The priest Medical consultant of classical Greece

wards in each of the far segments arranged so that each patient might have a view of the central alter, subsidiary rooms containing services, facilities, treatment and administrative areas form the periphery of the square. The building is more of a monument to Duke Stoza and to God than an efficiently organised hospital.

The real beginning of hospital planning based on scientific and functional relationship came up on the late 18th and early 19th century with the introduction of the 'Pavillion' typeplan where paitents segragated into smaller groups to ensure natural light ventilation. There was orderliness and similarity of the plan with clear, simple street type pattern of circulation and functional grouping of elements.

This philosophy of natural light and ventilation dominated the 19th century until the introduction of the theory of 'MIASIA' in 1860s resulting from the spread of cross infection attributed to gases or 'miasmas' generated by organic filth hence attention was paid towards reviewing the ventilation problem and distances between buildings.

Florence Nightingale in 1859 published her studies in "Notes on Hospitals" based on her experience as a nurse questioning the miasma theory - suggesting that defects of the then existing hospitals lay mainly in their inadequately lighting, ventilation and over crowding of the sick. She suggested precise areas and dimensions of some rooms and

'monoblock' require mechanical means of ventilations and vertical transport. Also there is the problem of so many life services for clean utility, dirty utility, medical staff etc resulting in prolonged waiting and also risk of mechanical failure or fire outbreak"[1]. This is only suitable in developed countries where there is no fear of power failure and land is limited. In developing countries such as Nigeria where land is abundant it's always safer to spread horizontally as far as the site can permit and to rely on natural light and ventilation.

More recently there has been a marked return to the horizontal concept in the developed countries like the United States because of its striking advantages over the vertical monoblock. The concept is to spread horizontally as far as the site can accommodate.

1.1.0 Health Care Services in Nigeria

The history of medicine in Nigeria goes back much further than is generally realised, though traditional medicine and its practitioners like the 'wanbar' and 'gozan' of the Hausas and Nupes in the North, and the 'adahunse' and dibia of the Yoruba and Ibos in the south, had existed from time immemorial and provided the earliest known form of primitive medical care. It can be said that the real roots of medical care as we know it today in Nigeria are exogenous in origin. One of the earliest contacts of the Western world with Nigeria was with the

Portuguese who had traded with and sent religious missions to Benin and Warri for some years, settlers towards the end of the first half of the fifteenth century. These setllers must have brought with them some form of European medical care.

Its the aim of every nation, rich or poor to be able to provide health care services to the totality of its population both in the urban and rural areas. The state governments are however responsible for the provision of health services in the rural and urban area. In the rural areas, mobile clinics, rural health centres are scatttered to cover the needs of the population since in Nigeria the majority of its population about 80% live in the rural areas. Usually such health centres are cheaper to construct and manage as no provision for special diagnostic and treatment facilities such as radiology and pathology department are made. Cases that require special diagnosis and treatment are referred to district hospitals where it can be handled or further referred to a teaching hospital or specialist hospital.

As we all know, the present health condition of this country is unfortunately characterized by social apathy and lack of initiative to force the pace of change. A great part of the population still live in slums and over-crowded environment and only one out of five persons in Nigeria has reasonable access to portable water and adequate sanitation. New cases of malaria are seen each day while many people are infested with river blindness

likewise malnutritional disease such as kwashiokor are rampant among children in rural areas.

More important still is the threat to health and life posed by the incident deterioration of our environment, our rivers, streams and ocean are becoming polluted by faeces, refuse, dead animal and oil. Many of our streets now constitute visual blight and health harzardness as uncleared refuse accumulates all over the place in a most unsightly manner. The simple rule of basic hygiene practices are ignored wilfully and one does wonder why we have lost pride so suddenly in the cleanliness of our environment. Most of the environmental problems in our society stem from ignorance and wilful disregard to public health law of the nation.

Nigeria like other countries in the race for WHO's 'health for all by the year 2000, in order to achieve this objective, we must first of all recognise the importance of improved health services to the large populace of this country. What programmes to be undertaken, when an how to undertake them should not be left out. Also more resources must be channelled into areas that promote health care of this country.

1.2.0 Proposed Health Care Facilities In Abuja

Planning of health services in the New Federal Capital city must take into account the need for flexibility and phasing, as

the population grows from approximately 20,000 construction workers in 1979-81 to a population of a half a million as soon as 1990, and to the projected 1.6 million sometime in the forseeable future. Planning must also take into account the provisions for health care facilities elsewhere in Federal Capital Territory.

Demand for medical service in the new Federal Capital city and the Federal Capital Territory will be shaped by the demographic structure which is characterized by a relatively high proportion of children, mothers, and middle-aged adults at above-Nigerian-average level of education and income the age structure suggest, at least, that the pediatric problems of young children and their mothers be the important element of health care.

Since data from Nigeria on incidence of overall illness serious enough to demand hospitalization are not available, it has been assumed that there would be enough illness appropriately treated in a hospital to demand approximately two general hospital beds per 1,000 population.

The National health plan, in addition to developing medical training institutions, has been focused around research, disease control, and health planning. The Basic Health service program is aimed at increasing medical coverage of the population as follows.

- to provide essential curative care as well as preventive

and promotive care.

- services should be provided to all people, thus correcting the present imbalance between urban and rural area.
- best health services are best provided through health clinics, and centres located in the communities and utilizing the lowest cadre of staff capable of accomplishing the task.
- these facilities will complement hospital services, creating hierarchial network of facilities, with a broad base of health centres and clinics linked to successively more specialised facilities and services at the apex.

Health clinics would be developed in the more rural areas of the FCT, distributed to serve populations of between 6,000 and 10,000 people. Health centre would be developed in town centres satellite cities and residential areas in the NFCC, distributed to serve population of approximately 20,000 people.

Because of the expected high demand of sophisticated medical care and as part of the support services appropriate to the seat of Government in a relatively remote area in the centre of the country, a system of referral hospitals should be planned from the outset. The apex of such a system would be a 1,250 bed teaching hospital to which patients needing sophisticated super-speciality care may be referred, and which will carry responsibility for training the professional personal for the system. This hospital would be the core of the NFCC medical centre centrally

located near the central area to maximize accessibility by public transport. The designated 40 acre site is large enough to accommodate nursing and medical school which would be part of this complex.

To provide primary and secondary medical care in the NFCC, referral hospital have been programmed for each sector centre for maximum accessibility. A site of approximately 6 hectares has been set aside for each referral hospital. In the major satellite city a single referral hospital with approximately 250 beds providing a balance of services.

Table 1: Medical Facilities Allocation

Type of Facilities	Population served	Site size	Rural	Res. districts	Sector Centre	CBD*
Health Clinic	6000-10,000	18 HA	X			
Health Centre	20,000	18 HA		X		
Referral Hospital	200,000-250,000	5.9 HA			X	
Central Hospital Complex	1250 beds	40 HA				X

* CBD = Central Business District

located near the central area to maximize accessibility by public transport. The designated 40 acre site is large enough to accommodate nursing and medical school which would be part of this complex.

To provide primary and secondary medical care in the NFCC, referral hospital have been programmed for each sector centre for maximum accessibility. A site of approximately 6 hectares has been set aside for each referral hospital. In the major satellite city a single referral hospital with approximately 250 beds providing a balance of services.

Table 1: Medical Facilities Allocation

Type of Facilities	Population served	Site size	Rural	Res. districts	Sector Centre	CBD*
Health Clinic	6000-10,000	18 HA	X			
Health Centre	20,000	18 HA		X		
Referral Hospital	200,000-250,000	5.9 HA			X	
Central Hospital Complex	1250 beds	40 HA				X

* CBD = Central Business District

1.2.1 Medical Facility Phasing

The initial facility constructed will be at least a 100 bed hospital designed for easy expansion from 300 to 500 beds as needed (eventually, this facility will become the central medical complex). It would be planned to provide both secondary and tertiary services over the first ten years and to be converted to purely tertiary referral work from that point onward.

As the population of the NFCC and FCT expand, the referral hospitals are proposed for construction similar to the central hospital complex, each of these facilities should have a strong out-patient clinic and each should receive patients for secondary care from a designated set of neighbourhood health centres. The dispersal of referral hospital throughout the city allows a more flexible hospital construction program to accommodate the actual future needs of the population.

Table 1.2: Health Projects Under Construction

S/No	Title of Project	Location	No. of beds	Programme	Remarks
1	Gwagwalada General	Gwagwa Lada	300 beds	80% completion	can be ready for use only time if funds are available
2	Garki I District General Health Centre	Wuse I district	80 beds	80%	almost completed
3	Wuse I District Health Centre	Wuse I District	60 beds	50%	
4	Karu/Nyanya General	Nyanya	30 beds		to be extended from health clinic nearing completion
5	Garki neigbourhood Dispensary	Garki Neighbourhood (B)	15 beds	69%	

Source: Abuja, the making of a new capital city for Nigeria, issued by Federal Capital Development Authority Abuja

1.3.0 Classification/Categories Of Hospital

Hospitals may be classified in three principal ways, according to ownership, usual length of stay of the patients, and type of services provided.

1.3.1 Ownership

Patterns of hospital ownership vary widely from country to country in some countries such as Japan, the majority of hospitals are owned by private business organisations. In Soviet Union all hospitals are owned by the government. In European countries, there is a mixture of church owned, non-profit hospital, government owned hospital and privately-owned hospital. In the United States there are four principal kinds of owners: voluntary non-profit corporations, religious bodies, government agencies, and business bodies. In Nigeria therea re principally the privately owned hospital and government owned hospitals.

1.3.2 **Length of Stay**: Hospitals classified according to usual length of stay of patients are of two types. Long term and short term. There is no sharp line distinction between the two, but generally patients in short-term hospitals stay an average of three weeks or less, while those on long term hospital stay an average of a month or more.

1.3.3 **Type of Service**:

Hospitals according to this classification are either general or special. General hospital may have a wide variety of services, including medical, surgical, obstetrics, pediatric, psychiatric and rehabilitation. They usually accept patients of all ages and with all type of injuries and diseases. Many General hospitals, in addition, have out-patient departments, or clinics as well as emergency ward, extended care services and home care services. Included among the general hospitals are osteopathic hospitals and the military hospitals run by the different branch of the armed forces.

Special hospitals include children's hospitals, maternity hospitals, eye, ear, nose and throat hospitals, cancer hospitals, and mental hospitals.

Certain hospitals are recognized as teaching hospitals, but this is not an official classification because of the differences in definition. In general, a teaching hospital is a large general hospital with full time physicians, medical students interns, residents and offering a wide variety of special services and research programmes.

1.4.0 **Primary, Secondary And Tertiary Care**

Whatever their administrative organisation and however they are financed, all systems of health care delivery comprise a

range of institutions which at least in theory, are graded according to their degree of sophistication and specialisation and the level of care they can provide.

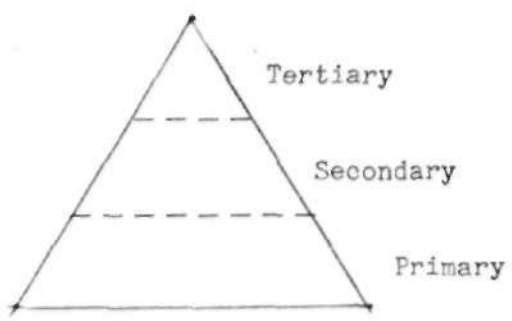


Fig. 1.6 The Health Pyramid

The three main levels can be identified and are usually termed primary, secondary and tertiary. This is called the health pyramid, see Figure 1.6.

1.4.1 **Primary Care**:

At the primary care level are all those health services which are based in the community and relatively accessible to patients. They are at the periphery of the system. These services include preventive health measures such as immunisation programmes, ante-natal and child care, and simple diagnosis and treatment.

1.4.2 **Secondary Care**

At the secondary level is the general hospital, to which

patients from a wide surrounding area or district are referred when necessary by primary care units for more sophisticated diagnosis or treatment "Hospitals are an indispensable part of the provision that is made for health because there will always be a preparation of patients who need the particular skills and equipment that can be concentrated in them and because they are essential centres for medical care and health education and research.

1.4.3 Tertiary care

This includes highly specialised services not normally found at secondary level,including super-specialities such as plastic surgery, and neurosurgery.

1.5.0 Inter-Departmental Traffic In General Hospitals

The traffic in any hospital is likely to be affected by a variety of factors, including size of hospital, size of departments and numbers of patients dealt with: all these reflect policy decisions for the hospital within its region. Traffic will also be affected by the planning of the hospital, the extent of which individual departments are self-contained and the way the work of the department is organised.

The effect of policy and planning on the flow of traffic have shown qualitatively on a number of occasions. For example, some hospitals dispense to outpatients while others issue

prescription, if direct dispensing is done, a subsidiary dispensary may be set up in the outpatient department, or the patients may be required to visit the main pharmacy as they leave the hospital.

Similarly the pathologist may or may not hold consultative clinics within the pathology department, X-ray departments may or may not provide services for local general patients without an intermediary consultant. Patients attending these special departments may have to visit the outpatient department first for reception and registration or a clerk may man a subsidiary reception desk in the individual department. .Traffic is obviously affected by whether the patients go individually to each service point or whether members of the hospital staff bring the paper work to them.

Most wards with between twenty five and thirty five beds, policy and procedures affecting traffic to and from individual wards are much more standardized than those affecting traffic in other types of department. Larger hospitals tend to have more wards than smaller ones, rather than more beds per ward.

Total traffic to and from the operation theatres depends on how many operations there are. Not surprisingly, the number of trips per operation tends to fall as the number of operations per session increases.

In the X-ray departments there are between seven and eight

trips per patient examined, and in physiotherphy departments, just under four trips per patient. Treated Traffic at pharmacy, as already discussed, is very much influenced by the policy of the hospital on dispensing to out patients, and in the pathology department it is influenced by the department. In other cases patient traffic amounts to between two and three trips per patient attending. Large departments tend to have slightly fewer trips per member of staff and small departments slightly more.

Excluding visits by patients to the reception desk, traffic at main records offices amounts to about one trip per hospital bed per eight - hour day and in the medical secretaries offices is rather less than one trip per two hospital beds per day.

Traffic in casualty and out-patient departments depends very much on how complete are the facilities within the department and is likely also to vary with the type of clinic held. The observations made suggest that total traffic may be of the order of eight to ten trips per patient attendance.

1.5.1 The Broad Picture

Detailed picture in any hospital depends on the planning and organisation within it, a broad picture showing four places of particular importance in all hospitals is clearly outlined. These four places, generating the bulk of the hospital traffic, hospital, are the outside of the hospital, the eating places, the

employed, times of meal breaks and the type of facilities provided. Some hospitals may have a large central canteen serving all type of staff - others may have a series of smaller dining-rooms for serving local areas with the hospital or particular grades of staff. Light refreshment. Facilities in the form of cafeteria, vending machines and so on are usually provided in the outpatient department and these may also be used by staff working in their vicinity. Inpatients usually eat within individual wards from a central kitchen, and tea often being prepared in the ward kitchen.

The special clinics held may vary from one hospital to another, and the extent to which patients attend a particular clinic may have to visit other parts of the hospital for diagnostic tests or treatments depend partly upon the nature of the clinic.

Medical and professional staff working in the outpatient department usually remain there for the complete session, their journeys to and from it are thus to report for duty or to go to and from meals. Porters and other staff may, however, make special collection and delivery trips between, the out patient department and the various medical service departments or offices.

In wards traffic is of course likely to be heaviest at visiting hours. Most general hospitals still have fixed visiting

periods of half to one hour on some afternoons and some evenings on week days there will probably be about one visitor per bed in evening periods. Weekends are likely to attract more visitors. Most of them go directly from hospital entrance to appropriate ward without visiting other places en-route.

Nurses as might be expected figure prominently in the traffic in wards making about one-quarter of all trips. More of half of these are to go to or from meals or to report on or off duty, the nurses other trips are mostly to escort services departments or adjacent wards. Doctors' visits are often arranged as ward rounds in which the people concerned proceed from one ward to the next.

Although all traffic in wards is caused by the presence of patients, the patients themselves figure only to a small extent on the average, they spend about two weeks in hospital. During this time they rarely leave the ward except when taken to the operating theatre, x-ray or physiotherapy departments for treatment and examination.

Chapter 2

2.0 METHODS IN PATIENT CARE

The primary function of the General Hospital is to care for the sick and injured. Thus the understanding of the methods of transfering this hospital care to the sick is of vital importance to the architect who takes the task of planning medical facilities.

During the patient's stay in the hospital he spends his time within the nursing units he is assigned to. He may make occasional visits to other diagnostic or therapeutic departments for certain investigations or therapy. He later returns to the nursing unit for further treatment.

Patients are traditionally grouped according to the services provided by the hospital. Patients needing surgical services are thus assigned to a surgical nursing unit under the care of nurses who will be responsible for their basic human needs as well as their hospital treatment and observation. The nursing units also separate patients according to sex and age. It is logical to note that the patients in a nursing unit do not need the same level of care. Some will need more nursing attention and treatment than others according to their degree of sickness. It is therefore wasteful for a bed which is surrounded by expensive equipment and personnel needed for a critically sick

patient.

"F. Abdelah states that a nursing technique based on the total 'patient needs' may be helpful to both acutely and chronically ill patients"[1]. The approach to the "Total Patient Needs" is expressed in terms of progressive patient care.

Thus to see the deficiencies of the conventional nursing unit, the progressive patient care concept is developed. The concept aims at tailoring all hospital services to meet the patient's needs, and to place the right patient in the right bed with the right services at the right time in order to

- satisfy the patient of his human needs and the needs due to his condition.
- organise staff movement which will result in their being more productive.
- Economically run the institution in terms of space and equipment usage.

"The classification of patient care according to progressive patient care makes the General Hospital a sort of community health centre consisting of"[2]

1. Intensive care unit
2. Intermediate care unit
3. Long term care
4. Self-care

KASHIM IBRAHIM LIBRARY

5. Home care.

Having classified patients into above categories of care, let us now consider each of these elements and see how the architect can contribute to achieve the concepts objective.

2.0.1 Intensive Care Unit

For critically and seriously ill patients who are unable to communicate their needs or who require extensive nursing care and observation by nurses who have been selected because of their special skills, training and experience. All necessary life saving emergency equipment, drugs, and supplies are immediately available.

Mr. Craig James in this study on intensive care unit in General Hospitals;in Canadian Hospital Jan. 1962 suggests three locations of this unit.

- As part of the active nursing unit.
- As a separate nursing unit with separate staff nursing station.
- As an adjunct to the surgical suite

Except in special cases of burns, pneumonia or special surgery who may need isolation to prevent infection of wounded areas or them infecting others, both surgical and medical cases could be treated here. Patients should be moved to intermediate care unit as soon as intensive care is not needed.

"Massaud A. A.suggests the location of this unit adjacent to emergency and recovery room of the surgical suite"[3].

2.0.2 **Intermediate Care**

This section of the progressive partient care for patients who are beginning to recover from their illness. The patients here are semi-ambulatory and therefore require a moderate amount of care from the nurses. They do not need most of the sophisticated equipment needed by those in the intensive care unit. A patient in the unit may be admitted either directly from the admission office or as a transfer from an intensive care unit.

Since patients here are beginning to participate in caring for themselves, the design of the unit should as much as possible give them the opportunity to care for themselves at least of their basic human needs.

3.0.3 **Self-Care**

The patients here are ambulatory and physiologically able to look after themselves. All they often need is nursing care in repect of medication, observation, special diets or other treatments, or investigations requiring dose control by nurses. Patients in this unit should be encouraged to do all they are capable of doing for themselves. The patient should be instructed by the nursing or other appropriate staff on how to

meet most of his needs including, taking medication, selecting his diet, etc. Such help gives the patient emotional support for the return to his normal home environment. "Ambulatory patients wish to experience an increasingly active life, but they disturb the bed ridden patients by moving up and down. A day space should be provided for these patients at the rate of $0.75m^2$ per patient"[3]

2.0.4 Long Term Care

The long term care category of patients include those requiring constant medical or nursing care. They normally require the services of a physical medicine or rehabilitation. In the physical medicine department the long term care patients are instructed on how to learn to adjust themselves to their illness or disability. Such patients include diabetic patients who need diabetic regulation, fitting of prosthesis and learning how to use it.

When the patient's condition improves, he may be transferred to a self-care or home care program after discharge. "Beds in this unit should be kept at best 12m apart with a minimum clearance of at least 90cm between the beds and adjacent wall space between bed ends should be 1.5m"[4]

2.0.5 Home Care

This is a program organised for patient who can be cared for in the home through visits to the hospital departments by extension of certain hospital services. In most cases, the extended care reaches the patient while at home. The hospital provides equipment and personnel who go round the homes to attend to the sick. This type of care compares favourably with the high cost of keeping a patient in the hospital. However its implimentation greatly depends on the home environment.

The architectural physical provision to such a care in the General Hospital is nothing more than an office for the coordinator and storage space for supplies. The equipment required will be provided by the departments involved. This method of patient care is not practised in Nigeria.

2.1.0 The Patient Care Units

The patient care unit being the building where the hospitalised patient is accommodated from admission to discharge is considered as one of the most important units in the hospital, seconded only by the diagnostic and therapeutic facilities.

The General Hospital patient care is divided by services. The total bed requirement of the hospital is divided into bed requirements for medical, surgical, obstetrics and paediatric patient care units. The World Health Organisation recommends the

following distribution of beds

Medical Nursing unit	24%
Surgical Nursing unit	33%
Obstetrical nursing unit	15%
Peadiatrics nursing unit	19%
Others	9%
	100%

Some General Hospitals provide a nursing unit for psychiatric patients. Nursing units (wards are further categorised into male and female wards and within each ward there are isolation rooms for patients requiring special treatment.

2.1.1 Planning Considerations

The size of the nursing unit is determined by the nurses ability to care and observation and the head nurses' ability to supervise the nurses working in the unit and the number of patients under her control. "Planning specialists put the census of patients that can be accommodated in any nursing unit at between 30-45 or less"[5]

> "Some nursing authority reason that the smaller the unit the most intimate the nursing service, others argue that the size of the nursing unit has nothing to do with the quality of nursing"[6]

The author believes that the size of the nursing unit should be limited and that because of the above reasons the following number of patients should be a maximum of 30-35

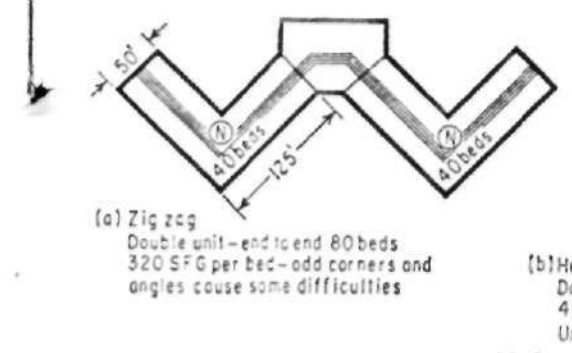
- possibility of cross infection is more likely in a large group of patients.

- A larger figure generates noise problem which will add to the discomfort of the patients.

2.1.2 Plan Shape

The prime consideration here is the distance from the most remote bed in the unit to the nurses station for reasons of observability and travel. This distance should not exceed 30m and a better design figure is 25m to reduce the nurses travel distance. In connection with this "test were made at Yale University, School of Public Health to determine the relative nursing efficiency of various plan shapes by measuring the distance from the nurses station to the patient room and the frequency of nursing trips for each plan"[7]. see (Figure 2.1).

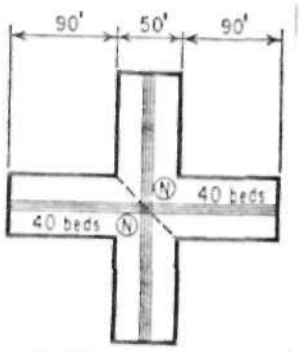
Various forms have been tried and some have been used in many hospitals in the world. Each plan shape as to be studied before being adopted. The structure of the nursing unit or any other facility should be determined with the following considerations in mind.



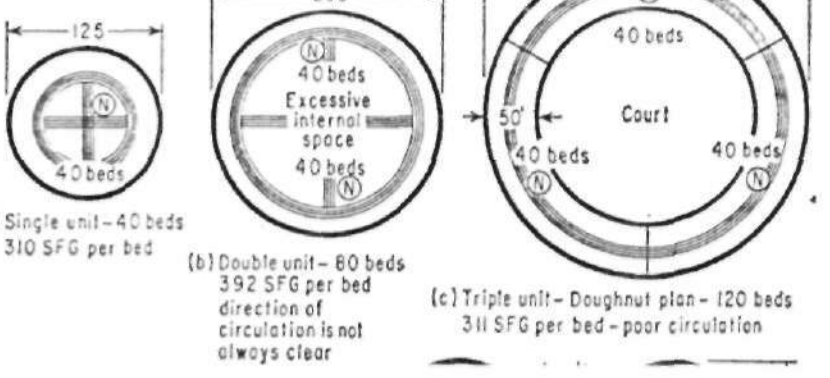
(a) Zig zag
Double unit – end to end 80 beds
320 SFG per bed – odd corners and angles cause some difficulties

(b) Hexagon
Double unit – 80 beds
450 SFG per bed
Undesirable

Odd shapes.



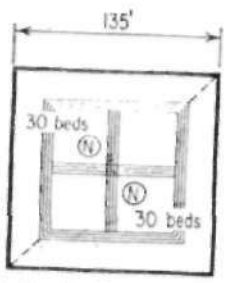
Double unit – 80 beds
256 SFG per bed
Economical to operate



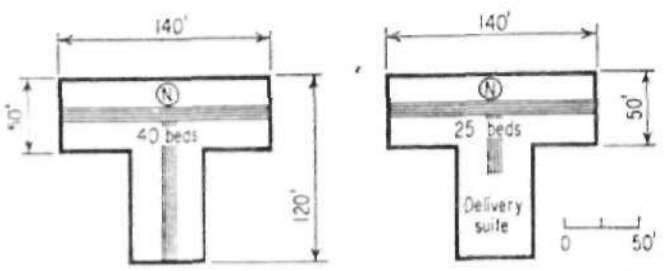
(a) Single unit – 40 beds
310 SFG per bed

(b) Double unit – 80 beds
392 SFG per bed
direction of circulation is not always clear

(c) Triple unit – Doughnut plan – 120 beds
311 SFG per bed – poor circulation



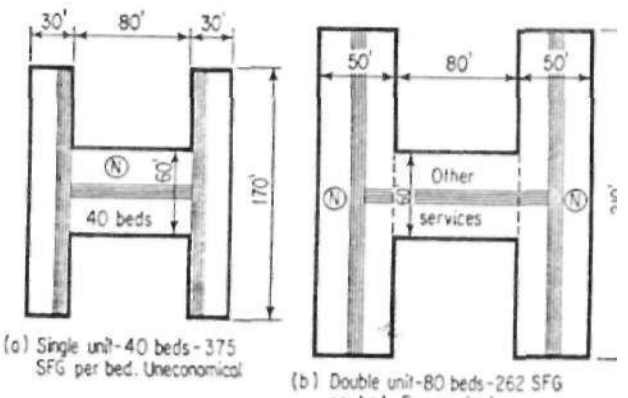
Double unit – 60 beds – 305 SFG per bed. Core satisfactory. The square plan is not easily expanded



(a) Single unit – 40 beds – 263 SFG per bed – circulation good

(b) Single unit – 25 beds plus delivery
280 SFG per bed

The T-shaped plan.



(a) Single unit – 40 beds – 375 SFG per bed. Uneconomical

(b) Double unit – 80 beds – 262 SFG per bed. Economical

FIG 2.1.

PLAN SHAPES OF NURSING UNITS.

- climate
- cost of construction and maintenance
- Architectural aesthetics
- site topography
- Expansion possibilities
- Relationship with other departments

2.2.0 Nursing Unit Distribution by Services

2.2.1 Medical Nursing Unit

The medical nursing unit is where patients with cases of medical nature are accommodated. Medical cases include cardiology, pulmonary, metabolism, dermatology, etc. Medical patient use the diagnostic aids of laboratory, x-ray and therapebutic aids of physical medicine more often than the patient in other nursing units. The patient is often admitted without a complete knowledge of his disease. It is while he is in the hosptial bed that tests and other investigations are made to identify the nature of his disease. The location of this unit near the diagnostic and therapeutic facilities is very important in order to reduce the distance of travel for staff and patients.

The patients here have a longer stay in the hospital because of the time required for tests or medical examination. Special attention should therefore be given to medication space in this unit.

2.2.2 Surgical Nursing Unit

This unit houses patients that have undergone or are going to undergo surgery. This may be minor such as appendicitis or a major operation such as a transplant. The pattern of traffic from this nursing unit goes to the surgical suite, emergency department, central sterile supplies and the diagnostic and therapeutic facilities. Apart from basic supporting service rooms, this unit requires

- a surgical treatment room for surgical dressing and minor corrective work, this takes the place of the examining room in this unit.
- a storage space for orthopaedic frames

2.2.3 Maternity or Obstetric Nursing Unit

Expecting mothers and new mothers with their new born babies are accommodated in this nursing unit. The unit is most related to the obstetrical delivery suite and surgical operating suite, and other diagnostic and treatment facilities. The unit relation to the surgical suite depends on where cesaerian sections are done. Tood Wheeler wrote: "An important factor in planning is the policy as to whether cesarean sections are to be done in the delivery room or surgery"[8]

Unlike most other departments of the hospital the maternity department is normally concerned with a natural rather than a

pathological event. It is also dealing with a continuous process, from pregnancy through delivery to after-care of both mother and child. It is not principally concerned with curing a condition but fulfilling it. Thus not only are its accommodation requirements different from those of other wards but it is important that it should not be associated psychologically with illness.

For this reason, and to avoid risks of infection to newly born babies, it is greatly preferred if the maternity department can to some degree be separated from the rest of the hospital, perhaps not geographically but certainly with its own entrance. It should retain also communication links with the hospital meals and supplies and reasonable links with other departments to which mothers may sometime need access.

Whatever its size the department has two main parts; the out-patient clinic and the accommodation for in-patient delivery and aftercare. The clinic, which may be associated with the out-patients department or may be separate, is primarily ante-natal.

Ante-natal patients are usually seen at the time of booking, at about the thirty sixth week of pregnancy and then weekly until admission for delivery. This clinic will preferably be approached separately from the department's ambulance entrance, and the accommodation will comprise a writing space, rooms for history taking and examination with three or four undressing cubicles to each room, a urine testing rooms and

lavatory, and space for office, and records. Easy access to the X-ray department and to pathology is an advantage.

The in-patient accommodation falls into two closely related divisions, one concerned with labour and birth and the other with the lying-in-wards. The labour suite should be accessible without passing through the wards.

Two types of patients are accommodated in this nursing units namely, the mothers and the new born babies. It is due to this factor that some supporting services which are not required in the other nursing units are required in this unit. Such services are:

- Nurses
- Instruction class for mothers

2.2.4 **Nurseries**

There are two types of nursery layouts:

(a) **Centralized Nursery**

In this type of nursery all infants are accommodated centrally away from their mothers. The infant may be taken from time to time to their mothers in their bassinets for feeding. "The provision is that each nursery shall have 2.3 to 2.8m^2 space per bassinet and that no more than 8-10 infants be placed in one nursery for the following reasons"[9].

- to discourage spread of infection
- A nurse can only effectively care for 8 infants. (Fig. 2.2)

(b) Decentralised Nurseries

Here, the nursery is broken into smaller groups of infants, with their services immediately adjoining their mothers rooms. (Fig. 2.3).

Advantages

- The infants do not have to be carried great distances through the corridor.

Disadvantages

- High cost due to a larger total number of bassinets.
- Visitors will tend to enter nurseries.
- Proximity of the nursery to the mother will enable the mother to have the baby with her for almost all her waking time, increases the chances of infection.

Provision should be made for isolation and premature infants. "Some authorities believe that premature infants should be removed to the paediatrics nursing unit on birth and presumably there should be the premature nursery anywhere in the

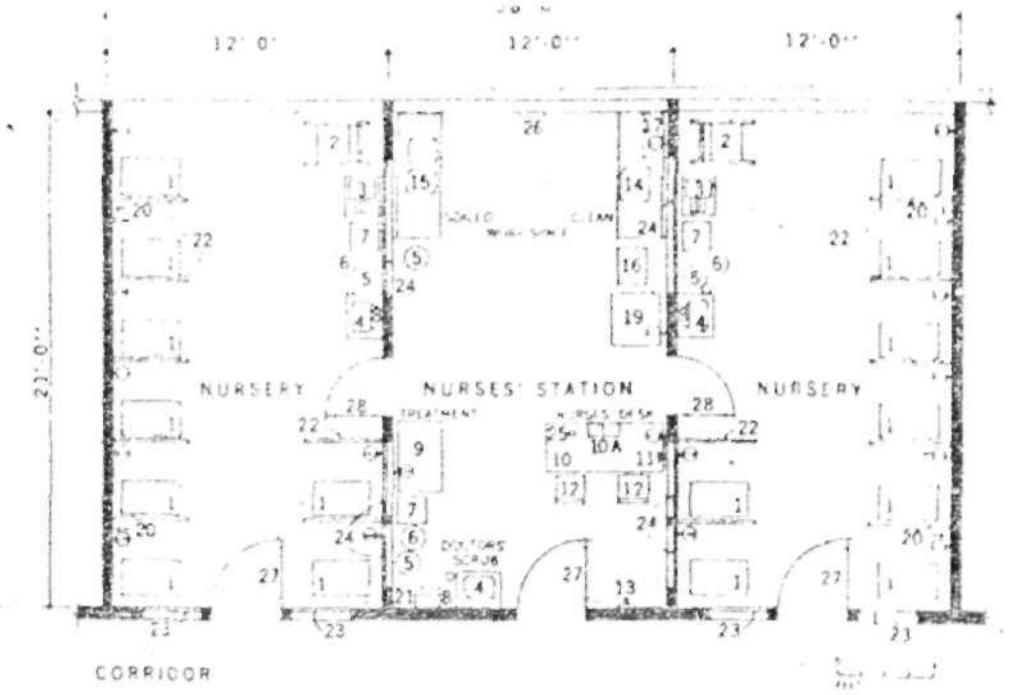


Figure 6. Detailed plan for two 8-bassinet full-term nurseries, with nurses' station between.

LEGEND

1. Bassinet with cabinet and pullout shelf below, on 3-inch ball-bearing casters, with wheel lock.
2. Rocking chair with armrests and washable finish.
3. Utility table, 16" x 20", with top drawer to hold infant scales.
4. Lavatory, 18" x 22", with gooseneck spout and knee or foot controls, splash cover.
5. Waste receptacle, foot-controlled cover, removable waxed liner.
6. Soiled diaper receptacle, foot-controlled cover, removable waxed liner.
7. Soiled linen hamper on 3-inch ball-bearing casters, removable waxed liner, foot-controlled cover.
8. Paper towel dispenser and waste can.
9. Treatment table, 24" x 36" x 36" high, on 3-inch ball-bearing casters with wheel lock.
10. Nurse's desk, 30" high.
10A. Chart rack.
11. Telephone outlet.
12. Office chair, swivel, without arms.
13. Bookstrip.
14. Double compartment sink with gooseneck spout and knee or foot controls, in counter 36 inches high.
15. Bottle warmer on portable carriage.
16. Wall cabinet.
17. Incubator, on 3-inch ball-bearing casters with wheel lock.
18. Refrigerator, with built-in thermometer.
19. Double oxygen outlet.
20. Shelves (three), starting 4½ inches above floor, for clean gowns, supplies.
21. Cubicle partition, starting 42 inches above floor, with 2-foot high clear glass or plastic panel, wall- and ceiling-hung metal frame.
22. Clear wire-glass view panel in steel frame, 1296 square inch maximum, bottom 42 inches above floor.
23. Clear plate-glass or plastic view panel, bottom 42 inches above floor.
24. Hand-wind clock, desk type.
25. Electric clock.
26. Door with upper panel of wire glass.
27. Door with upper panel of clear glass.

FIGURE 22 CENTRALIZED NURSERY UNIT

(c) Instruction Classes For Mothers

These are classrooms provided to educate the mothers in infant care e.g. the preparation of the infant's formula.

(d) Paediatric Bursing Unit

This nursing unit accommodates children within an age range of 0-21 years. Paediatric patterns follows both the medical and surgical pattern of care with an increasing number of surgical patients.

Since some of the paediatric patients would sleep in cribs, some in bassinets, and some in adult size bed, it becomes essential to adopt a flexible room design, in order to replace cribs for adult sized beds in cases of need. The folllwing bed distribution of the total is recommended for the pediatric nursing unit.

bassinet	20%
cribs	40%
Beds	40%

The need to accommodate mothers overnight in some cases should be given consideration since sick children require the presence of their parents.

Planning Principles

1. The paediatric nursing unit should not be as large as an

maternity section for the following reasons"[10].

1. The care of premature infants generally comes under the direction of the paediatrician.
2. It is easier to care for such infants there, as the paediatrics department has already got infant services.

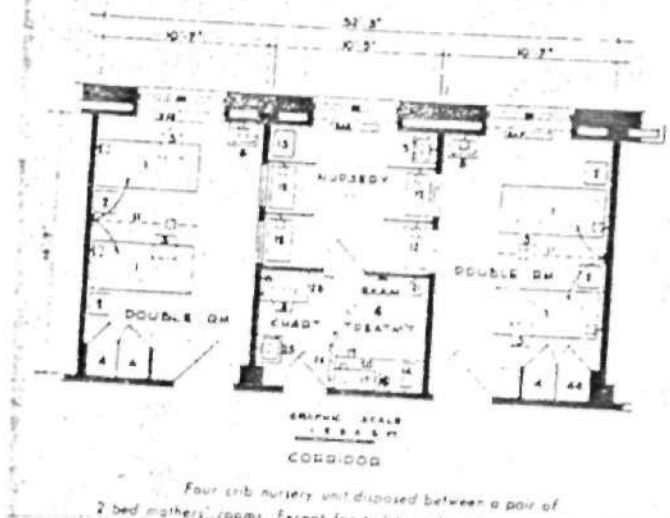
It is the author's opinion that premature infants be kept within the delivery suite after birth because such infants should not be moved far after birth.

> "... Incubator (premature babies would be better housed in a separate nursery as close to the delivery suite as possible. They should be grouped in four preferably a nurse should not be obliged to care for more than that number of premature infants because they require much closer attention than do normal babies ..."[11]

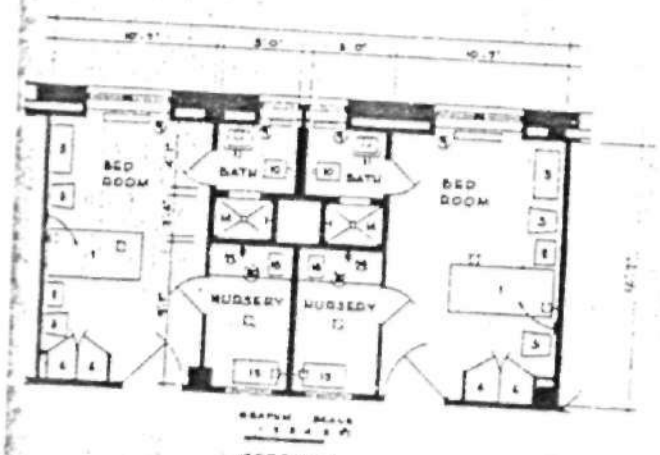
Nursery provision include:

- small examination room into which the infants can be carried or passed by the nurse without the doctor passing through the nursery.
- small workroom adjoining the examination rooms and accessible from the nursery. It is through this room that the nurse gets access into the nursery and prepare infants formula.

In addition to the normal nursery, there must be at least two and preferably far isolation bassinets for babies with known or suspected infection.



BEDROOM (EACH)—1. Bed. 2. Bedside stand. 3. Straight chair. 4. Locker unit. 5. Lavatory. 11. Curtained NURSERY—5. Lavatory. 12. Bassinet unit. 13. Table for scales. EXAMINATION AND TREATMENT ROOM—16. Sink, counter type. 17. Cabinets over counter. 18. Electric hot plate. 19. Instrument sterilizer. 20. Refrigerator under counter. 21. Linen hamper. CHART ROOM—3. Straight chair. 23. Desk. 25. Lavatory. 26. Floor strip.



Four crib nursery unit disposed between a pair of 2 bed mothers' rooms. Except for toilets and communicating doors, this type proved to be the most popular (see photo on page 137). "Nurseries Designed for Modern Maternity."

BEDROOM (EACH)—1. Bed. 2. Bedside stand. 3. Armchair. 5. Dresser. 6. Locker unit. 9. Waste receptacle. BATH (EACH—9. Waste receptacle. 10. Water closet. 11. Lavatory ... by 18 inches. 14. Shower. NURSERY (EACH)—15. Bassinet unit. 18. Sink. 19. Electric hot plate. 20. Sanitary waste receptacle.

Private room, bath, and nursery. "Nurseries Designed for Modern Maternity."

DECENTRALISED NURSERY. FIG. 2.3

adult unit, since children need more care.

2. Every bed should be separated by a partition. This is on the assumption that every child is a potential carrier of disease that could be transmitted to another child. The partition should extend to the floor and ceiling. This precaution according to Isadore Rosenfield is necessary to prevent children passing toys or other objects to each other and in order to create at least a partial physical barrier to airborne bacteria.
3. There should be an observation section which is used to house new admissions until they are fully diagnosed. This again on the assumption that every child is a potential carrier of some kind of communicable disease.
4. All partitions should be glazed. To be happy the children must at least be able to see each other and exchange smiles if nothing else.
5. Sufficient floor area should be given to each patient for toys, small table, chairs, etc.
6. A play room and an outdoor play terrace should be provided. These are necessary features for convalescent children. In larger children institution it could be desirable to add a classroom and a shop"[13]

The paediatrics nursing unit should be located in an area away from possible sources of infection because of the nature of children. However, Massoud, A. A. in his book 'Hospital

Architecture' writes that

> "... it is not preferable to have the children's patient care unit adjoining a womens obstetric nursing unit because of risk of infecting the new born.

The author agrees with Mr. Massaud's view, because the unit can be located by a medical women's unit.

The paediatrics nursing unit being a medical-surgical nursing unit for children, requires the servies of all the adjunct diagnostic and therapeutic facilities and supporting services of the central supply store, kitchen, pharmacy and general stores should therefore be linked to these facilities.

2.30 Design Components Of The Nursing Unit

2.31 The Patient Bedrooms

It is the focus of the hospital service and that of the patient's life at a time when his condition exaggerates the effect of every detail of environment. There is no multi-purpose bedroom space in the hospital more demanding in its design requirements than the patients bedroom. It serves as his bedroom, his visitors reception, dining room, treatment room, etc. The patient's bedroom would be analysed under the following headings.

2.32 Bedroom Size

This is determined by the number of beds in the room.

Apart from the popular open ward size patient ward, recent developments have brought into being the one bed and multiple bed patient bedrooms. The most popular of the multiple bedroom are 12 bedrooms, 4 bedroom and 6 bedroom. The traditional open ward has the following advantages.

- ample visibility of patients
- good cross ventilation
- low cost of construction and maintenance
- more accommodation per floor area.

It also has the following disadvantages

- lack of privacy
- high chances of cross-infection
- noise
- Difficulty in controlling climatic conditions to suitall patients.

Privacy is a very important factor in the design of the patient bedroom. Gainsborough, H. and Gainsborough, J. - stressed this in their book "Principle of Hospital Design, by pointing out that a patient in an open ward might not give a comprehensive medical history since he is aware that the patient in the next bed, with his nose buried in his book has his ears tuned into all that is said.

The distribution of beds into one-bed and multiple-bed rooms depends on

- The level of privary required
- The provision for isolation needed
- Flexibility
- Construction and running cost
- Economy in space usage.

The one bed room is ideal when it comes to privacy, isolation or flexibility. Patients requiring isolation can only be effectively isolated if they occupy a one bed room. The main problem of the one bed room is its economy. It is obvious that a non-profit oriented hospital cannot afford it.

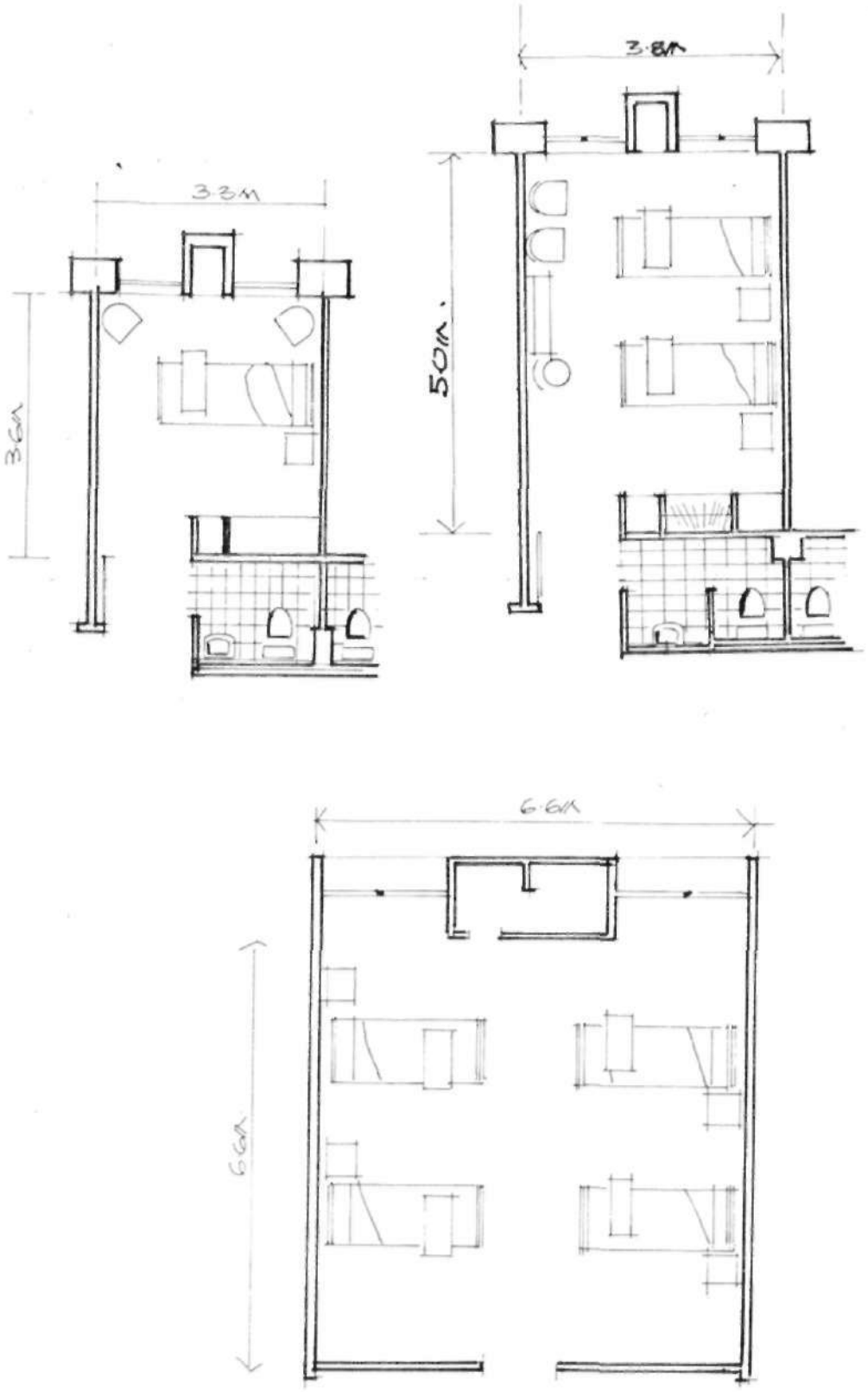
Two bed and six bed rooms has the problem of two patients who may not like to live together. The six bedroom type has a tendency of being more like an open ward.

The most compromising in all aspects is the four bedroom. It is a better social unit each patient has his corner especially when the door is centrally placed. The depth and arrangement of four bed-room allow. Sufficient natural light to reach the remotest bed from the window wall and at the same time eliminate glare. (Fig. 2.4) shows some bedroom sizes and layout.

2.3.3 Beds Layout

The bed is the most important unit of the patient bedroom. It must be designed to support the patient in a sitting as well

FIG. 2·4·



I

NURSING UNITS BEDROOMS LAYOUT

as reclining position. Numerous devices are attached to the patient bed. These include side tails, frames for suspension of an arm or leg in a cast or for traction, a shelf at the foot for books and flowers, a ring for soiled linen bag, etc. Other furnishing are a bed side table, an overbed table, a dresser and chair (Fig. 2.5).

Types of bed layout

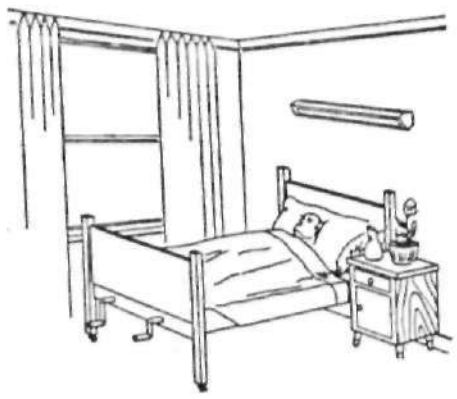
(a) Nightingale's Open Ward Layout

In the Nigtingale's open ward, the wards were designed to accommodate 30-40 patients, with the beds so arranged that the head of the patient is against the external window wall. The construction method provides a window for each patient's bed. The patient, when he glances either side, sees a glaring window and cannot possibly do otherwise because of the nature of the bed arrangement. The only way he can escape from this hardship is by lying on his stomach which he may not be able to do because of his nature.

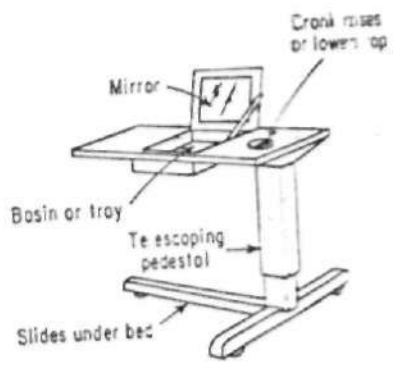
(b) Rigs Ward Layout

39997G

Many of the difficulties of the perimeter of Nightingales ward are overcome by the Rigs ward. It is named after the Rigs Hospital of copenhagen, Denmark, where it was first built. The beds are arranged such that the beds of the patients are against partition walls subdividing the open ward into bays. In the original Rigs Hospital, beds were grouped in semi-private groups



The patient's world centers in the bed.



The overbed table

FIG. 2.5
THE PATIENTS BED SIDE

of four. With this arrangement the patient is able to turn his head away from the window at will.

Area per Bed-room

The actual sizes of the patient bedrooms are obtained from the determined number of beds required. Time Saver Standard gives the sizes for the various types of bedroom as:

- single bedroom - 10.87 - 15m^2
- two bed-room - 14-59 - 19.51m^2
- Four-bed room - 28.61 - 37.25 m^2

Major differences are found in depths from inside of external wall to room side of corridor partition

- single-bedroom - 4.400m
- two-bed room - 4.572m
- Four-bed room - 6.604m

"The width of single and double rooms is 3.5m max. or less depending on furniture requirement"[14].

Generally to determine the size of bed-room, a schematic layout of the room should be made with the various furniture required. This will give a better reliable space size rather than relying on standards. However an accepted area per bed of 7.5m^2 can be used for calculation of sizes of rooms bigger than one-bed room. For single rooms area is between 9.3m^2 - 11.15m^2.

of four. With this arrangement the patient is able to turn his head away from the window at will.

Area per Bed-room

The actual sizes of the patient bedrooms are obtained from the determined number of beds required. Time Saver Standard gives the sizes for the various types of bedroom as:

- single bedroom - 10.87 - 15m^2
- two bed-room - 14-59 - 19.51m^2
- Four-bed room - 28.61 - 37.25 m^2.

Major differences are found in depths from inside of external wall to room side of corridor partition

- single-bedroom - 4.400m
- two-bed room - 4.572m
- Four-bed room - 6.504m

"The width of single and double rooms is 3.5m max. or less depending on furniture requirement"[14].

Generally to determine the size of bed-room, a schematic layout of the room should be made with the various furniture required. This will give a better reliable space size rather than relying on standards. However an accepted area per bed of 7.5m^2 can be used for calculation of sizes of rooms bigger than one-bed room. For single rooms area is between 9.3m^2 - 11.15m^2.

These areas exclude the required provision for toilet.

2.3.4 The Nurses' Station

This is the working and control centre of the nursing unit. All patients' medical records are kept here. In addition to its medical function; the nurses' station controls the movement of visitors and handling all patients correspondence while in the unit. The station should be centrally located near the main entrance for control of all public movement into the unit. Design should allow for easy nursing observation and access to the various patients rooms. Facilities include-control desk, charting desk and nurses lockers and toilet.

2.3.5 Medication Room

This is normally an integral part of the nurses station because of the nurses' frequent use. It can be a small alcove with shelves for keeping medication and a counter for preparation of all medicines before they are taken to the patients' rooms.

2.3.6 Sister's Office

This is the head nurse attached to the nursing unit office. Her function is to supervise all the activities at the nurses station and the unit in general. The room could be used for small group conferences between staff members. The location is best as an integral part of the nurses station or very near to

it.

2.3.7 Examination and Treatment Room

This is necessary for procedures which cannot be done in the patient's room such as surgical dressings. The room should be designed to take one standard treatment table, and should contain a stool; two treatment trolleys, a standard inspection lamp and lab basin. Filled with elbow operated tops. The doors should be high and whole and the room size should not be less than $7m^2$.

2.3.8 Utility Room

This is usually divided into clean and solid areas. Here is disposed all bulky waste not taken care of in the patients' toilet. Soiled linen and rubbish carts are stored here before taken out of the unit. On the clean side are the storage carts or shelves for clean linen or other supplies except drugs and food. The room should adjoin the examination and treatment room with a window connecting the dirty side and the treatment room. $20m^2$ of space is enough for this room.

3.3.9 Floor kitchen or pantry

This should be easily accessible from the central kitchen. The food will be received in heated containers from the central

kitchen and will be distributed from here on trays. Trays will later be returned to the central kitchen for cleaning.

2.3.10 **Test Room**

The room is for carrying out minor investigations like urine, or blood test. An alcove in the doctors room can be used for this purpose. In the author's view all laboratory investigations should be carried out in the central laboratory. However, the room can be used for taking specimens.

2.3.11 **Toilets And Bathrooms**

A toilet and bathroom equipped with a W.C. a shower and wash hand basin should be provided for each patient bedroom. Each shower room should be a minimum area of $1.0m^2$. Special attention should be given to clearances and to provide hand rails and grab bars as aid to the faltering patient. All doors should swing out to permit access should a partient faint and fall against it.

Other requirements of the nursing unit includes day room for patients, a small waiting space for visitors, and a storage space for wheel chairs and stretchers and a janitors closet.

REFERENCES

1. Ekistics Journal Volume 31 number 186, May 1971, page 372-375,
2. Gainsborough and Gainsborough J. Principles of Hospital Design page 63.
3. Massoud, A. A. - The General Hospital as an Architectural organism page 29.
3. Neufert - Architects data - page 166-177
4. Massoud, A. A. The General Hospital as an Architectural organism page 33
5. USPHS Publication - Extracted by Massoud, A. A., in his - The General Hospital as an Architectural organism, page 37.
6. Isadore Roson Fiedl - Hospital Intergrate Design, page 58.
7. E. Todd Wheeler - Hospital Design and function 1964 p 72.
8. Hospital design and Function, E. Tood Wheeler, Mc Graw Hill Book Co. page 50
9. E. Todd Wheeler - Hospital Design and function page 108.
10. Isador Rosen Field - Hospital-Integrated Design page 183.
11. Isadore Rosenfield - Hospital - Integrated Design p. 64.
13. Massoud, A. A. The General Hospital as an Architectural organism page 49.
14. Calender-time saver standard-hospital paper 1156.

Chapter 3

3.0 DIAGNOSTIC AND THERAPEUTIC DEPARTMENTS

The diagnostic and therapeutic departments can be referred to as the workshop or laboratory of the physician. A significant part of patient care is given by this department which include the out patient department, the emergency department, the pharmacy, the radiology, the pathology, the physical medicine and the theatre.

In some hospitals these departments receive patients by reference from other hospitals and clinics in the community, particularly for special services not available locally. Each department in this section is treated in detail and design requirements with functional relationships with other departments studied.

3.1.0 The Out Patient Department

The function of the department is to diagnose and treat home based patients and if necessary to accept them as inpatient Hospital beds are expensive and cannot be supplied to all those that need diagnosis and treatment in a hospital. The hospital out-patient department is defined as:

> "that section of the hospital with alloted physical facilities regularly schemed hours, and personnel in sufficient numbers assigned for established hours, to provide for care of patients who are not registered as in patients receiving physician, dentist or allied service"[1].

The above definition clearly shows how the out-patient care division opposes the in-patient care services from an organisation structure point of view.

The out-patient department (OPD) is often a patient's first introduction to a hospital except where a patient comes through the emergency unit. Thus the department should be located at the main entrance to the hospital. It should be conveniently associated with the hospital diagnostic and therapeutic facilities like the pathology department, the radiology department, physical medicine department, pharmacy, etc. It also requires allowance for future expansion because of the growing need of immediate medical consultation by the community.

The functions of the out patient department are three in number; Education, prevention, and diagnosis and treatment. Health education and preventive care are offered through teaching and taking adequate medical measures towards preventing preventable diseases.

There are basically three categories of out patients:

- General out patients
- Referred out patients

- Emergency out patients

3.1.1 **General Outpatient** - is a person given diagnostic or therapeutic services, on an outpatient basis, for other than emergency, conditions, and who has not been directly referred for such services by his attending physician.

3.1.2 **Referred Outpatient** - is a person directly referred by his attending medical practitioner for specific diagnostic or treatment procedure, for other than emergency condition.

3.1.3 **Emergency Outpatient** - is a person given outpatient emergency or traumatic care, for conditions determined clinically as requiring immediate physician's attention.

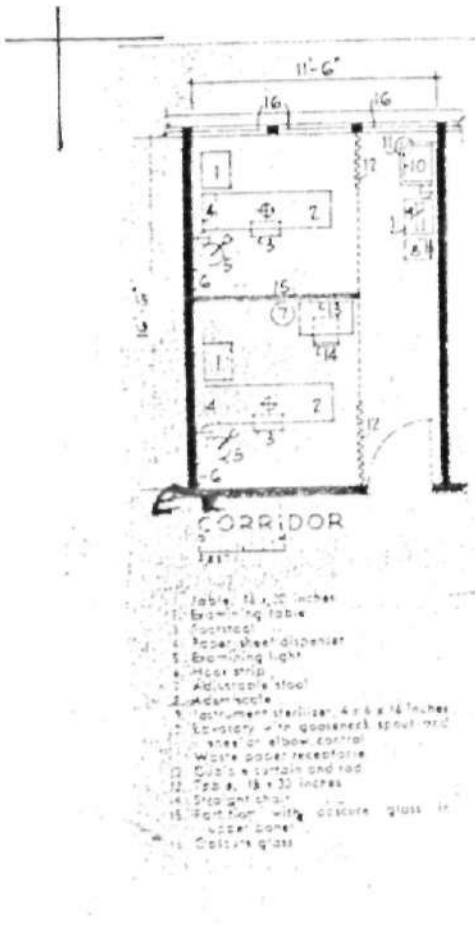
3.1.4 **Outpatient Clinics** - In accordance with the different types of diseases, the OPD offers diagnostic and treatment services in the following clinics.

- General Medical
- General surgical
- Dermatology
- Maternity
- Paediatrics
- Eye Clinic
- Ear, nose and throat (ENT)
- Gynaecology
- Orthopaedic

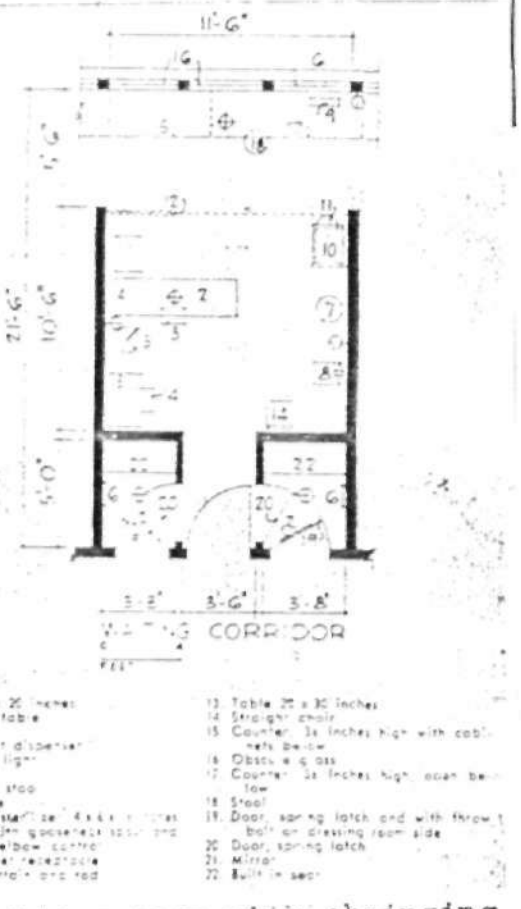
- Immunization
- Dental

The elements of this department are:

- Reception and waiting facilities
- consulting and examination rooms
- Special clinics for opthalmology, ENT, Dentistry, etc.
- Reception and waiting facilities - the reception should be the main entrance hall of the department. All registrations and record facilities will be accommodated here. It is better, apart from the main waiting hall, to have decentralized waiting spaces adjoining the various clinics.
- Consulting and examination rooms - these are the actual diagnostic rooms where the doctor attends the patient. Some hospitals provide separate consulting and examination room while others could use one room for both, however it is solely economic. (Fig. 31).
- Treatment rooms - these are for surgical treatment (wound dressing) and injections. The rooms should also be close to consulting rooms for easy movement of patients. For layout and equipment of these rooms see (Fig. 3.2).
- Special clinics - some special clinics require specially planned rooms because of sophisticated equipment used and the diagnostic procedure. An eye clinic requires adjoining the examination room, a darkroom for diagnosis of certain cases. A refractionist room could be used for

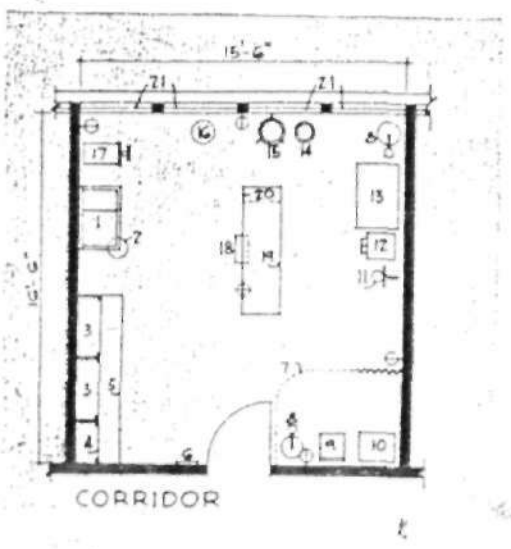


Consulting/Exam room



Consulting room with chainging cubicles

FIG. 3.1



Surgical treatment room

FIGURE 3.2- OUTPATIENT DEPARTMENT SERVICE ROOMS

consultation and vision test. An audiometry room is required in an ENT clinic for measuring the sensitivity of a patients hearing system.

A cyclic pattern of movement is the most suited for the outpatient department (Fig. 3.3). That is a movement which brings one back to where he started. See Fig. 3.3 for flow pattern.

The starting point is the reception and waiting room, through the consulting and treatment room to the dispensary waiting room and then out. It is thus adviseable to have a combination of reception and waiting and the dispensary waiting or at least locate them as close as possible to each other.

3.2.0 The Surgical Operating Suite

It is technically a therapeutic aid in which a team of specialist doctors and trained nurses operate upon a patient. The surgical operating suite serves the admitted surgical cases and those coming in through the emergency department and from time to time consult specialists from the departments of radiology and pathology for advice. Service also come from the central sterile supply department and pharmacy. These requirements determine the location of the suite in relation to other departments. See flow chart in (Fig. 3.4).

Flow patterns for people, services and air with a view of avoiding causes of infection reaching clean areas are crucial.

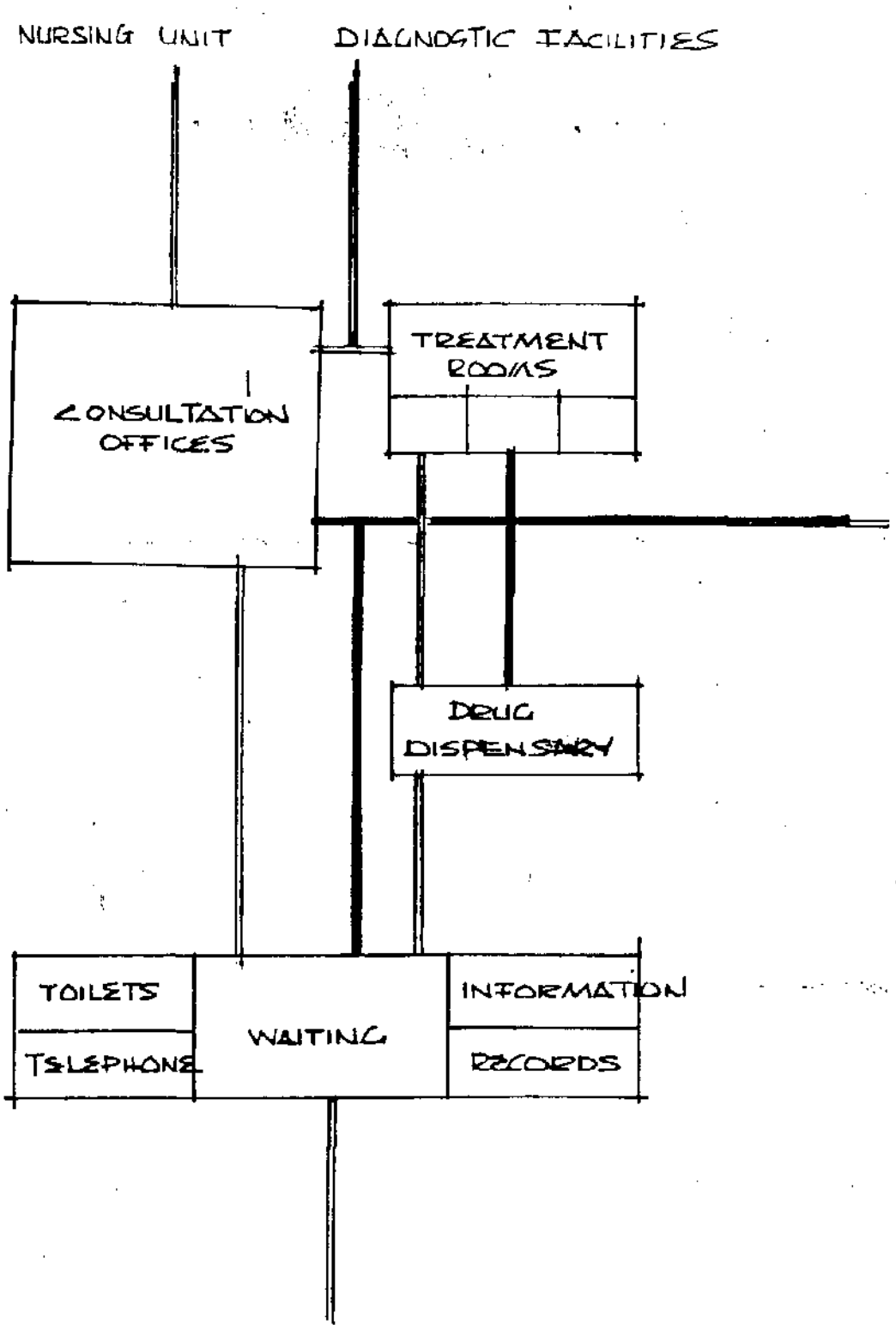


FIG. 3.3
OUTPATIENT DEPARTMENT
FLOW PATTERN

mechanical system of ventilating critical area such as the theatres are prescribed to minimise entry of air-borne contamination. Window attached to the theatres should be avoided, however external view has some psychological benefit to the surgeons minimising the inevitable clinical and highly technical environment of the department.

The department should be intimately, tied to the surgical nursing units and should be located off the main hospital corridor (street).

Size

The size of the surgical suite is determined by the type and number of operations the department expects to handle. The length of time and seriousness of different types of operations varies, which in turn affects the size of the suite.

Types of operations generally handled in general hospitals are both minor and major operations requiring use of anaethesia they include the following.

1. Chest
2. Abdominal
3. Cranial operations
4. orthopaedic operations

Special operations are also done there: these include

5. gynaecological operations

6. caesarean sections
7. cystoscopic operations
8. eye and ENT.

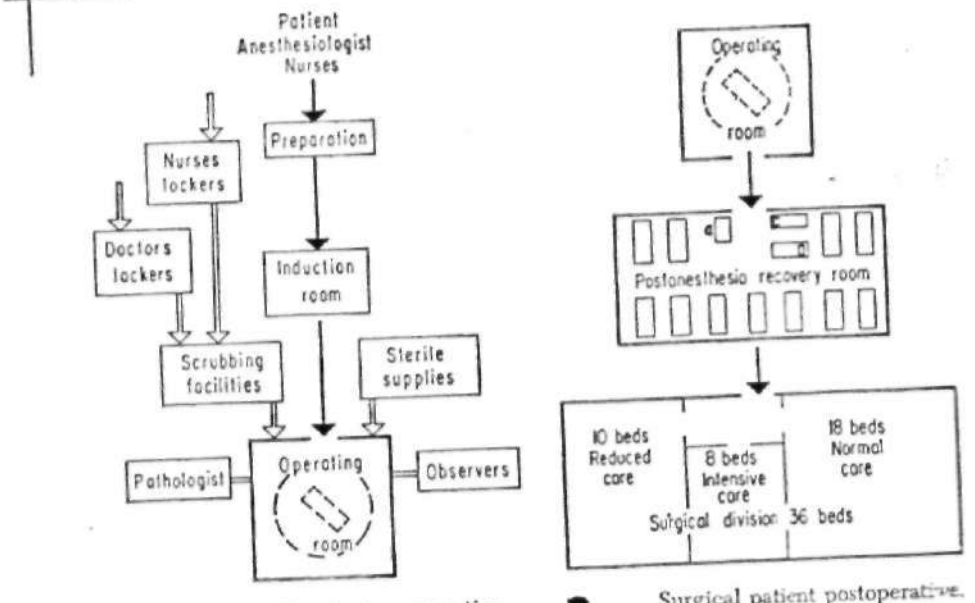
It should be decided at the initial stage of the programme where gynaecological and caesarean sections will be performed. These are either done in the delivery suite or in the operating suite.

Cystoscopic operations performed by the urologist calls special equipment but only a limited use of general anaesthesia. Cystoscopic cases are received from the nursing units and the out-patient department.

Within the surgical suite three basic zones will be discussed (Fig. 3.5).

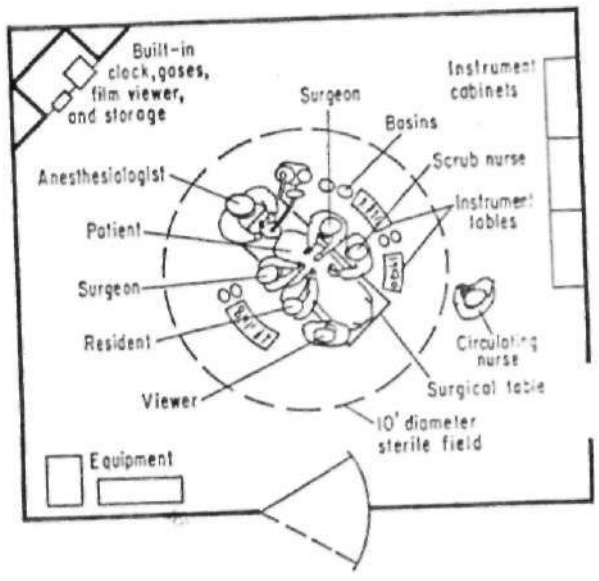
(a) **Outer Zone** - The zone receives all traffic coming to the surgical suite. A reception space is required at the entrance with a small waiting space for hospital staff and stretcher patients. This zone should be accessible from the emergency and nursing units. Element include; reception and records, clerical offices, staff changing and rest room (nurses and doctors), non-sterile store.

(b) **Intermediate Zone** - is essentially a work and storage area. Outside personnel deliver services to this zone but do not penetrate the inner zone. Elements include recovery room,



Surgical patient preoperative. Surgical patient postoperative.

FIG. 3.4



The operating team.

FIG. 3.5

sterile storage, nurses station.

The recovery room should be an open ward type to ensure maximum observability by the nursing staff.

Inner Zone - The inner zone is the space requiring a careful design in terms of flow of patients and operating staff. It requires a high level of aseptic condition. The elements here are, the operating room, scrubbing space, patient holding and induction area workroom and sterilization space.

3.2.1 **General Surgical** - General surgery consist of all operations usually done in the conventional operating room ragardless of their surgical character. They include the chest, abdominal and cranial operations as well as many minor operations. In all surgical procedures, even the minor ones, aseptic procedures must be observed.

3.2.2 **Orthopaedic** - This is the section where operations are performed taken on the human frame. Orthopaedic operations need the use of some special equipment in certain cases.

3.2.3 **Eye And ENT** - Special operation rooms (as required by calculations are justified for eye, ear, nose and throat operations, with equipment resembling a densist's chair. These operating rooms must be darkened but need not be as large as those required for general surgery.

3.2.4 **Gynaecology** - Gynaecologic operations are usually performed in surgery, but if not there may be an operating room

adjoining the delivery rooms for them and caeserean sections. The decision carried on by the hospital planner is with the assistance of the surgeons and obstetricians.

3.2.5 **Cystoscopic** - Cystocopic operations performeed by the urologist call for special equipment but only a limited use of general anesthesia. The cystocopic rooms are usually separate, occasionally located away from the surgical suite and adjoining x-ray and emergency.

3.3.0 **The Obstetrical Delivery Suites** - The obstetrical delivery suite is very, much like the surgical operating suite in terms of requirements and location. It is required to have this suite near the emergency entrance to the General Hospital and easily accessible to the obstetrics ward unit.

If it is decided to perform caeserean sections in the operating suite, the delivery suite should adjoin the surgical operating suite. This suite is related to

- the surgical operating suite
- The central sterile supply
- Pharmacy
- Ante-natal clinic

The elements of this clinic suite will be discussed under the following headings.

- **Administration and Reception** - patients from the nursing unit or emergency are received here. Usually the patients

are accompanied by their relatives, therefore a waiting space is required for them. The patient is then taken to a labour room.

- Staff Changing Facilities - are required for doctors and nurses. This is exactly the same as in surgery. A small lounge where doctors or nurses could rest after delivery or wait for the next delivery case to be ready is the optimum requirement. It should be close to the workroom and the scrubbing spaces.

- Labour and Preparation - A woman in labour is brought to this room where she will spend her labour period before delivery. She is later prepared and taken to one of the delivery rooms for delivery,

> "It is agreed that this should be a single room and if it is to be used for preparation each room should have its own toilet closet and adjacent shower and wash hand basin ..."[2]

The number of labour rooms required in a general hospital depends on the number of delivery rooms in the suite. In other words it depends on the expected daily deliveries in the hospital.

- Delivery Room and immediate services - This is the room in which the baby is delivered. It should be located away from the entrance to the unit in order to reduce traffic and provide privacy for the patient. The requirements of

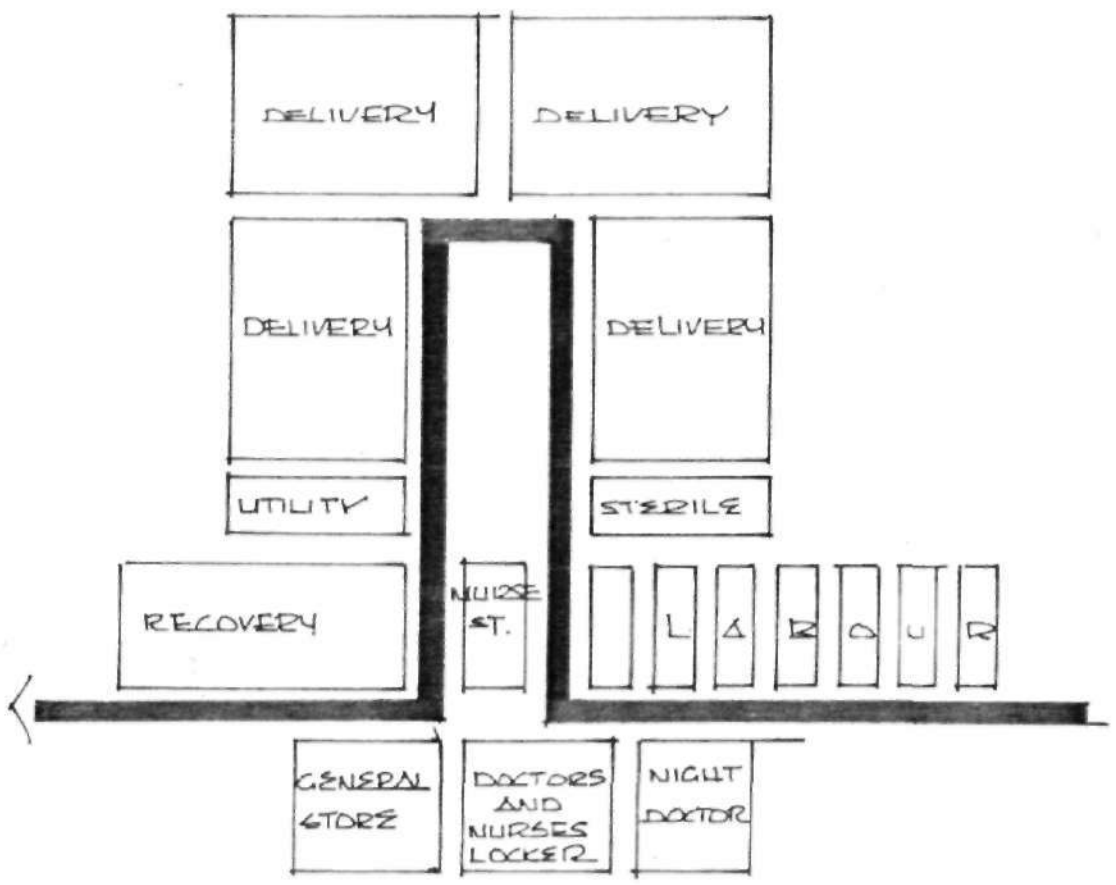
the room are similar to those of an operating room although less people are induced here. The size should be at least 5.0m square. Scrubbing space should adjoin it with a central or decentralized work room nearby.

A nursing station should be conveniently located near the recovery beds and labour room since a constant visit to the labour room is essential, see flow chart in (Fig. 3.6).

3.4.0 **The Pathology Department** - This department consists of the technical laboratories which receives for examination specimens taken from in-patient and out-patient. These specimens come from the nursing units, the theatres , emergency and out-patient departments and the mortuary unit. Patients may in certain cases visit the department for fresh specimens to be taken or for special examinations to be performed. For flow chart see Fig. 3.7.

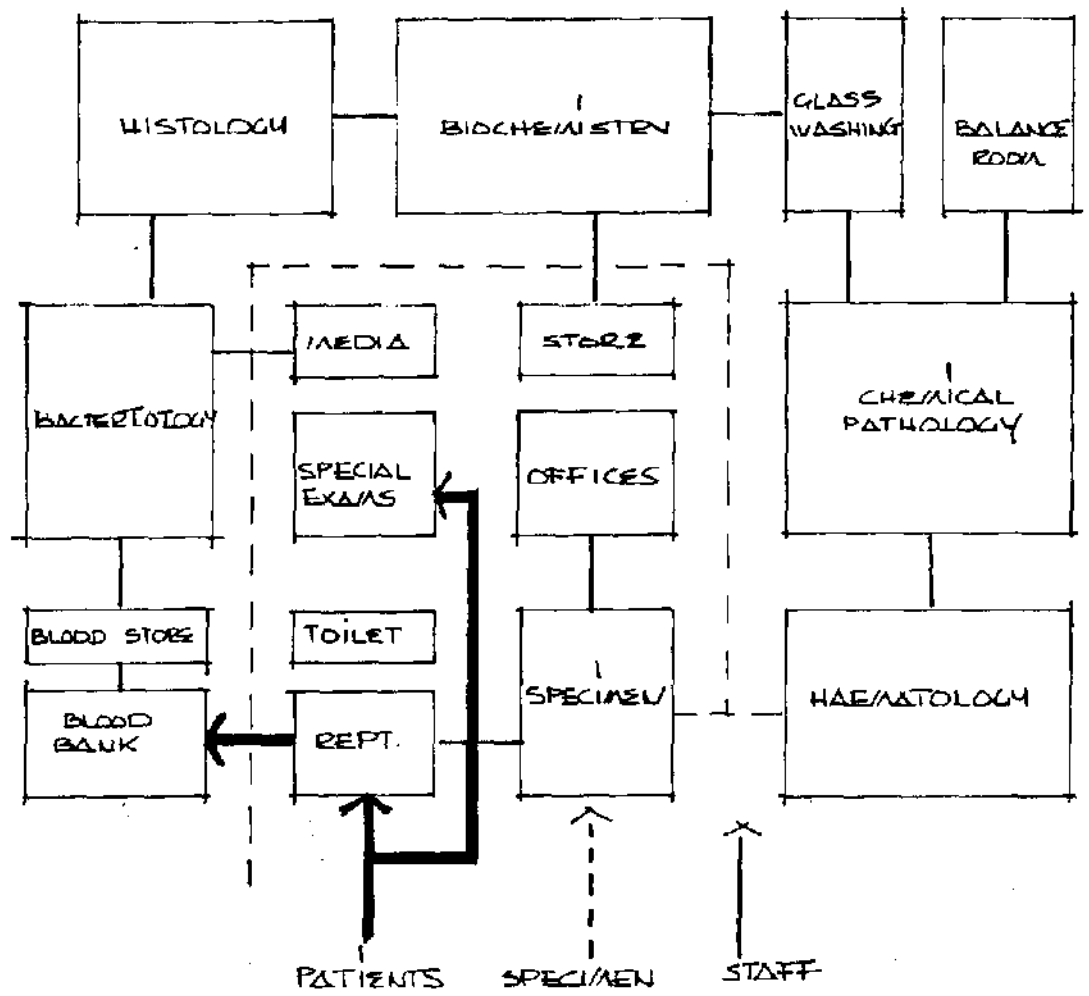
This department should be located within the access of the laboratory staff and the ambulant inpatients and out patients in mind. Another important determination in locating the laboratory is the consideration for future expansion.

The size of the department is determined by the number of tests performed annually. This figure is made up of various tests performed by the various units of the department. The number of technologists should be determined according to that capacity, to do the work and finally the necessary equipment and space for each technologist could be determined; see Table 3.1.



FLOW CHART DELIVERY SUITE.

FIG. 3.6



PATHOLOGY DEPARTMENT FLOW CHART.

FIG. 3.7

Table 3.1: Laboratory tests performed annually in a hospital 150-200 beds.

Unit	Number of Test	Tech. exp.
Urinalysis	11,300	0.4
Haematology	35,300	2.5
Serology	6,800	0.6
Biochemistry	6,600	0.7
Parasitology	Includeurinalysis	
Bacteriology	1,800	0.2
Histology	1,800	0.5
Basal Metabole	400	0.5
Rate Test	1,300	
Ek6	4,500	1.0
Blood Bank Test	1,060	
Transfusion	1,700	
Other		

Source: Callender. Time saver Standards for architectural design.

Pathology Department Sub-Division By Services

The Pathology Department services can be subdivided into the following diagnostic laboratory services.

3.4.1 Chemical pathology

In this unit analysis is made of samples of blood, urine, spectrum, faeces, mucosa, and other body elements. The work benches for chemical procedures are about 900m high, with drawers and cabinets below.

Requirement include:

- A general laboratory
- Instrument Room (colorimeter, flame photometer, spectrophotometer, carbondioxide gas apparatus, centrifuge and refrigerator).
- Glass washing room

3.4.2 Bacteriology Laboraotry

This unit is concerned with the bacteriological study of diseases and immunity to diseases. Besides a general laboratory for this procedure the unit requires

- A media in which bacteria can be culturated
- Glass washing room
- Sterile storage for materials and equipment.

3.4.3 Histology

This unit deals with the study and examination of tissues and it is used for the examination of surgical and autopsy specimens and for selection of tissues for slide section to be prepared by the technologist. The unit is separated from the

other units by a partition to prevent odour from spreading to other areas. It is located near the pathologists office since the medical technologist here works under his direction and supervision.

Space will be needed for specimen cutting and cytodiagnostics procedures.

3.4.4 Haematology

This is concerned with the count of red and white corpuscles and general blood chemistry. Estimation of coagulation time, the control of anti-coagulant therapy and bone marrow investigation are also done in this laboratory.

Requirements include a transfusion laboratory and if no separate blood bank is provided, there should be a storage space for blood usually in bottles in a blood bank refrigerator.

3.4.5 **Parasitology** - This unit studies parasites commonly found in tropical diseases. It uses chemistry and microscopy largely on specimens of faeces. The unit can be part of a chemical pathology unit adjoining bacteriology since most of the investigations concern these two units. Other units which can be part of the main laboratory units or separate, depending on the amount of investigation available are virology - the study of diseases caused by virus serology. The microscopic and chemical investigation of blood serum.

Test included in the laboratory are

1. BMR (Basal metabolic Rate)

This is essentially a volumetric test of inhalation and exhalation measuring the patients metabolism.

2. EGG (cardiography)

The Electrocardiographic test is for recording the changes of electrical potential occuring during the heart beat, and is used especially in diagnosing irregularities of heart action.

Cardiography and Basal metabolic tests are normally grouped together because of their common requirement of a quiet location. This grouping enables only one technician to look after both.

3. P.B.I. (Protein Bounol Iodine)

This test is replacing the BMR test because its results yield a more complete analysis with regard to the loading content. The P.B.T. is a blood test. The serum protein-bound iodine determination when performed accurately, is the most valuable diagnostic test of thyroid function. It measures the amount of iodine bound to serum protein, which actually is the iodine content of the thyroid molecule.

The location of the room for P.B.I. test should be close to the Biochemistry laboratory, but isolated for test accuracy.

E.E.G. - Electro-Excephalography

The test is for recording graphically the electrical emanations from the brain which indicate areas of imbalance or malfunction. Thus this test is a neurological test.

It should be located in a quiet area and as far as possible from equipment. The location should be near the psychiatric unit of the out-patient department or a neurological nursing unit if they exist in the general hospital.

(Figure 3.3) shows a typical pathology laboratory equipped for a small general hospital. For room sizes and equipment for PBI and EEG.

The mortuary unit of a general hospital is attached to this department but because of the nature of its function it is usually situated away from this department nearer to emergency, surgery and nursing units. This unit receives dead bodies from the departments mentioned above for storage before post-mortem is carried out. Specimens of body tissue are taken for further investigation in the main histology laboratory. See flow diagram.

3.50 Radiology Department

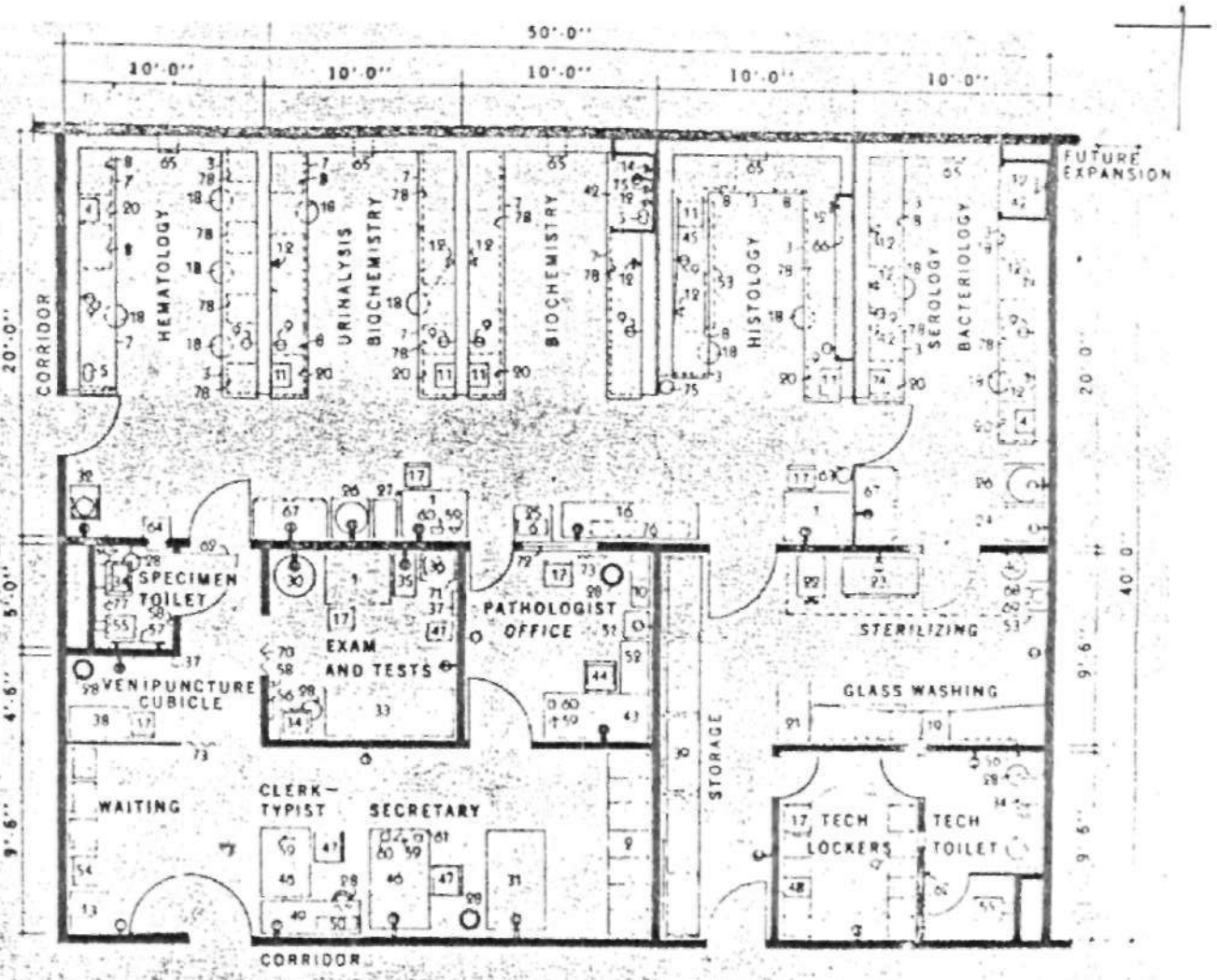
The department receives in-patients, out-patient and casualties. Its function is to photograph, process the film and provide facilities for its interpretation and storage. Unlike in

TYPICAL PATHOLOGY LABORATORY

FIG. 3.8.

LEGEND

1. Desk, 30 by 40 in., single pedestal
2. Filing cabinet, letter size
3. Counter, 30-in. high
4. Staining sink
5. Cup sink
6. Analytical balance
7. Counter, 36-in. high
8. Cabinets with adjustable shelves, below counter
9. Electric strip outlets, continuous
10. Bookcase
11. Utility sink
12. Gas outlet
13. Table for magazines
14. Suction outlet
15. Compressed air outlet
16. Table for instruments
17. Straight chair
18. Stool
19. Two-compartment sink 8-in. deep; drainboards-noncorrosive metal; peg boards above drainboards
20. Cabinet with trash receptacle on inside of door
21. Utility cart
22. Laboratory pressure sterilizer
23. Hot air oven
24. Incubator
25. Shelf or table for analytical balance
26. Centrifuge
27. Table for Harvard trip balance
28. Waste paper receptacle
29. Refrigerator, 8 cu. ft.
30. Refrigerator, blood bank
31. Worktable
32. Micro-hematocrit centrifuge
33. Examination table
34. Lavatory
35. Basal metabolism apparatus
36. Electrocardiograph
37. Hook strip
38. Table, 24 by 36 in.
39. Storage cabinets
40. Water still, 2-5 gals. per hr.
41. Adult scale
42. Fume hood
43. Double pedestal office desk
44. Office chair, swivel, with arms
45. Noncorrosive metal work surface; pitch to sink
46. Typewriter desk
47. Posture chair
48. Technicians' lockers
49. Specimen receiving table
50. Request file with pigeon holes
51. Slide file cabinet
52. Microscope table
53. Exhaust hood
54. Easy chair
55. Wall-hung water closet
56. Paper towel dispenser
57. Grab bar, continuous
58. Emergency call station (push button) connected to buzzer at secretary's desk



Plan A (70,000–120,000 Tests Annually)
for Average Size of 150–200 Beds

the laboratory, here it is the patient who come to the department not his specimen. The penetrating x-rays cast shadows on photographic film, showing the outline of bones and other dense elements the organs are outlined and any abnormality would be revealed. Figure 3.9.

Essentially two diagnostic techniques are used

- Radiography
- Fluorescopy

Radiography is making of a pictorial record by means of x-rays on a sensitive film.

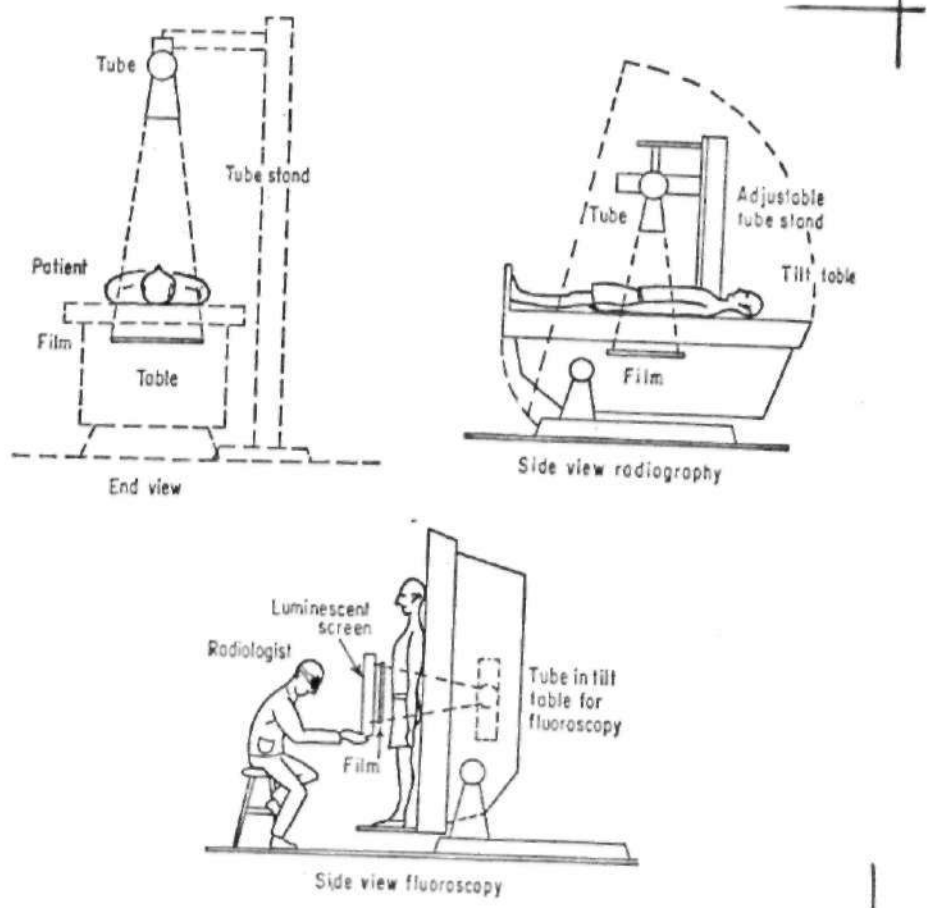
3.5.1 **Fluoroscopy** - is the direct visualization of parts of the body on a fluoroscopic screen which glows under x-ray.

Equipment serving the dual function of radiography and fluorescopy have now been developed.

The therapeutic service at the radiology unit is given under the form of radiation therapy. This is divided into two elements.

3.5.2 **Deep Theraphy room**: where patients are exposed to treatment by means of high voltage x-ray or radioisotopic cobalt 60 machines.

3.5.3 **Superficia Therapy Room** where patients needing less intensity of radioactive radiation are treated.



X-RAY MACHINE :

FIG. 3.9 .

The department should be located where it can be accessible to both out and in patient, in locating it;it should be noted that it has a direct inter-departmental relationship with the out patient department, the emergency department, the surgical operating suite, the pathology department and the nursing units. (Fig. 3.10).

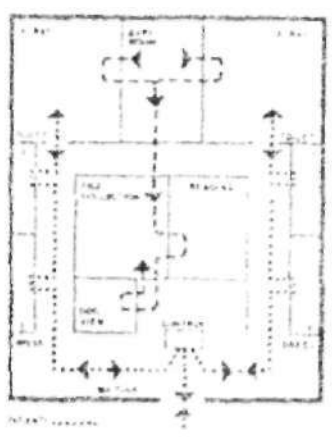
The size of the radiology department and details of the machines to be used would be given in the program determined by the radiologist. Mr. Tood Wheeler in his book, Hospital Design and Function wrote:

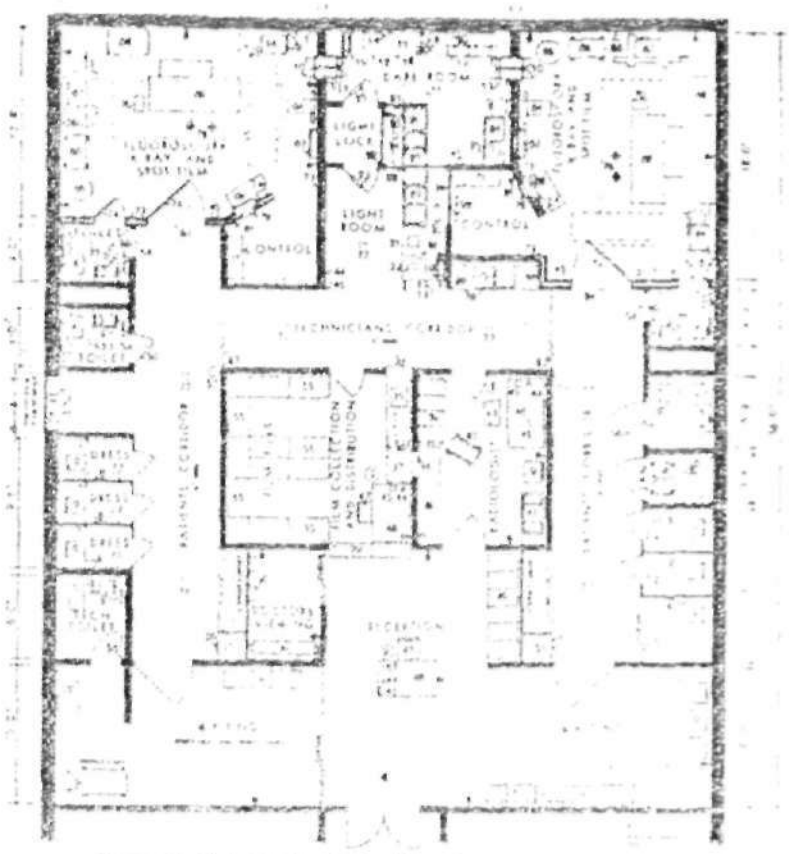
> "In a small hospital one machine can be used for all diagnostic work, usually a 200- or 200 milliampere combination radiographic and fluorescopic unit with tilt table, rotation tube, possibly a spot-film device and diaphragm. In larger hospital there will be several different kinds of machines for different procedures"[13].

Design Elements of the Diagnostic unit.

- Reception and administration
- Changing and preparation
- viewing Radio-diagnostic Room
- Film processing and viewing
- staff facilities

1. **Reception and Waiting Space** - For out patient and impatients should be provided at the entrance to the department. Consideration should be given to patients coming in stretchers and wheel





Diagnostic Radiographic Suite - Plan A

LEGEND

1. Paper towel dispenser
2. Waste paper receptacle
3. Lavatory
4. Wall-hung water closet
5. Continuous grab bar
6. Emergency calling station push button
7. Block strip
   mirror and shelf below
8. Straight chair
9. Cassette pass box
10. Film loading counter
11. Film storage bin
12. Film hanger racks under counter
13. Safelight
14. Ceiling light, switch and cord
15. Timer
16. Counter with storage cabinets below
17. Counter with storage bins
18. Tract drying cabinet
19. Cassette storage cabinets and wall shelves
20. Dark room sink with gooseneck mixing valve
21. Access panel
22. Door with [illegible]
23. Safelight
24. Safety light
25. Safelight
26. Developing tank
27. Thermometer
28. Light switch
29. Wall shelf
30. Key, dark room door
31. Film dryer
32. Film dryer
33. Film viewer
34. Film panel
35. Film viewing [illegible]
36. Film viewing [illegible]
37. Film viewing [illegible]
38. Counter with cabinets below
39. On-wall or mobile film illuminators
40. Temporary film file rack
41. Stereoscope
42. Executive type desk
43. Executive type chair
44. Telephone outlet
45. Intercommunication system outlet
46. Bookshelves 4'-0" by 1'-0"
47. Toilet desk
48. Filing cabinet, letter size
49. Gown storage, open shelves, storage [illegible]
50. Gown storage, open shelving with [illegible]
51. Technicians' lockers
52. Fire door
53. Frame light, buzzer and annunciator at [illegible]
54. Closed metal film file, 5 shelves high
55. Hook on toilet side of door
56. Fire extinguisher
57. Mop truck
58. Shelf
59. Sink and receptor or janitor's sink
60. Mop hanging strip
61. Storage cabinet and working counter
62. Fluoroscopic apron and glove holder
63. Fluoroscopic chair
64. Laundry hamper
65. Clean linen cart
66. Cassette [illegible]
67. Transfer [illegible]
68. Loading [illegible] with spot film [illegible]
69. [illegible]
70. [illegible] unit
71. Leaded glass view window
72. Lead lining for other shielding [illegible]
73. Lead-lined door, light proofed
74. Barium sink
75. Darkroom storage (below counter)
76. Red light for dark adaptation
77. Fluoroscopic ceiling light
78. Counter with gate
79. Film identifier, cabinet below
80. Antiscatter panel
81. Wall cabinet over sink
82. Curtain, floor to ceiling
83. Warning light
84. Microphone
85. Loudspeaker
86. Annunciator (for emergency calling station)

FIGURE 3.5 - X-RAY DEPARTMENT AND FLOW CHART (PATIENTS & FILMS)

FIG. 3.10

chairs. From here the patients are directed to an assigned dressing room.

2. Changing and Preparation

- changing cubicles where patients change into a hospital garment or undress to the requirements of the radiographer prior to diagnosis. The requirements are
- Minimum 3 cubicles/room
- Minimum size 1.5m^2 with height of at least 2.1m [4]

The changing cubicles should be adjacent to the x-ray room for privacy and shorter distance of travel. (Figure 3.11).

A toilet should be provided for use by Barium enamal patients undergoing gastro-intestinal investigations. It should be adjacent to the changing cubicules.

3. Radio-Diagnostic Room

It is the most important element in the radiology department. All diagnostic procedures are performed here with the aid of the x-ray equipment.

"The optimum size of the radio-diagnostic room is about 4.20m x 5.4m with a height of 1.9 m minimum"[5]. There is also need for a control booth to protect the radiographer from radiation.

4. Film Processing and Viewing

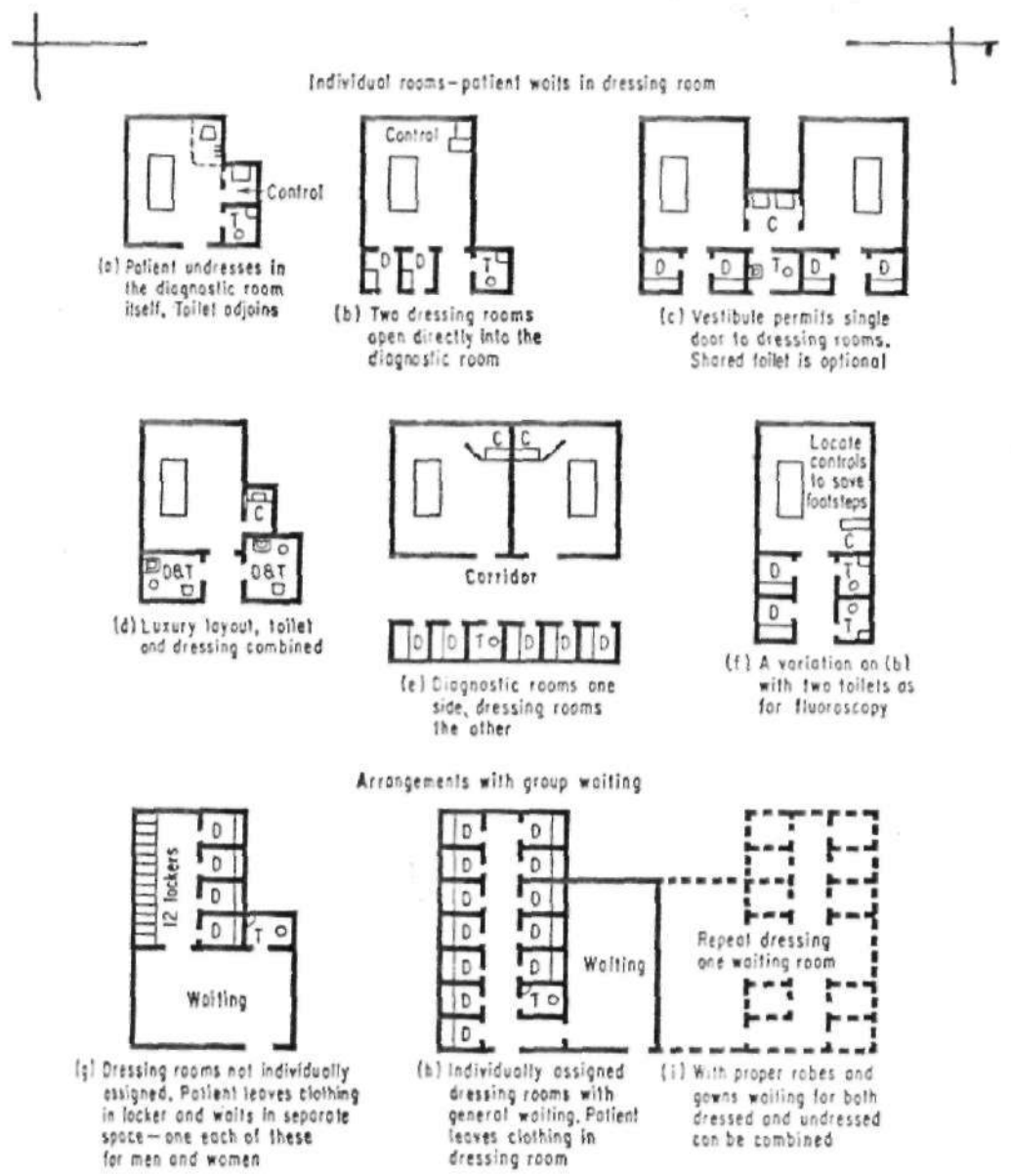


Fig. ■■. Dressing rooms for radiology.

FIG. 3.11

Exposed film processing is done in a dark room. The darkroom could serve two or more rooms if conveniently situated. Automatic processing machines capable of developing 140 films per hour are now used. The size is about 3500 x 420mm. This has reduced the size of darkrooms to small loading cubicles.

A viewing room is required at the output end of the automatic processing unit. Films will be sorted here before distribution to patients and departments.

A film storage alcove should be attached to the darkroom so that fresh films could be loaded into cassettes before they are taken to x-ray rooms "A cupboard for 3,000 film is about 2.1m x 09m.[6]

5. **Staff Facilities**

Staff facilities include offices for radiologist and radiographers, a rest room with toilet facilities. There is a need for storage spaces for used films and portable x-ray units used in surgery or emergency department but under the care of the radiology department.

Design considerations

- smooth flow of patient and staff
- climatic considerations
  - . lighting
  - . temperature

- Technical considerations
  - . positive and insulation of equipments
  - . protective insulation against radiations.

3.6.0 Physical Medicine

The physical medicine department is a therapeutic facility serving both out patients and in-patients. The location of this department should be such that it is easily accessible to the patient it serves. The trip from the hospital entrance to the physical medicine should be as short as possible since most of the patients are disabled.

The department has two therapy units

- Physiotherapy unit
- Occupational therapy unit.

3.6.1 Physiotheraphy Unit

The treatment through the utilization of physical aids of heat, light, water, electricity etc. Thus the treatment is in the form of exercise, manipulation, massage, hydrotherapy or electrotherapy.

The physiotherapy unit does not handle a large number of patients daily as in radiology. A ground floor location, convenient for both patient and for access to an outdoor exercise

area is recommended.

Physiotherapy Elements

- Patients reception and waiting
- Passive treatment area
- Changing and active treatment
- staff facilities and storage.

A reception space capable of keeping current records of patients should be provided. Adjacent to the space should be a small waiting space at the rate of 1.5m^2 per patient. A small parking space is needed for wheel chairs and stretchers. Wheel-chair patients should be considered in planning patient toilets.

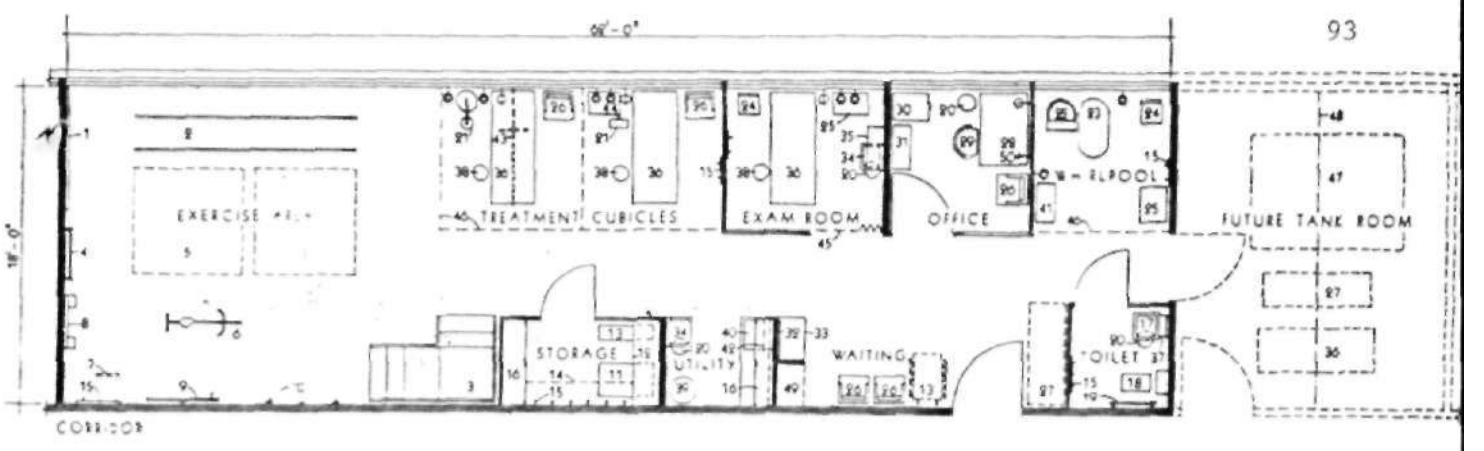
- Passive treatment area - requires cubicles for thermal, massage or manipulation treatment. The cubicles should be at least 24m^2 to enable a physical therapist to work on either side of the table. Cubicles are best sub-divided by drapes for easy access by wheel-chair or stretcher patients.

- Changing and Active Treatment Area - requires arranging rooms for both sexes and a large active exercise hall. One wall of the treatment hall should be reinforced for installation of stall bars. See Fig. 3.12 for layout and and equipment.

- staff facilities and administration include.

  . a general rest room and toilet

Physical Therapy Department



TYPE "A" PLAN

GRAPHIC SCALE

NOTE: MAJOR PIECES OF EQUIPMENT RECOMMENDED FOR ONE PHYSICAL THERAPIST ARE AS INDICATED ON TYPE PLANS

Equipment list

1. Posture Mirror
2. Parallel Bars
3. Steps
4. Stall Bars
5. Gym Mat
6. Stationary Bicycle
7. Spider Head Sling Attached to Ceiling
8. Pulley Weights
9. Shoulder Wheel
10. Gym Mat Hooks
11. Cart with Open Shelves
12. Open Shelves
13. Wheel Chair
14. Shelf
15. Wall Hooks
16. Wall Cabinet
17. Lavatory, Gooseneck Spout
18. Water Closet
19. Hand Rail
20. Waste Paper Receptacle
21. Portable Equipment
22. Adjustable Chair
23. Whirlpool
24. Chair
25. Table
26. Chair, preferable with arms
27. Wheel Stretcher
28. Desk
29. Swivel Chair
30. File Cabinet
31. Bookcase
32. Bulletin Board
33. Wall Desk (counter, shelf below)
34. Lavatory, Gooseneck Spout and Foot Control
35. Wall Cabinet with Lock
36. Treatment Table, Storage below
37. Mirror and Glass Shelf over Lavatory
38. Adjustable Stool
39. Laundry Hamper
40. Sink with Drainboard
41. Paraffin Bath
42. Glass Shelf over Sink
43. Overbed Trapeze
44. Three Single Outlets on separate branch circuits. 1 outlet 2-pole, 2 outlets 3-pole
45. Folding Door
46. Cubicle Curtain
47. Under Water Exercise Equipment
48. Overhead Lift
49. Coat Rack
50. Telephone Outlet

TYPE "B" PLAN

NOTE: MAJOR PIECES OF EQUIPMENT RECOMMENDED FOR ONE PHYSICAL THERAPIST ARE AS INDICATED ON TYPE PLANS

GRAPHIC SCALE

FIG. 3.12

- offices for administrative purposes
- private room for patient interviewing and examination.
- storage space for equipment and supplies usually needed in the passive and active treatment area.

3.6.2 Occupational Therapy

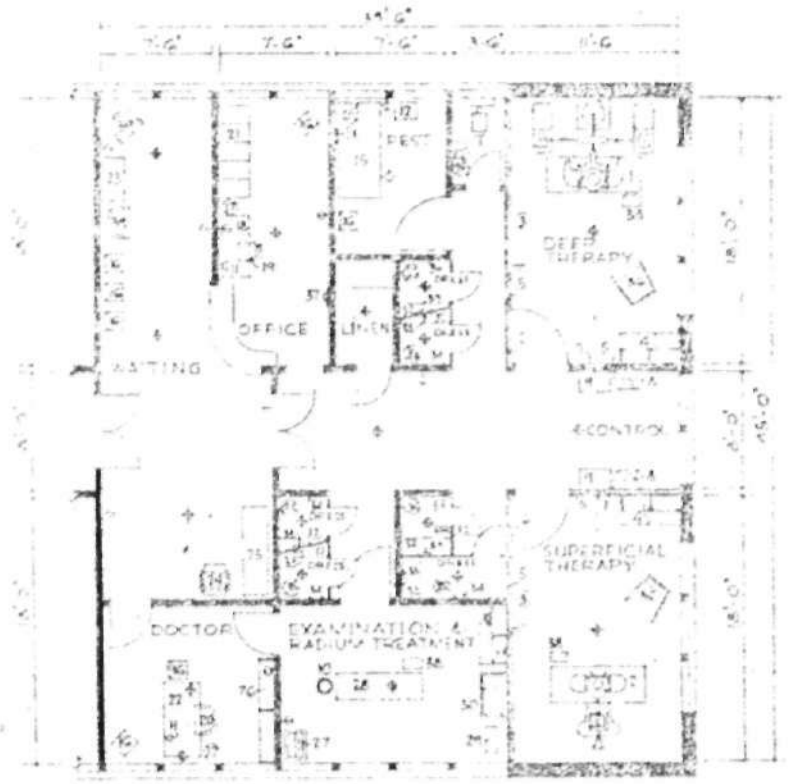
The occupational therapy seeks to help the patient in putting-his regained physical ability to some economic or social use. Thus it deals with physical handicaps and deficiencies, but its techniques are applied through processes of demonstration and training and not primarily manipulation as with physical therapy. It is meant to supplement physical therapy with training activities (Fig. 3.13).

Design components. Mr. Todd Wheeler wrote

> "The occupational therepy department usually includes a main therapy room with equipment and materials for printing and drawing music dramatics clay modelling with sometimes a KILN for ceramics, weaving, sewing and playing games;a second smaller space for a wood work shop, isolated because of its noise and diet, an office for the therapist; storage for equipment used in the department"[7].

3.7.0 The Pharmacy Department

The pharmacy supplies medication, anaesthesia requirements, laboratory chemicals and other chemical requirements to the therapeutic department and the nursing units. The department is



1. Deep therapy unit
2. Superficial therapy unit
3. Adjustable stool
4. Supply cabinet
5. Lead lining (Size and extent varies for floors, walls and ceiling)
6. Lead lined door
7. Leaded glass view window
8. Control unit
9. Counter, 42 inches high
10. Sanitary waste receptacle
11. Telephone outlet
12. Bedside table
13. Bed light
14. Nurses calling station
15. Bed
16. Straight chair
17. Waste paper receptacle
18. Typewriter desk
19. Typist's chair
20. Desk chair
21. Film filing cabinet
22. Desk
23. Table, 12 x 24 inches
24. Wrex Chair
25. Wrex stretcher
26. Bookcase
27. Couch
28. Examining table
29. Instrument sterilizer, 6 x 8 x 16 inches
30. Combination instrument and scrub sink, with gooseneck spout and knee control
31. Instrument cabinet
32. Shelf—31 inches high
33. Mirror
34. Hook strip
35. Stool with back
36. Non-metallic treatment chair
37. Dome light and buzzers
38. Foot stool
39. Easy chair

OCCUPATIONAL THERAPY

FIG. 3.13

therefore required to be accessible to the ambulant patient, to the staff of the therapeutic and nursing units. For easy supply of its requirements, it should be located in such a way that it could be accessible from central store. For bringing in supplies (Fig. 3.14).

The pharmacy function as a dispensing, compounding, and in some bigger general hospitals manufacturing unit. Only the dispensing section should open to the public. It is more functional to have a separate dispensary in the out patients department only to be supplied with bulk medication from the central dispensing unit serving all departments.

"The size of department depends on the size of the general hospital. The United State public health service recommends $20m^2$ for a 50 bed hospital, $50m^2$ and $110m^2$ for a 100-bed and a 200-bed hospital respectively"[8].

The pharmacy performs three essential functions:

- dispensing
- compounding
- manufacturing which is usually found only in the largest hospitals or in those connected with schools of pharmacy.

3.7.1 **Dispensing** - The dispensing pharmacy should be readily accessible to the public. Waiting space is desirable for use while the prescription is being filled.

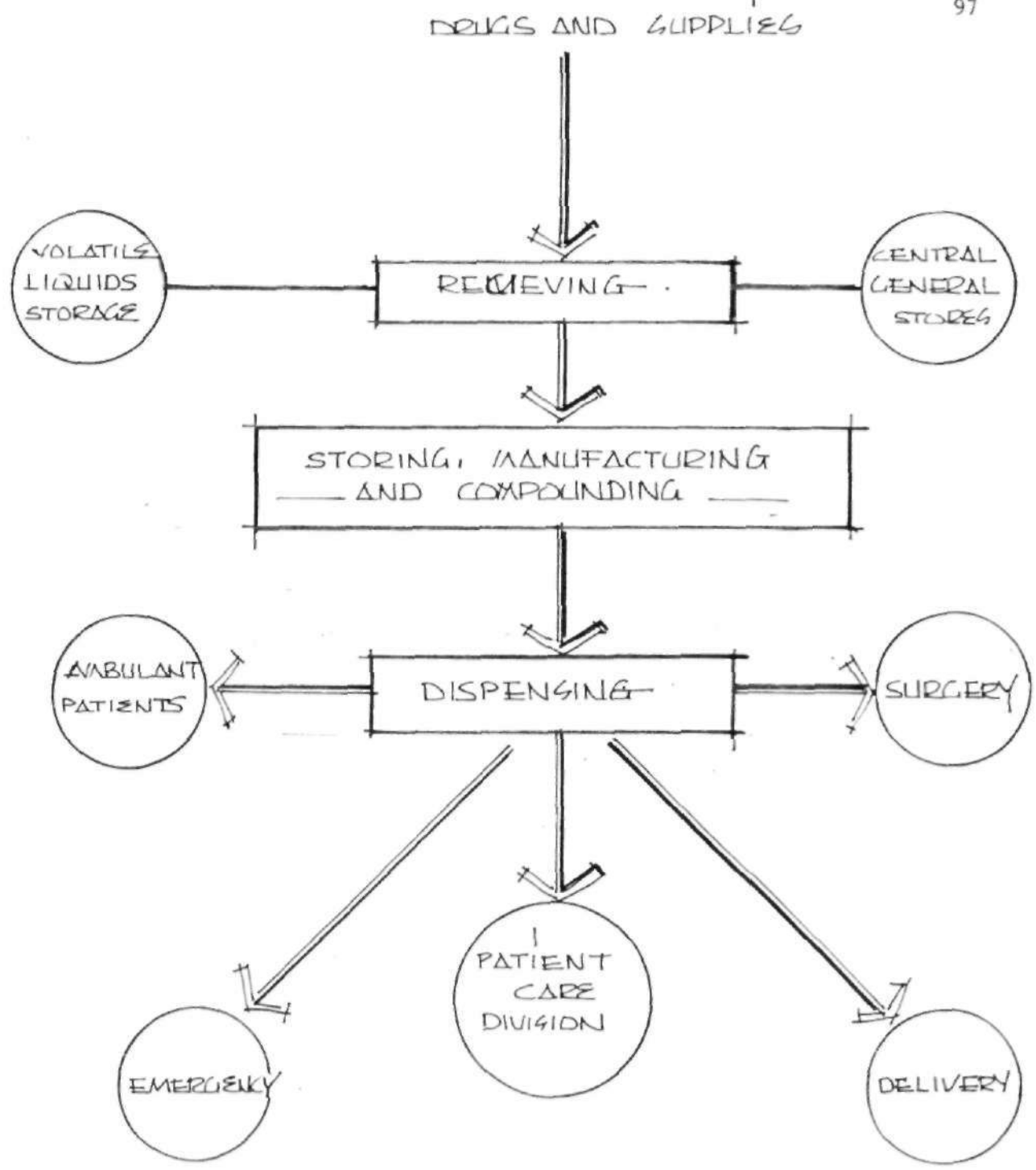


FIG. 3.14

PHARMACY DEPARTMENT
FUNCTIONAL RELATIONSHIPS

3.7.2 **Compounding** - This is drug manufacturing on a small scale Provision for this function is provided and a pharmasist undertakes the job.

3.7.3 **Manufacturing** - The question of drug manufacturing arises only in the largest hospitals, this is because large volume may show economy in manufacturing certain items.

The pharmacy department consists of the following facilities.

- waiting at the out patients dispensary and storage for goods dispensed.
- Distribution room for supplying requests to hospital departments.
- offices (at least one for pharmacist)
- storage for bulk chemicals and drugs
- decks and records office
- compounding area
- Manufacturing unit if required.

3.8C **Emergency Department**

Injury or sudden illness beyond the capacity of the First Aid Box drives most people to a doctor or, if they are near a hospital, to its accident and emergency department, where they expect immediate attention and reassurance. The department provides life saving services needed immediately uponadmission before it can properly be determined which hospital division

should receive the patient.

Emergency patient may need immediate laboratory tests x-rays, and even surgical interventions. Following emergency treatment, a patient may need intensive care.

Thus the department should be close to

- surgical suite
- Radiology
- Pathology
- Admission office

The department consist of the following design components

1. Ambulance parking
2. Reception of patients and waiting
3. Treatment rooms
4. Minor operating theatre
5. Post-treatment observation beds

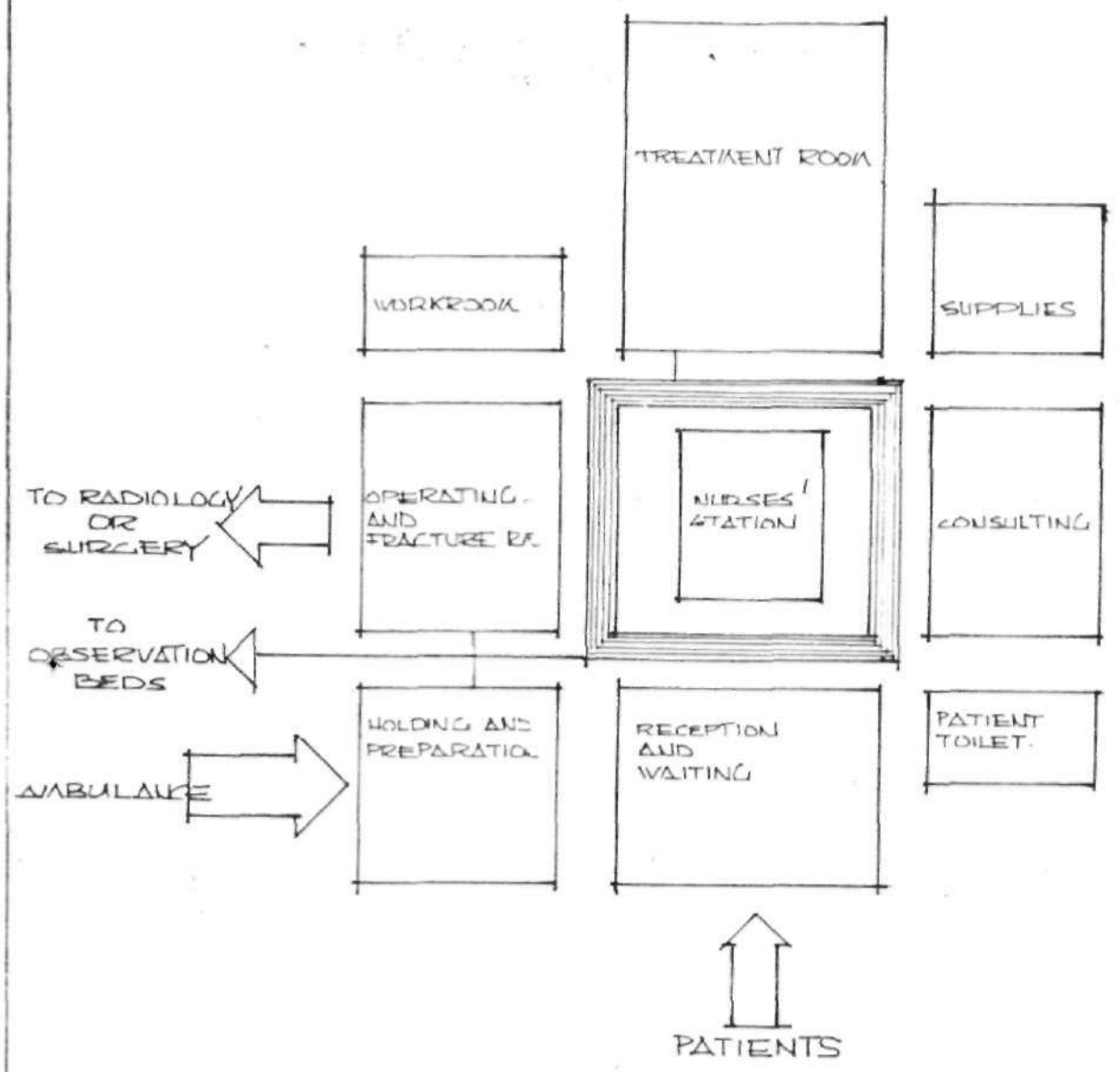
1. **Ambulance Parking** - This should be placed in such a way that the unloading of the ambulance can not be viewed from the waiting. A staff is placed close by to inform the others about arrivals.

2. **Reception of patients and waiting** - The ambulance parking should open into the reception, and should be screened from the view of the public in the waiting room.

3. **Consulting rooms** are similar to those provided in the OPD. Adjacent to these should be treatment rooms with workrooms and a nurses station for control of patients and staff.

4. **Minor Operating Room** - It is general argued that only a minor operating room should be provided in the emergency department. The author shares this view to avoid duplication of equipment and staff. The patient if need be is immediately transferred to the surgical suite.

5. **Post-treatment observation beds** This is for patients that require intensive care before transfer to the important department. A nursing station should be located in such a way as to make supervision easy. See Flow Chart of emergency traffic. (Figure 3.15).



EMERGENCY SUITE FLOW CHART

FIG. 3.15

KASHIM IBRAHIM LIBRARY

similar designs. Each clinic contains a corridor-like waiting area. It also contains utility and work areas. Various offices have been provided and in the case of the pediatric clinic, space has been provided for demonstration to mothers and for social workers.

Consultative Out Patient Department

This is approached from the main entrance lobby after which the patient goes through the vertical circulation (lifts, stairs, ramp). The patients register at the registration centre, in the waiting hall. Here their records are taken after which they proceed to the various clinics.

There are four main consulting clinics served by a main and service corridor. The consultative (OPD) clinics include some activity units for demonstration, rest, electro-cardiography (EGG and EEG), offices and staff toilets. Also provision has been made for a dietatic sub clinic.

The four clinics are

- Ophthalmology and E.N.T.
- Medical
- Paediatric
- Surgical

399970

Most of these units are of similar design to ensure a 'general use' approach. However, the obstetrics and Gynaecology,

REFERENCES

1. Facts and Trends on Hospital outpatient services 1964 page 24.
2. Gainsborough, H and John Gainsbarough - Principles of Hospital Design Page 199
3. Hospital Design Function. E. Tood Wheelen, Mc Graw Hill Book Co. page 159.
4. Hospital Building Notes Vol. 4
5. Time Saver Standards building types, 2nd Edition. Joseph De ahiora and John callender. McGraw Hill Book Co. page 414.
6. E. Neufert. Architects Data page 115-177.
7. Hospital design and function. E. Todd Wheeler, Mc Graw Hill Book Co., page 177.
8. Massoud, A. A. - The General Hospital as an architectural organism page 83.

Chapter 4

4.00 ANCILLARY SERVICE UNITS

This department like the adjunct diagnostic and treatment facilities, gives secondary service to the patients. These services are no less essential than the professional departments, but they are usually considered separated because little of their activity involves medical supervision.

Special attention should be given to devising efficient operation layouts in the service departments. For large hospitals a separate service building may be advantageous, having all the service departments. Those departments will be dicussed under the following headings.

4.1.0 Dietry

This department prepares and serves food to hospital inpatients and employees. Depending on the hospital policy it also caters for patients in some cases.

The functional elements of food service include procurement, preparation, distribution and disposal. Procurement is from the central general stores, preparation in the kitchen, distribution to the nursing units and staff canteen of these

functional elements the patient is aware principally of distribution, yet the quality if not the served temperature of the end product is equally affected by the first two. The most controversial among these processes is distribution.

Procurement - This process includes advance planning of menus, ordering and selecting food, receiving, checking, storing and handling it up to the begining of preparation.

Preparation - this can be further subdivided into the processing of meat, vegetable salads, desert and pastries.

Distribution - The objective here is to serve palatable food, which means the hot food hot, the cold food cold, moist foods moist, dry ones dry. Three methods of distributing food exist.

- The central tray service where trays are completely assembled in the main kitchen.
- Decentralised, hot food bought from the central kitchen in bulk is served in plates on trays set up in the floor kitchen.
- This method, called bed side food service uses the floor pantry for making of the plates. The food is brought in bulk in insulated food cast from the main kitchen and served into the plates in front of the patient.
  Sincethe kitchen obtains supply from the central general store,and distributes food to the patients nursing unit

and the staff canteen, it is just logical that it should be close as possible to the central general stores and nursing unit, to minimise travel distubances and should be located close to service route for supplies.

Design components

- kitchen stores for storing of food and equipment
- preparation area
- cooking and service area
- food trolleys washing and parking
- general wash-up space
- staff facilities
- refuse disposal.

4.2.0. The Central Services Supply Department

The central sterile supply department supplies from a central point all necessary sterile materials and equipment required by these medical service departments

Service departemnts

Surgical suite

Delivery suite

Patient care units

Emergency and OPD.

Its location should be convenient to the staff of the above for efficient receiving and distribution of used and sterile items. The processes involved in this department are receiving

and sorting, washing and drying, packing, storing, and distributing (see work flow diagram in Fig. 4.1).

"The recommended floor area for the central sterile supply department is $0.65m^2$ to $1.0m^2$ gross per hospital bed. For determining the total space needed for this department, the most accepted figure is $0.75m^2$ per bed. This estimation will be acceptable in hospitals of up to 600 beds in size."

In designing this department these points should be considered.

- It should be organised and planned to provide proper work flow and economy of labour
- Contaminated articles and sterile packs should be kept separate
- A formula room should be provided within the C.S.S.D. to avoid the duplication in the maternity nursing unit
- The supervisors office or station should overlook the entire unit for effective supervision.

4.3.0 Central General Stores

The central general store function as a storage area for goods purchased in bulk only to be used in small quantities. The purchasing unit of the hospital is also accommodated here. Thus the central general store is the main receiving and storage area as well as the distribution centre of hospital requirements.

CENTRAL STERILE SUPPLY UNIT.

WORK FLOW DIAGRAM.

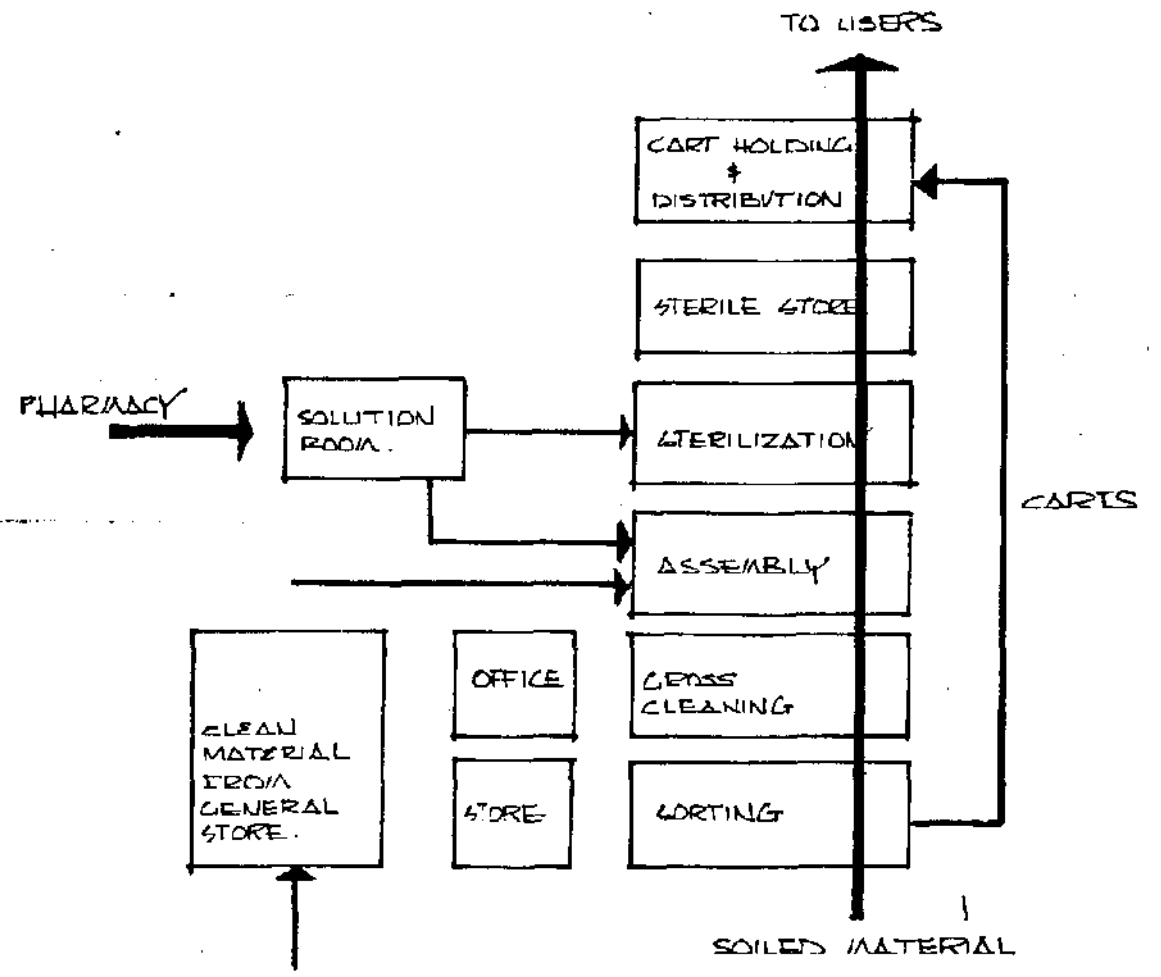


FIG. 4-1

Stores include

- Pharmacy main store with separate volatile store
- Bulk food store for non-perishable foods
- Furniture store
- Hospital equipments stores

Apart from the main store area there is need for

- offices for clerks and supervisors
- Receiving room with counters
- Work space for finishing outgoing goods.

The stores should be grouped in such a way that they are easily accessible to vehicles bringing in fresh supplies. See clean material flow diagram in (Figure 4.2).

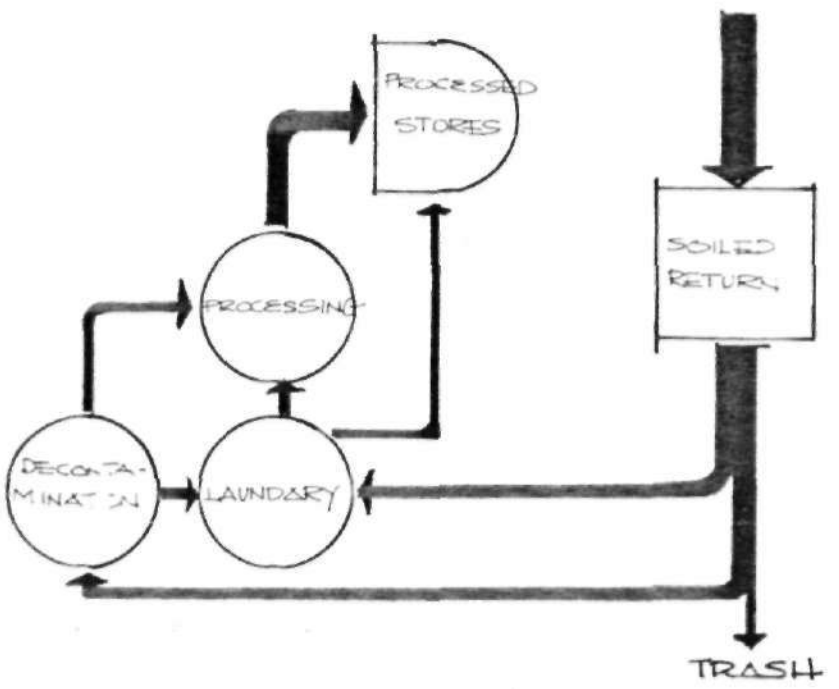
4.4.0 Maintenance Unit

This is a form of workshop for repairs of furniture, painting and general building maintenance. It is the duty of this unit to repair all electrical faults in the hospital and run the hospital standby generator, thus the units requirements will include workshops for patients, woodwork plumbers, electricians, etc.

4.5.0 Employee Facilities

Changing facilities should be provided to enable hospital workers to change from street clothes into hospital garments.

FLOW CHART, SOILED MATERIAL



FLOW CHART, CLEAN MATERIAL

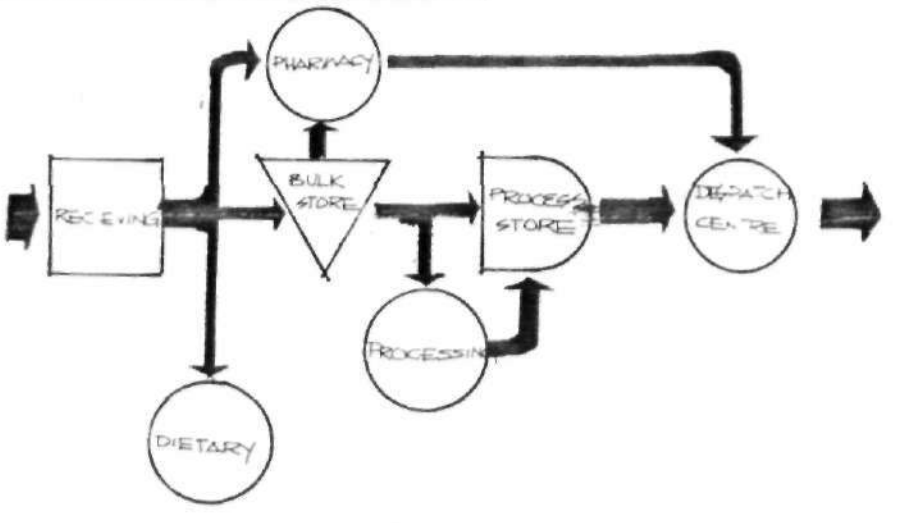


FIG. FLOW OF SOILED AND CLEAN MATERIALS

There should be some rest or coffee rooms for each department if no central one is provided. Dining facilities are also required so that staff do not have to leave the hospital premises for their meals.

4.6.0 Laundry And Housekeeping

The hospital laundry handles all linen washing, mending, marking and distribution. Linen requiring sterilization is later taken to the control sterile supply for sterilization.

The laundry can functionally be divided in two work areas.

- Dirty work area where dirty items are received and sorted out. Here is required a number of sorting compartments depending on the types of linen handled. The sorted linen are then fed into washing machines.
- Clean work area where the washed materials are extracted and dried. Those requiring mending are passed to the tailors for inspection and mending, the rest areironed, folded and stored for distribution. See flow chart of soiled materials in (figure 4.3).

For these fuctions, the department requires the following facilities

- Space for collection and sorting
- Office space for supervisor and clerks
- Main washing area
- Mending room

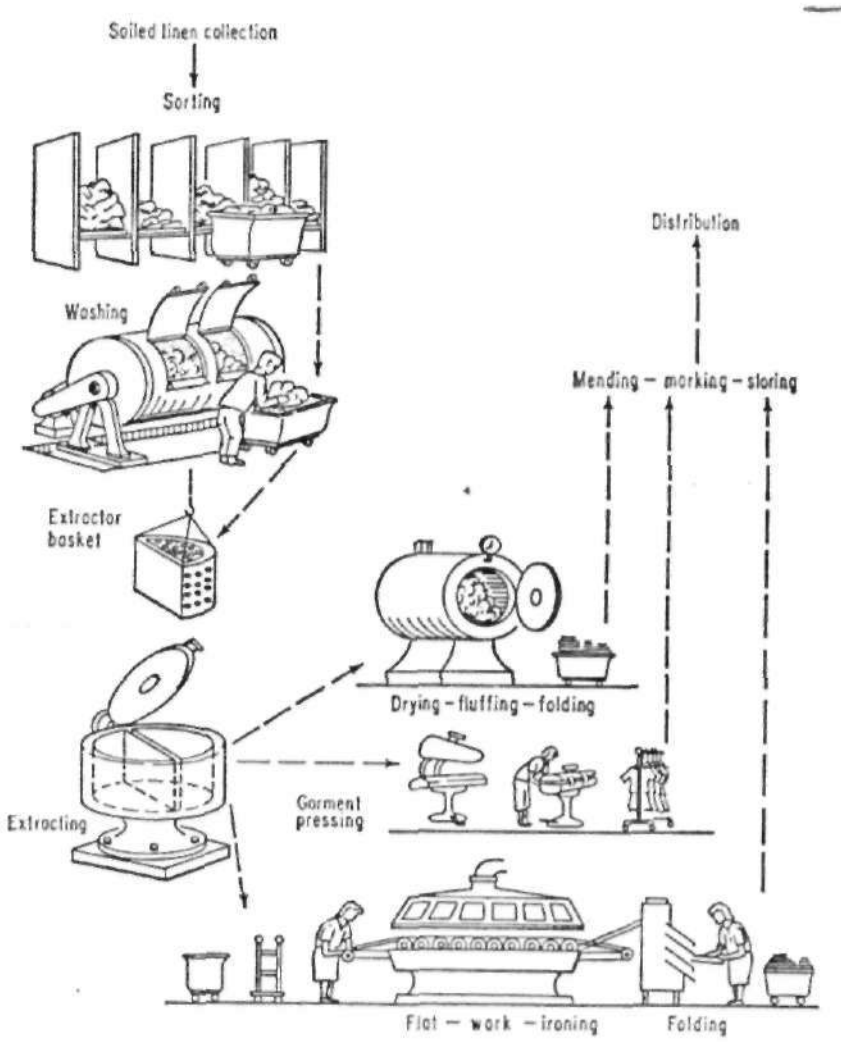


Fig. 4. Processing hospital linen.

FIG. 4.3

- Dry work area for pressing and folding
- General store
- Distribution area

The receiving and sorting room should be near the main service corridor to shorten the travel distance the staff have to cover. The same spplies to the distribution centre. The whole block should be easily accessible to the central sterile supply unit because of service connection. See (Figure 4.4) for layout and equipment in a typical laundry.

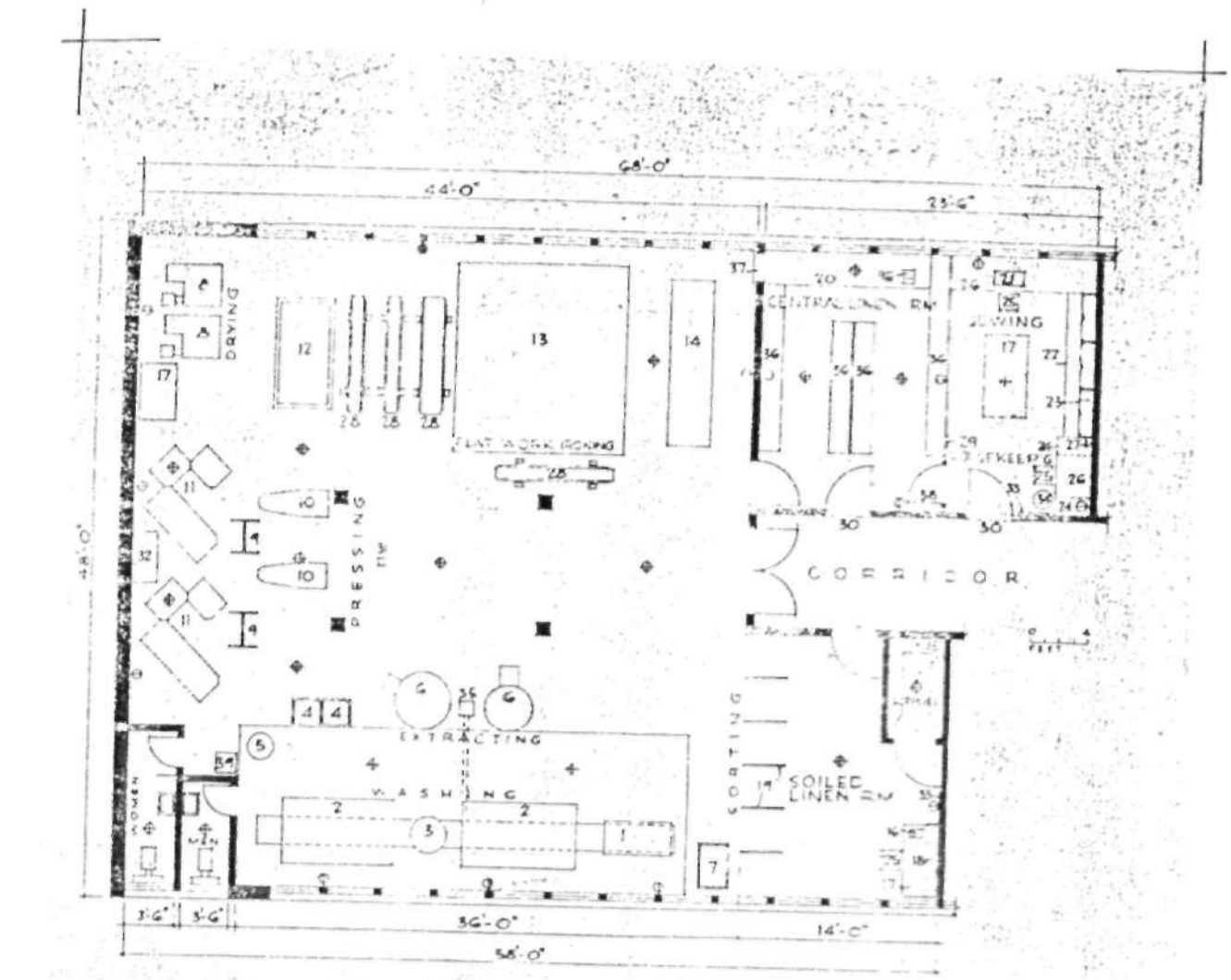
The house keeping section of a general hospital deals with cleaning of the hospital buildings. This is an important section in that standards of cleanliness required in a hospital are exceptionally high. The unit does all the cleaning, gives maid services and handles all sanitary supplies.

Elements

- Floor cleaners' store
- central workroom
- storage for supplies
- office for housekeeper
- rest room for cleaners

4.7.0 Administration

This includes offices for normal running of the hospital and the main entrance hall and public facilities like telephone



1. Metal washer, 35 or 50 lb. open end
2. Metal washer, 1—42 x 54 inch end 1—42 x 72 inch
3. Soap tank, 90 gallons
4. Double compartment laundry trays
5. Starch cooker, 25 gallons
6. Extractor, 1—30 inches, 1—60 inches
7. Platform scale, flush with floor
8. Tumbler, 36 x 30 inches
9. Uniform rack
10. Ironing board
11. 2—61 inch and 4 mushroom presses
12. Shakeout table with sloping sides
13. Flat work ironer, 4 roll, 120 inches
14. Table, 36 x 144 inches
15. Shelving
16. Marking machine
17. Tables, 1—30 x 60 inches, 1—36 x 48 inches, 1—36 x 72 inches
18. Sheet error table
19. Sorting bins
20. Counter, 36 inches high with shelving below
21. Sewing machine
22. Counter 31 inches high with cabinets below
23. Wall cabinet
24. Filing cabinets below counter
25. Straight chair
26. Counter, 30 inches high, open below with drawer
27. Telephone outlet
28. Thread rack
29. Hook strip
30. Switch door
31. Floor drain
32. Compressor
33. Bulletin board, 36 x 24 inches
34. Waste plaster receptacle
35. Sump
36. Shelving with bins
37. Pass window
38. Grate
39. Water cooler

PLATE 42 Laundry

FIG. 4:4.

booths and the like. The administration section deals with public relations matters, employment and purchasing of hospital materials and equipment, medical and nursing staff organization; public health programmes and social service for needy patients.

Offices required for these functions include:

- Administrator and Assistants
- Business or purchasing office such as:

  Accountants

  General Office

  Purchasing Office
- Public Relations offices
- Medical staff offices
- Nursing staff offices
- Library
- Conference room
- Toilets for males and females

4.7.1 Admission Department

The admission unit handles all patient admission and discharge problems as well as records keeping for all in-patients and out-patients.

The admitting office should provide privacy convenient to the main lobby and preferably adjacent to the social service office. Facilities required within the admitting section are

- office for admitting officer
- clerical office for records
- Medical screening and interview rooms
- Room for night doctor
- Waiting space for patients and relatives
- The records section requires adequate space to handle the anticipated in-patient and out-patient load, and the necessary number of personnel to staff the section. Elements include filing space.
- Filing space
- Workspace for sorting and stocking of current records adjoining active records storage.
- space for records clerks
- office for records officer
- store for equipment and supplies

Space required for records keeping depends on the type of filing methods adopted and the method of distributing and collecting records from patients.

4.7.2 Public Spaces

Waiting and other spaces in the hospital are similar to those for other institutions, their size will be influenced considerably by the hospitals visiting policy and its medical care program.

- office for admitting officer
- clerical office for records
- Medical screening and interview rooms
- Room for night doctor
- Waiting space for patients and relatives
- The records section requires adequate space to handle the anticipated in-patient and out-patient load, and the necessary number of personnel to staff the section. Elements include filing space.
- Filing space
- Workspace for sorting and stocking of current records adjoining active records storage.
- space for records clerks
- office for records officer
- store for equipment and supplies

Space required for records keeping depends on the type of filing methods adopted and the method of distributing and collecting records from patients.

4.7.2 Public Spaces

Waiting and other spaces in the hospital are similar to those for other institutions, their size will be influenced considerably by the hospitals visiting policy and its medical care program.

Consideration must be given to the waiting requirement in the patient care divisions and at the adjunct services, it is best to decentralize waiting as much as possible without losing control or duplicating space.

Experience shows that over load is caused by those who accompany patients to the clinic but do not go through the clinic with them. It is therefore wise to estimate a waiting load of at least 85 per cent of the clinic capacity.

4.7.3 **Medical Records**

This forms a very important connection between patient care and administration. The medical record of a patient is a chart upon which all relevant personnel information about him, i.e. name, address, etc., are entered on his first visit to the hospital. To this chart are added notations and explanations of everything that is done for the patient on his subsequent visits to the hospital. The record thus grows.

The hospitals have to devise a system of storing these records in order to save space. The records in the case of each patient are kept for "seven year" after which they are micro-filmed for permanent retention and the bulky orignals destroyed.

REFERENCES

1. E. Tood Wheeler - Hospital Design and Function, page 206

Chapter 5

5.0 CASE STUDY

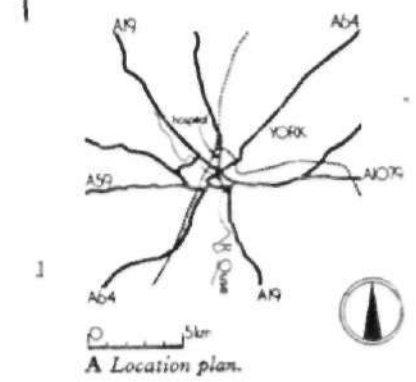
5.1.0 York District Hospital

This hospitals contract was tendered in July, 1971 and work began in October, 1971. Thus hospital was planned to accommodate 800 medical and surgical beds and eventually over 1000. The accommodation includes accident and emergency, outpatient, x-ray, pathology, rehabilitation pharmacy and education departments. New operating theatres, and isolation facilities, kitchens, dining and non-resident staff changing facilities, boiler house, workshops and chapel.

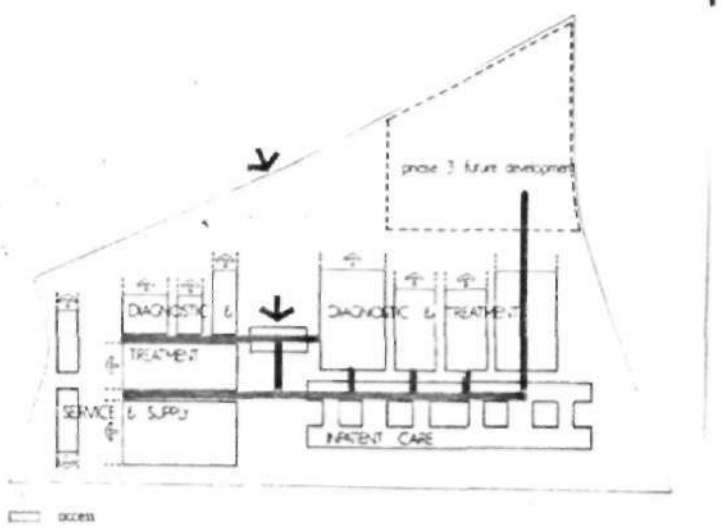
5.1.1 The Site

The site was a sports ground (83 Hectures) accessible only from its eastern boundary, lying within working distance of York minister and in area of Edwardian brick terraced houses and some industrial development. Four hundred car spaces are distributed around the buildings and landscaped into their surroundings. For the site cover is approximately 50% giving a plot ratio of 0.87:1 (See Fig. 5.1).

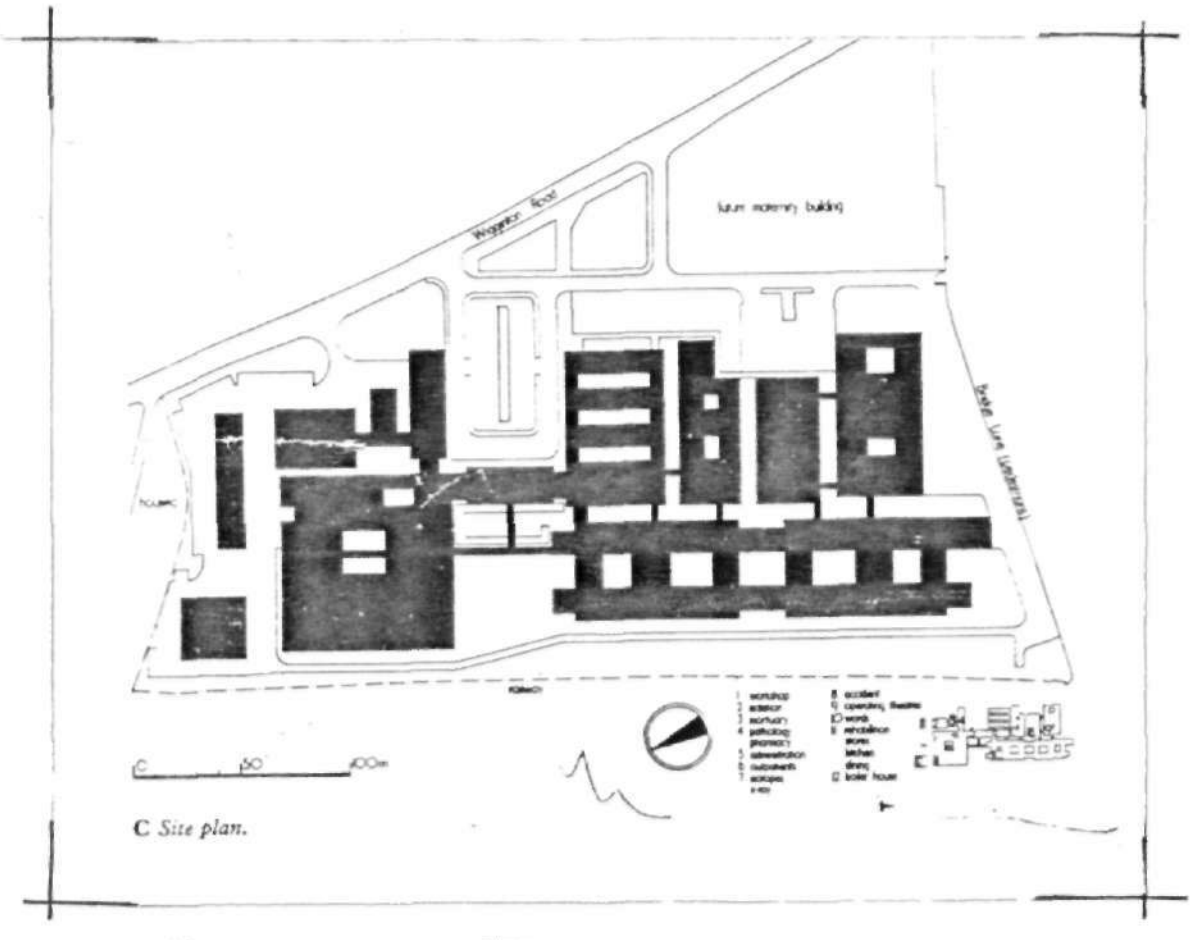
York District Hospital



A *Location plan.*



● *Diagrammatic layout. Goods traffic shares a wide corridor with staff and patients to reduce capital cost. No modern hospital of this size has previously combined all traffic.*



C *Site plan.*

FIG. 5.1.

5.1.2 Design Concept

The design of York is based on the concept that the simplest diagram for an extendible building is one where the primary communication rate or "spine" is a straight line from which secondary communication links to departments branch outat right angles. These communication links or corridors are open ended so that departments may extend differentially. The resulting spine and pavilion plan, is characteristic of the concept of "inderminancy" consistently advocated by its designers and may of its underlying objectives anticipated the design strategies adopted.for "Harness" and later for the "Nucleus" hospital concept although these were developed in a different and more formalised context.

Access to the site from Wiggington Road is simple and direct, comprising a single entrance and exit for all staff, visitors and patients to the hospital and a separate entrance and exit for goods traffic to the service zone. Access to thebuildings themselves is limited for efficiency and control, the main hospital entrance serving all visitors and patients. Separate entrances are only provided for stores, mortuary and emergency and accident departments with a further minor pedestrian entrance for staff in the south-west conner of the site with direct access to the spine corridor.

The Four-storey Ward Block contains approximately 800 beds with 240 beds on each of the upper floors made possible by combining

end to end two entirely self-contained groups of 120 beds. Each of these 120 beds-groups has a central core of lifts and contains four linked 30-bed ward units with the single rooms in the cross links to give some nursing flexibility. All wards are on the perimeter except those adjacent to the centre courtyard. An interesting feature of the plan is the combination of day spaces between some of the 5-bed bays to form a social ward is left partly open at each end for future infilling to provide an additional 60 beds, the remainder of the ground floor on one side of the hospital street being given over to plant rooms, chapters, medical roads and social areas.

The operation department is a two storey building with barrier changing facilities at ground level and ten major operating suites above with a direct link to the surgical wards. The theatre sterile supply unit (TSSU) is also at the upper level to supply the theatres in addition to the remainder of the hospital. Below the theatres are the intensive care unit, non-resident staff changing and a 14-bed short-stay ward.

The accident and emergency department is a single-storey building with links to the operating department for major surgical works, to the intensive care ward and short stay ward where patients can be kept under observation for short periods without being admitted to hospital.

Radiology is a single storey building, directly accessible

from the out patients department and from the wards via the hospital street.

The out patients' department is large and planned on two floor levels entered directly from the brightly carpeted main entrance with spacious seating areas and a tea-bar. The general clinics are at ground floor level connected by a ground staircase from the reception area and lift to special clinics and clinical investigation area at first floor level all of which are accessible to the wards. The outpatients' records section forms part of the main medical records department and is diectly accessible from the out patients' reception area.

The highest building on the site is administration and training containing the main entrance, reception and waiting area at ground floor level, with three floors of administration offices and a further two floors which accommodate the nurse training school.

The laboratories are in a four-storey building and consist of standard laboratory module designed to be fully serviced within their own space and flexible and demountable. The pharmacy and its dispensary are at ground floor level.

Physiotherapy and rehabilitation department is a long haul from the wards but is well located for the large outpatient load.

The supply/(services department comprises the kitchen staff dining and central stores are grouped together at the end of the

hospital street from where supplies are distributed to all parts of the hospital by hand, trollies or a motorised "train system".

Typical floor plans of the wards are shown in Figures 5.2, 5.3, 5.4, 5.5.

5.1.3 Advantages

Being a low rise hospital complex a high degree of articulation of the various departments is achieved and consequently efficient service.

- travel distances are vertical and are done by lifts and staircases, thus the problem of internal circulation has been reduced to the barest minimum.
- time and labour are saved since most services are done by automation.
- the hospital probably represents the limit to which a low rise spine and pavillion plan can be stretched andstill satisfy acceptable functional amd environmental criteria.
- A simple structure that would be able to extend in small increments as finance and medical need demanded and be capable of subdivision into three main phrases that form part of the initial brief.
- The hospital layout is clear and logical
- Entrance to the complex is simple and direct
- The structure is a reinforced concrete frame with a

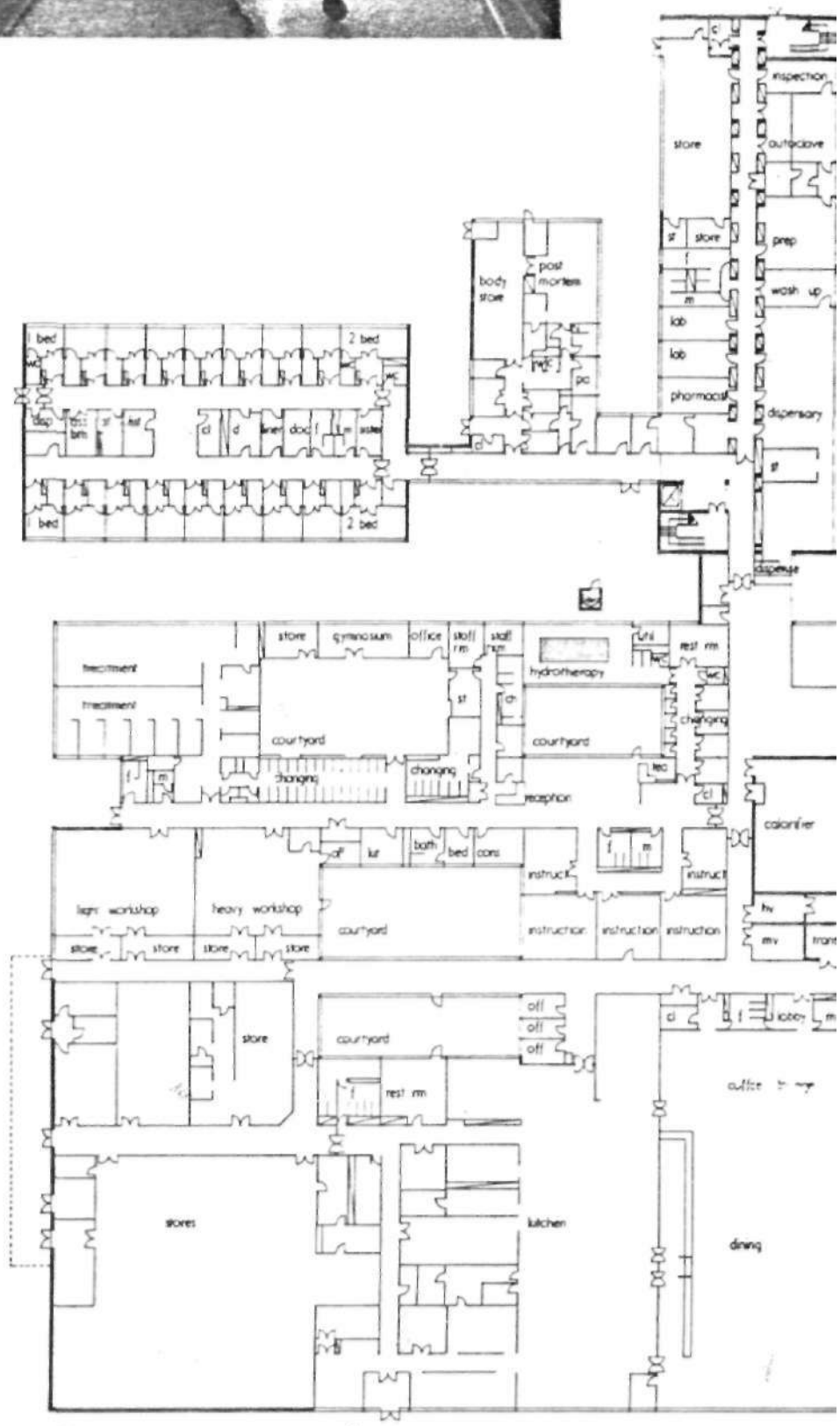


1

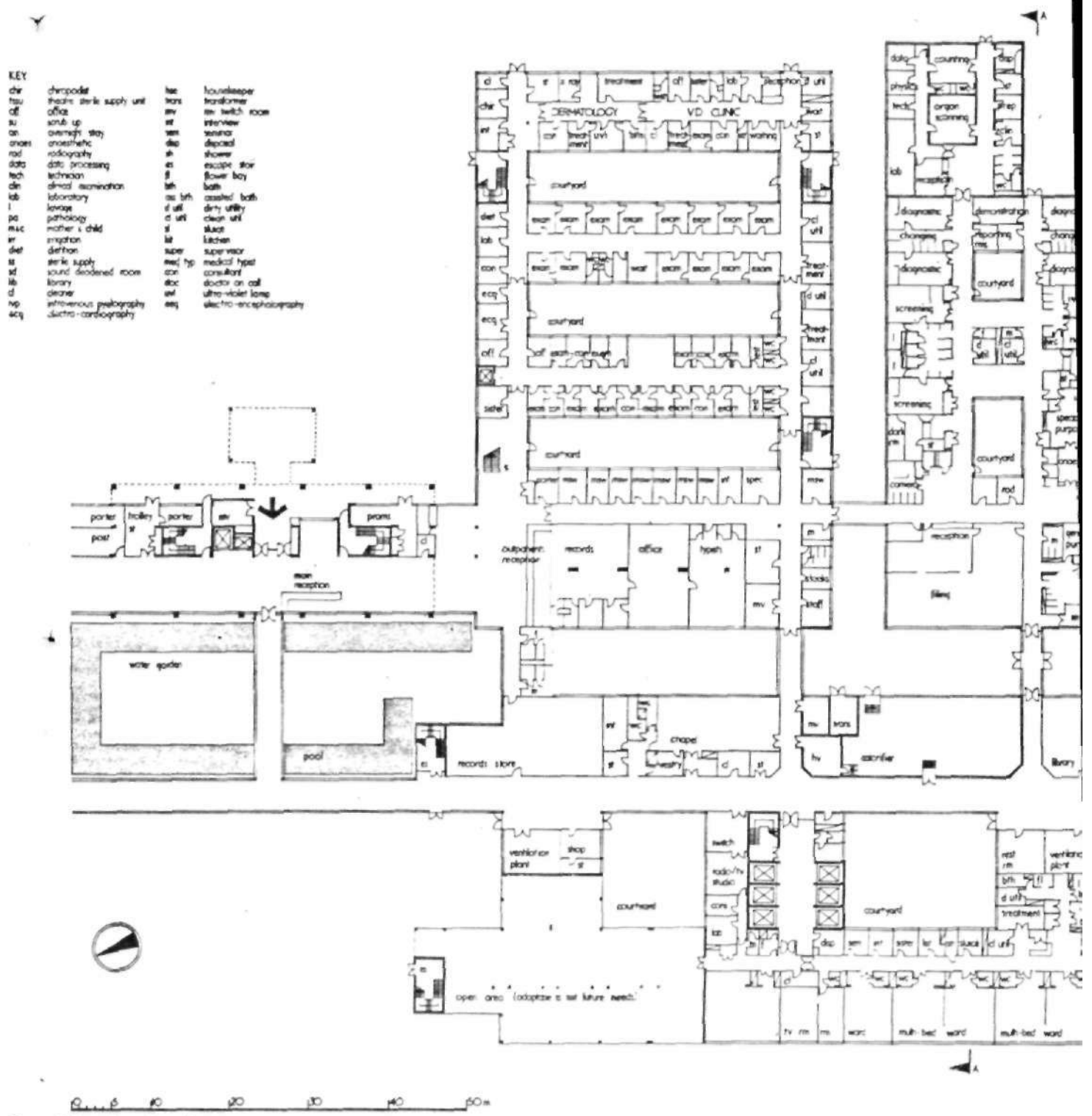
FIG. 5.2



2

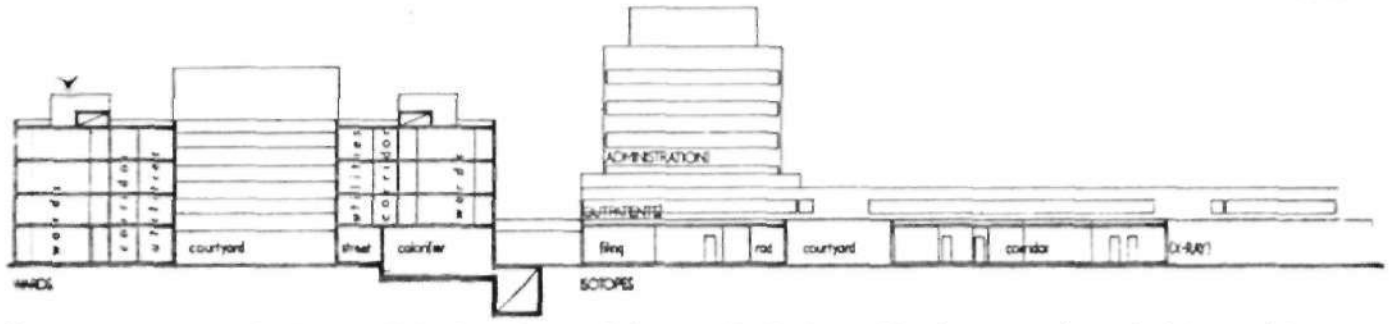


● *Ground floor.*

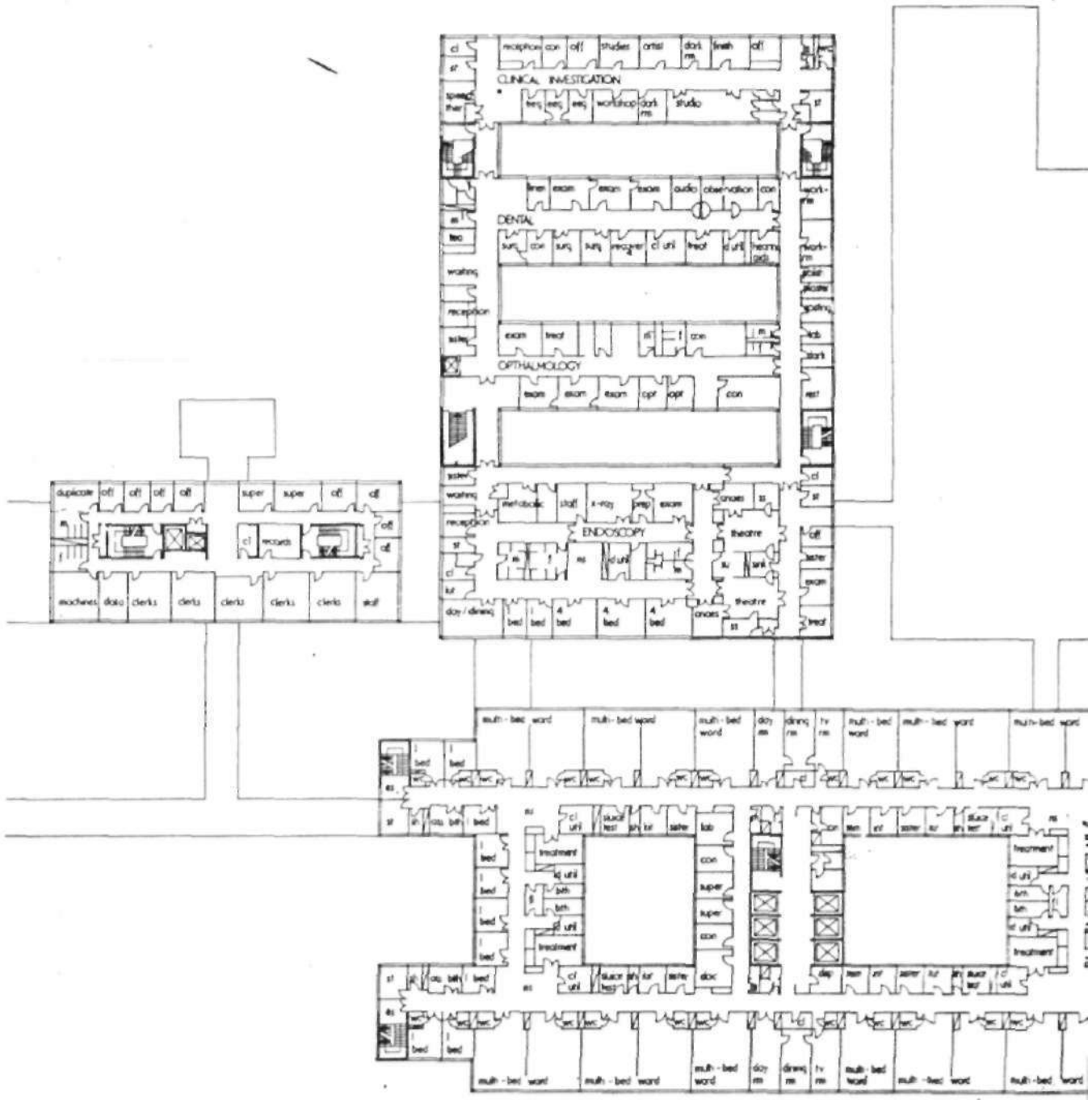


Ground floor (continued).

FIG. 5.3



● *Section AA. The calorifier room links the underground pipe tunnel with the roof duct by means of a vertical riser and thus simplifies the traditional arrangement of service runs.*



● *First floor.*

FIG. 5.4.

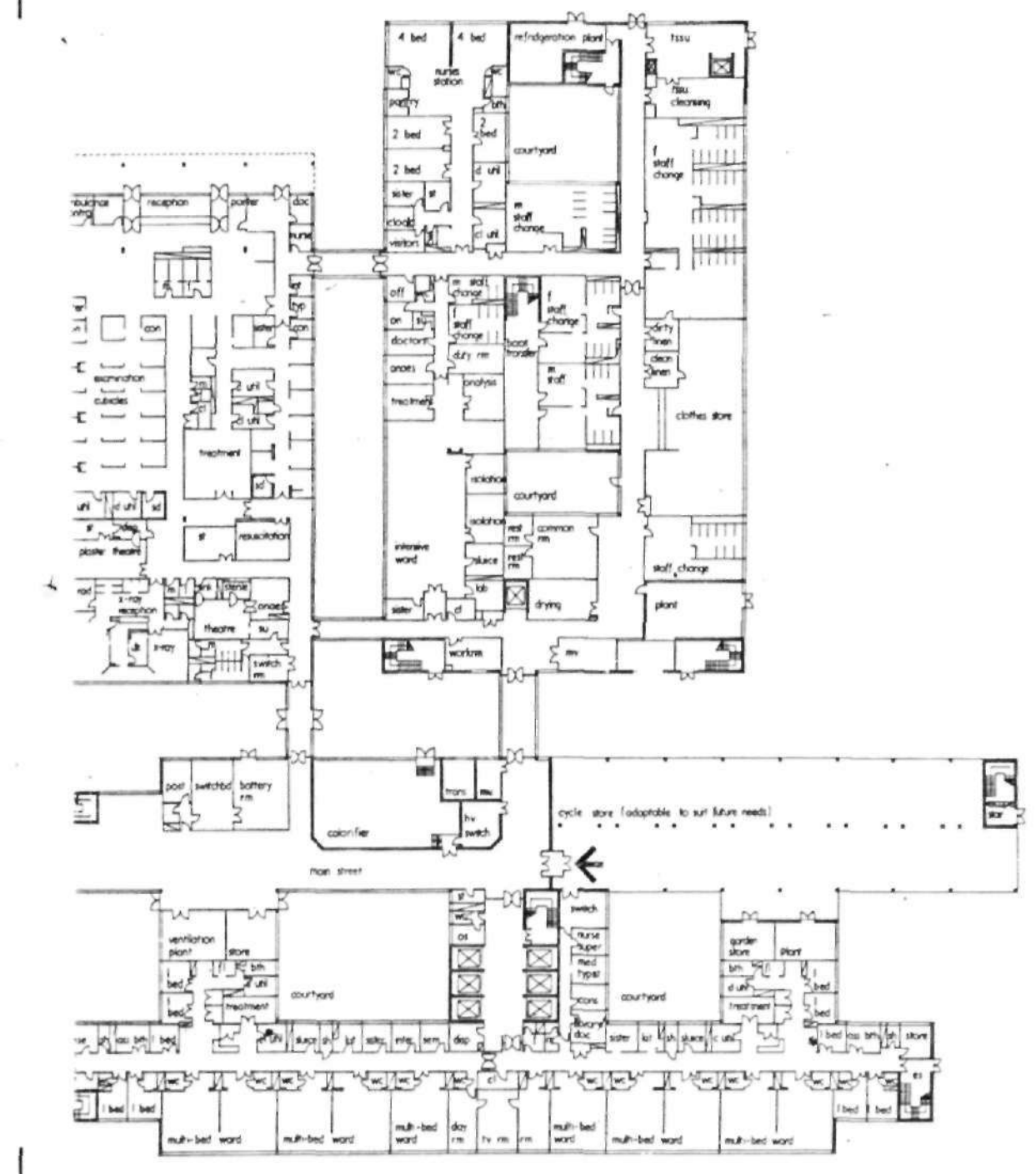

4 bed
4 bed
refrigeration plant
tssu
nurses station
pantry
2 bed
2 bed
courtyard
staff change
sister
visitors
staff change
off
staff change
doctors
duty rm
analysis
treatment
boot transfer
dirty linen
clean linen
clothes store
examination cubicles
treatment
isolation
courtyard
isolation
rest rm
common rm
plaster theatre
resuscitation
intensive ward
sluice
rest rm
staff change
lab
drying
plant
theatre
switch rm
workrm
post
switchbd
battery rm
trans
hv switch
calorifier
cycle store (adaptable to suit future needs)
main street
ventilation plant
store
courtyard
nurse
supervisor
ward
typist
icons
courtyard
garden store
plant
treatment
multi-bed ward
multi-bed ward
multi-bed ward
day rm
tv rm
multi-bed ward
multi-bed ward
multi-bed ward

FIG. 5.5.

specially designed and highly penetrable flooring system to accommodate changes in services and partitioning requirements throughout the life of the building

- The volume per floor area, that is, floor to floor height has been kept low
- An appealing architectural form is achieved which is pleasant to the eye and the demonstration of a technically and functionally versatile solution to hospital design embodying a capability for change to degree beyond most and possessing a humane interior environment never far from an outside view.

5.1.4 **Disadvantages**

- the main problem of the vertical concept is expansion. Should there be any expansion it becomes detached from most of the facilities needed by it and hard to duplicate
- Ventilation and lighting are mostly artificial courtyards have been employed but to serve waiting areas the hospital main street. In Nigeria it is difficult to achieve this because of economy
- Joblessness is created by the use of automation and automation itself is expensive.
- No laundry services for the complex
- Majority of Nigerians are illiterates, the complex nature of this hospital concept will be confusing and difficult to get by

- High degree of maintenance is necessary for this types of hospital complex since all facilities are grouped together
- This type of hospital environment will be quite strange since it is lacking in natural environmental features brought about by courtyards and pavements when pavillion type of design is adopted.

The author, having enumerated both the advantages and the disadvantages of going vertical in hospital design, considers the vertical type of design not the most appropriate for the Nigeria situation. Rather, the spine and pavillion type of design, of not more than two storey (low rise' and expanding horizontally will be most suited for the Nigeria circumstance, that is a low rise and pavillion plan that can be stretched and still satisfying acceptable functional and environmental criteria.

5.2.0 Ajaokuta Medical Centre

Proposed 250/500-bed hospital for Ajaokuta steel township, Kwara State, Nigeria. A project of Federal Ministry of Health designed by Deji Oyenuga and Partners.

5.2.1 The Site

The hospital site is located at the north central part of the steel township and is directly accessible from the proposed

main road which links the town with a dual carriage way from Okene. The 20 hecteres land is sparsely wooded with an undulating terrain and the soil chracteristic is generally hard and loamy in some areas.

5.2.2 <u>The Site Development And External Circulation</u>

(See Fig. 5.6)

From the dual carriageway an access road shall be constructed to bring the hospital occupants to the complexes' different entrances. The first entrance is the principal entrance that leads directly to the OPD/Administration block. This access also branches to the staff parking area and the services and goods delivery area. Patients and guests are provided with ample parking spaces in front of the OPD/Admin block and on its west side. This internal road exits to the dual carriageway. The second entrance is emergency entrance that leads to the casualty block and service building. This road goes round the back of the hospital complex giving the emplyees access to their parcking area and an exit to the dual carriageway. Near the exit is the elevated water reservoir so located because of the site elevation in this area. The third entrance is the access to the employees block of flats which are also provided with a common parking area. The entrance also gives access to the sewage treatment plant and incinerator house. These facilities are located on this area because of the wind direction consideration. The smoke from the incinerator and the foul air

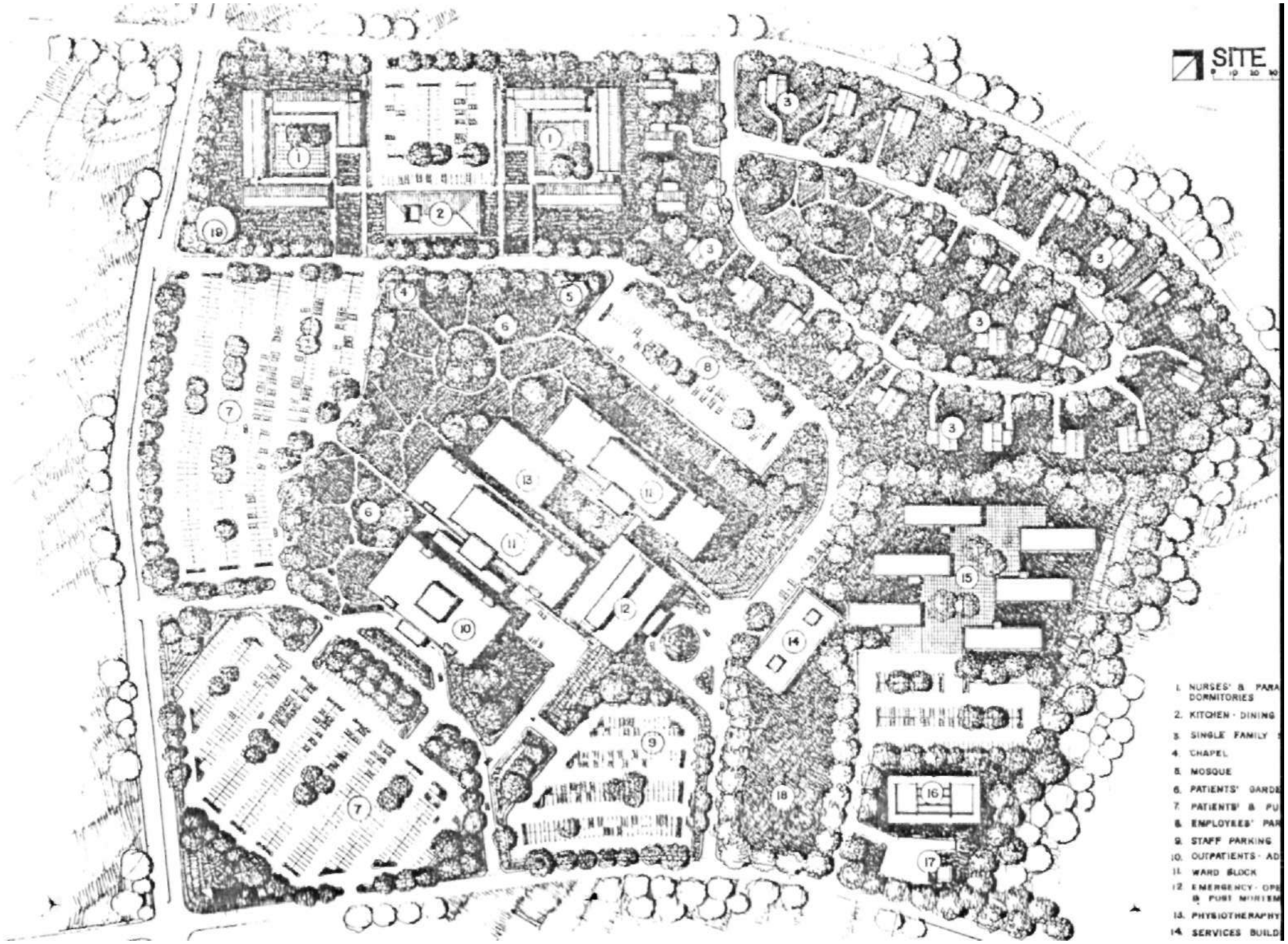

SITE
1. NURSES' & PARA DORMITORIES
2. KITCHEN · DINING
3. SINGLE FAMILY
4. CHAPEL
5. MOSQUE
6. PATIENTS' GARDE
7. PATIENTS' & PU
8. EMPLOYEES' PAR
9. STAFF PARKING
10. OUTPATIENTS · AD
11. WARD BLOCK
12. EMERGENCY · OPE & POST MORTEM
13. PHYSIOTHERAPHY
14. SERVICES BUILD

FIG. 5.6

that might arise from the sewage treatment plant are driven away by the wind from the entire complex. Thick deciduous trees shall be planted on designated places to conceal and/or protect adjacent areas. The north west side of the property is also bounded by a second proposed access road from the dual carriage-way giving a staff members access to their residences. Very near the entrance are the nurses' and paramedical staffs' dormitories and a dining pravilion. The doctors' and department heads' bungalows are found next to these dormitories. These bungalows had been carefully laid out providing each unit a private outdoor living area.

The overall outlook of the proposed site development is a multi-complex packed with flower gardens for the use of all the people concerned. Other structures that can be found in the site are: a chapel, a mosque, and a vertical signage rising to 6 meters height located at the main entrance brings you to a big lobby attended by people at the information centre counter. You are then directed to your proper place of reference. By the left are general consulting doctors and if a specialist is needed then you are lead to the right side of the main level. Both areas are provided with ample waiting spaces.

To avoid contamination, it was decided not to put waiting patients all at one corner. At the information counter they are led to the right doctors for their consultation. This will determine which would be the next doctor to see (a specialist or

otherwise) in front of each doctor's cubicle is a waiting area each according to the sickness and diseases patients have. Patients coming to this department for the second time will not have to pass by the information counter but go directly to the doctor concerned. The design of this department has been based from thorough observation and study of existing medical centre problems.

The main level is accessible to the first floor and lower Ground Floor Areas by a wide staircase located within the lobby. The Admitting section is also located in this level behind the information counter.

After your treatments the presribed medicine can be obtained at the pharmacy conveniently located on this level and very much accessible from all blocks. The Radiology department is also very accessible.

5.2.3 **Method of Construction**

The nature of the project called for a very flexible planning for future adaptations to changing needs on each unit so a 7.50m x 7.50m grid was used.

The construction of the hospital complex is to be done in two phases, The phase 1 will cover all of the facilities for a 500 bed hospital but building only one ward block which shall contain 250 beds. The additional 250-bed ward shall be phase II The phase II block could be constructed without disturbing any of

the regular hospital operations.

External Finishes shall be plain cement plaster mixed with color admixtures. Most of the external walls shall be in white and all doors and windows shall be black transparent glass on black anodized aluminium frames. The architect desires to give the hospital a very dignified exterior looks in almost black and white. These finishes are also economical and easy to maintain. Internal finishes calls for bright colors that shall stimulate the patients psychologically.

5.2.4 Internal Circulation

You as an outpatient or as a visitor to the First Aid section. For all types of treatment, if a surgical operation is needed, a bed elevator is conveniently located in the section. After the operation, the administrative personnel in this block fills out your record and you are wheeled to the ward block as an inpatient.

5.2.5 Summary of Areas

- Administration/OPD block
- service block (between OPD and Ward block)
- Emergency Block
- Physiotherapy Block
- Service Building

This is a single storey building housing the installation for technical, maintenance and is located totally off the hospital complex - This include power house for emergency electricalsupply, air conditioning, central gas supply for medical gasses and for kitchen. Workshops and boiler room are also found here.

5.2.6 **Recapitulation of beds**)

- General Surgery	60
- Internal Medicine	70
- Cardiology	15
- ENT	15
- Orthopaedics	15
- Paediatrics	15
- Genaecology and obstetrics	20
- Intensive care	10
- Isolation	15
- Psychiatry	15
Total	250

Patients going down to the lower ground floor level you will find the public cafeteria, postal services counter and public pay Telelephones. Going up from the main level you will find the Administrative department.

You as a member of the staff

As you enter the staff entrance directly from the staff parking you will find right before the staircase leading to main level, and access to the following: male staff main changing room, staff restaurant (with a common servery with the public cafeteria linked to the main kitchen). Above the male changing room on the main level is the female staff main changing room.

From this point you will have your access to either the outpatient or the inpatient Departments.

You As An Inpatient

Let us take your case as a female patient scheduled for caesarean operation. You will pass through the main entrance, register at the admitting section and taken to the Ward Block to occupy one of the Maternity Wards located at the next level. The bed elevator lobby is located to have a direct access to the operating units. For normal deliveries, labour with all conveniences the nursery and children's ward is located on the same level.

5.2.7 **Power Supply**

A transformer station is integrated with the power house in the service building and shall be designed to have a capacity of approximately 500 KVA that will operate the hospital in case

of power interuptions.

5.2.8 Water Supply

An elevated water tank shall be erected on the highest elevation with the required capacity and pressure. This will be the common source of water for both hospital and residential buildings. Speed filteration shall be employed. Overhead water tanks and underground water reservoirs are provided to the hospital blocks for both domestic and fire fighting purposes.

5.2.9 Waste Disposal

Disposal of refuse from all departments like used surgical bandages from operation and all kinds of wet and semi non-combustible waste are incinerated. The incinerator nstallation consist of the following: incinerator, post burning chamber, additional burner and a multicyclons flue gas dust separator to conform with the antipollution regulations.

5.2.10 Fire Protection

The underground water reservior and overhead tanks are designed for emergency fire protection. Sprinkler system shall also be used. All hospital blocks are provided with fire stairs which are easily accessible to all occupants

For sketches see Figs. 5.7, 5.8, 5.9, 5.10, 5.11, 5.12, 5.13

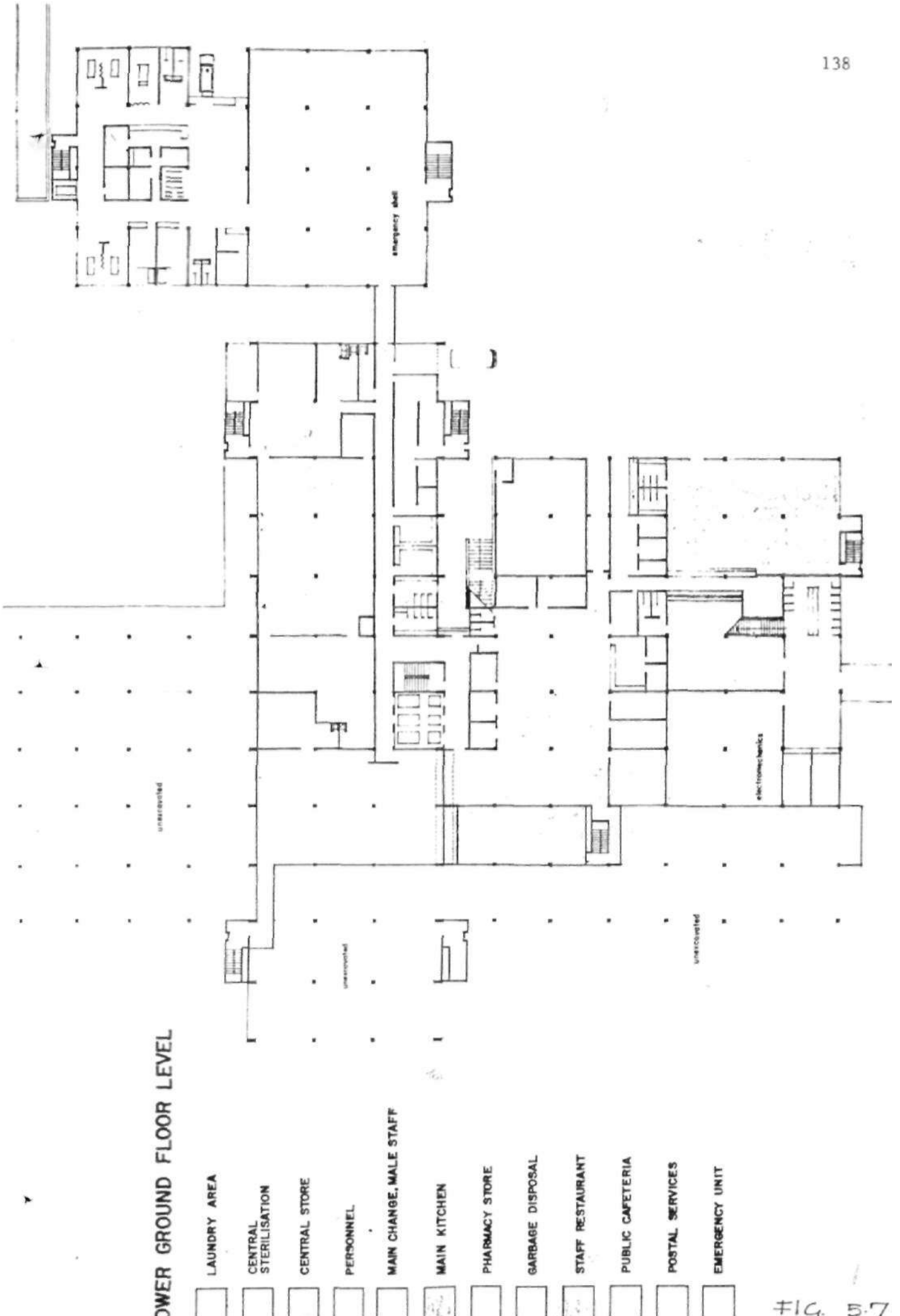

LOWER GROUND FLOOR LEVEL
LAUNDRY AREA
CENTRAL STERILISATION
CENTRAL STORE
PERSONNEL
MAIN CHANGE, MALE STAFF
MAIN KITCHEN
PHARMACY STORE
GARBAGE DISPOSAL
STAFF RESTAURANT
PUBLIC CAFETERIA
POSTAL SERVICES
EMERGENCY UNIT
unroofed
unroofed
unroofed
electromechanics

FIG. 5.7

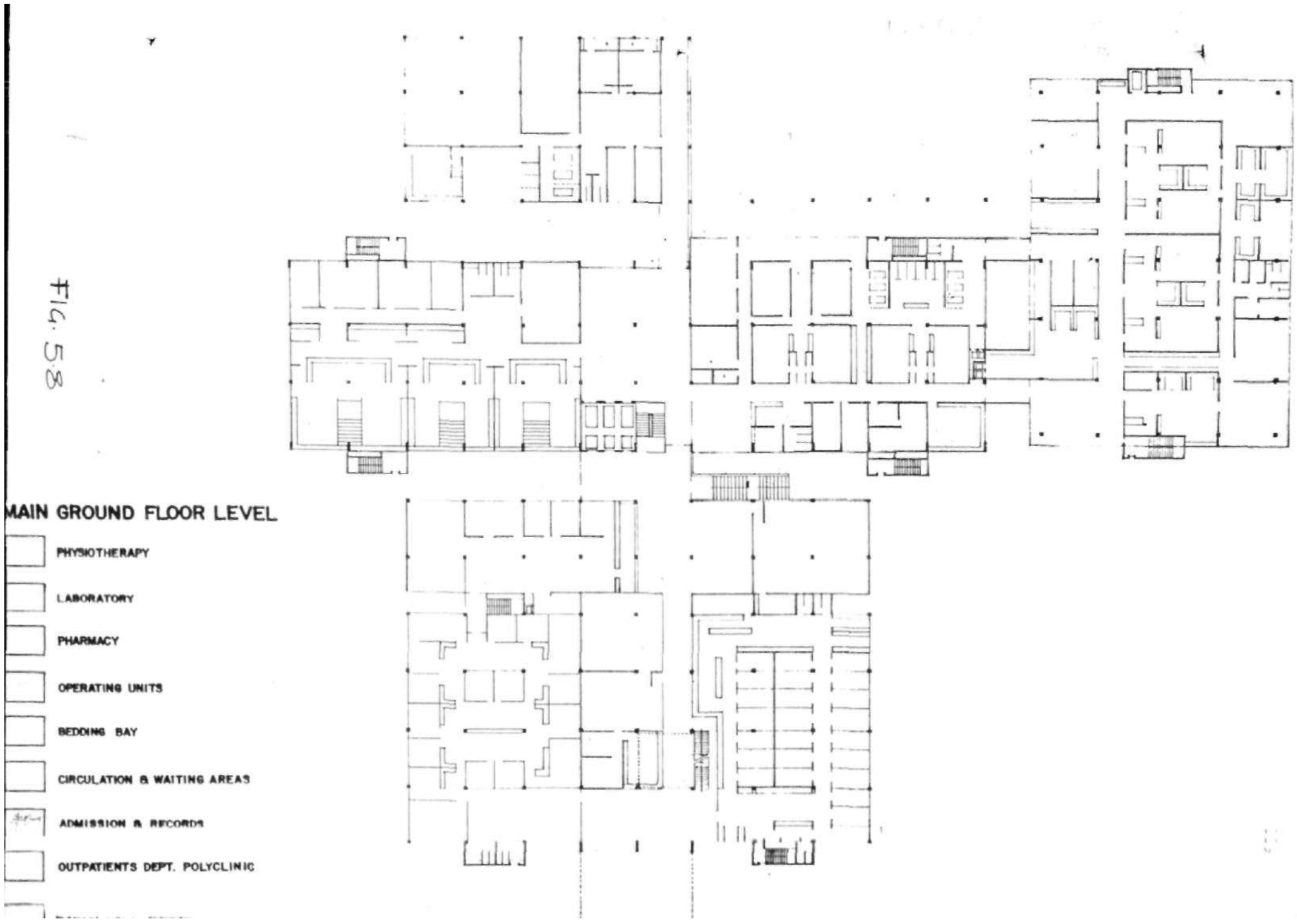

MAIN GROUND FLOOR LEVEL
PHYSIOTHERAPY
LABORATORY
PHARMACY
OPERATING UNITS
BEDDING BAY
CIRCULATION & WAITING AREAS
ADMISSION & RECORDS
OUTPATIENTS DEPT. POLYCLINIC

Fig. 58

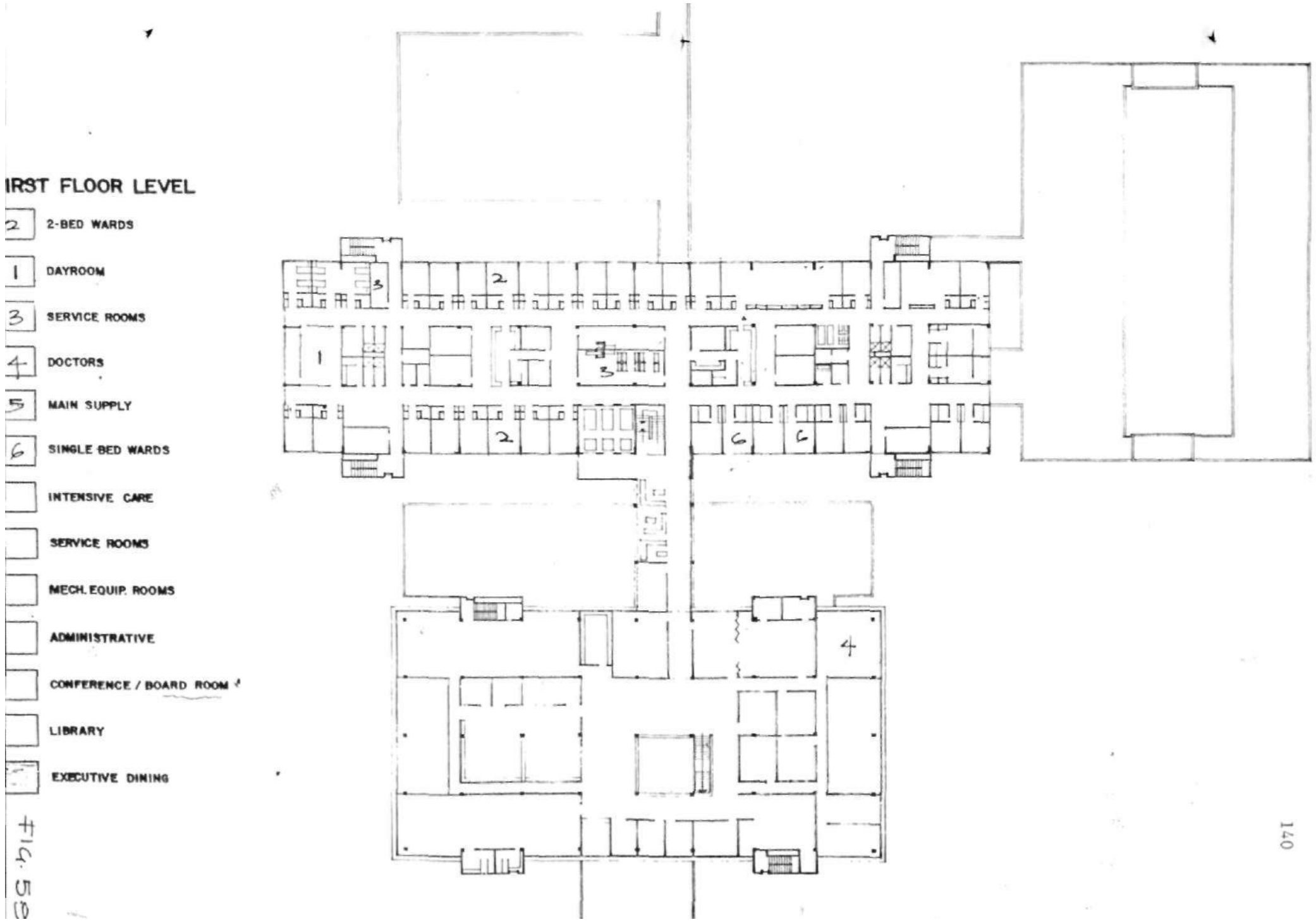
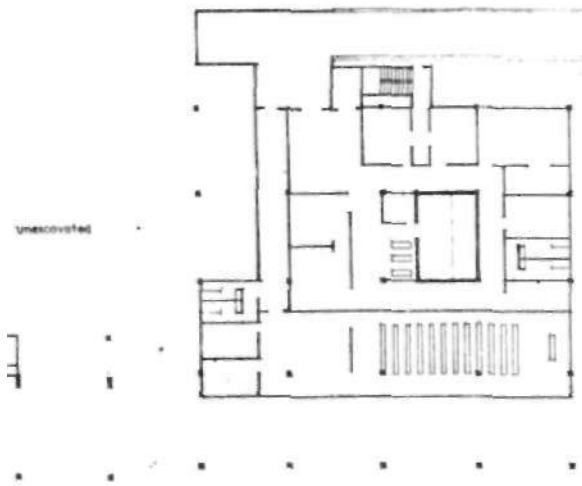
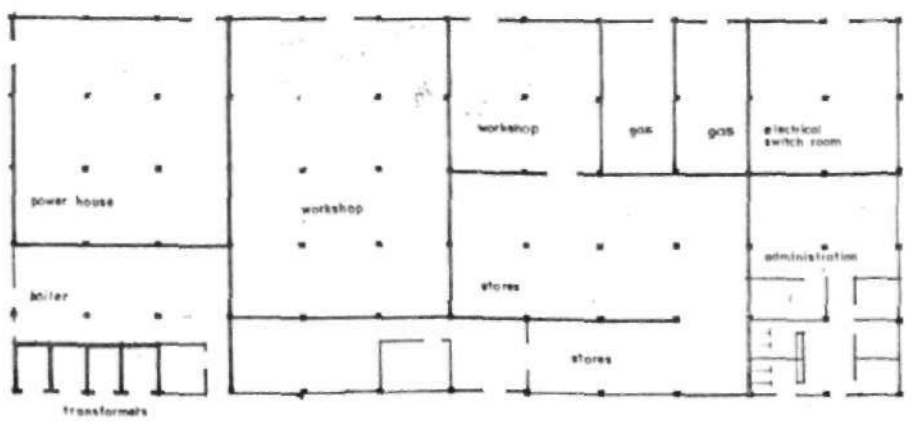

IRST FLOOR LEVEL
2 2-BED WARDS
1 DAYROOM
3 SERVICE ROOMS
4 DOCTORS
5 MAIN SUPPLY
6 SINGLE BED WARDS
INTENSIVE CARE
SERVICE ROOMS
MECH. EQUIP. ROOMS
ADMINISTRATIVE
CONFERENCE / BOARD ROOM
LIBRARY
EXECUTIVE DINING

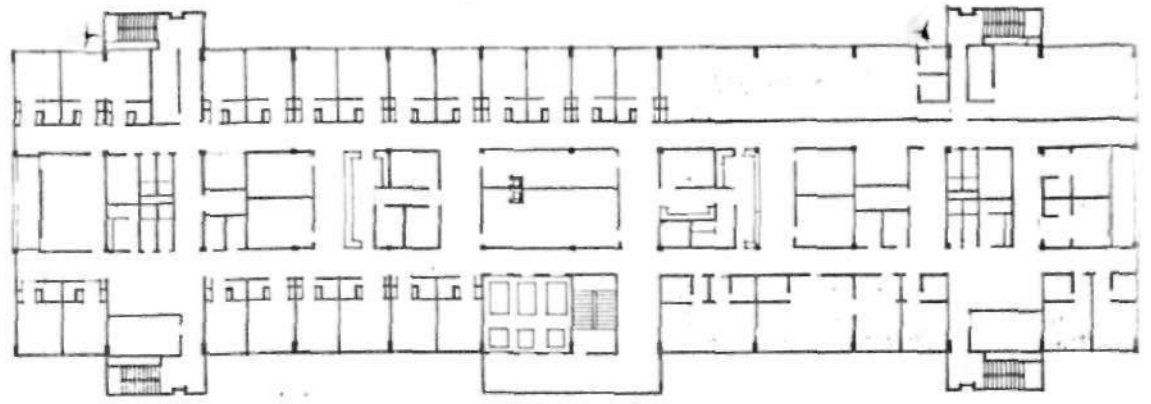
Fig. 58



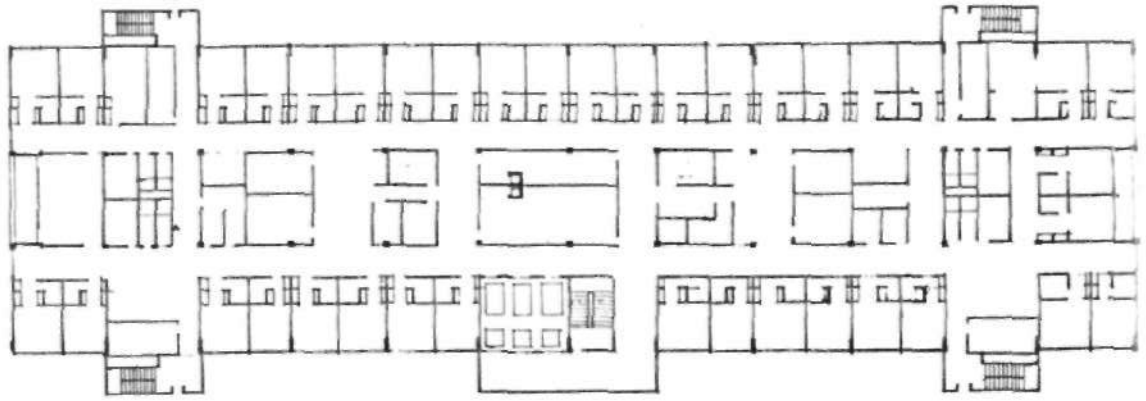
BASEMENT (UNDER EMERGENCY UNIT)



SERVICE BUILDING



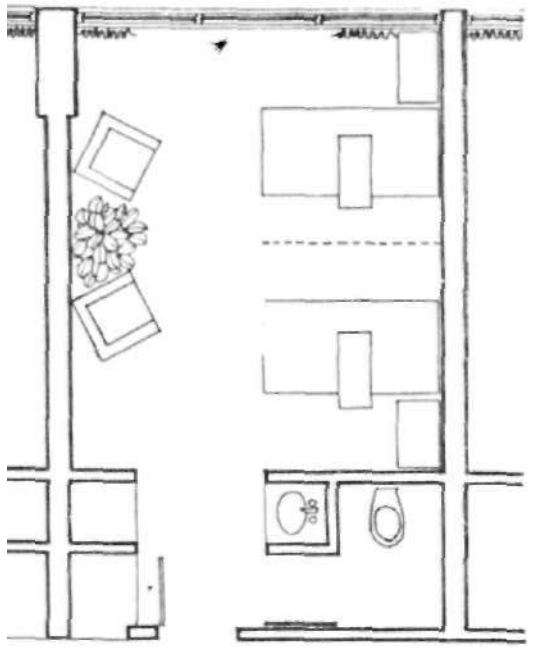
SECOND FLOOR LEVEL



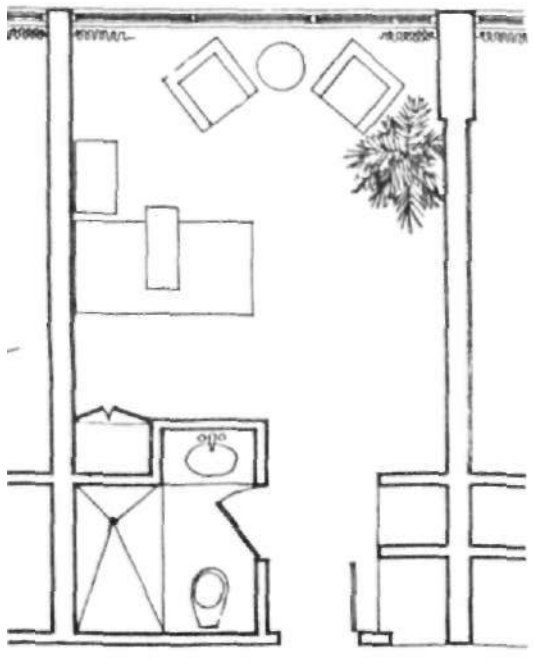
TYPICAL UPPER FLOORS

- POST MORTEM/AUTOPSY
- FUNERAL CHAPEL
- MECH. EQUIPMENT ROOMS
- SERVICE ROOMS
- DOCTORS
- MAIN SUPPLY AREA
- NURSERY & BABIES WARDS
- LABOUR ROOM
- 2-BED WARDS
- SINGLE BED WARDS

Fig. 5.10



2-bed ward- floor plan



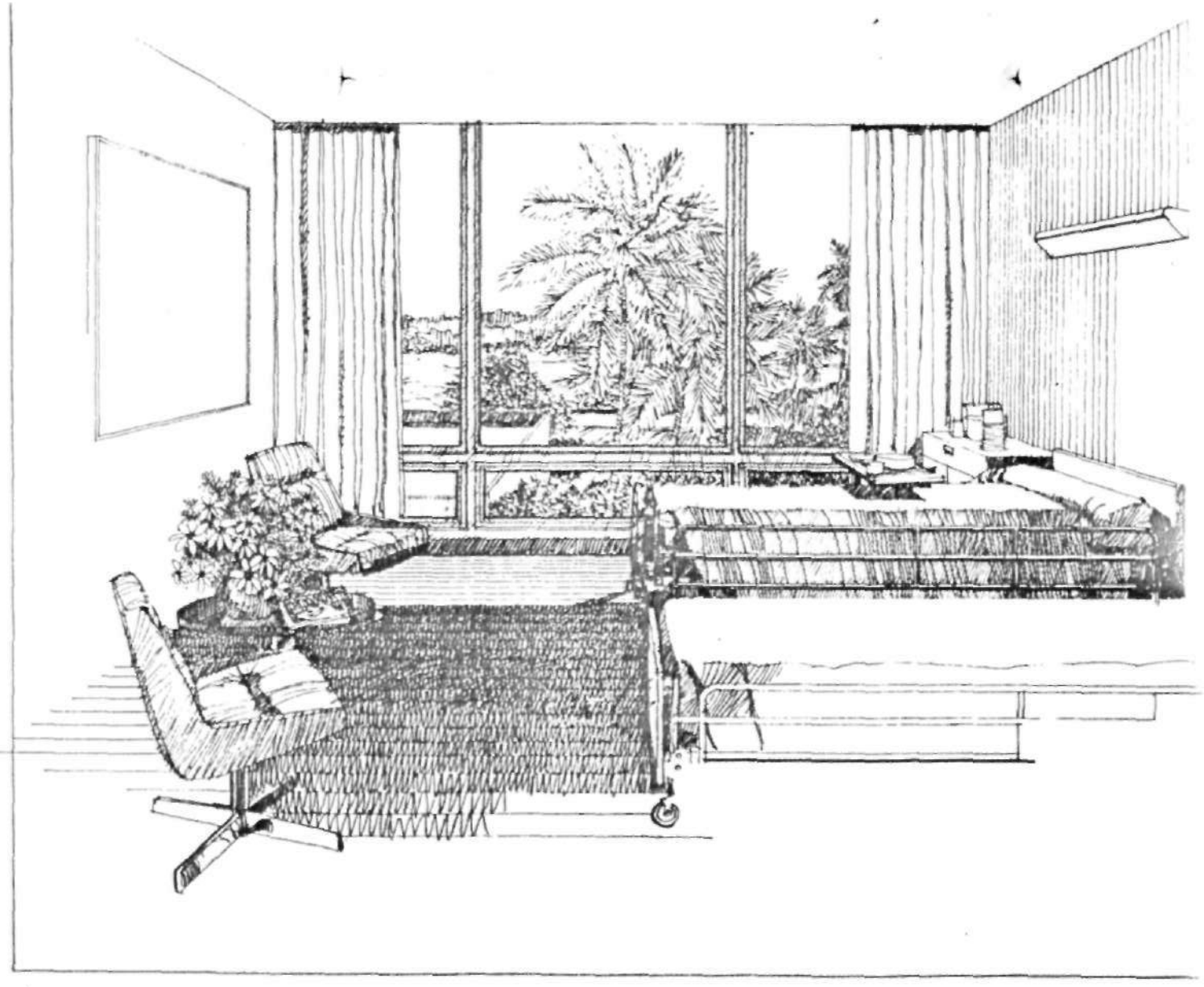
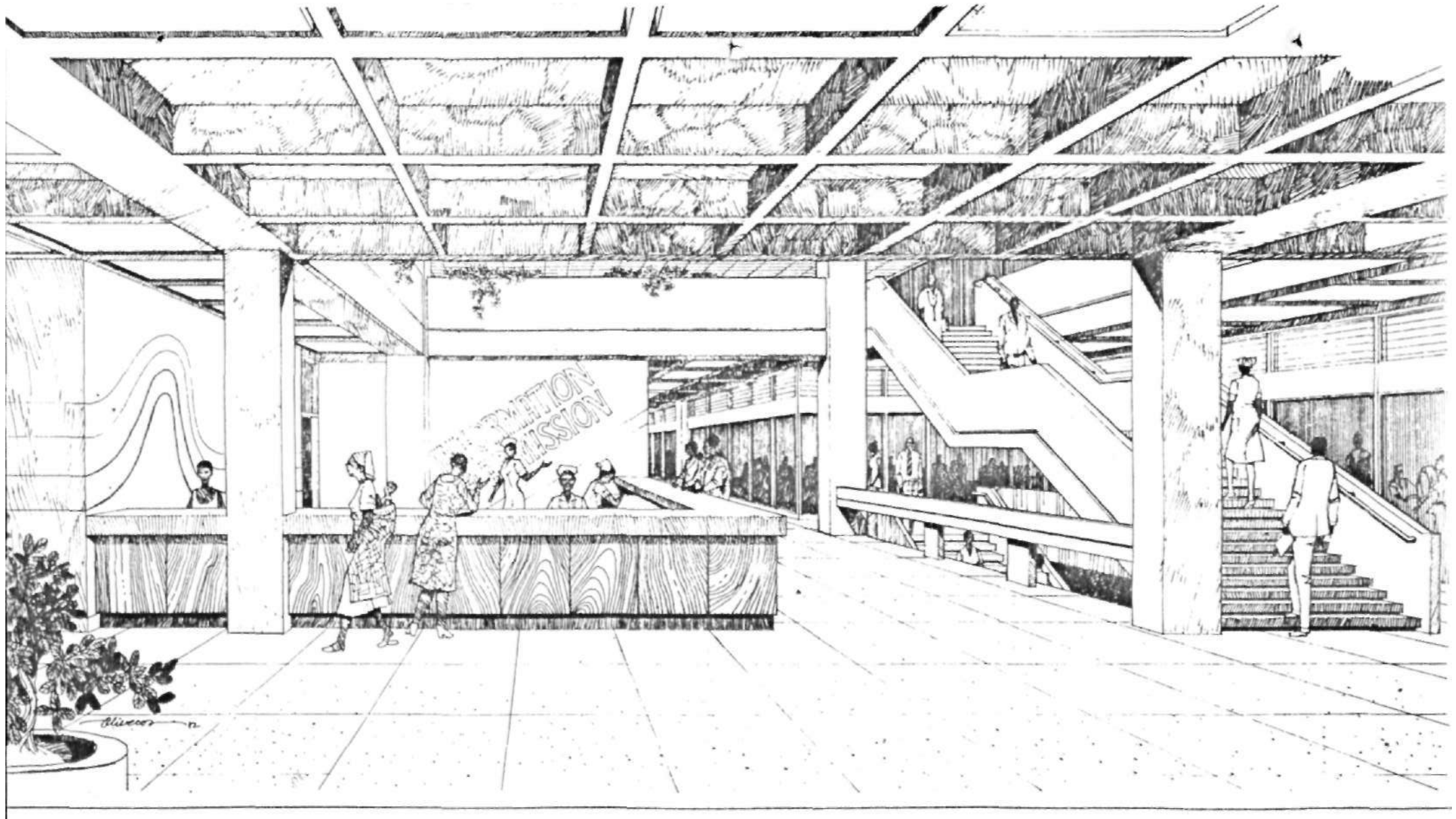


FIG 5:11

INTERIOR OF A TYPICAL 2-BED WARD

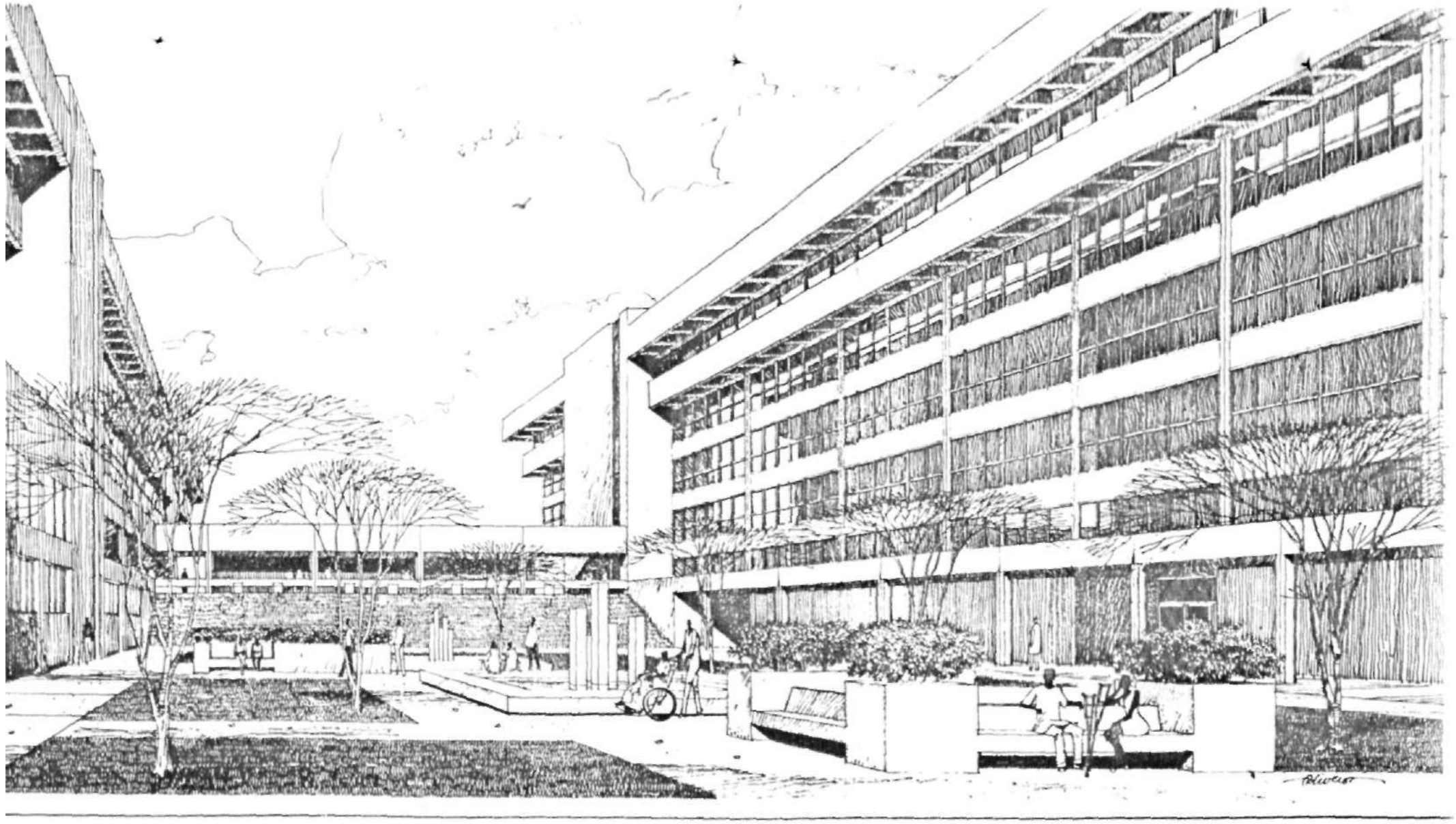


MAIN ENTRANCE lobby·· opd block

blg. 5.12

143

AR 1
JUNE 72



VIEW FROM OPEN COURT

The Physiotherapy block (center) is so located to be useful to both Phase I (left) and Phase II (right) ward blocks.

FIG. 5.13

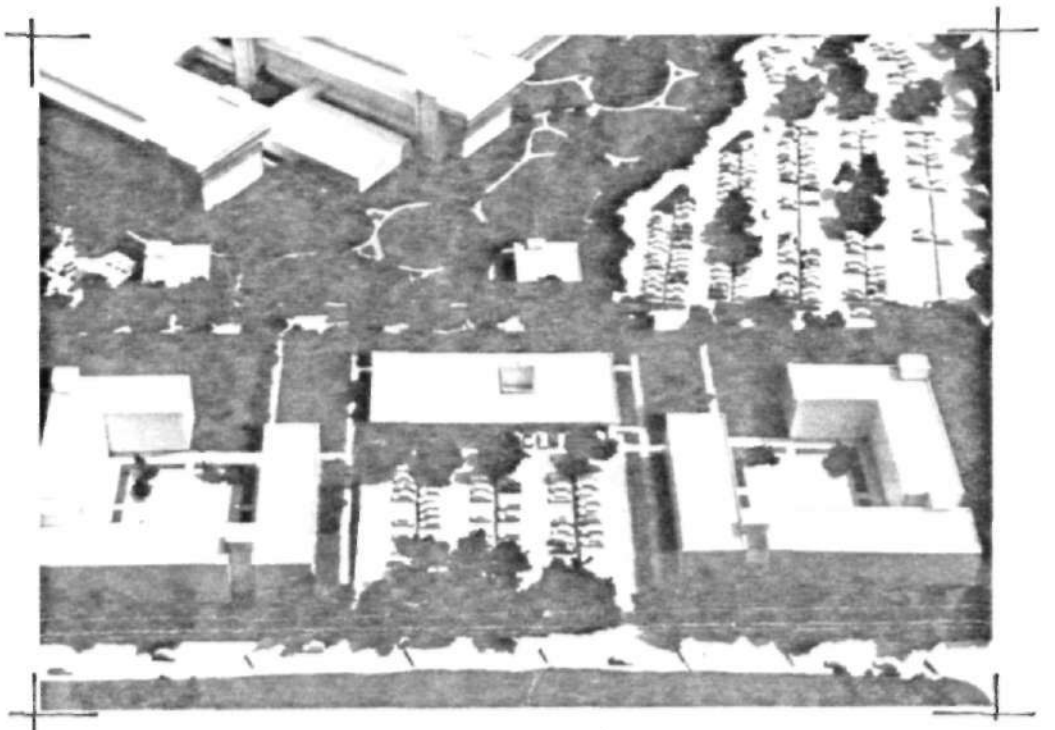


PLATE 5·1

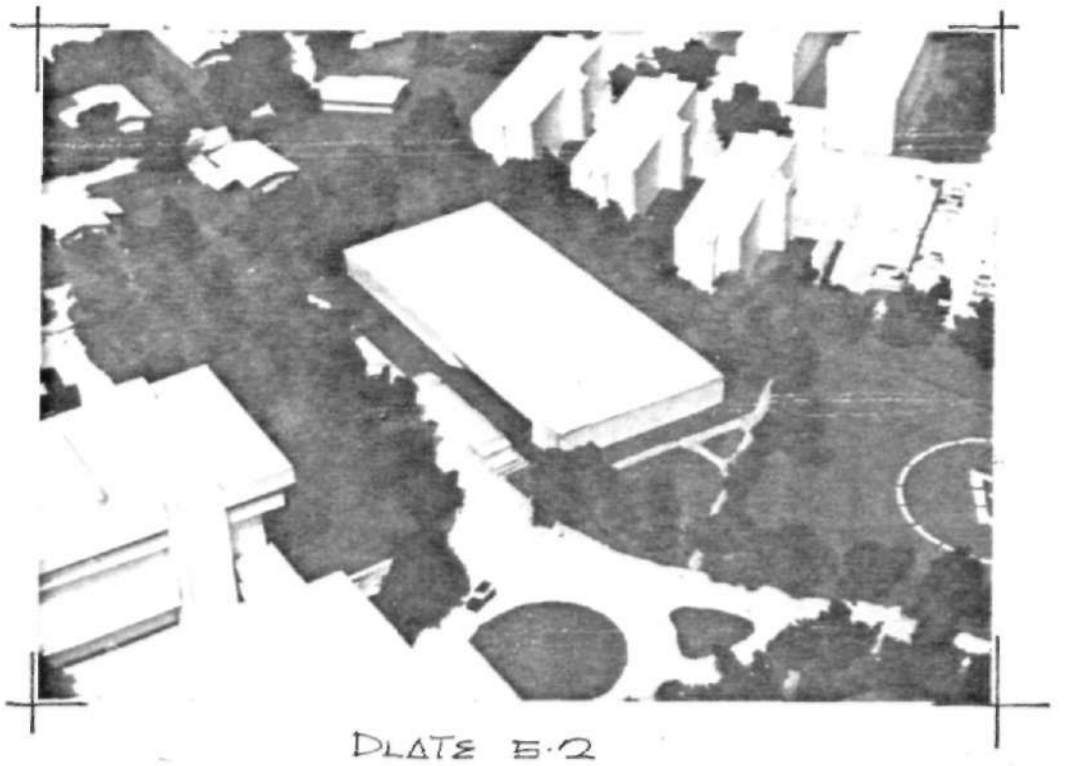


PLATE 5·2

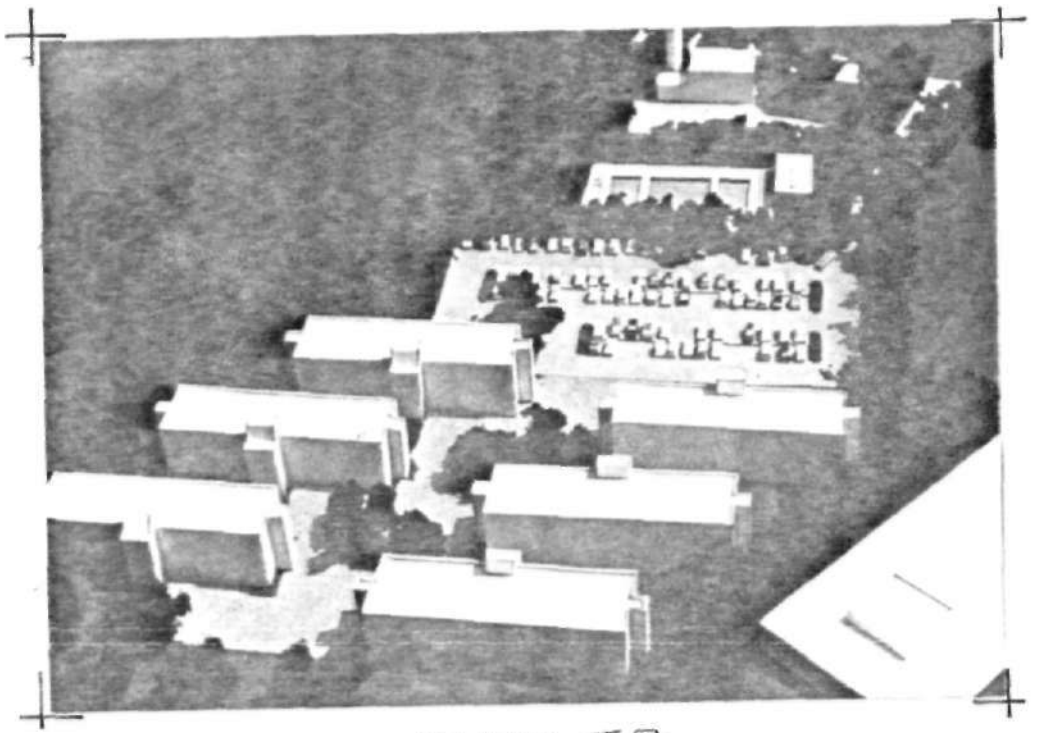


PLATE 5.3

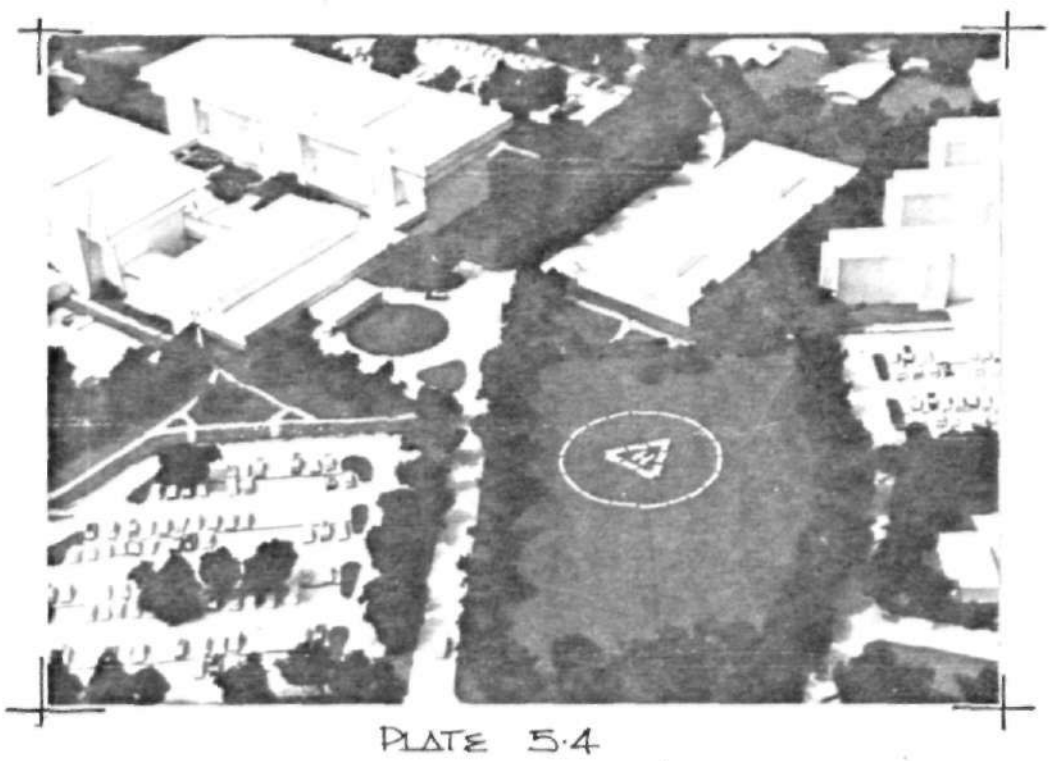


PLATE 5.4

5.3.0 Teaching Hospital of Khyber Medical College, University of Peshawar, WEst Pakistan

Isadore and Zachary Rosenfield, architects, Noon Qayum and co-consulting engineers and architects. Located in what may seem a remote or exotic part of the world on the historic road coming down the Indian continent from the khyber Pass, yet with a climate comparable to Arizona's, this hospital present problems characteristic of countries trying to accelerate their development. As a teaching hospital to a recently built medical school, it will provide modern medical care to a population which has long been deficient in doctors, nurses, and hospital facilities.

The medical centre for Peshawar University, in the north west corner of west Pakistan, is interesting not so much for its size, complexity and diversity, but as a simple example of what a medical centre should be.

In the first place it is physically part of the university complex (Fig. 5.14, master plan). The already existing schools, consisting of two smallish two storey buildings (only one is shown in the illustration). All other buildings, except the teaching hospital are conjectural at this stage.

The architects were invited to design a 500-bed teaching hospital, expandable to 1000 beds, and the choice of two sites who offered to them, they replied that they could not conjure up

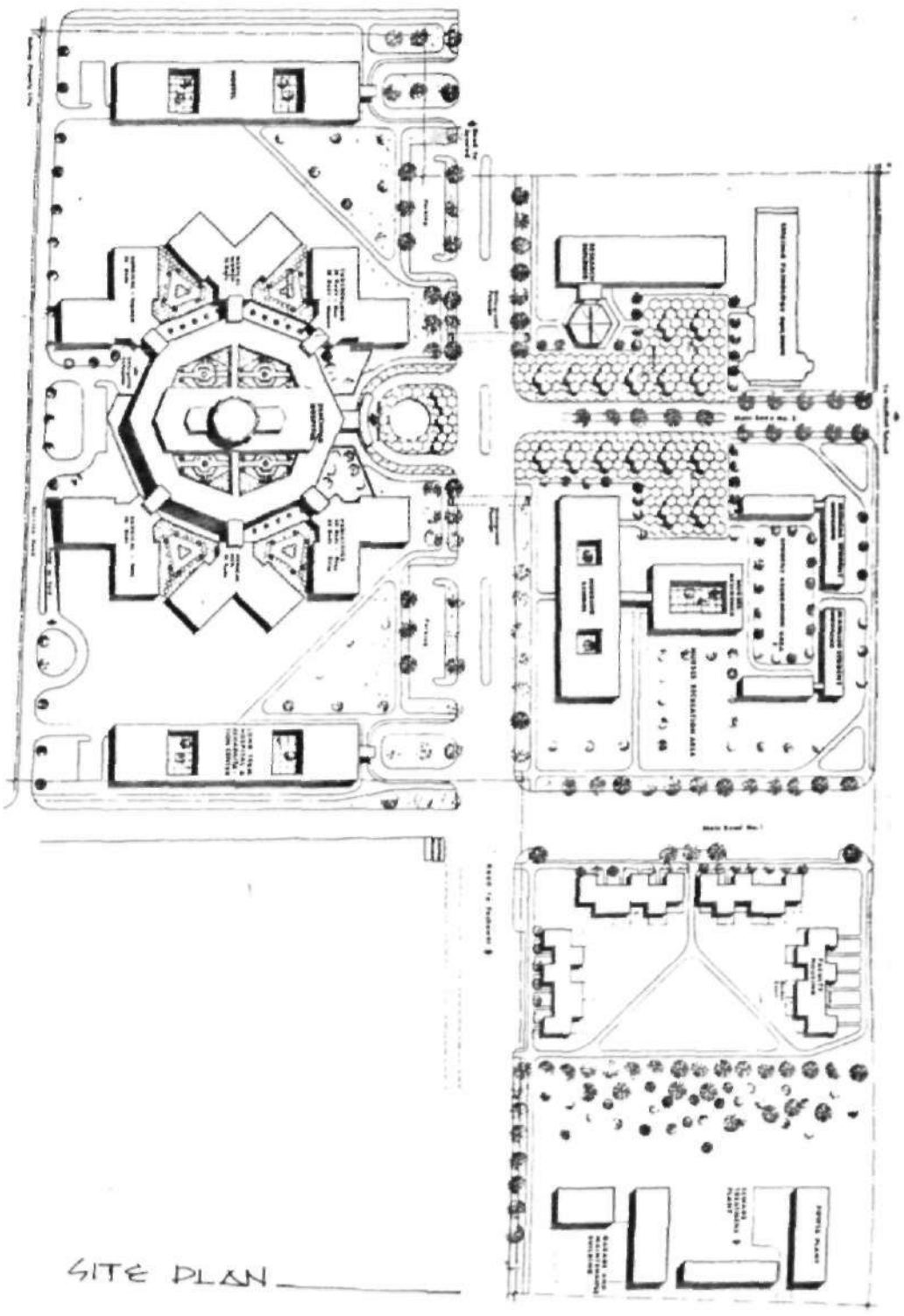


FIG. 5.14

a location for the hospital on site without first visualizing a future medical centre which would ultimately come into being if this medical complex were to do something meaningful for Pakistan. The client then agreed that the commission to plan the teaching hospital should include the projection of future medical centre in which the teaching hospital would stand in a rational relationship to other elements that would follow soon later.

To provide adequate teaching service, the hospital will initially have 500 beds, through the present needs of the peshawar area itself might have been better served by distributing the beds in smaller units over a wider geographical area. In further it is foreseable that 1,000 teaching beds may be needed. The tightly organized core is planned to expand peripherally without altering relationships within the core or between the diagnostic-therapeutic departments and the nursing wings - third floor is planned to expand to size of the lower floors. Number of beds would be doubled by adding second stories to nursing units. The distinctive configuration of the building derives from the logic of horizontal contiguity design.

Location for future development are indicated. A hostel for self-care patient, for relatives accompanying patients and the like a long term hospital and rehabilitation contact with training facilities for psychiatrist and physiotherapists; a school of nursing, residential groups, a service area. The research building would link the hospital group to the existing

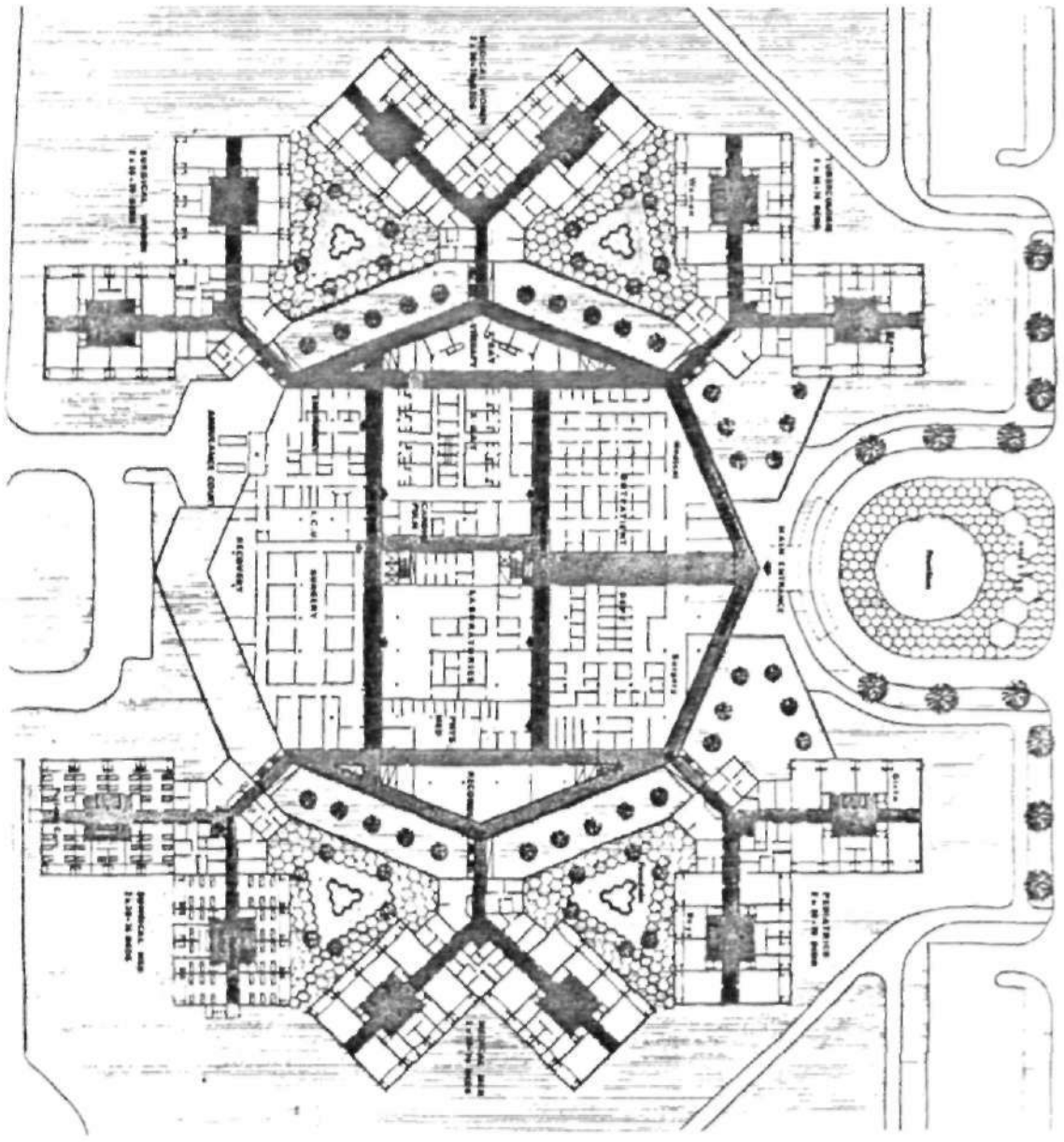
medical school, of which the pathology building is shown. Tunnel passage under the Khyber road join hospital to the rest of the medical teaching facilities and university campus. However modest the initial programme, planning a teaching hospital provide the possibility. For comprehensive development.

5.3.1 **First Floor Plan** (Fig. 5.15)

In the initial stage, this is essentially a one storey hospital on the first floor floor of the octagonal core (diameter about 110m) are all the diagnostic therapeutic department except obstetrics (a relatively self-contained department). Face to face consultation between any combination of specialities is not impeded by stacking departments on different floor levels. From the front, the outpatient department is contigious to requisite diagnostic therapeutic facilities. From the rear, emergency facility is contiguous to the same facilities particularly the surgical suite. Recovery room and intensive care are contiguous and can share personnel and equipment. One storey teaching/ nursing units are deployed around perimeter separated by garden courts. Ancillary services are in the basement, daylight is via a perimeter moat.

5.3.2 **Second Floor** (See Figure 5.16)

Private rooms including "family suites" to accommodate private practice of teaching staff. T shaped nursing unit with



GROUND FLOOR PLAN

FIG. 5.15.

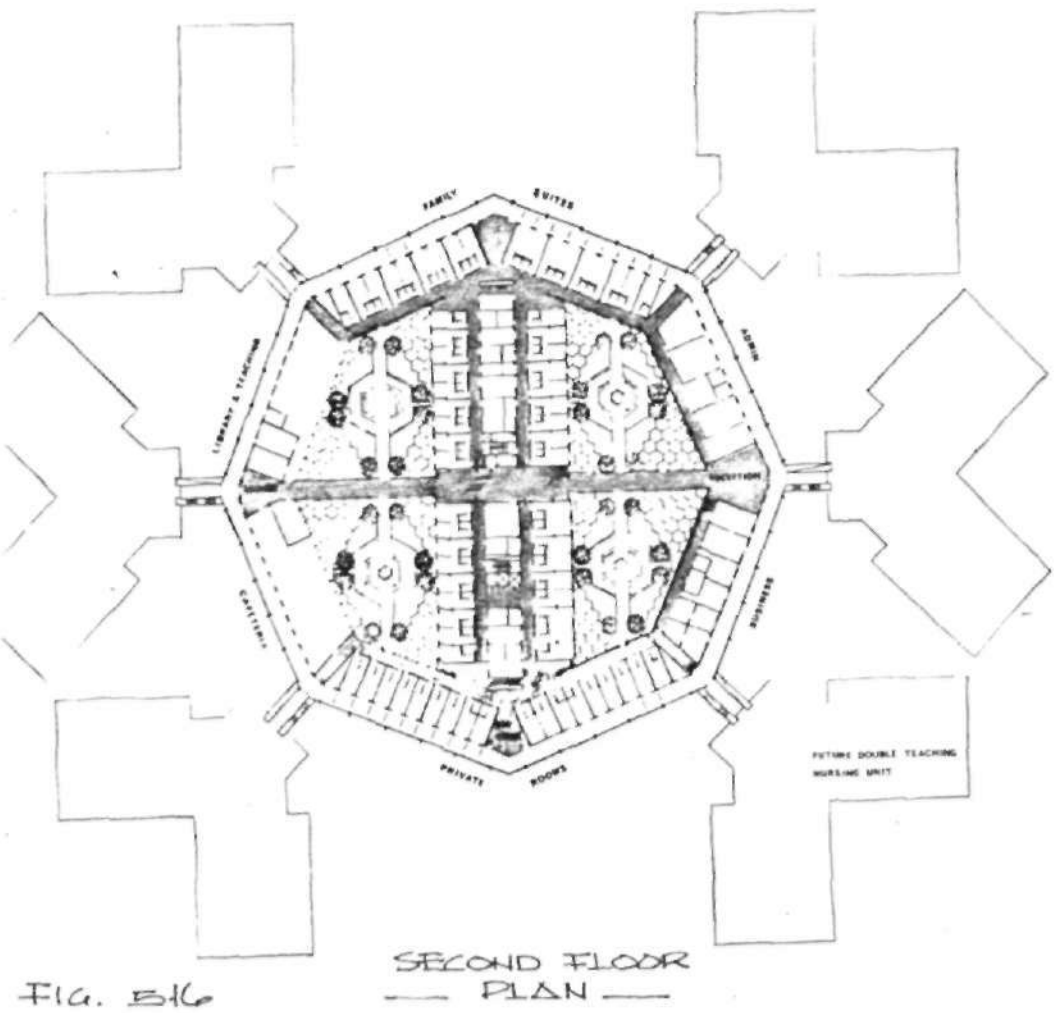


FIG. 5.16 — SECOND FLOOR PLAN —

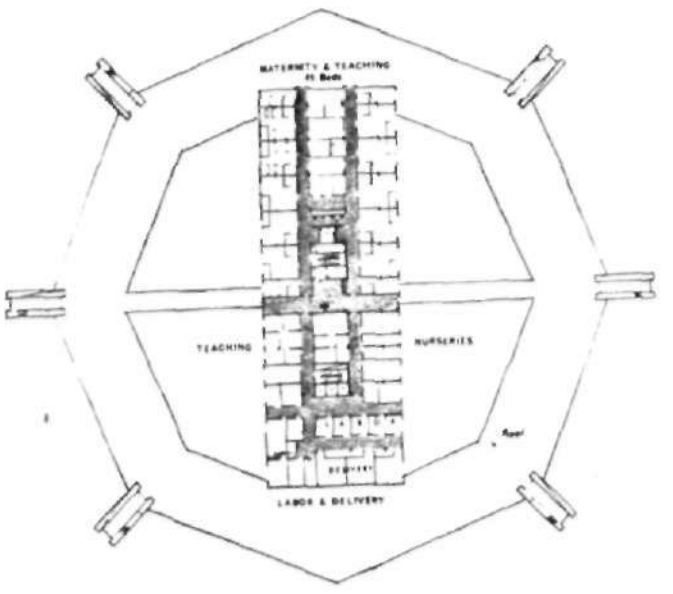


FIG. 5.17 — THIRD FLOOR PLAN —

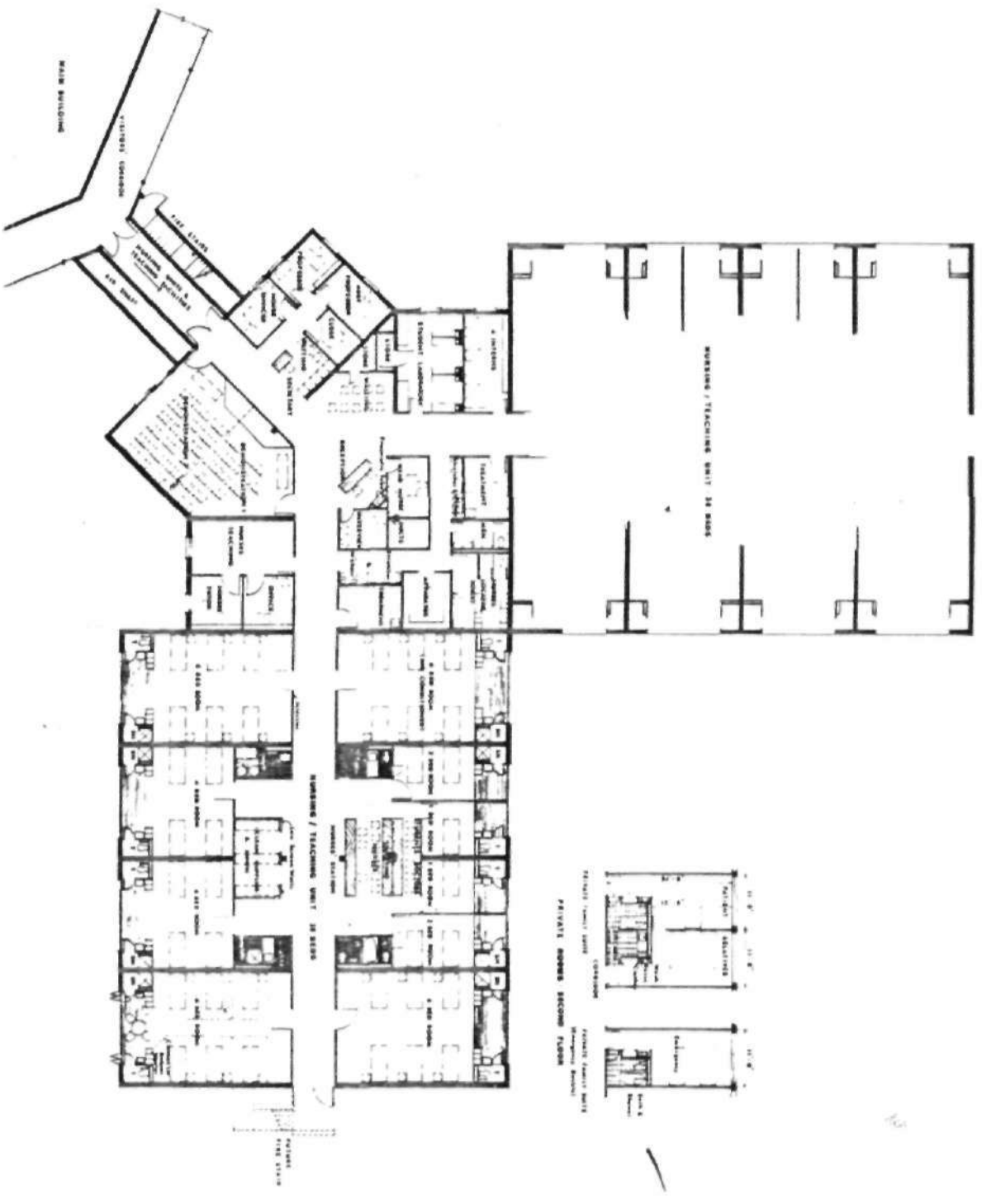
combination of double and single corridors, nursing stations at crossing of T, administation, cafeteria, library, garden courts.

THIRD FLOOR (Figure 5.17)

Contains the obstetric suite, nurseries maternity nursing unit including teaching facilities.

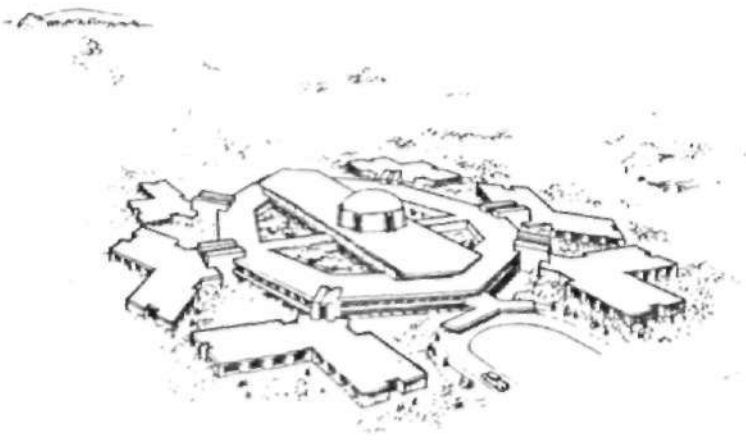
5.3.3 Teaching Nursing Units (Fig. 5.18)

Two nursing units with 38 beds in each arm of six-Y. A flexible aggregation of one, two, four and six bed rooms. High proportion of six bed rooms reduces corridor length and eases nursing where there is a grave shortage of nurses. Toilet and shower in each room (except singles which have no showers) will ease nursing and encourage good personal hygiene. Sitting space in each room encourages early patient mobility in winter. This space will be included in room and exterior openings. In summer, it will be open to weather with folding louvered wall separating sitting space from room. For cross-ventilation and a combination of privacy and supervision, corridor partitions of patients rooms are to be four feet high. Teaching facilities in stem of Y offices, professor, assistant professor, house officer-clerk (a resident physician) and secretary; interms, study room, students laboratory, treatment rooms, a partitionable demonstration room, a nurses' teaching suite, charting space. These facilities are adequate - by no means ample. Spaces in stem of Y are air conditioned as is one six bed room in each nursing unit.

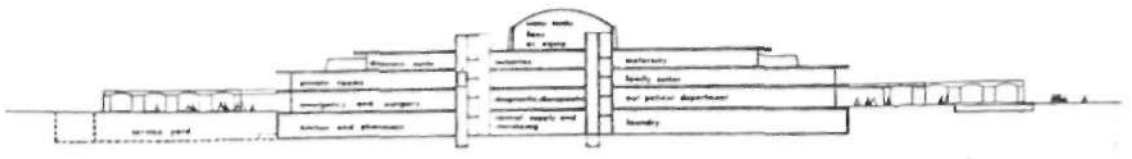


NURSING/
TEACHING FLOOR PLAN

FIG. 5.18



AERIAL PERSPECTIVE



SECTION LOOKING WEST

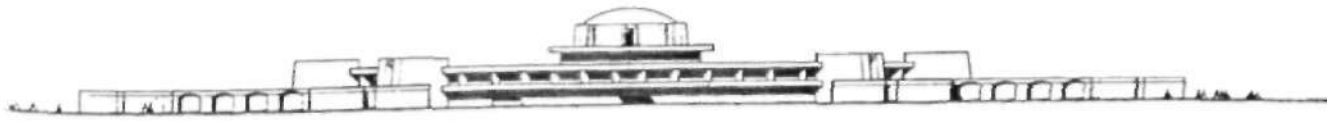


FIG. 5.19

Private rooms and family suites (upper right) family suite include a patient room, a room for relatives who accompany patient to hospital, kitchen and bath. By converting kitchen into bath, two private rooms can be achieved.

5.4.0 Obafemi Awolowo University Teaching Hospital Ife, Nigeria

Architect Niger consultants in association with Harsen and Johns partnership Architects.

Engineers - structural - Iyi Omisore and partners

mechanical - Unecon associates

electrical - Mek-inol associates

Quantity surveyors - Odail and Partners.

5.4.1 Site

The whole complex is laid in an open plan system which though results in long circulation corridor, provide the very pleasant environment of green courts and fresh air. This affords adequate lighting and ventilation without recourse to mechanical systems.

The main treatment areas (wards, and treatment and diagnostic units) are planned on either side of the main service corridor which runs from the ancillary service and medical school areas to the general out patient department. In patient's

visitors also use this corridor which opens to the public parking lot at the OPD and borders the second parking lot at the other end of the treatment and diagnosis department.

The intensive care and special care units are located at the end of the treatment and diagnosis unit, away from the main circulation corridor, but accessible to and from it. Provision has been made adjoining it for the development of an amenity ward block, if deemed necessary. The latter is therefore not amongst the already designed units.

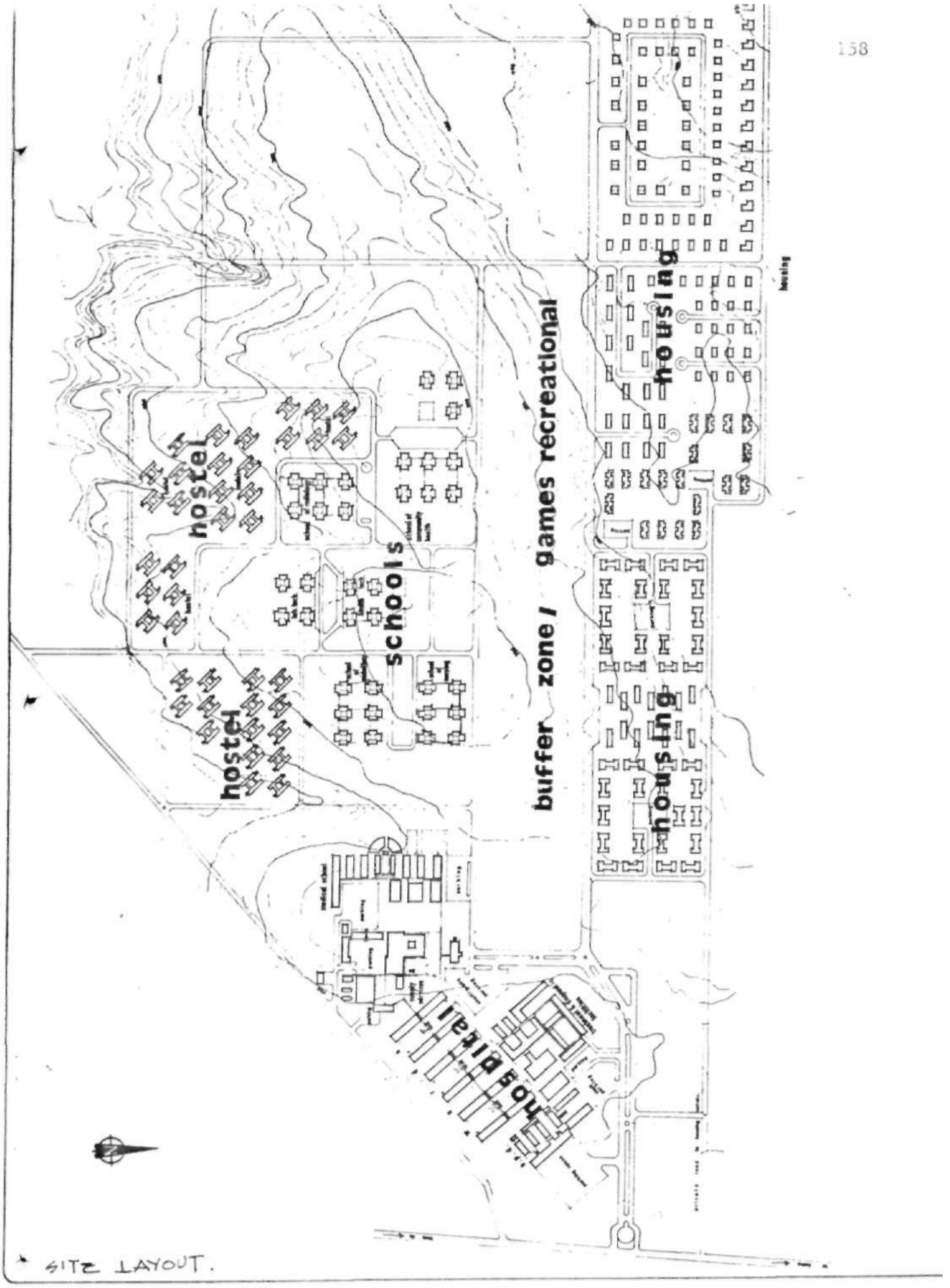
The main administrative block has been centrally placed between the hospital proper, ancillary services and medical school. For easy and shorter circulation routes. See Fig. 5.20 and 5.21.

5.4.2 Outpatient Department

From a functional and conceptual point of view, the out patient Department has been divided into two major sections.

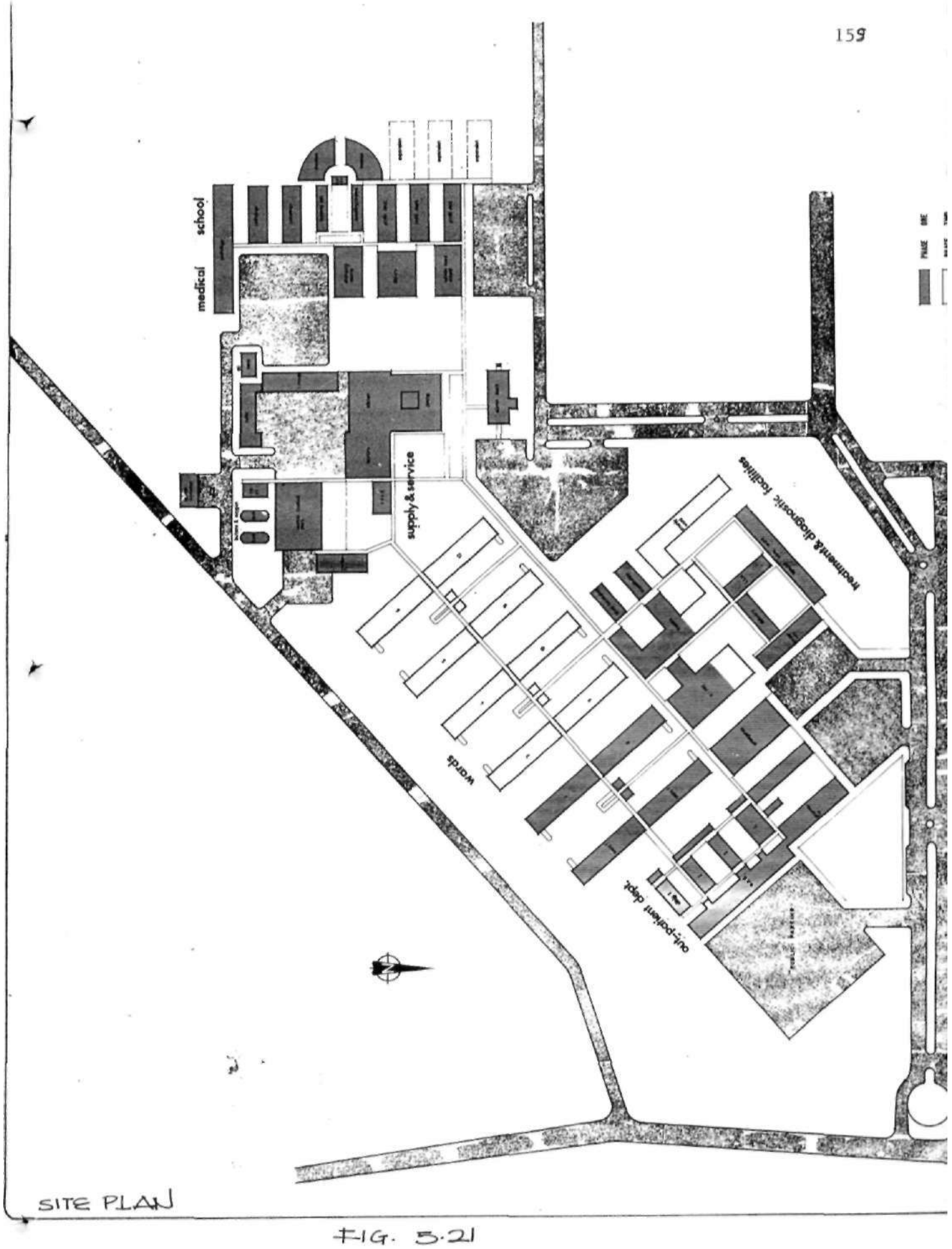
- General out-patient Department
- Consultative (Referred) out-patient clinics

The Out patient Department is sited on the ground floor and constitutes the hospitals main entrance area. It is designed for unreferred patients as well as patients requiring dressings, injections, plastics, etc.



SITE LAYOUT.

FIG. 5.10



SITE PLAN

FIG. 5.21

The consultative Out patients Department caters for referred patients. These may be from the general outpatient department or from other hospitals health centres, private clinics. it is planned on the first floor and apporoached by a ramp, steps, and lifts.

There are various ancillary facilities planned in the overall department. These include:

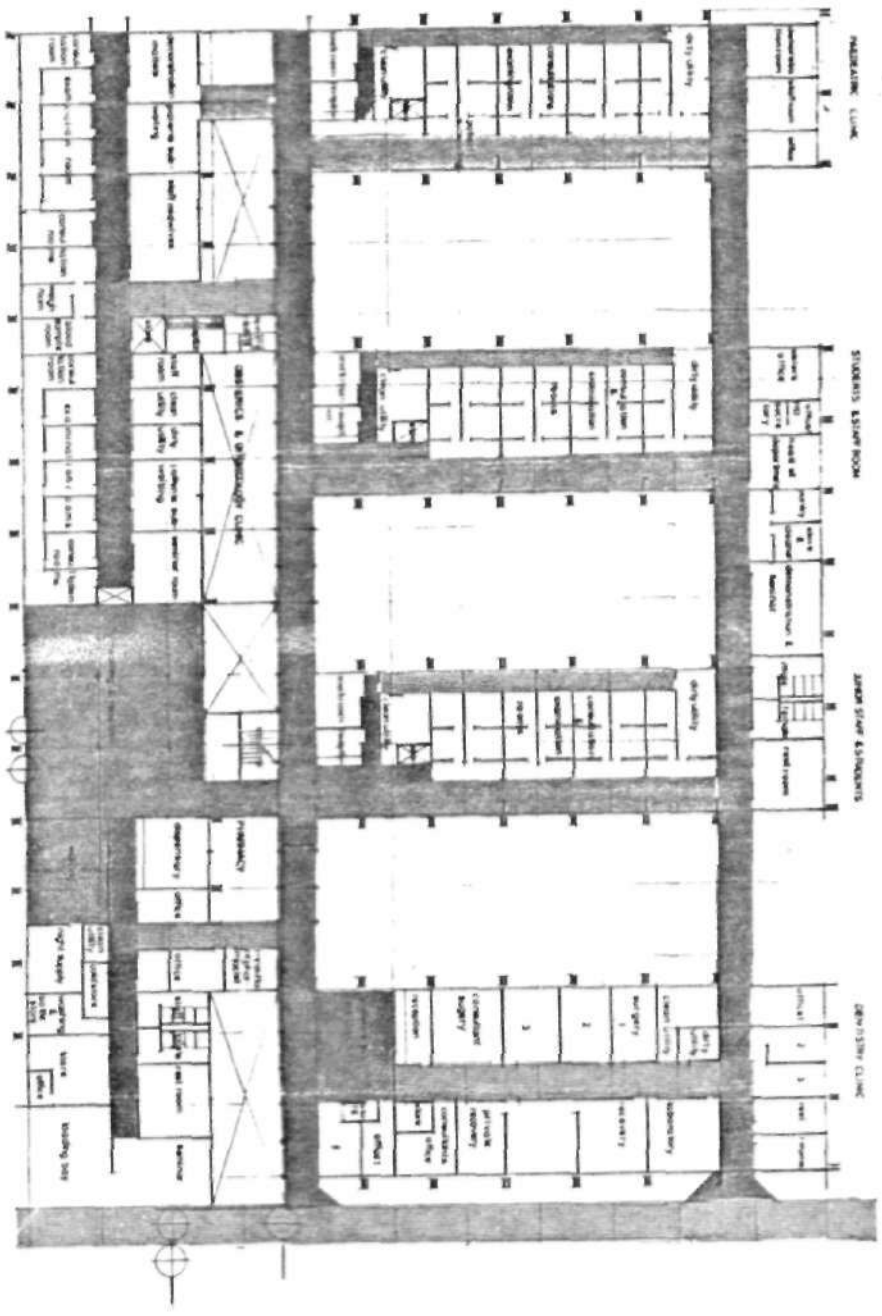
- Accident and emergency unit
- Admission unit and observation wards
- Paediatric Emergency Drip
- Staff and student facilities
- Dental clinic
- Routine Laboratory

General Out-Patient Department (Figs. 5.22, 5.23)

At the main entrance, provision is made for a large waiting hall for general waiting patients register at the reception and registration counter and after this go to the clinics depending on the circumstances.

- Surgical and Treatment clinic
- Medical clinic
- Paediatric clinic

These are designed with the multi-use concept featuring



GROUND FLOOR PLAN

FIG. 5-22

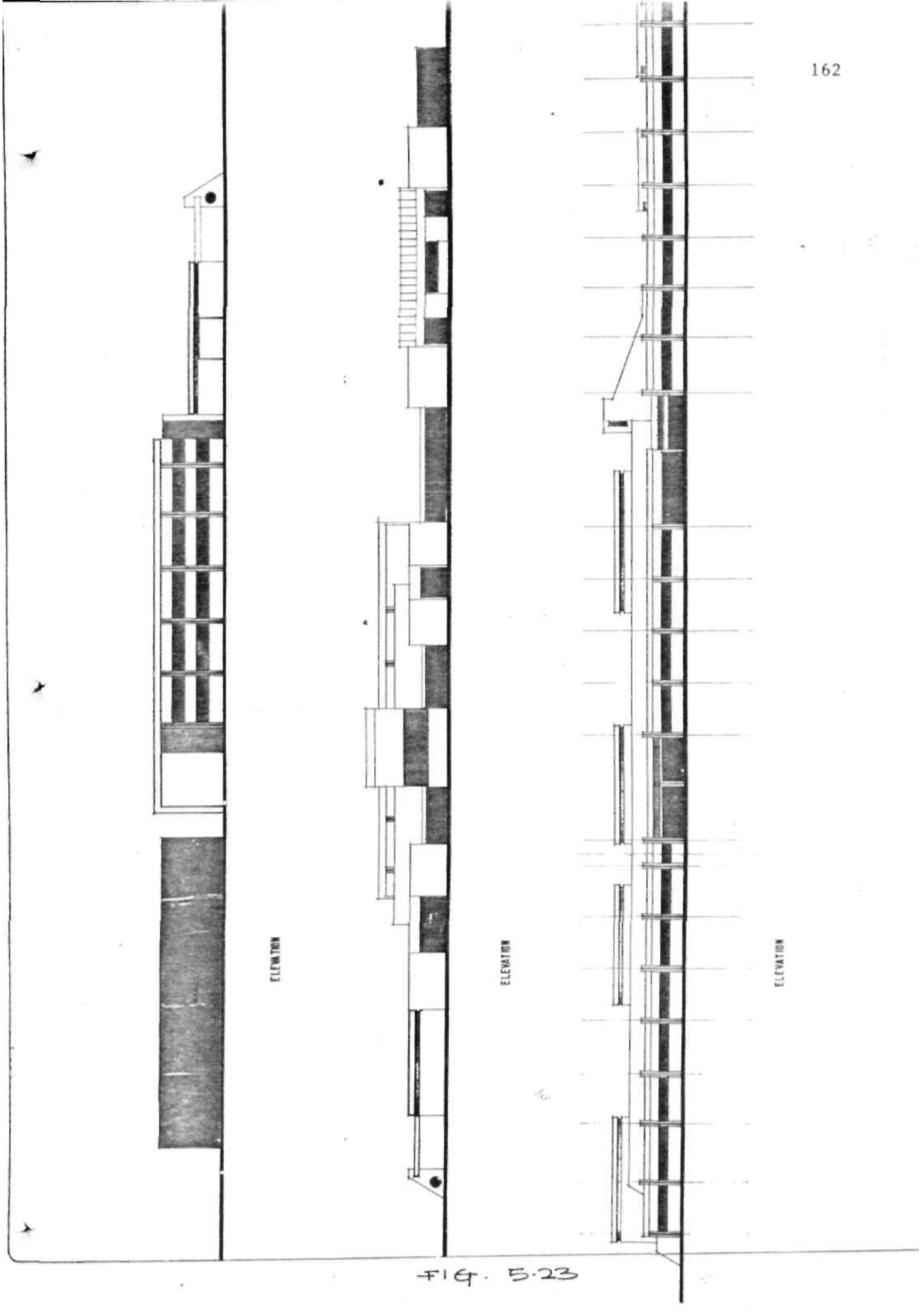


FIG. 5.23

Opthalmology and ENT, are of separately individual design in response to their specific requirements.

5.4.3 Diagnostic and Treatment Department

This area accommodates all the facilities for treatment and diagonpsis in the hospital. It consists of the following.

1. Central operating theatre
2. Diagnostic x-ray Department
3. Maternity Department
4. Special Therepy Department - with the following
   - Intensive Therapy unit - ITU
   - Children's special care unit
   - Adult Day care unit

Planning

As these facilities are used both by the "In and out patient" they have been centrally treated between the two along the main corridor of the Hospital. Access is, therefore, direct from the main corridor of the hospital. The central operating theatre, being the focus of all surgical activities has been placed in the centre of all other facilities i.e. between the intensive therapy wards and the main hospital wards. All the buildings are alligned in perpendicular direction to the main corridor which in itself, is in the NE-SW direction so that most of the blocks are in the NW-SW directions.

5.4.4 Inpatient Services

Wards

The wards are laid out in blocks of two, consisting of twelve ward units on three floors. Each pair of blocks is served by three lifts, a staircase and a ramp; centrally located, exclussive of the two escape stairs at the ends of each book.

Each ward unit is of a 30-bed standard ward design, with access via a general waiting and reception area which also has the trolley and wheel chair boy. Adjoining this is a seminar room and an interview room. The treatment areas with the associated staff facilities (office, rest rooms, changing rooms) than follow, with the patients conveniences at the end of that ward for maximum cross ventilation.

The wards are designed on a 4-No. and 6-No. bed bay system with a central circulation corridor, thus allowing for the localization of specific cases and the improvement on the psychological effect of the open-hospital ward on the patients. Each ward is provided with 2-No. private bed space, each with attached to toilet facilities. For the gynaecological, surgical and obstetric wards, the day space is reduced to make provision for 20 cots nursery. It is expected that an initial block of 12-ward unit (360 beds) will be erected during the 1st phase. A second and third phase of 360 beds each will bring the total to 1080 beds. See Figs. 5.24, 5.25.

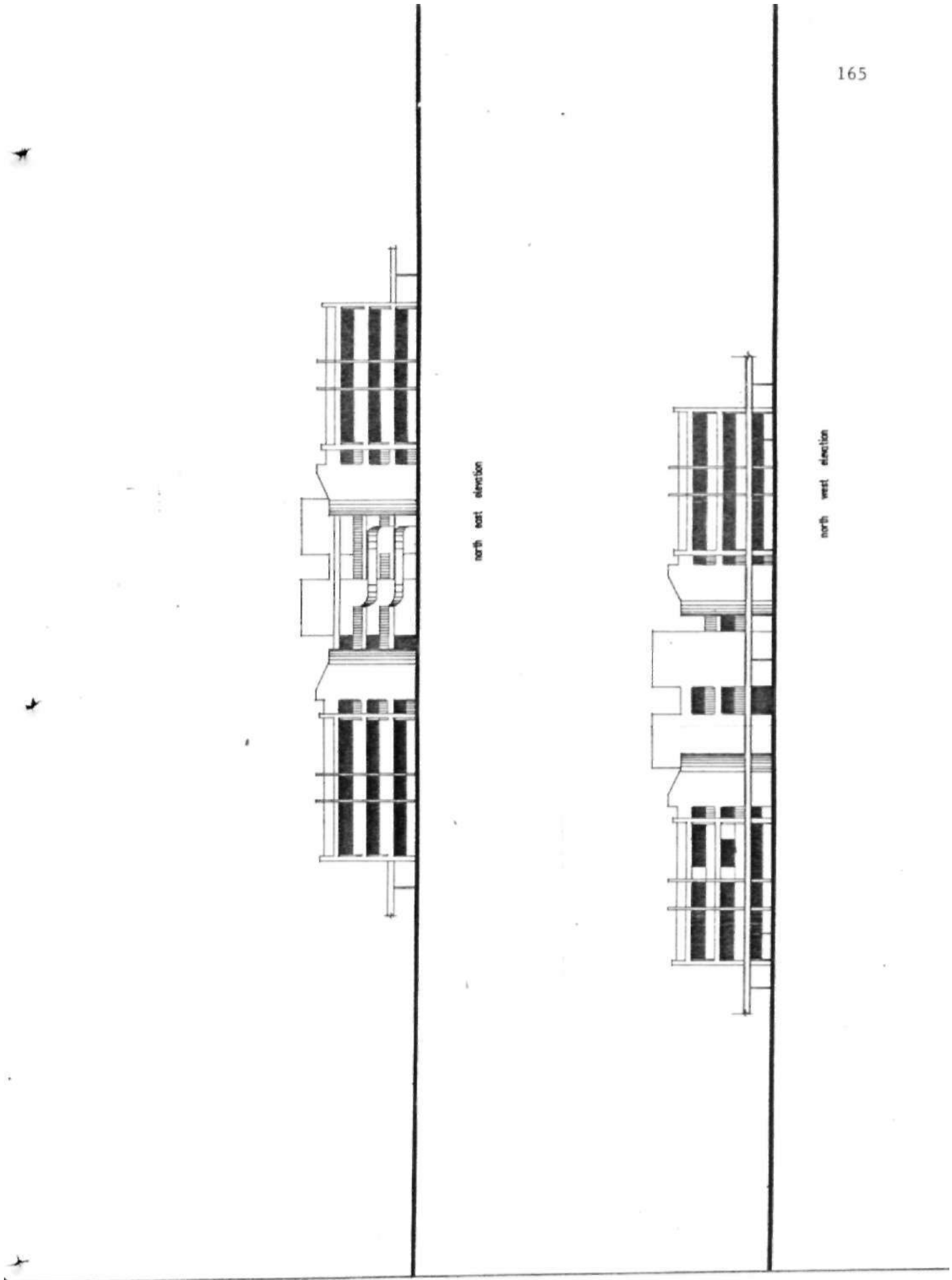


FIG. 5.24

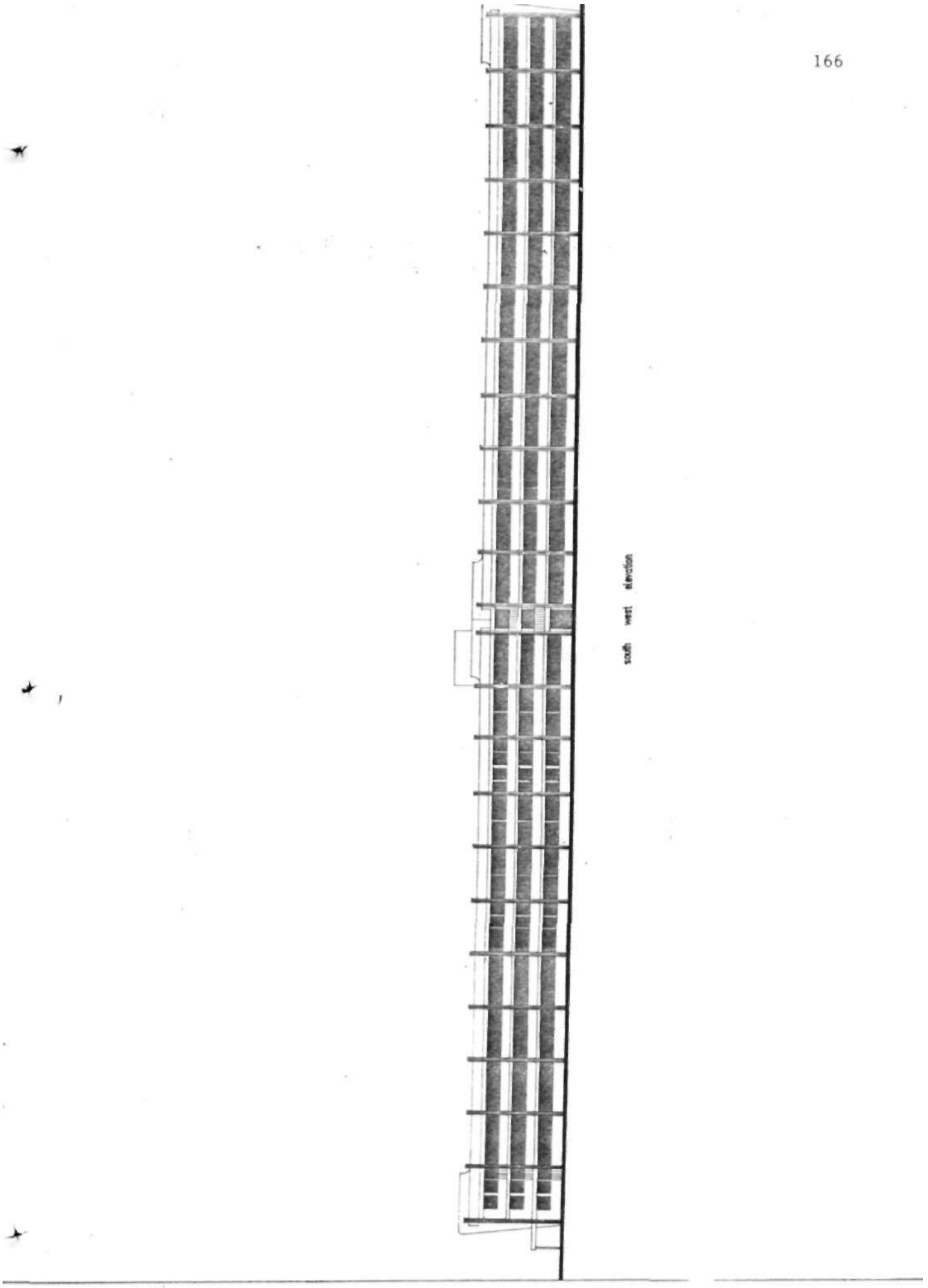


FIG. 5.25

Central Operating Theatres (Figs. 5.26, 5.27).

Basically this Department consists of the following sub-areas. These are:

Sub-areas

- Theatre suites and ancillary facilities
- Patients pre-operation area
- Theatre sterile supply unit
- Staff changing and rest rooms
- Teaching facilities - Galleries and seminar

All the first three departments are placed on the ground-floor for easy access to the patient. the Galleries on the 1st floor to enable students watch the operation.

The theatre and ancillary rooms are arranged in a single file with the clean corridor on one side and the dirty corridor at the other.

Diagnostic X-Ray Block

The x-ray consists of the following major areas

- Patients waiting and office
- x-ray suites and ancilliary facilities
- Technical staff area
- Staff changing and rest rooms.

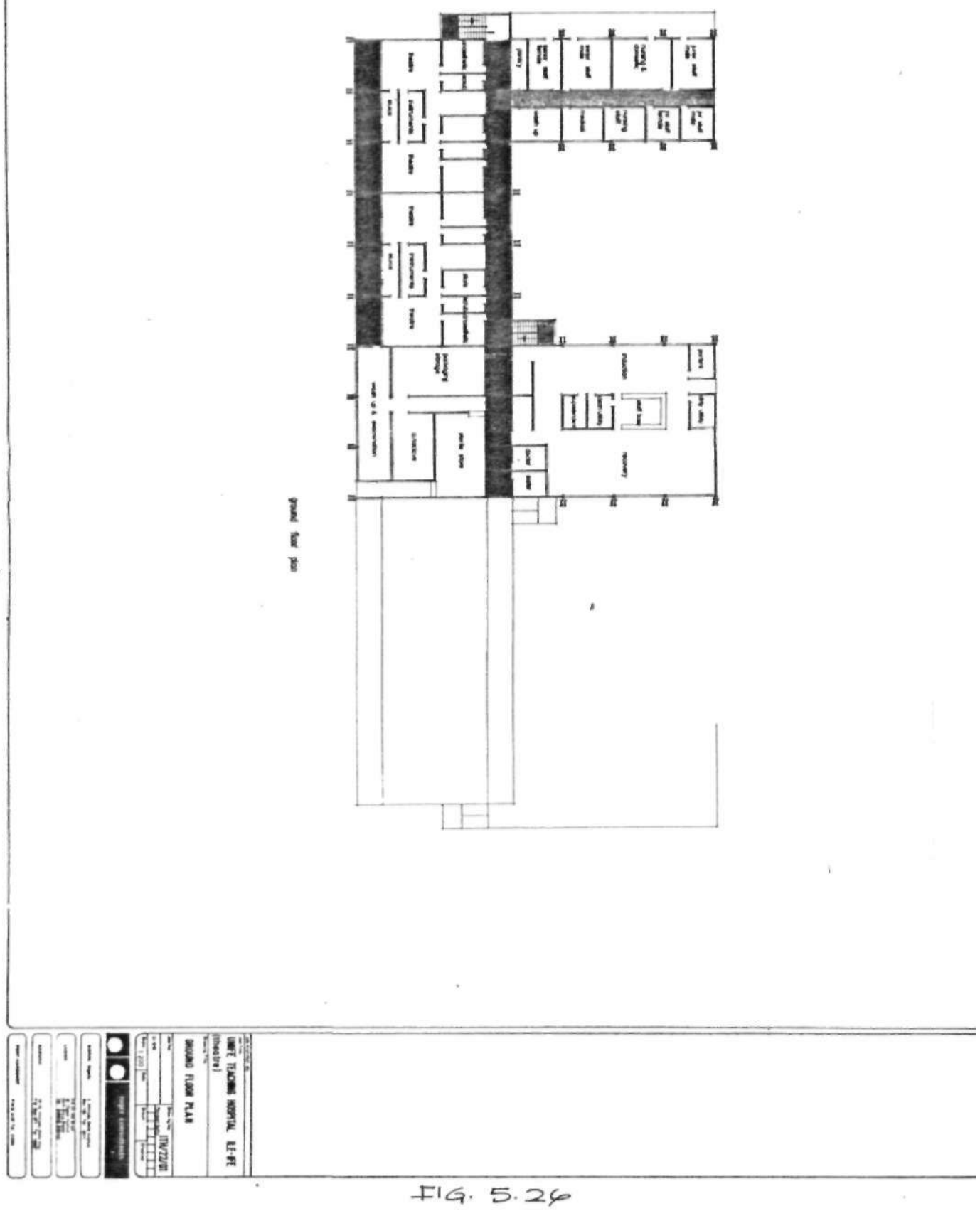

ground floor plan
UMPE TEACHING HOSPITAL ILE-IFE
GROUND FLOOR PLAN

FIG. 5.26

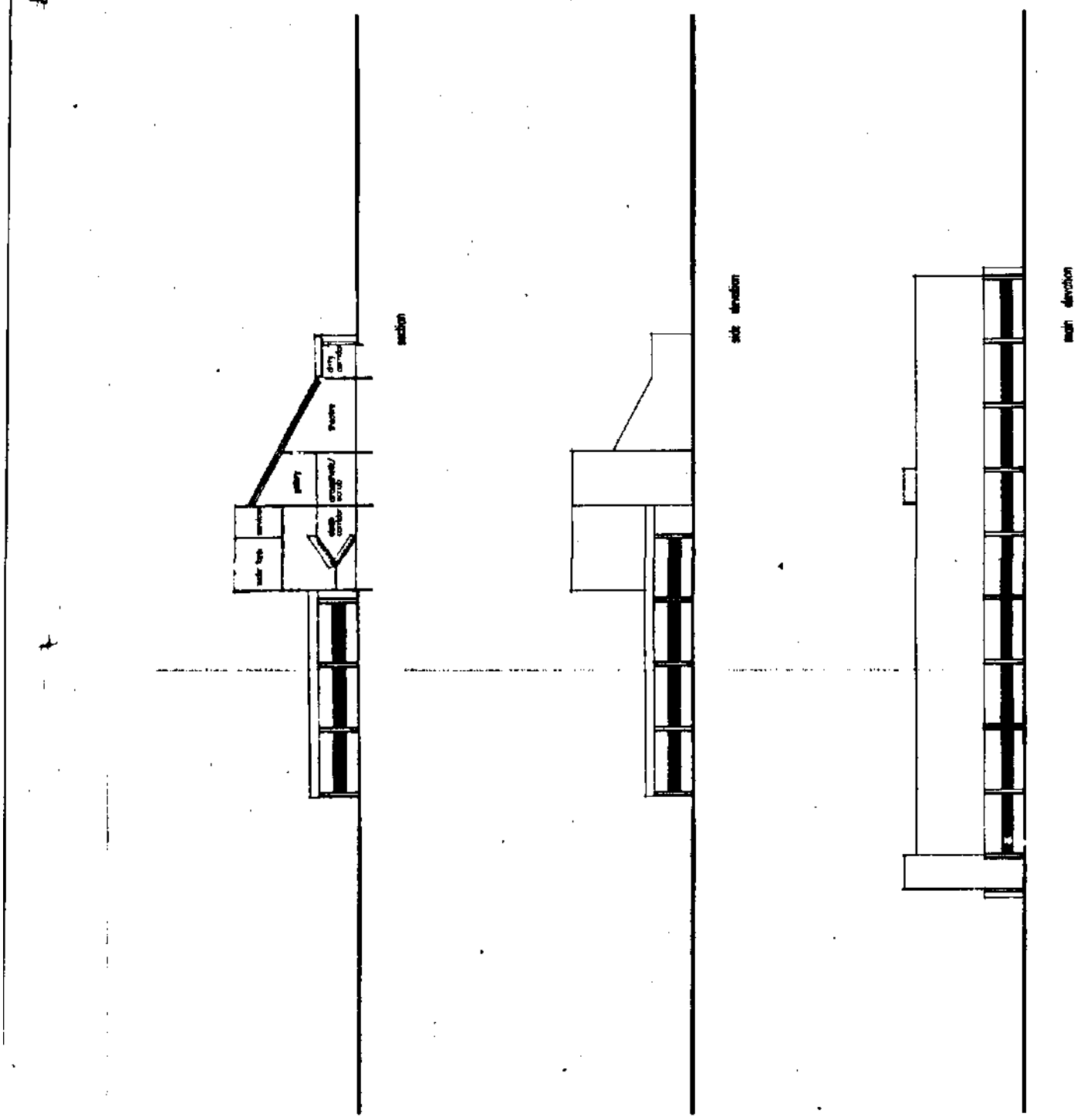


FIG 5.27

Planning

The whole department is planned on the ground floor with two wings of x-ray suites namely

- Ordinary patients
- Emergency

Linked together by the patient waiting reception and offices on one end and the technical staff area sandwitched between the two wings to service them. The staff changing area is detached from the main building so that all x-ray activities can go on without interference. The block is placed close to the emergency block and the theatre.

5.4.5. **Administration Department**

The hospital will be administered by a Board of management appointed by the Federal Military Government of Nigeria

The Hospital administrative Department contains the following

- Hospital Administation
- Medical Administration
- Nursing Administration
- Personnel Administation
- Public relation section
- Domestic Administration and Dieticians unit

- Planning project section
- Accounts section

Ancillary Adiministrative Services

- Banks
- Post Office
- Telephone Exchange

For operational reasons, certain other administrative offices have been decentralised and planned within their appropriate departments or areas e.g. Estate Management department, supplies department, staff changing facilities and porters.

5.4.6 Services and Supply Departments

The services and supply departments are a group of single storey buildings located at one end of main hospital corridor supplies reach the wards via this corridor. Provision has been made for the following facilities.

- Boiler House, Incinerator
- Central medical store
- Inflammable stores
- Maintenance and instrument workshops
- Vehicle Workshop
- Mortuary and post morten
- Control sterile supply Department
- Laundry/kitchen and Dinning Rooms

5.4.7. Medical School

The medical school is the core of the teaching activities of the Hospital. It is antripetal to all the other schools on the site. This is where the Dean of the school has its office.

It is situated north central area of the site bordered on the east by other school facilities on the west by the supply and services and southward by the open buffer zone between residential and work area. Its position facilitates co-ordination between the other specific schools and the hospital proper. That means while the practicals can be done in the hospital wards specific subjects can be taught in the different schools while all other activities take place in the medical school. It consist of the following components:

- Medical school Administrative Block
- Changing room facilities
- Library
- Professional Department
- Pathology Department
- Teaching facilities and close circuit television unit
- Anatomy and physiology
- Pharmacognosy

Planning

There are two major routes to the area. The first one

comes from the hospital wards, passes by the dining and other service facilities and enters the medical school by the Administrative Block. This route serves both students and staff and visitors going into the school.

The other route serves for supply mainly and some staff parking. This one comes through the mortuary and supply sector of the service area and ends up by the pathology one as parking area. So, while the pathology ends up the northern part, the Administration forms the border to the south, aided by another parking lot at this end.

Chapter 6

6.0 THE SITE

In the chapter, attempts will be made to introduce the readers of this work to Abuja - the city and the "Territory". Then also, attempts will be made to futher introduce them to the sector of the only where the site has been located. Thereafter, the geography of the site will be analysed. All so, that in the end, deductions can be made that will have far reaching effect on the design.

For ease of understanding the various themes, I have sub-divided the chapter.

6.10 The territory and the city

6.20 The site and central area

6.30 Traffic studies and access

6.40 Climate studies

6.50 Geology and vegetation

6.60 Topography and drainage

6.1.0 **The Territory and the City** (Fig. 6.1)

Abuja, the new Federal Capital of Nigeria occupies an area of roughly 8,000 sq. km., lying south of Suleja town (old Abuja).

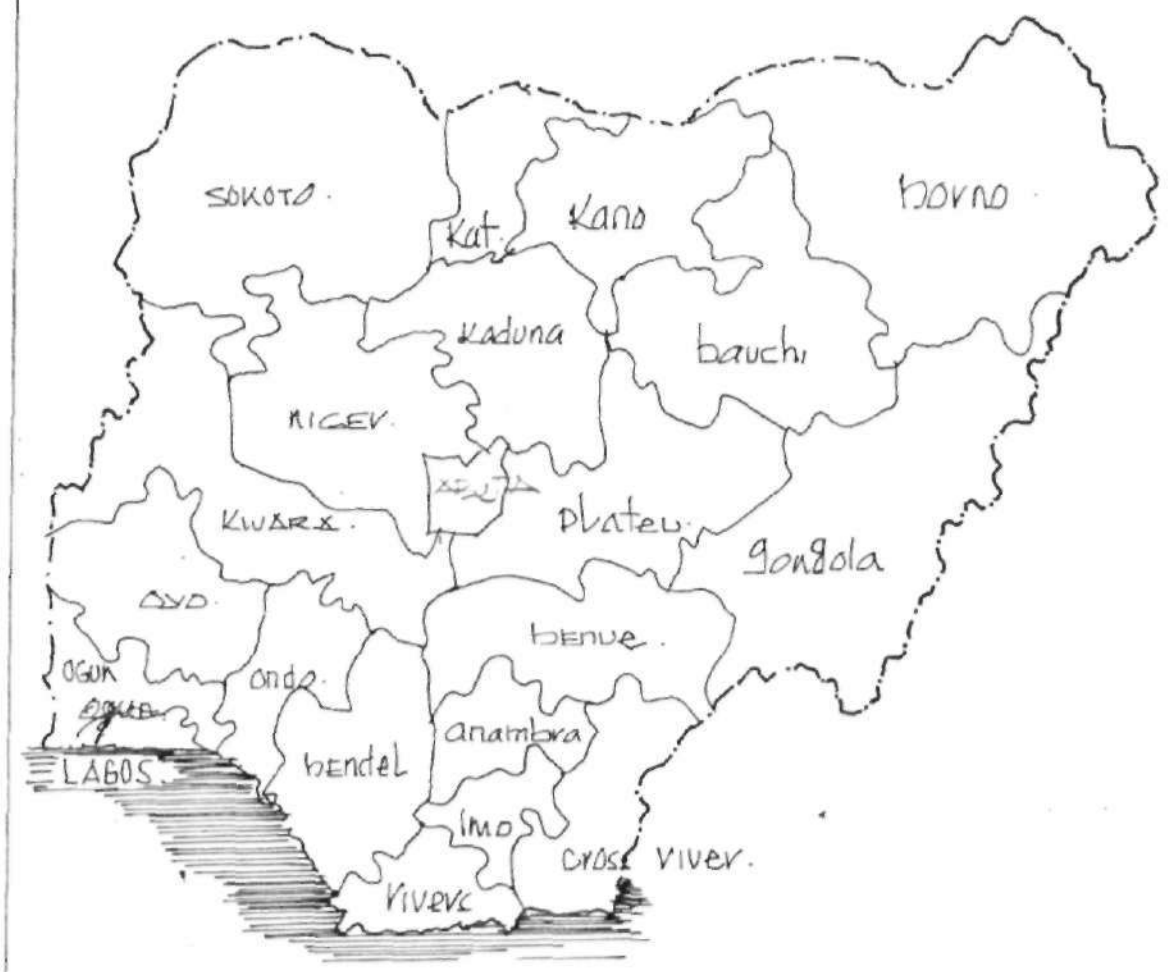


Fig. 6.1[A] FCT - a national context.

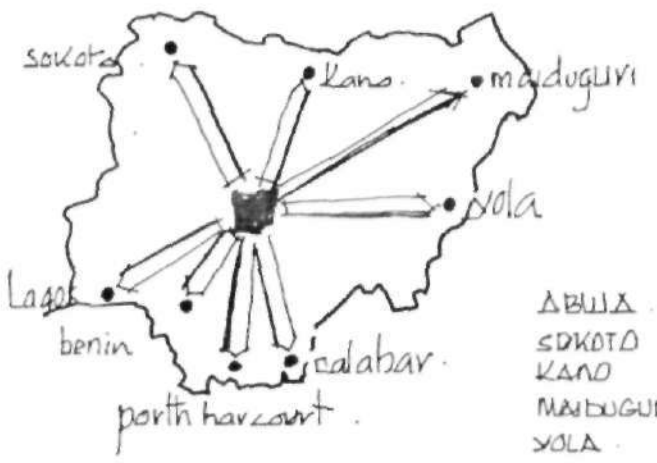


Fig. 6.1[B] Centrality of F.C.T.

ABUJA	000
SOKOTO	525
KANO	345
MAIDUGURI	735
YOLA	890
CALABAR	465
PORT HARCOURT	470
BENIN	345
LAGOS	505

FIG. 6.1

The territory is surrounded by Niger, Plateau, Kwara and Kaduna States. It is about 795kms from Lagos the city from where the capital has been transferred. It is central to Nigeria. Lying just above the hot and humid low lands of Niger-Benue trough, but below the drier parts of the country lying to the north. The territory lies just north of the wide alluvial plains formed by the confluence of the Niger and Benue rivers. This territory consists of a little plain rising from elevation 300ft in the south-west corner to above 2000ft at the north-east corner where the city proper is located. Rising out of the plain are numerous rocky outcrops and inselbergs, and several ranges of low mountains - making for the very interesting landscape that characterised the FCT.

Economically and geographically, the location of the Federal Capital Territory and the planned infrastracture improvements will create a context which is the physical embodiment of many national goals for unity. It signifies a commitment to equalize physical accessibility to government and provide a balanced focus for the nation.

The Federal capital city itself lies to the northwest quadrant of the Federal capital territory in what is now called Abuja Municipal local Government Area. The city has its overall landuse pattern confined to a crescent shaped site defined by the developable land above 1200 ft in the Gwagwalada plain below the escarpment surrounding the outer area of the site including the

promontory of the Aso Hills. It is bounded by the Abuja Hills to the west, the Zuma-Bwari-Aso hills to the north, the Kanu-Agwai hills to the east and the Zango-Kuku hills to the south. From aesthetic point of view the site has exciting visual potential. For purposes of development, the city has been divided into three phases, this project falls within the second phase.

6.2.0 **The Central Areas and The Site** (Fig. 6.2)

The exact area for the general hospital project lies in the central area of phase two of the federal capital development. The central area itself was conceived as the hub, not only for the city but also for the nation - a place that will symbolise Nigeria to the outside world. This central area is located along an axis centering on the great granite inselberg of Aso hill. This central axis transverses four low, rounded hills, interspersed with minor streams and valleys which cross at right angles to the axis. Where the axis crosses the high point of each hill, sites of important public buildings have been located. The national assembly, the national monument and the national Botanical gardens are located on a promontory of the eastern end of the axis with the Aso hills overlooking the body of the central area. The national square (formed on a Knoll by the intersection of the axis with the central parkway). Visually, by a large informal landscaped mall which is flanked on both sides by the ministerial buildings. Blocking the wall at the end of the national square is the municipal administration centre

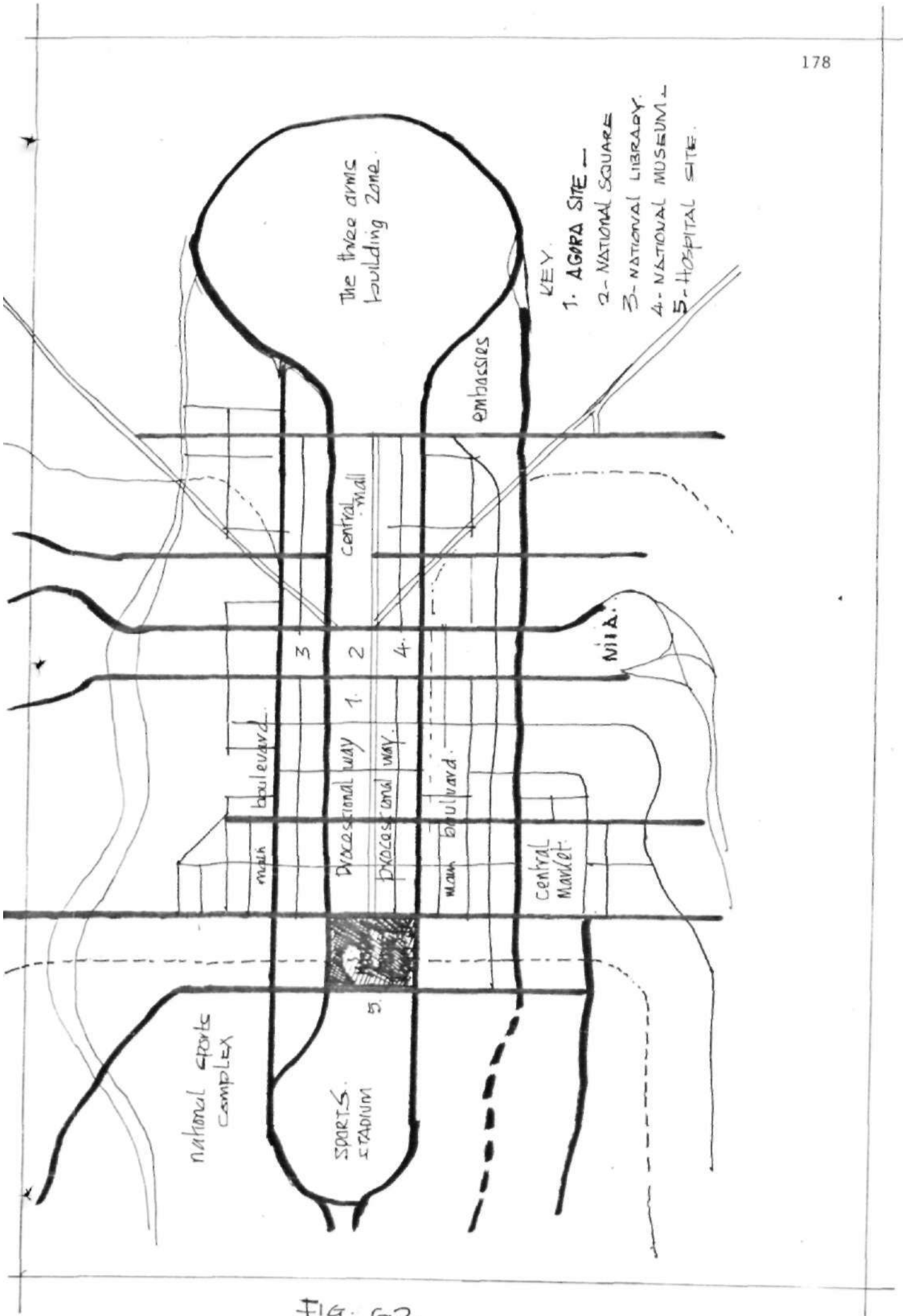

The three arms building Zone.
embassies
KEY.
1. AGORA SITE —
2- NATIONAL SQUARE
3- NATIONAL LIBRARY.
4- NATIONAL MUSEUM —
5- HOSPITAL SITE.
central mall
3
2
4
1.
5.
main boulevard.
Diagonal way.
Diagonal way.
main boulevard.
central Market.
national sports complex
SPORTS STADIUM

FIG. 62

perpendicular to the central axis and along the central parkway on either side of the central Area are plots for cultural institutions with the national library, the national square and the National museum.

Located at the extreme western end of the central shopping street is the general hospital towards the junction to the airport.

6.2.0 Traffic Studies And Access

I consider this study of utmost importance because it will layout in clear terms how the people in various parts of the city may have access to the facility, so that the full potentials of the 'hospital' can be realised. Here, I will be discussing the access to the central area in general and to a site in particular.

The access from the residential sectors to the central area falls into five categories1. (See Fig. 6.3).

(a) through the interchanges on the the express-ways which run along both sides of the central area and the inner express way and the outer expressway.

(b) From the parkways which run through the centre of the residential sectors. These are the main auto-approaches from the city.

(c) From residential sectors by the ring road which leads to

Fig. 6.3 Traffic Network of Abuja

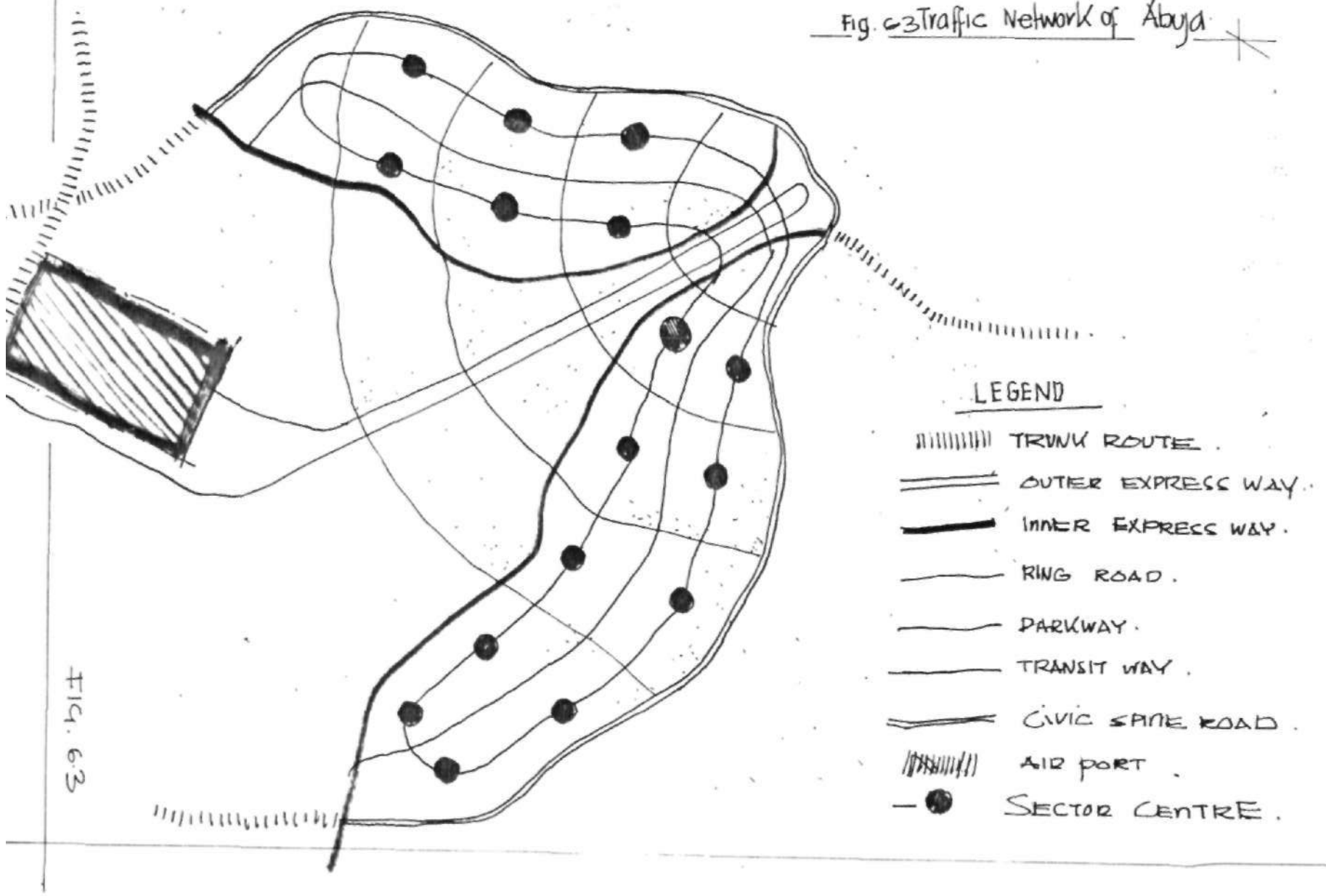


FIG. 6.3

the airport.

(d) From the outer expressway to the roads which run along both sides of the Botanical garden and into the circular road that surrounds the three arms buildings, and

(e) From Residential sectors by transitway buses and subway in the future.

This way, the central area of the city is envisaged to be the most accessible place in Abuja. Possible additions to and changes in routing of public transit lines have been considered a matter of greatest importance in maintaining maximum accessibility to the area. Hence the application of grid iron pattern of street layout in the central area. This allows for one way streets, the easy rerouting of traffic, the elimination of peculiar intersections and of course allowing for great flexibility in the location and aggregation of Building sites.

Upon arrival at the central area, there is an expected change in character with the routes mentioned above, particularly the parkways changing into Boulevards, and the point of change, becoming the gateways to the central area each of theseareas marked by important building or an appropriate symbolic structure echoing the traditional gateways of historic Nigerian cities.

My site which is within the phase II of central area is bounded by arterial B6 and arterial B12, on the sides and ring road in front. It is easily accessible from ring road 1.

6.4.0 Climate Studies

Man's comfort is the measure of the extent to which physical environment should be controlled. Architecture has therefore, to serve man and his living comfort. For a comfortable living environment will most often depend on maximizing the aspects of the environment which reduce heat and the effect of humidity, and protect from rain and dust. Thus for a successul exercise, one has to plan with climate at all scales. Here, attempts will be made to understand the climate of the site (FCT) by studying the phenomenon under these sub-topics namely: Humidity, rainfall, sun and cloud cover, temperature, wind and dust. The micro climate of the proposed site would also be considered.

Humidity

There is low humidity during the dry season coupled with high afternoon temperatures, this accounts for the dessicating effect of the dry season. In the rainy season, the relative humidity is high and temprature is slighty lower and this creates a heat trap thereby making the place uncomfortably hot.

Solution

- Design solution must make for proper ventilation
- The possible use of artificial ventilators
- Use of water fountain and other landscape elements.

Rainfall

The rain starts in the Federal Capital Territory around the 10th of April and tapers rapidly after the 20th of October. Duration of the rainy season is between 180 and 190 days. Mean monthly distribution shows a tendency for concentration in 3 or 4 months. In Abuja 60%, of the annual is in the months of July, August and September.

Squall lines are also frequent with thunder and lighting, followed by strong winds and intense rainfall which may last a few hours. The lines squalls normally happen in the afternoon and could cause serious property damage.

Solution

The concentration of rainfall calls for need of drainage design that would handle large volumes of water very rapidly.

Possible drainage due to the forces of the line squalls must be taken into consideration.

Sun And Cloud Cover

The further away from the coast, the more the general increase in number of sunshine hours. Abuja area is exposed to about 12,500 sunshine hours annually.

During the dry months (November-April) the monthly

variation in the amount of sunshine follow the general trend of an increase from 275 hours over the city site. The approach of the rainy season, reduces the sunshine hours due to cloudiness. This decline becomes instense as the rainy season progresses and reaches as lowest in the month of August causing possibly a temperature inversion over the city site.

Solution

Adequate sunshading devices must be thought out for the building.

Temperature

The FCT records its highest temperatures during the dry season when there are a few if any clouds. Changes in temperature as much as 17°C have been recorded between highest and lowest temperature in a single day. During the rainy season, the max temperature is lower due to the dense cloud cover. Diurnal range is also much lower sometimes not more than 7°C in July and August (Fig. 6.4).

Wind And Dust

Two major air masses dominate the climate of the FCT. These are the tropical maritime air mass and the tropical continental air mass. The tropical maritime is formed over the Atlantic Ocean to the south and is therefore warm and moist. It moves inland generally in a south-west to north-east direction.

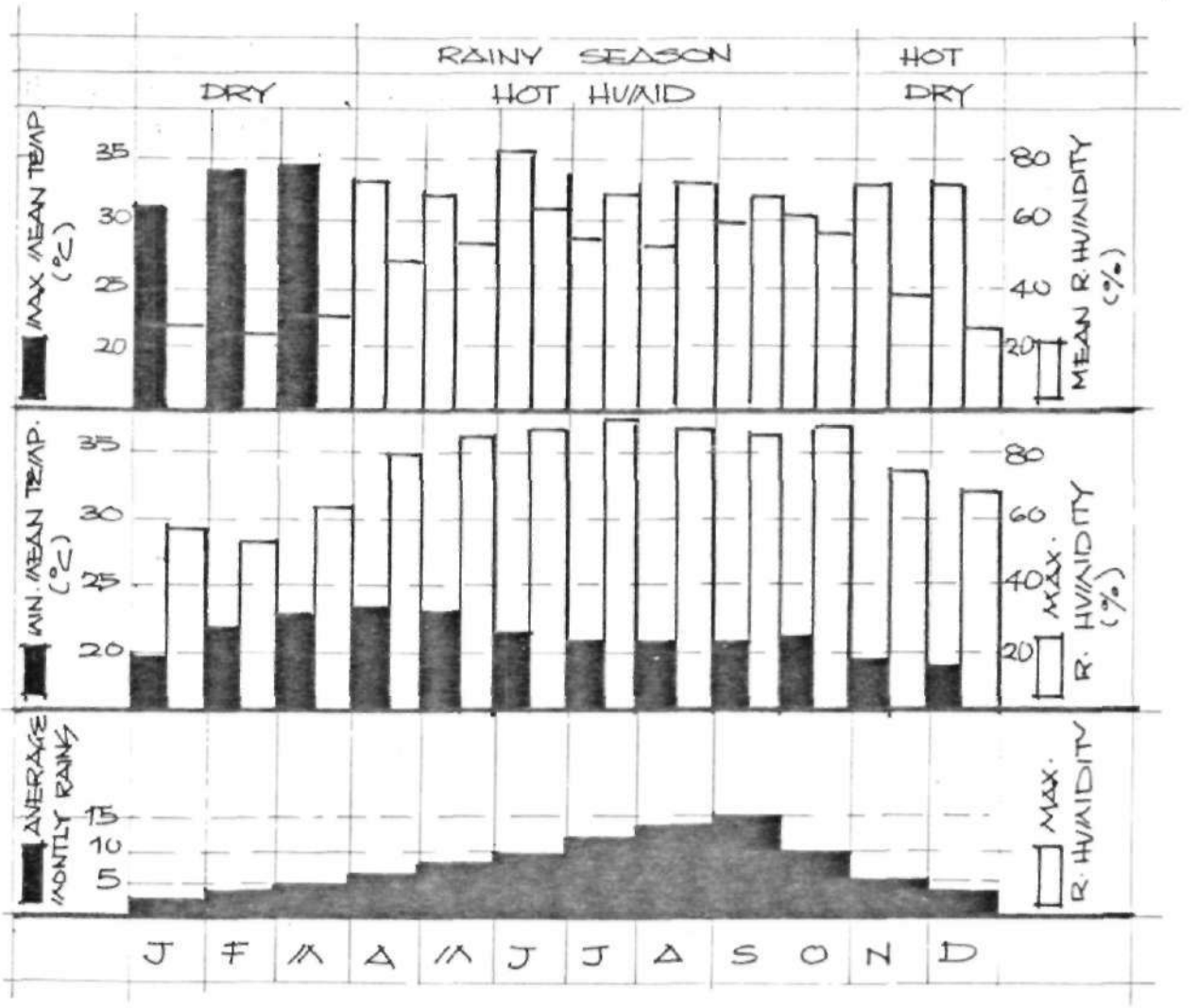
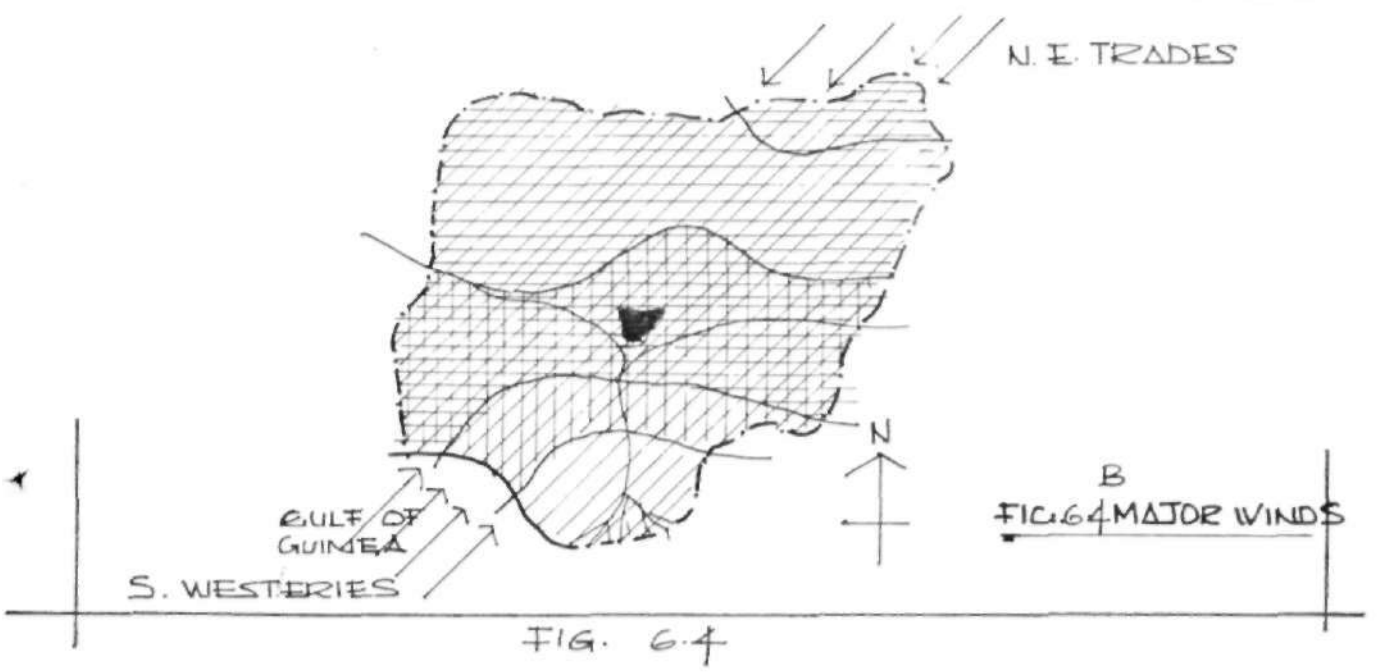


FIG. 6.4 MEAN MONTLY TEMPERATURE. HUMIDITY AND RAINFALL.



B
FIG. 6.4 MAJOR WINDS

FIG. 6.4

The tropical continental air mass is developed over the sahara desert and therefore is warm and dry and blows in the opposite direction, North-East south-west. It is the interface between these two air masses that dictate the intensity and duration of the wet and the dry seasons.

In June, the northerly flow of air component has weakened and only the southerly flow predominates. Being moisture laden, it brings a lot of rain. In September the tropical continental begins to intensify over the territory and the north-east trade becomes dominant wind from October to March bringing with it dry, cloudless but dust laden conditions associated with the harmattan.

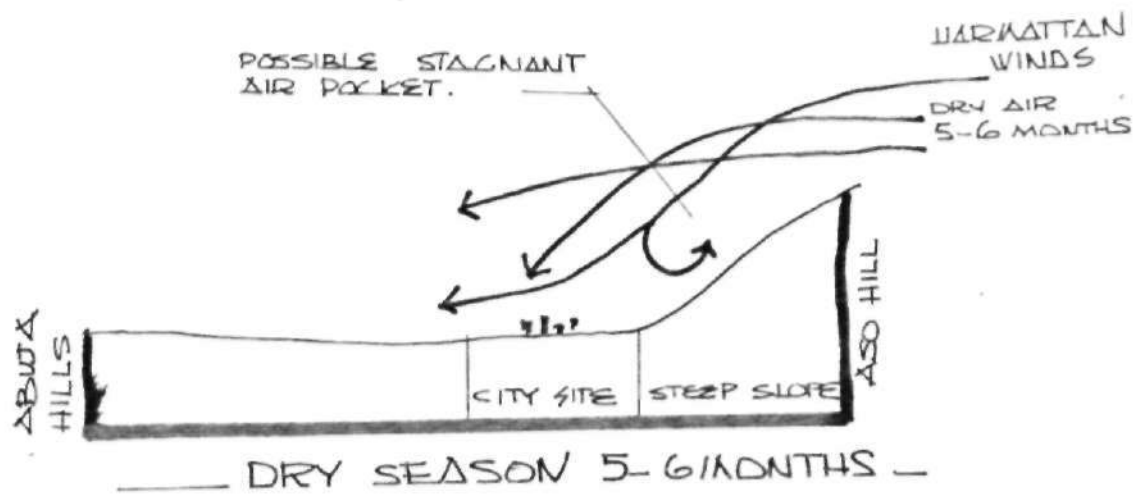
Mist and fog are not uncommon around this period due to temperaure inversion reducing visibility at times to below 100m due to dust particles which float in the air or settle as thin film over furniture and other objects. Fig. 6.5.

Comments

- Trees should be planted as wind breakers on the site
- Openings to be made with due regard to wind direction (good orientation).

(diagram - separate sheet)

FIG. 6.5



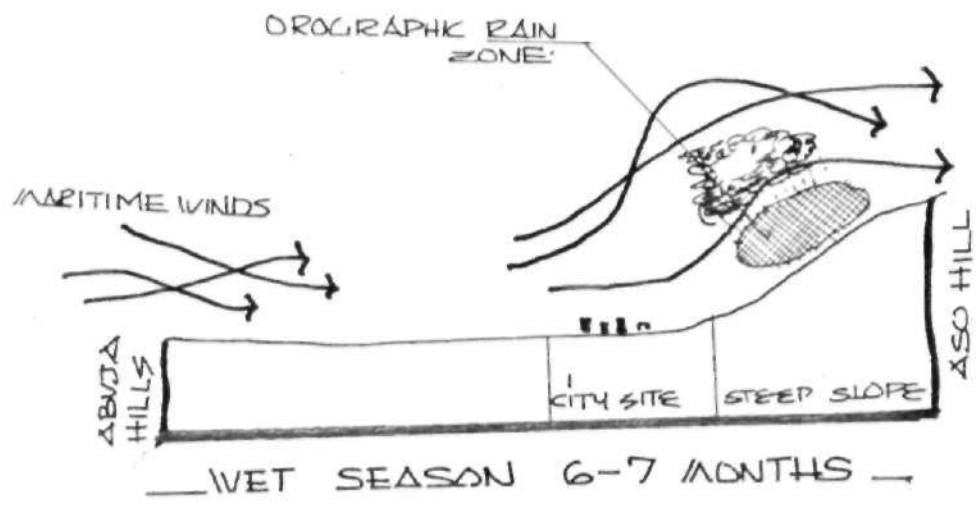


FIG. 6.5A SEASONAL WIND PATTERN OVER ABUJA.

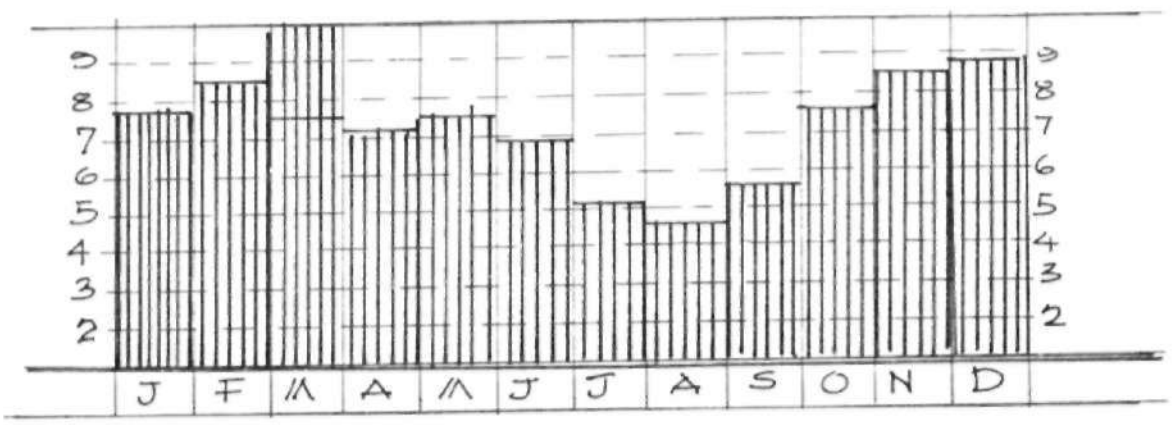


FIG. 6.5B MEAN MONTHLY SUNSHINE DURATION

6.5.0 **Geology, Soil and Vegetation**

Federal capital city site can be broadly classified into

three categories.

- Metamorphic rock: Including Biotite-Muscovite Schist limited to four narrow outcrop bands along ridge tops at the eastern edge of the site. Majority of the city site is underlaid by migmatite.
- Igneous Rock: Include granite (coarse porphyritic) large intrusive masses commonly elliptical in shape forms the dissected zones of the Zuma-Bwari-Aso Hlls and outcrops of Gwagwa plains; Biotite Gravinite fine to medium grained, forms the vidaelines trending north-east, southwest through the city site.
- Sedimentary rock including Alluvium, located in streambeds throughout the territory. It has been found out that none of the above rocks have presented any major geotechnical constraints to the type of structures proposed for the city. Hence our site with its underlying biotile granite (both fine and medium grained) will be suitable and capable of supporting the structure of the facility.

Soil

The soils underlying the capital city are generally, as a type, deep and well drained. These soils are also more fertile than many soils in the FCT. They are generally the deepest and least stone of the soils derived from granitic gneiss and migmatite that underlay the site. They have low to moderate erodibility

and run off potential textures of the soils are typically loamy sand to scanty clay loam on the site for the "hospital", the dorminant type of soils are the residual laterite. They are deep, well drained and believed to be fertile - a great potential for intense landscaping.

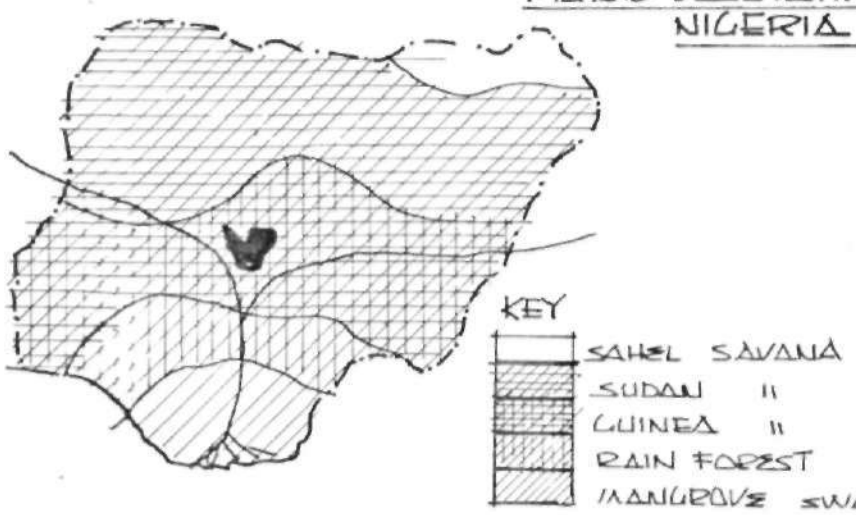
Vegetation

The vegetation of the city site is generally characterised by park savanna - a major component of the guinea savannah zone into which the territory falls. Riverine depressions within city site and most of the FCT are typically skirted by fringes of thickets and big trees. There are also occassional patches of forest or heavy wooded areas. On my site the main vegetation type is the dense park savannah. This is typically a stratified community with a discontinuous canopy, shrub, and grass layer. (Fig 6.6).

6.6.0 Topography And Drainage

The bulk of the city would be concentrated on land with elevations from 360 to 510m above sea level. Thus, it has been said is so as to capitalise on the climatic advantages of higher altitude. Topographically speaking, the city site is typical by greatly undulating terrain, interlaced by riverine depressions. The central area where our site has been located consists of uplands and plains with numerous inselbergs and other rock outcrops of various sizes. (Fig. 6.7).

FIG.6.6 VEGETATION MAP OF NIGERIA.



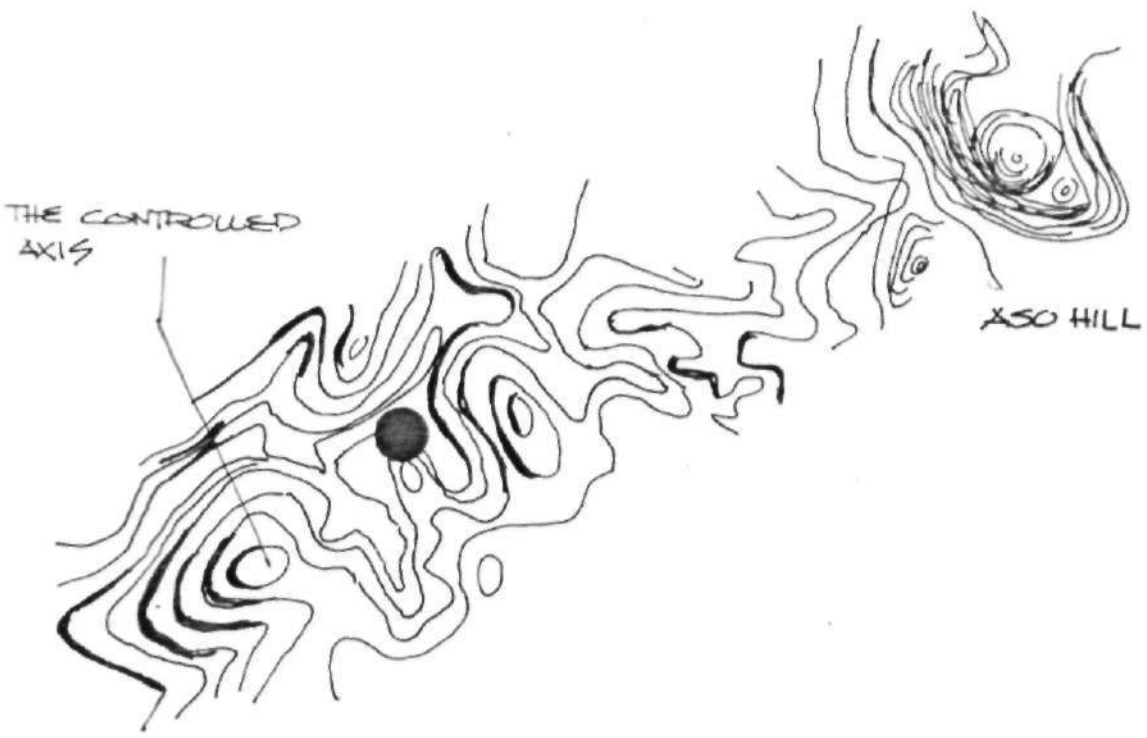


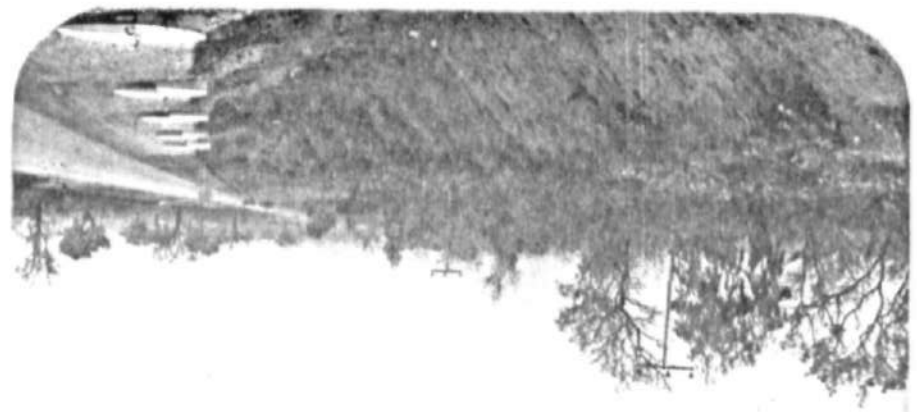
FIG.6.7 TOPOGRAPHY OF CENTRAL AREA - ABUJA.

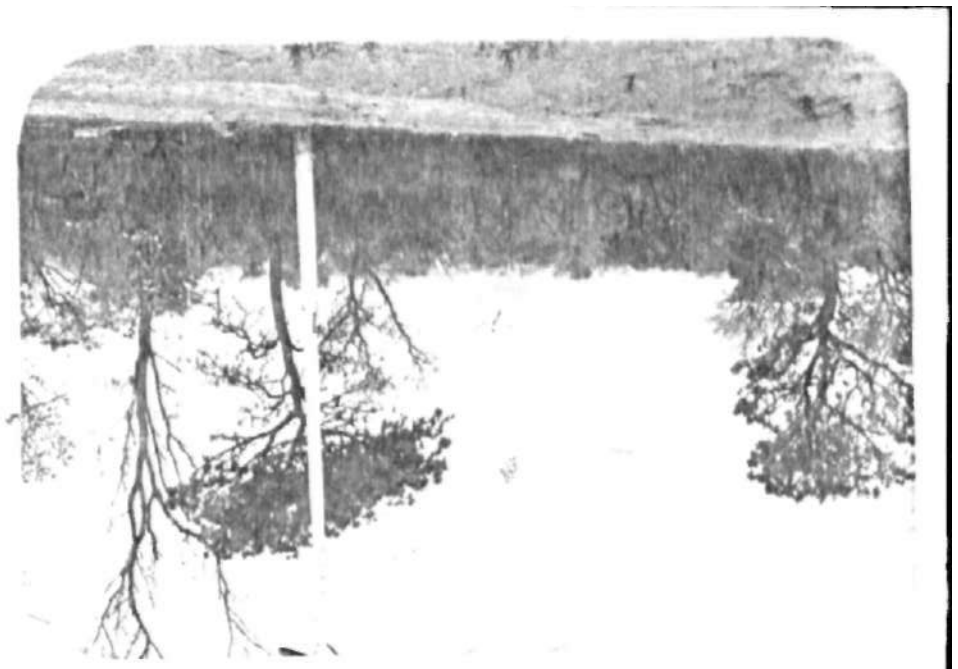


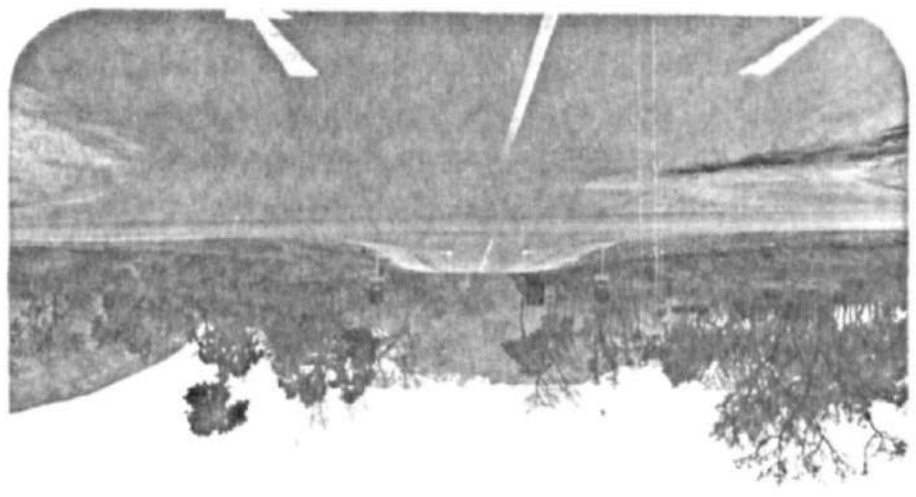


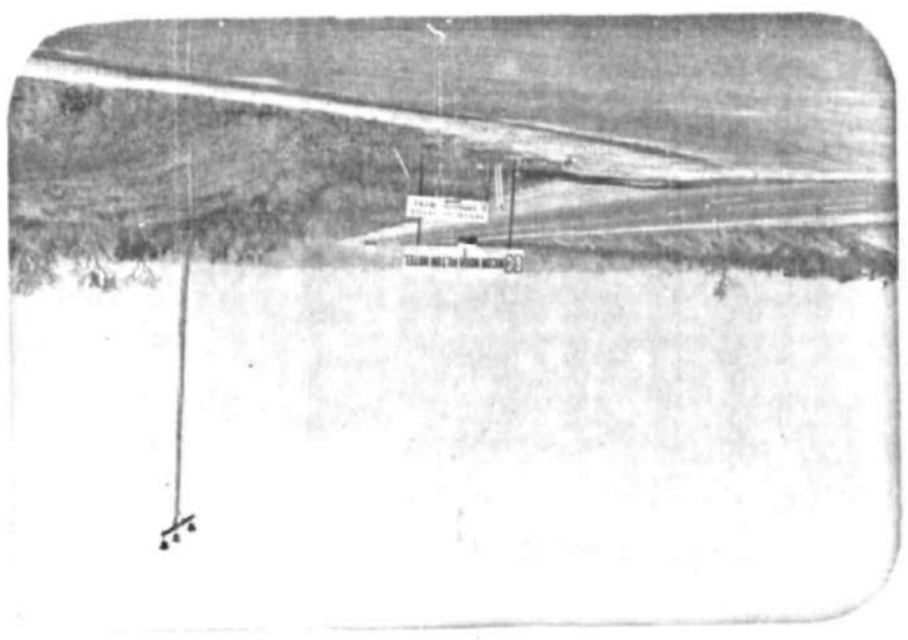












Chapter 7

7.0.0 DESIGN METHODOLOGY

Research study in hospital design shows two concepts in the trends of hospital architecture.

(a) The pavillion hospital

(b) The vertical monoblock.

The pavillion hospital is characterised by corridors known as "hospital streets" where all other departments are attached at right angle to it. In this concept of design it allows natural light and ventilation thus suitable for hospitals in tropical climate. The only disadvantage of the concept is the long noisy "hospital street" I have adopted this concept, in view to solve this problem.

The "vertical monoblock" minimises the long travel distances within hospital department, the other advantage is the optimum utilisation of the site. However mechanical means of ventilation have to be exployed. Expansion becomes more difficult requiring special technical ability. This approach is not very suitable for our climate.

7.1.0 Concepts

7.1.1 Site Concept

In arriving at the site concepts, which eventually determined the layout of the designed complex, two major influences were respected. The first important influence was the functional requirement of the hospital complex as enumerated in the earlier parts of this thesis. Secondly, site factors both on site and off-site, greatly influenced the concept formation.

First, the site factors shall be discussed with respect to their influence on the site concept formation. The site constraints include micro climatic considerations, topography and shape of the site, and expansion possibilities, compact planning using a system of courtyards is adopted to provide avenues for planting, which allow for interesting view of open spaces and therapeutic in nature to the patients.

The fact that the site was surrounded by roads also created some design problem. For this reason the access to the site had to be tapped from the least busy road, avoiding the expressway completely, and providing a sound barrier by planting trees. See Fig. 7.1.

In considering the influences of functional requirements, a number of conceptual issues were generated:

(a) it is acknowledged that the hospital complex would need to be

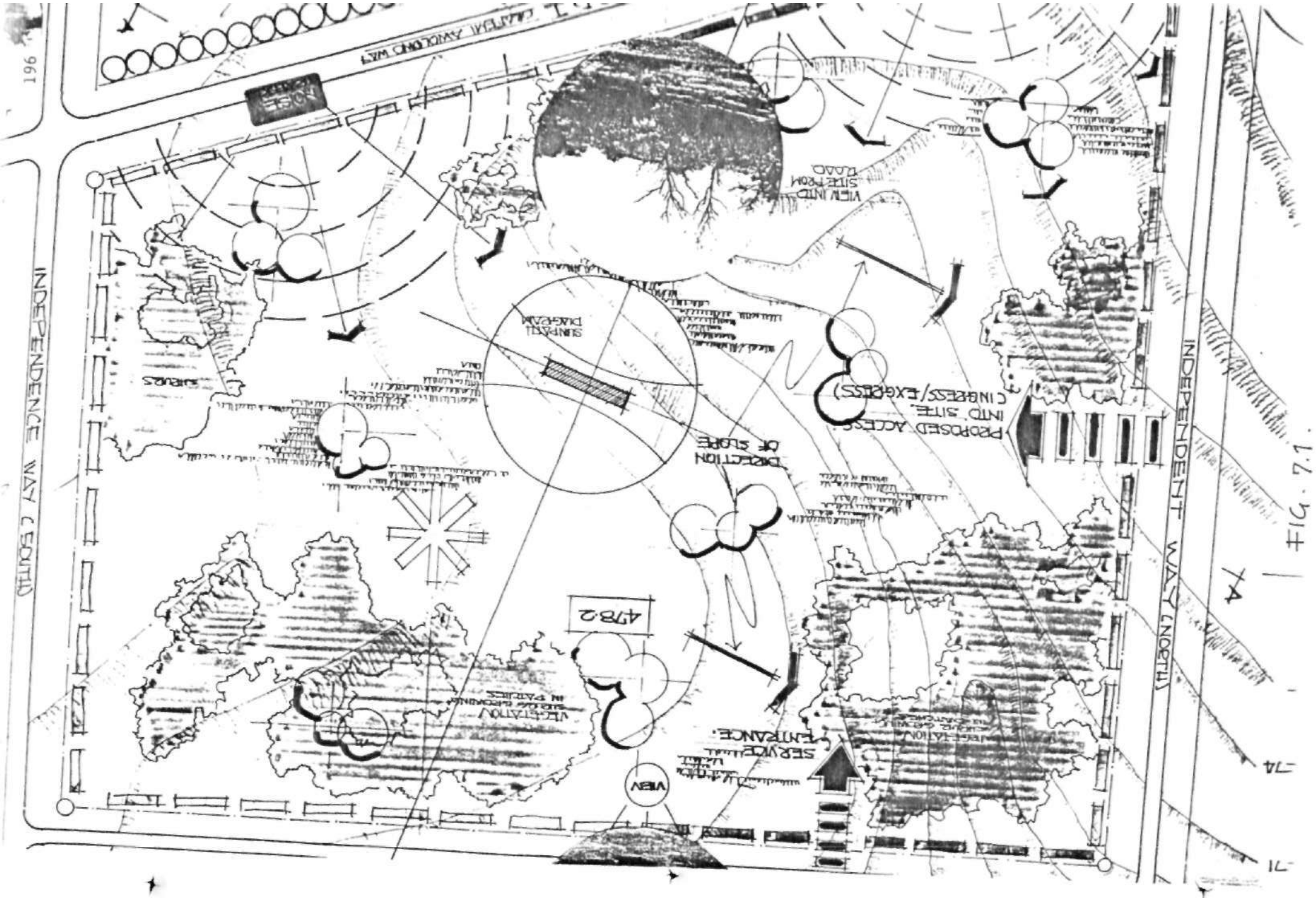

INDEPENDENCE WAY SOUTH
INDEPENDENCE WAY NORTH
196
VIEW INTO SITE FROM ROAD
SURFACE DRAINAGE
DIRECTION OF SLOPE
PROPOSED ACCESS INTO SITE (INGRESS/EGRESS)
SERVICE ENTRANCE
VIEW
4782
74
71

FIG. 7.1.

planned with a view to future expansion of in-patient services and hence physical plant. By this realisation, the site layout concept provides for the complex to be in the middle of the site, as a sort of core from which subsequent expansion can occur. (See Fig. 7.2).

(b) The need for proximity of students and staff accommodation close to the complex. Other components shall also be spread around, as and where needed, but at the same time keeping the requirement of growth in mind.

(c) the hospital will obviously witness a lot of public traffic. This dictated a need for a zoning concept whereby different functions and activity areas would be identified for better site and plant utilisation. Three zones were identified, the first being the "public zone" where the visiting public are attended to, and where the hospital services to the public are rendered. The second zone is the "semi-private zone" where the school are and where mostly students would be found. Finally the "private zone" consisting of student and staff accommodation and some general services.

Bringing together these various concepts, and making a general functional analysis of the components of the hospital, a site structure is arrived at. This structure naturally respects the conceptual configurations as well as the functional requirements enumerated earlier (See Fig.).



FIG. 7.2 SITE LAYOUT CONCEPT

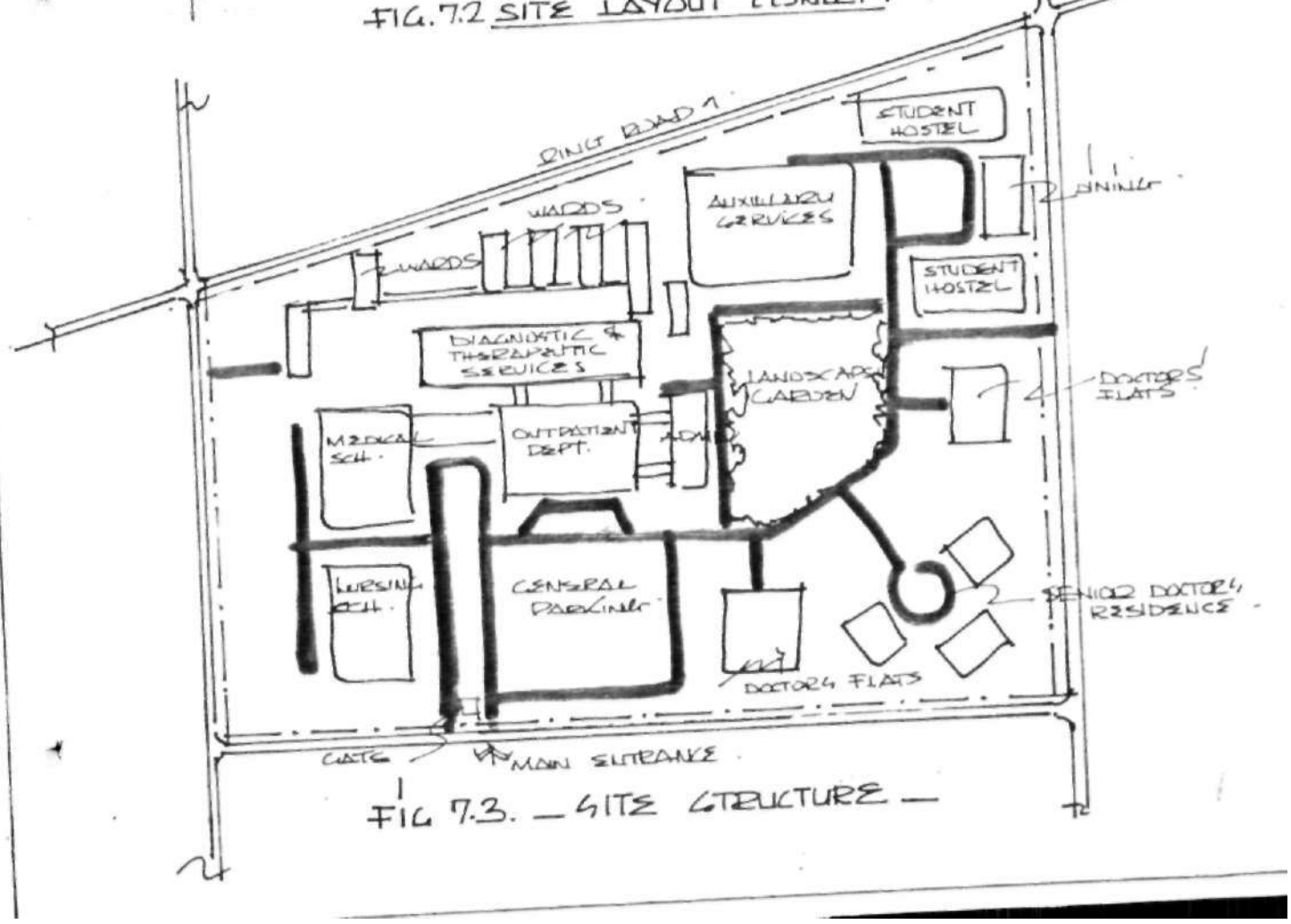


FIG 7.3. — SITE STRUCTURE —

In it, the hospital is related to the medical and nursing school, which in turn is related to the students hostels and staff accommodation.

The common services are placed between the school and the hospital.

Further more, certain conceptual site systems were generated, namely buffer systems, traffic systems and drainage systems. The buffer consists of tree placed along the outer periphery at such positions as to enhance visual experience, reduce traffic noise, dust and other off-site nuisances vehicular access are from three points on the site, one to the main hospital complex, second for visitors and third for student and staff. Drainage would be collected along the major circulation routes in suitable concrete section channels and would be collected at the low point of the site in a major channel which would discharge it out side to the channels along side the major road network.

7.1.2 Design Concepts

This design will be based on the principle of contiguity of units.

Research study conducted by the author on functions and inter-relationship in hospital architecture yields "the contiguity theory" which is now gaining world wide recognition.

In this theory, all closely related functions of the various hospital departments should be tied together in a horizontal contiguous plane. In this manner, long travel distances between related departments is reduced and vertical movements using staircases, elevators, etc., is almost completely eliminated. This principle has been employed successfully in other medical centres, a good example of which is the teaching hospital of Khyber medical college, university of Peshawar, West Pakistan designed by Isandore and Zachary Rosenfield (see case studies).

In the layout of the main hospital, shortest distances between the various components of the hospital is hoped to be achieved.

Also to achieve proper zoning of the hospital into public (for out-patients and public) semi-public (surgical and medical general services) and non-public or quiet zone (for in-patients). In the process, I come up with two divisions in the planning of the main hospital. One for the inpatients and services and the other for out-patients.

Also three entrances envisaged one the main out-patient department entrance, the casualty entrance for ambulances and other accident and emergency cases, also service entrances for the quick and convenient unloading of goods in the central stores, dispensary, etc.

7.2.0 Design Synthesis

The summary of goals is to design a hospital that meets the needs of the population of the immediate vicinity and to have various units working in conjunction to accelerate the services needed, and also to design a hospital that will satisfy needed and spatial needs within its life span by its adoption to changes in medical technology.

That following objectives have been executed to arrive at this goals.

(a) case studies and investigation into changes in developments in the scientific world in relation to medicine.

(b) seek a proper balance between capital and running costs by reducing manual tasks and the encouragement of mechanical task for smooth running of the hospital.

(c) The use of present construction techniques and building materials to create flexibility and expansion facilities in the buildings.

(d) to create a building that is functional, of good quality and that exhibits good planning concept.

(e) control of infection by the separation as far as practicable, work corridors from general circulation corridor.

(f) Ultimate balance in flow. Minimal movement distances with as little conflict as possible. Easy to understand routes especially for patients.

(g) Efficient scheme for future expansion from 300 to 500 and

eventually 1000 over the years.

This thesis is not just based on the hospital unit itself, but how various units relate with one another on site. Therefore I would start with the site layout and planning of the whole complex.

7.2.1 The Site lay-out

Having laid down the site concepts i.e. at the conceptual development stage, and having generated site systems compartible with these concepts, a site scheme was arrived at.

The main hospital block lies in the centre of the site, while the medical school and nursing school lie to the west of it with the student hostels and doctors residences to the east.

From the layout top priority as being given to access to the emergency unit, this is conspicuous from the main entrance, as an emergency case is a matter of life and death. The out patient department is located in front for easy access by patients, since this department receives the largest number of patients. A separate entrance as been provided, for visitors to allow for direct access into the wards without having to pass through various areas causing traffic problems.

Housing for the students is placed in the private zone of the site with provision for interns, both married and single.

Staff housing is also within the same area. A barrier hasbeen created to separate the residential area from the hospital complex to prevent spread of disease.

General plant and services like water treatment, boilers, etc., are towards the north of the hospital complex. Other auxilliary services serving the hospital are located within the same area.

7.2.2 **Growth**

Ample space is be provided for future expansion most especially towards the rear of the hospital.

7.2.3 **Orientation**

Buildings as much as possible face north-south for maximum solar protection, which is essential for the climate condition.

7.2.4 **The Main Hospital**

The buildings, essentially are designed from a very simplistic approach, considering their use and respecting their requirements of that use. Basically in medical architecture, two approaches are identifiable. One is the approach that recognises the complexity of functions in a medical complex, and respects first and foremost that functional requirement and subordinates the aspects of form, while the other, even though it respects

function, lays certain emphasis on the form as a tool for attaining certain objectives e.g. healing through form configurations. The first approach can be likened to factory production flow whereby the processes, i.e. flow of production, determines the layout of the complex, and sometimes even the form. In the second approach, functional aspects are subordinated and are considered less critical, therefore the options, choices, are more, form can be manipulated to achieve desired effects.

The design of this hospital was purely from the former approach; satisfying functional requirements first and then providing a suitable building envelope that respect the socio-cultural and environmental factors.

7.2.5 Plan

The plan is made up of basically three units

- The out patient
- the diagnostic and therapeutic unit
- the inpatient.

The courtyard concept also respect climatic and local building patterns. The planted areas are a source of physiological and visual comfort to the occupants of the building. Such as therapeutic relief to patients.

7.2.6 Structure

The normal structural system for hospitals i.e. post and

beam with grid deck as roofing is used. Grid modules of 6.5 x 6.5 was mainly employed. The whole structure is basically a simple structure of reinforced concrete. Since the external columns are structural and carrying all load. All external walls and internal partition walls are non-structural. The floors are projected to form a balcony-like extension which provides shade for the lower floors and give an interesting solid and void composition on elevation.

The over all result is a retilinear framed building in which interior partitions can be manipulated at will without any structural adjustments. This satisfies some of the most important requirements of hospital design.

7.2.7 Landscape

Landscaping is used to provide privacy, define circulation and recreational spaces, provide shade, reduce noise, provide pleasant visual experience, reduce glare and movement of dust particles, filter harmattan haze, induce humidity and define certain circulation route. The courtyards employed offer a great opportunity whereby landscape element can be used to achieve most of the enumerated functions above.

Shade trees are provided at the parking areas and of building facades, to limit exposure and glare.

To conclude this chapter on design synthesis, a brief

discourse into the special design standards and requirements of the medical institution shall be presented.

7.3.0 **Special Design Standard** - Technical and safety requirements.

7.3.1 **Plumbing** - To provide greater flexibility, all units should have air, vaccum, water gas and electrical services at all work areas.

Fixtures must be selected with care to suit the particular function they serve. There are standardised type, however, they shall be discussed here. Care must be exercised in selection to ensure materials that will withstand rigorous usage.

7.3.2 **Piping System** - Four basic considerations are important in piping systems design for hospitals.

1. Location of systems to provide easy accessibility.
2. Provision of sufficient space to accommodate systems without crowding.
3. Sizing and arrangement of systems to facilitate expansion and modification as required, and
4. Quality of materials used in fabrication of the systems.

Normally systems are concealed in wall chases, both vertical and horizontal. Vertical systems should have shafts of sufficient size to permit entrance of service personnel and the use of tools within, and horizontal connections may be in

horizontal chases with removable panels or overhead above the ceiling.

Overhead systems may be exposed or concealed above a suspended ceiling. Exposed systems will require a lot of cleaning as they will accumulate dust and so are not quite advisable in the Sudan Savannah climate. Concealed systems only have the disadvantage of having to remove ceiling panels for servicing.

7.3.3 Drainage Systems - In general, systems used and material will conform to standards for hospital construction. However, systems serving laboratories, especially the waste lines, are subjected to harsh use. Types of liquid waste to be disposed from each laboratory should be the basis for the selection of piping materials and design of systems. To ensure permanent trouble-free drainage system, acid-resisting piping materials should be used. Where the volume of such waste is large, separate waste systems may be provided.

Where extensive use of high-level radioisotopes is indicated, a separate drainage system is required discharging to a stainless steel tank. Stainless steel is recommended as drainage material here because it can be made leak tight and its smooth interior allows easy flushing.

Water: An analysis showing the characteristics of the local water supply should form the basis for the selection of

piping materials for the hot and cold water systems. This analysis will also indicate whether treatment is required, and the type.

Copper piping is recommended for water distribution systems with galvanised wrought iron for mains over 5 inches in size. Water systems in laboratory areas are in constant danger of contamination from toxic elements and can endanger the whole hospital water supply. Color coding and lettering of piping systems is therefore necessary.

Sprinkler system: A sprinkler system in addition to the standard standpipe system is recommended for storage rooms housing volatile materials and laboratories in which such materials are used.

Gaslines: should be generally sized to provide for expansion of services and maintain constant pressure outlets. A main emergency shut off valve controlling the gas supply to different hospital area should lie available at an accessible location, preferably outside the laboratory, black steel piping is appropriate for gaslines.

Compressed air and vaccum systems: Copper tubing is usually used although galvanised steel and threaded malleable iron fittings may be used. They too should be generally provided to cater for expansion. Discharge from vaccum pumps should be to the outside, and the pumps and air compressors should be located

on lower floors and isolated from the building structure because of vibrations that occur during their operation. This vibration may seriously affect micro-balances, electron microscope and other precision equipment.

7.3.4 **Oxygen Systems** - Copper piping is recommended for these systems. An emergency shut-off valve is equipped, accessible. and preferably on the outside for the hospital. Care must be exercised in locating the outdoor bulk supply because of fire hazards.

7.4.0 **Structure** - It is important to consider the selection of structural frame and floor system which allows flexibility of space arrangements and adequate life load to support hearing and movable equipment associated with hospitals.

It is not always possible to determine where future expansion will be required; therefore, structural elements and their enclosing walls should permit elements and their enclosing walls should permit expansion in all directions. Load bearing wall construction methods are not suitable. Floor construction should be of a type that will accept economically the many varied openings and surface depressions required intially and in the future.

7.5.0 **Materials And Finishes** - Laboratories, preparation rooms, utility rooms and the like should have floor finishes which are smooth and acid resistant. Quarry tiles with core base are

recommended. Good results can be obtained from the use of such resilient flooring as vinyl-asbestors and rubber base.

Wall finishes may be plaster, glazed tile, or the more economical masonary block for partitions, cement, asbestos, most especially steel partition for their resilient qualities. Masonry block is also a satisfactory material.

In sterilising and glassworking areas, quarry tile or terrazzo floor is desirable. Walls and ceilings should be moisture resistant. Portland cement plaster and water resistant, high-gloss paint is acceptable. Glazed tile with sanitary cove is however better.

Cold rooms should have ceramic or quarry tile floors, core base, and cement mortar walls and ceilings. Where fabricated cold rooms are installed, prefinished surfaces are usually stainless steel or porcelain enamel.

In dissection rooms, vinyl-tile floors, glazed structural tile wainscot, and mansory block walls are recommended. If ceiling are installed, the finish should be plaster.

Corridors should have resilient flooring. Walls may be of mansory block or other durable finish. Corridor ceilings should be removable for access pipes and ducts. Removable acoustic tile ceiling boards are recommended.

Such areas as autopsy rooms, scrub up and storage areas,

embalming suite, etc., should have finishes such as quarry tile floor and base with glazed tile walls. Ceilings should be plaster if not exposed.

Materials and finishes for auditorium, offices, lobbies and similar areas should be selected for durability and minimum maintenance. High quality should be used to cater for hard usage. Solid core doors with hardwood or similar veneer and with the best institutional grade hardware are recommended.

7.6.0 SCHEDULE OF ACCOMMODATION

Wards

	Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1.	1-Bed room	6	20	120
2.	2-Bed room	1	1	17.5
3.	4-Bed rooms	9	30	270
4.	Nurses' Station	1	17.5	17.5
5.	Medication room	1	12.5	12.5
6.	Treatment room	1	20	20
7.	Clean utility	1	16	16
8.	Dirty utility	1	6	6
9.	Doctor's room	1	24	24
10.	Sisters' room	1	20	20
11.	Linen Store	1	17.5	17.5
12.	General Store	1	15	15
13.	Stretcher bay	1	8	8
14.	Day room	1	32.5	32.5
15.	Pantry	1	12.5	12.5
16.	Staff toilets	2	1.5	1.5
17.	Patients' toilet	8	1.5	1.2
18.	Waiting area	1	10	10
19.	Janitor's closet	1	10	10
Total				626.0$_m$2

Out-Patient Department

This provides consultation, investigation, diagnosis and treatment for patients who require little or no recovery services afterwards, and are not admitted to acute wards.

Number of Consulting and examination rooms required

In determining these, average weekly attendance and consultation time are employed. The calculations are as follows:

$$Y = \frac{M \times t}{S}$$

where Y = Critical number of sessions held

M = Average weekly attendance

t = Average consulting time in minutes

S = Total length of each session.

For an annual attendance of 513,000 patients, weekly attendance will be 9865.4 - 10,000, an average consultation time of 5 minutes, and a session of 7 Hours (8.00 a.m. to 3.00 p.m.) = 420 minutes,

$$Y = \frac{10{,}000 \times t}{420} = 119 \text{ Critical number of sessions}$$

Number of consulting rooms (c) therefore,

$$C = \frac{Y}{n} = \frac{119}{6} = 20 \text{ Consulting rooms}$$

Where n = number of sessions per week

Number of examination rooms are a maximum of 2 per Consulting room.

In this case, 1 examination room/consulting room is considered. Therefore examination rooms also = 20.

Male O.P.D. (37%)

	Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1.	Waiting area	2	111	222
2.	Appointments & information	1	30	30
3.	Records	1	23.5	23.5
4.	Drugs dispensary	1	40	40
5.	Consulting rooms	8	13.5	108
6.	Examination rooms	8	13.5	108
7.	Staff toilets	2	1.5	3.0
8.	Public toilets	6	1.5	9.0
9.	Treatment rooms	2	35	70
10.	Injection rooms	2	25	50
Total				664.5m^2

Female & Children's O.P.D. (63%)

	Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1.	Waiting area	3	111	333
2.	Appointments & information	1	30	30
3.	Records	1	23.5	23.5
4.	Drugs dispensary	1	40	40
5.	Consulting rooms	12	13.5	162
6.	Examination rooms	12	13.5	162
7.	Staff toilets	3	1.5	4.5
8.	Public toilets	10	1.5	15.0
9.	Treatment rooms	2		35
10.	Injection rooms	3		25
Total				$915.5m^2$

This is technically a therapeutic aid in which a team of surgical staff operates on a patient.

For a hospital of 500 beds of which 165 are surgical, assuming an 8 day average stay and 100 percent maximum occupancy, estimated number of annual operations

$$= \frac{\text{165 beds x 100\% occupancy x 365 days}}{\text{8 day average stay}} = 7528$$

These are then subdivided as follows:

1.	General Surgical	- 64%	= 4818
2.	Orthopaedics	- 14"	= 1054
3.	Eye & E.N.T.	- 10"	= 753
4.	Gynaecologic	- 6"	= 452
5.	Cystoscopic	- 6"	= 452
		100%	7528

Number of Operating Rooms

1. For a hospital of 500 beds with 165 as Surgical, 4818 general surgical cases per year, a full day schedule (8.00 a.m. to 3.00 p.m.), $5^1/2$ days per week, number of general operating rooms required is:

$$N = \frac{\text{4818 operations per year}}{\text{286 Days x 3.5 operations per room per day}}$$

= 4.8 5 operating rooms.

2. For 1054 Orthopaedic Surgical Cases, number of operating rooms required = 1.

3. Eye & E.N.T. = 1 operating room

4. Gynaecologic operations = 1 operating room

5. Cystoscopic operations = 1 operating room

Total number of operating rooms = 5 + 1 + 1 + 1 = 8.

Recovery beds

The requirement is $1^1/2$ to 2 beds per operating room. For 8 operations rooms, taking the lower value of $1^1/2$, number of beds = 1.5 x 8 = 12 recovery beds.

	Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1.	Entrance lobby	1	30	30
2.	Janitor's Closet & Stretcher bay	2	10	20
3.	Doctors' lockers	2	25	50
4.	Nurses' lockers	2	25	50
5.	Scrub-Up	2	18	26
6.	Operating rooms	8	36	288
7.	Anaesthesic rooms	2	10.5	21
8.	Frozen sections labs	2	25	50
9.	Staff room	2	25	50
10.	Supervisors	2	15	30
11.	Instruments Storage	2	20	40
12.	Toilets (staff)	4	1.5	6.0
13.	Unsterile equipment store	2	20	40
14.	Recovery rooms (12 beds)	2	20	40
15.	Bulk items storage	1	15	15
16.	Disposal room	1	9	9
Total				775.cm^2

Obsterical Delivery Suite

This is where pregnant women come at the on-set of labour to the time of delivery. There is also provision for post-portum recovery.

Number of delivery room

For an average annual live births of 3643, number of delivery rooms required are

$$N = \frac{DLY}{365 \times DLRD}$$

Where N = Number of delivery rooms

DLY = Deliveries per year (including caesarian sections)

365 = Days per year

Taking an average DLRD of 5,

$$N = \frac{3643}{365 \times 5} = 1.98 = 2$$

Add 1 to off-set need for extra room therefore

N = 2 + 1 = 3

For each delivery room, provide 2 labour rooms

Labour rooms = 2 x 3 = 6.

Accommodation Requirements

	Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1.	Delivery rooms	3	49	147
2.	Labour rooms	5	20	100
3.	Toilets	9	1.5	13.5
4.	Doctors' lockers	1	25	25
5.	Nurses' lockers	1	25	25
6.	Staff lounge	1	42	42
7.	Soiled holding	1	15	18
8.	Janitors' closet	1	6	6
9.	Scrub-up	1	15	15
10.	Sub-sterilizing	1	15	15
11.	Anaesthesia store	1	6	6
12.	Recovery room	1	27	27
13.	Sterile store	1	12	12
14.	Sleeping rooms	1	24	24
15.	Fathers' room	1	8	8
Total				$491.5m^2$

Nursery

This is where the new born are kept until they are fit for home care or until their mother is fit to go back home after parturition.

Number of bassinets

For an annual average of 3643 live births, 6% are considered premature (low birth weight of less than or equal to 2,5 Kg).

6% of 3643 = 0.06 x 3643 = 220 premature births Full-term births, therefore, are 3643-220 = 3423. Dividing full term births by 73 (the number of periods in one year resulting from an average 5-day stay).

3423-73 = 47 full-term bassinets

Number of premature births divided by 18 (the number of periods in one year resulting from an average 20-day stay).

220-18 = 12 premature bassinets

Total bassinets = 47 + 12 = 59 = 60.

Nursery

Accommodation Requirements

Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1. Nursery	3	56	168.0
2. Nurses' Station	2	25	50.0
3. Work space	2	20	4.0
Total			258.0m^2

Pathology Department

This department consists of the clinical laboratories where specimens from patients are investigated to establish disease or confirm it.

	Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1.	Waiting area	1	20	20
2.	Pathologist's office	1	13.5	13.5
3.	Venipuncture cubicle	1	10	10
4.	Specimen toilet	2	1.5	3.0
5.	Glass Washing and Sterilization	1	12	12
6.	Storage room	1	10	10
7.	B.M.R. Room	1	30	30
8.	E.E.G. room	1	25	25
9.	Haematology laboratory	1	30	30
10.	Chemical pathology lab.	1	30	30
11.	Histology laboratory	1	30	30
12.	Serology and Bacteriology	1	30	30
13.	Parasitology laboratory	1	30	30
14.	Technicians lockers	1	25	25
15.	Technicians toilets	4	1.5	6.0
16.	Janitor's Closet	1	6	6
Total				312.0m^2

Emergency Unit

This provides 24-hour, 365 days per year service for accident and emergency cases which may occur in any place.

Number of Emergency Beds

In determining this, the general rule is that there should be a minimum of 4 beds in two rooms (for separation of Males and Females) plus an additional two for each 100 beds of the hospital over 100.

Therefore in this hospital of 500 beds, number of beds = 4 + (2 x 4) = 4 + 8 = 12 observation beds. These are distributed equally for both sexes (6 each).

	Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1.	Reception/Waiting	1	40	40
2.	Ambulance parking	2	11.5	23
3.	Doctor's office	1	13.5	13.5
4.	Nurse's office	1	13.5	13.5
5.	Treatment room	1	16	16
6.	Observation rooms	2	25	50
7.	Utility rooms	2	15	30
8.	Operating room	1	36	36
9.	Janitor's Closet	1	6	6
10.	Scrub-up	1	15	15
11.	Clean-up	1	15	15
12.	Staff toilet	2	1.5	3.0
13.	Patients toilets	4	1.5	6.0
Total				282.0m^2

Radiology Department

This department is mainly a diagnostic department which utilizes the penetrating power of X-rays to provide information of body organs.

Number of diagnostic rooms

To determine the number of radio-diagnostic rooms, Todd Wheeler provides a formula for that in his book - Hospital design and function.

$$N = \frac{DTY}{DW \times WKS \times HD \times DTRH}$$

Where N = Number of radiographic rooms

DTY = X-ray determination per year

DW = Working days per week

WKS = Weeks per year

HD = Hours in a days

DTRH = Determination per room per hour

Maximum determination per day = 50

Therefore determinations per year = 14,300

Length of determination - 15 to 20 minutes

Working days = $5^1/2$

Hours per day = 7 (i.e. 8 a.m. to 3.00 p.m.)

Weeks per Year = 52

$$N = \frac{1430}{5.5 \times 52 \times 7} = 2.4 = 3$$

Assigning 3 cubicles per room, number of cubicles = 3 x 3 = 9 = 10

Accommodation Requirements

	Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1.	Reception	1	16	16
2.	Patients' Waiting	1	50	50
3.	Patients' toilets	2	1.5	3.0
4.	Stretcher waiting	1	9	9
5.	Dressing Cubicles	11	1.5	16.5
6.	W.C. for barium patients	3	1.5	4.5
7.	Barium Kitchen	1	5	5
8.	Radio-diagnostic rooms	3	25	75
9.	Dark room	1	15	15
10.	Doctor's Viewing	1	15	15
11.	Sorting and distribution	1	15	15
12.	Radiologist office	1	20	20
13.	General Store	1	20	20
14.	Staff toilets	2	1.5	3.0
15.	Film store	1	7.5	7.5
16.	Janitor's Closet	1	10	10
Total				$284.8m^2$

Physical Medicine Department

This department consists of two sections:

1. **Physiotherapy**

This is a form of physical exercises which utilizes heat, water, electricity, message etc., to help patient regain motor control of a disabled member of his body.

Accommodation Requirements

	Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1.	Reception	1	25	25
2.	Waiting area	1	40	40
3.	Stretcher Storage	1	9	9
4.	Examination room	1	15	15
5.	Office	2	15	15
6.	Locker rooms (Changing)	2	21	42
7.	Treatment Cubicles	4	9	36
8.	Hydro-therapy room	1	150	150
9.	Exercise room	1	150	150
10.	Store	1	12	12
11.	Patients' toilets	4	1.5	6.0
Total				$500m^2$

2. Occupational Therapy

This is the second part of the physical medicine department. it seeks to asist the patient in putting his regained physical ability to some economic or social use.

Accommodation Requirements

Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1. Reception/Waiting	1	50	50
2. Records room	1	9	9
3. Offices	2	12	24
4. Store	1	12	12
5. Staff toilets	4	1.5	9.0
6. Patient's toilets	4	1.5	9.0
7. Patients shower	4	1.5	9.0
8. Main therapy room	1	540	540
9. Wood Workshop	1	100	100
10. Workshop store	1	45	45
11. General store	1	45	45
12. Staff lockers	1	25	25
13. Our-door therapy	1	750	750
Total			$1627.0m^2$

Pharmacy Department (Dispensary)

This department is conderned with drugs and medications and consists of two parts, that is compounding section and dispensing section.

	Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1.	Waiting and distribution	2	30	60
2.	General Storage	1	25	25
3.	Pharmacist's office	1	15	15
4.	Bulk Chemicals Store	1	30	30
5.	Storage for Flammables	1	10	10
6.	Storage for narcotics	1	10	10
7.	Compounding area	1	50	50
Total				195.0m^2

Supporting Services Department

1. Kitchen and Catering Facilities

This Unit is the Meals supply centre where meals for the patients are prepared.

Since the hospital will accommodate 500 patients at 100 percent occupancy, the kitchen serving three times in a day, it should then be capable of serving 1500 meals every day.

Accommodation Requirements

Space	Number of rooms	Size of each (M^2)	Total area (M^2)
A. Kitchen Stores	-	-	-
1. Cold store (Meat)	1	20	20
2. Vegetable Cold store	1	20	20
3. Dairy products	1	20	20
4. General Store	1	25	25
5. Janitor's Closet	1	6	6
B. Preparation area	-	-	-
1. Meat and fish	1	20	20
2. Pastry and sweet	1	20	20
3. Vegetable	1	20	20
4. Diet	1	20	20
C. Cooking area	-	-	-
1. Cooking space	1	80	80
2. Trolleys parking	1	20	20
3. Trolleys washing	1	20	20
D. Staff Facilities	-	-	-
1. Offices	2	15	30
2. Locker room (Changing)	2	25	50
3. Toilets	6	1.5	9
Total			380.0m^2

2. Laundry and housekeeping unit

This Unit receives for cleaning all garments and hospital clothes from the nursing units and other hospital departments. The housekeeping section concerns itself with the general cleaning of hospital buildings.

Accommodation Requirements

	Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1.	Collection and sorting	1	25	25
2.	Main workroom and washing area	1	200	200
3.	Storage for supplies	1	25	25
4.	Mending room	1	20	20
5.	Clean Storage	1	20	20
6.	Staff lockers	1	25	25
7.	Staff toilets	3	1.5	4.5
8.	Staff rest room	1	25	25
9.	Housekeeper's office	1	15	15
10.	Clerks' office	1	20	20
11.	Head of Unit's office	1	15	15
12.	Distribution space	1	25	25
Total				$299.5m^2$

3. Central General Stores

This store all bulk items purchased for the hospital's use. These include food items, stationeries, equipment, etc. Items are checked and recorded before being stored or passed to appropriate departments for use.

Accommodation Requirements

Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1. Receiving & distribution	1	75	75
2. Clerks' office	1	25	25
3. Bulk food store	1	50	50
4. Linen store		50	50
5. Volati e liquids		25	25
6. Used equipment	1	175	175
7. General stores	2	150	300
Total			$700.0m^2$

4. Central Sterile Supplies

This unit receives for Sterilizatin, all hospital gowns and equipments used in the Surgical and delivery suites as well as the emergency unit; and all hospital departments requiring its service.

Accommodation Requirements

Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1. Receiving & distribution	1	75	75
2. Wash-up space	1	25	25
3. Gloves & instruments	1	25	25
4. Clean work area	1	100	100
5. Sterile Store	1	50	50
6. Non-sterile Store	1	40	40
7. Supervisor's office	1	16	16
Total			331.0m^2

5. **Maintenance Unit**

This unit is responsible for maintaining the hospital buildings and other equipment e.g. plumbing, electrical and mechanical works, etc.

Accommodation Requirements

	Space	Number of rooms	Size of each (M^2)	Total area (M^2)
1.	Head's office	1	15	15
2.	Clerks	1	15	15
3.	Carpenters	1	20	20
4.	Plumbers	1	30	30
5.	Masons Store	1	30	30
6.	Painters	1	30	30
7.	Electricians	1	30	30
8.	Telephone exchange	1	20	20
9.	Staff rest room	1	16	18
10.	Staff toilets	4	1.5	6.0
Total				112.0m^2

Chapter 8

8.0 CONCLUSION

8.0.1 Fire Protection in Hospitals

It is platitudinous to say that the dominant consideration in fire protection in hospital is the safety and well-being of patients. But it is not enough merely to save their lives if a fire breaks out, the whole hospital complex should be so planned, constructed and equipped that, if possible, patients not only are disturbed, but are not even aware of an outbreak. This aim is not impossible to achieve with a new building.

A second aim is to avoid disturbances as far as possible of the day to day life of the hospital so that an outbreak in one department shall not disorganise others. This aim is far easier to achieve.

A third and relatively unimportant aim is to minimise damage to building and equipment. One cannot have a fire, however small, in a building without its causing some damage. But again, by various means, this can be kept small.

8.2.0 Acoustics and Sound Control in Hospital

Noise in hospitals present a serious problem to both patients and medical staff. Hospitals are becoming steadily noisier as a result of its growing complexity and lack of concern to control unwanted noise in hospitals. There is more nursing and medical activity because more patients are in acute condition and sources of noise have increased.

The chief sources of noise in hospitals identified during a sound measurement survey conducted jointly by the investigation and building research station include

(a) The corridors

(b) Door openings

(c) Sanitary fittings

(d) Noisy departments (ancillary services)

- central kitchen
- laundary
- incinerator, boiler, generator house
- maintenance workshop
- CSSD.

Large multi-storey hospitals (the vertical mono-block present a more serious problem as a result of compact planning bringing all sources of noise closer to the patient.

Sound generally is controlled by minimizing noise at its source, by isolating or muffling structure-borne reverberations

caused by impacts by providing sound reducing walls and floors between the sources of noise and the patients, and by applying absorbents to surfaces in areas where noise is likely to occur. Many of these noises result from and are emphasised by the hard hygienic surfaces which are generally required in hospitals. This is so because most of the common sound absorbing surface treatments are not popular with the medical profession as a result of their germ harbouring possibilities special treatments, however, such as thin non-porous films over soft absorbent material overcome this problem and are now commonly used in the United States of America. The use of these absorbent materials can be most helpful and they should certainly be used in corridors and circulation spaces. They should however, not be used in wards because they can increase the intelligibility to an embarrassing degree.

Every item used in the finishings and fittings should be considered to see if some resilient material could be used to replace a hard one. To check noise in corridors and other circulation spaces, the floor finishing should be sound absorbent material such as cork tile which has pleasant-looking surface. A carpet in the 'day space' where convalessent patients stay, further absorbs the noise there. The use of ceilings of various absorbent materials are commonly used in hospitals. All doors should be fitted with silient closers. Swing doors are preferable in very busy room such as the treatment rooms, though they

only provide spatial sound-barrier. All other doors should be provided with an automatic closing device. The door is free until it reaches a point with a few inches to the door frame where an overhead mechanism takes charge and shuts it gently against a cushioned jamb.

The insulation of walls between roors in general, except where neither require protection from noise, should be at least 40 dB. If a room of high noise level such as the ward kitchen, occurs next to a room requiring very quite condition such as intensive care rooms, floors between wards should preferebly have an overall insulation of 50 dB. Noisy service corridors in the nursing units are separated from that of the medical staff. The surgical suite is on the first floor to avoid the noisy and congested ground floor corridors.

All noisy ancillary services units such as the laundry, incinerator, boiler, generator house and the animal quarters in the research section are sited in remote areas to prevent noise disturbance.

Also, proper landscaping and planting of green area play an important role in muffling noise.

8.30 Conclusion

In conclusion, it is hoped that this thesis report apart from providing complementary data on the design solution, would

also have contributed in its own little way to the furtherance of information on hospital planning and design.

Proper, co-ordination of the various departments of a hospital is a very difficult aspect in the design of hospitals - thus the auther realized by going through the study. This is due to the fact that the expansion programme has to be incorporated into the initial design sketch. The author has achieved this far, a workable design solution keeping the building to the ground floor and adopting the pavillion system of hospital design.

BIBLIOGRAPHY

1. Ahmed M. (1976), Kano Township General Hospital, unpublished M.Sc. (Architecture) Thesis, Ahmadu Bello University, Zaria.

2. Ahmed Abdel-Hadi Massord - The General Hospital as an Architectural organism, The Catholic University of America Press, Washington DC q965.

3. Allen, R. I. V. and Karolyi, I. - Hospital planning handbook, John Wiley and Sons, New York, 1976.

4. Anthony Cox and Philip Groves, Design for Health care, Butterworth and Co. (Publishers) Ltd., 1981.

5. Architechtural Record - Hospital, clinics and Health Centres, F. W. Dadge Corporation, 1960.

6. Ekistics Journal, Volume 31, No. 186 May 1981 page 367-375.

7. Gainsborough, H. J. - Principles of Hospital Design. The Architectural Press London 1964.

8. Isadore Rosenfield - Hospital Intergrated Design, Reinhad Publishing Corporation . New York, 1960.

9. Isadore Resenfield - Hospital Architecture and Beyond - Van Nostrand Reinhold Company, New York, Toronto, London, 1969.

10. King, M. (Ed.) - Medical care in Developing countries - Oxford University Press Nairobi, Lusaka< Addis Ababa, London, 1968.

11. Mills, Alden B. - Functional Planning of general hospitals, McGraw-Hill, New York, (1969).

12. Ministry of Health London - Hospital Building notes Volumes 1-24, 1968.

13. Newfert E. Architects' Data "Hospitals", second Inter-national edition Granadc, Publishing Limited London 1980.

14. Nuffield Provinsial Hospital Trust - Studies in the Function and design of Hospital (Oxford University Press), 1960.

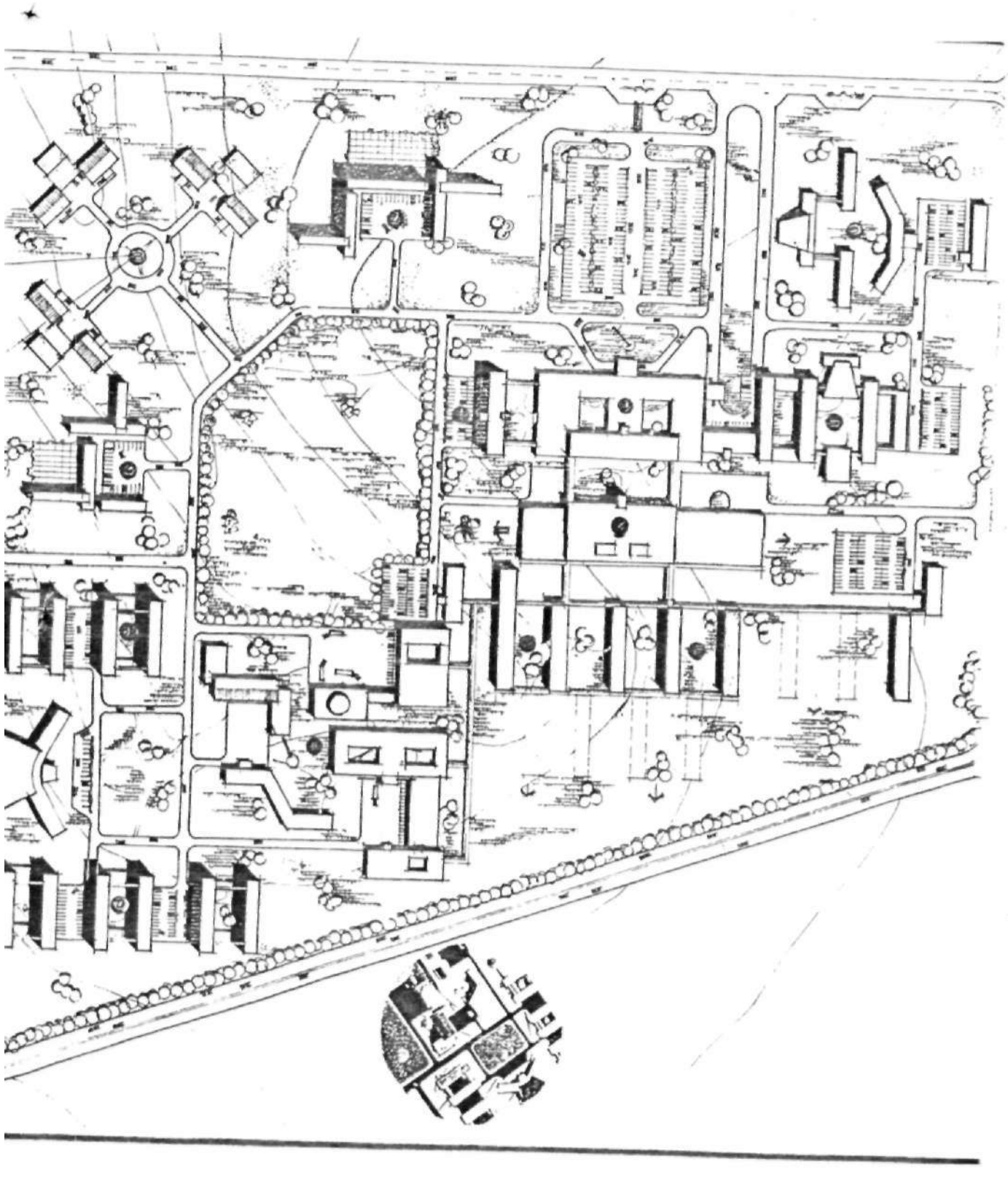
15. Ralph Schran - A history of Nigerian Health services, University of Ibadan Press, Ibadan, 1971.

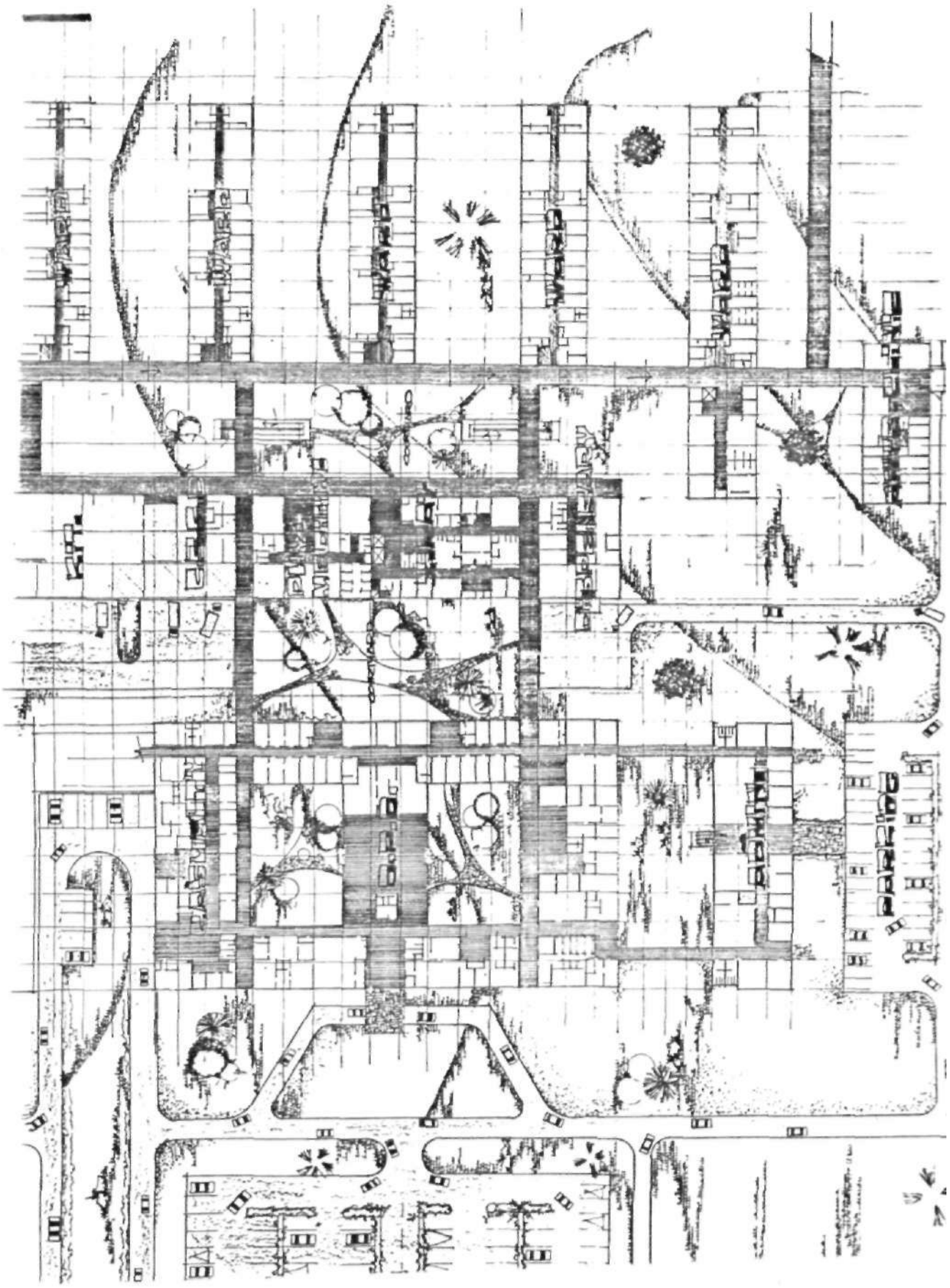
16. Wheeler, E. Tood - Hospital Design and function Mc-Graw Hill book company. Toronto, London, 1964.

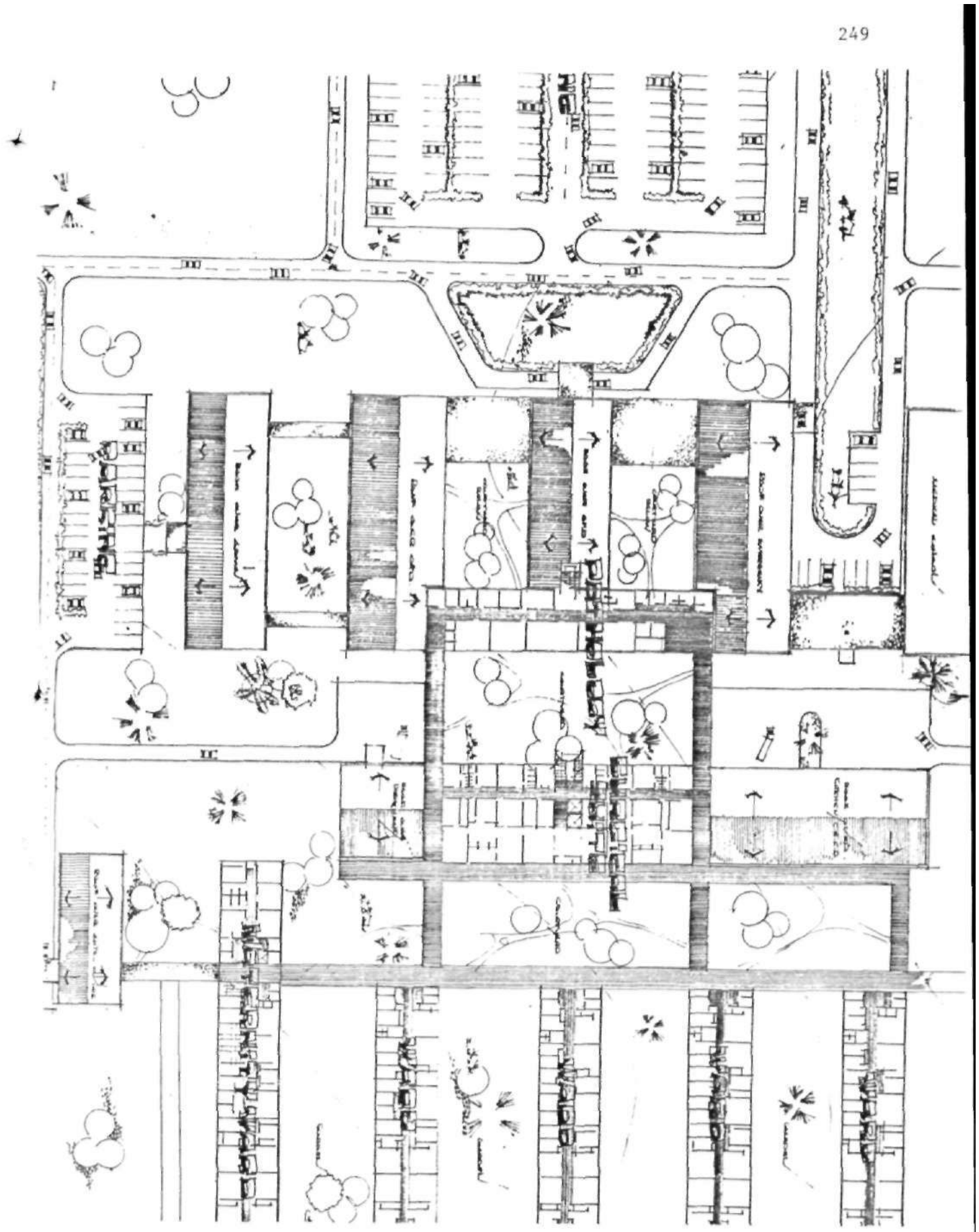
17. Wheeler, E. Todd - Hospital Modernization and Expansion - Mc-Graw Hill Book Company, New York, Dusselolorf, Toronto, London, 1971.

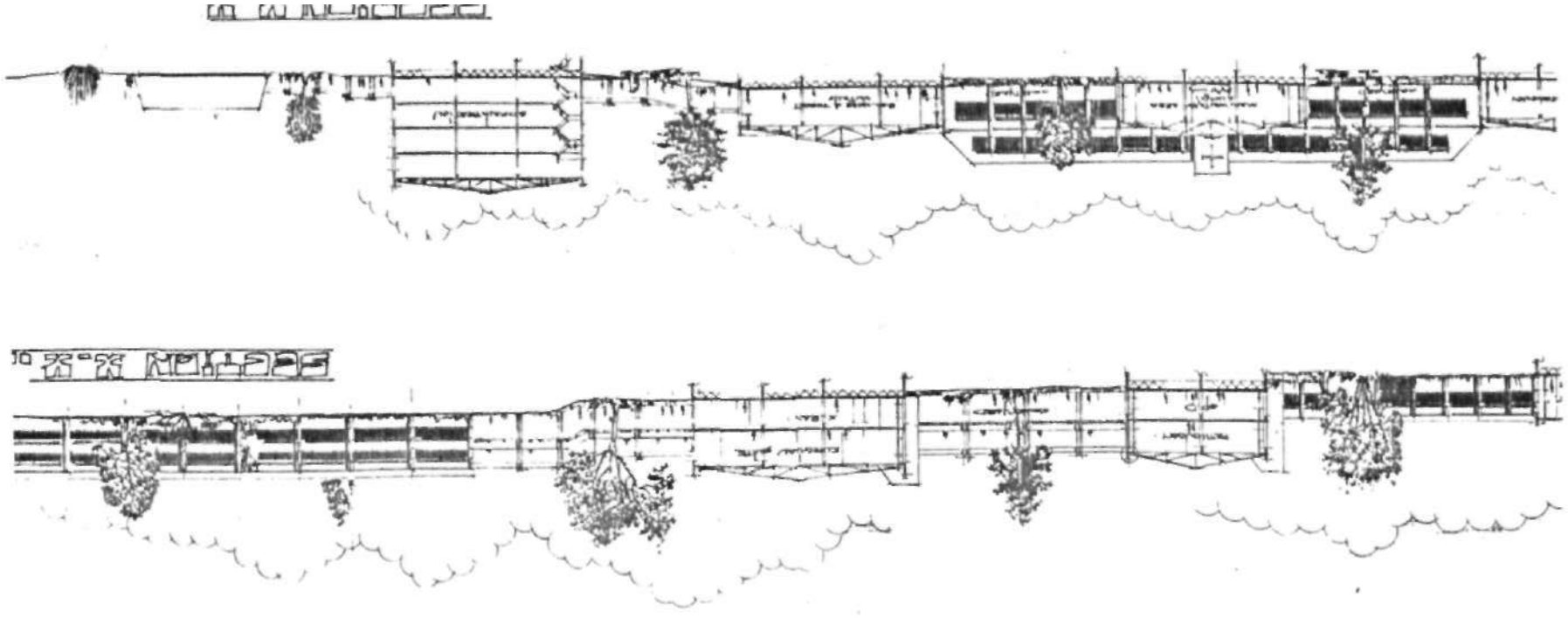
18. World Health Organisation, Approaches to the planning and design of health care facilities in developing Areas. WHO offset Nos. 29, 37, 45, WHO, Geneva (1976/7/9).

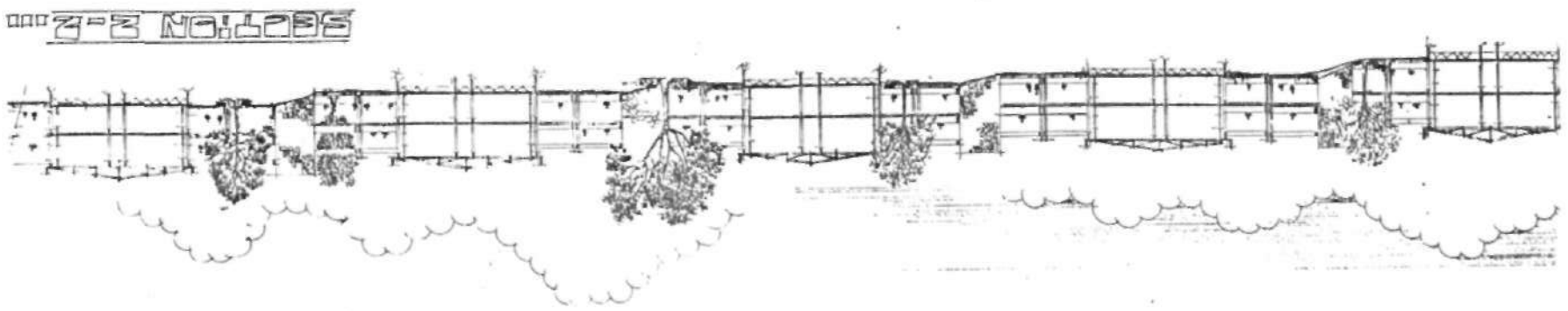
19. YRM International, Health Buildings, in hot climates, a design guide for thermal performance, DHSS, London (1976).

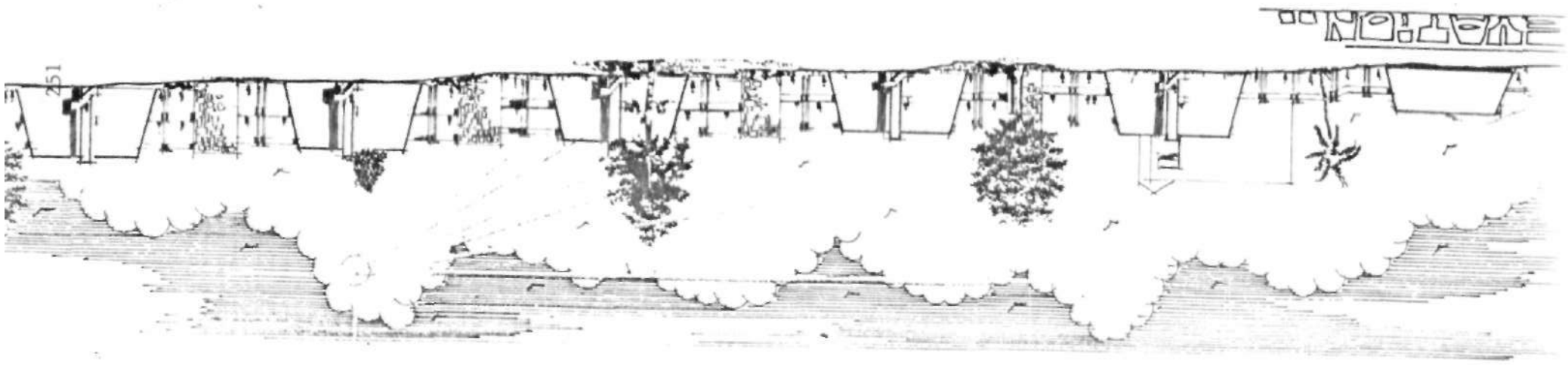


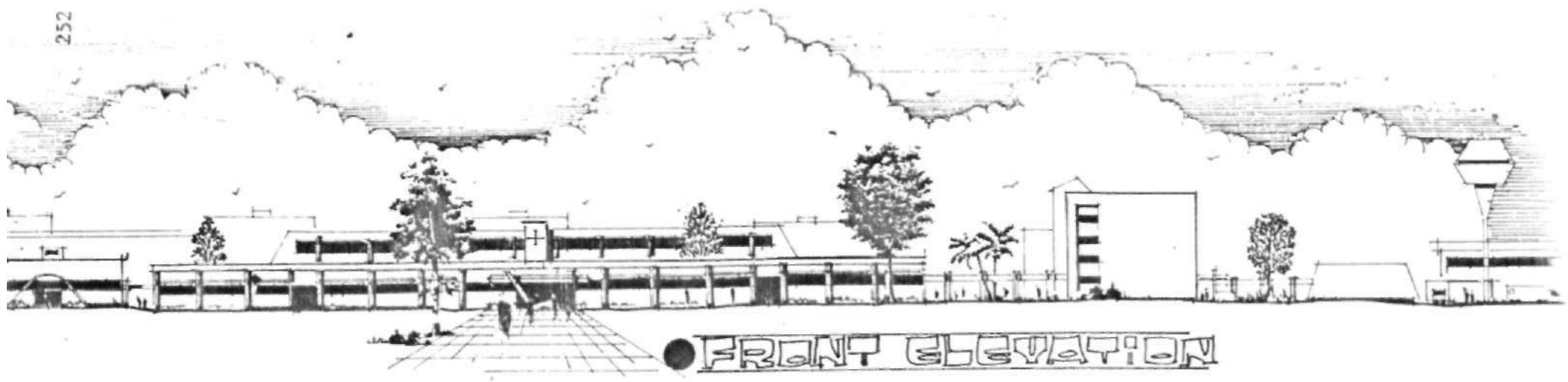

PARKING








251
RIGHT ST

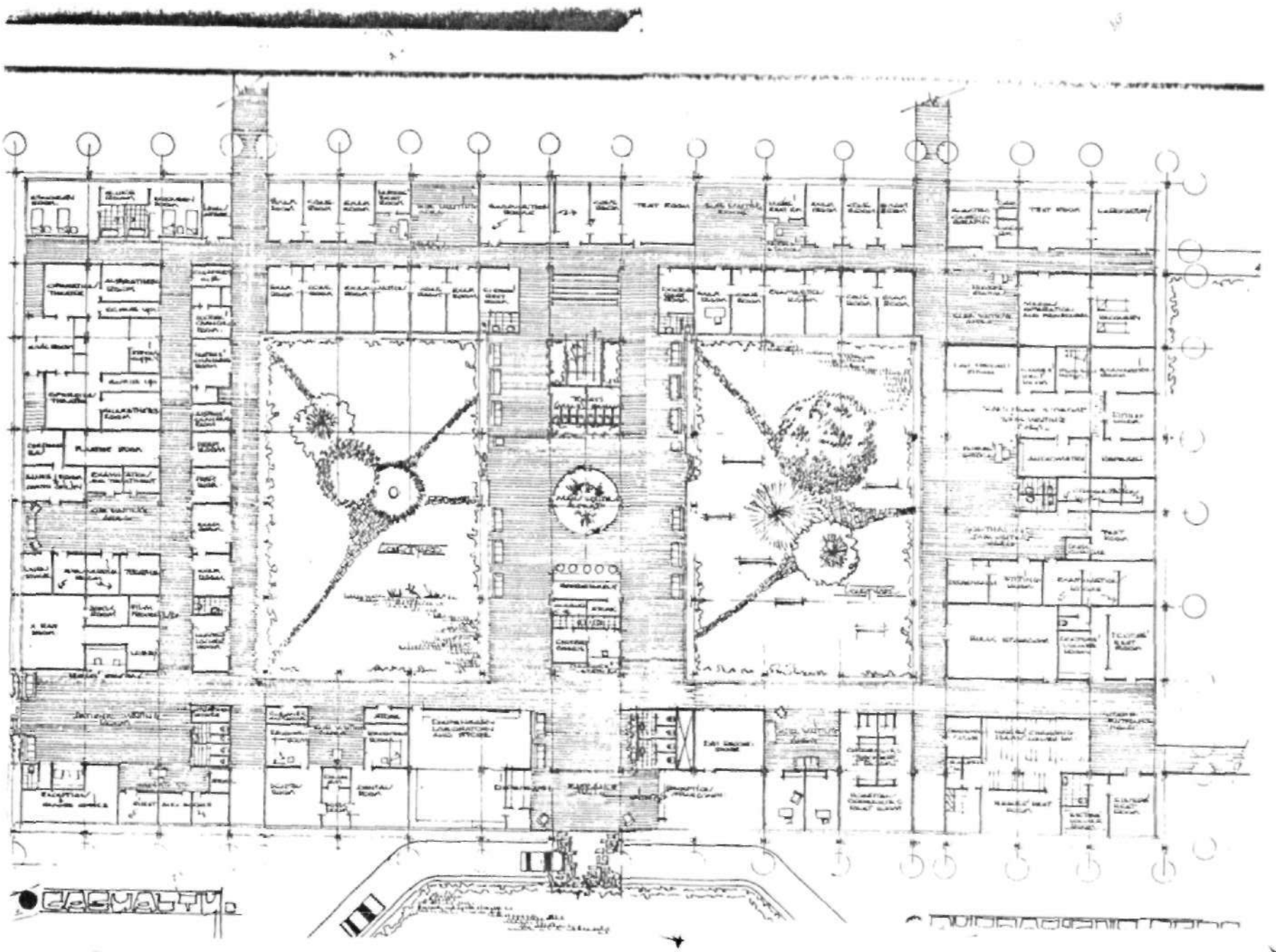


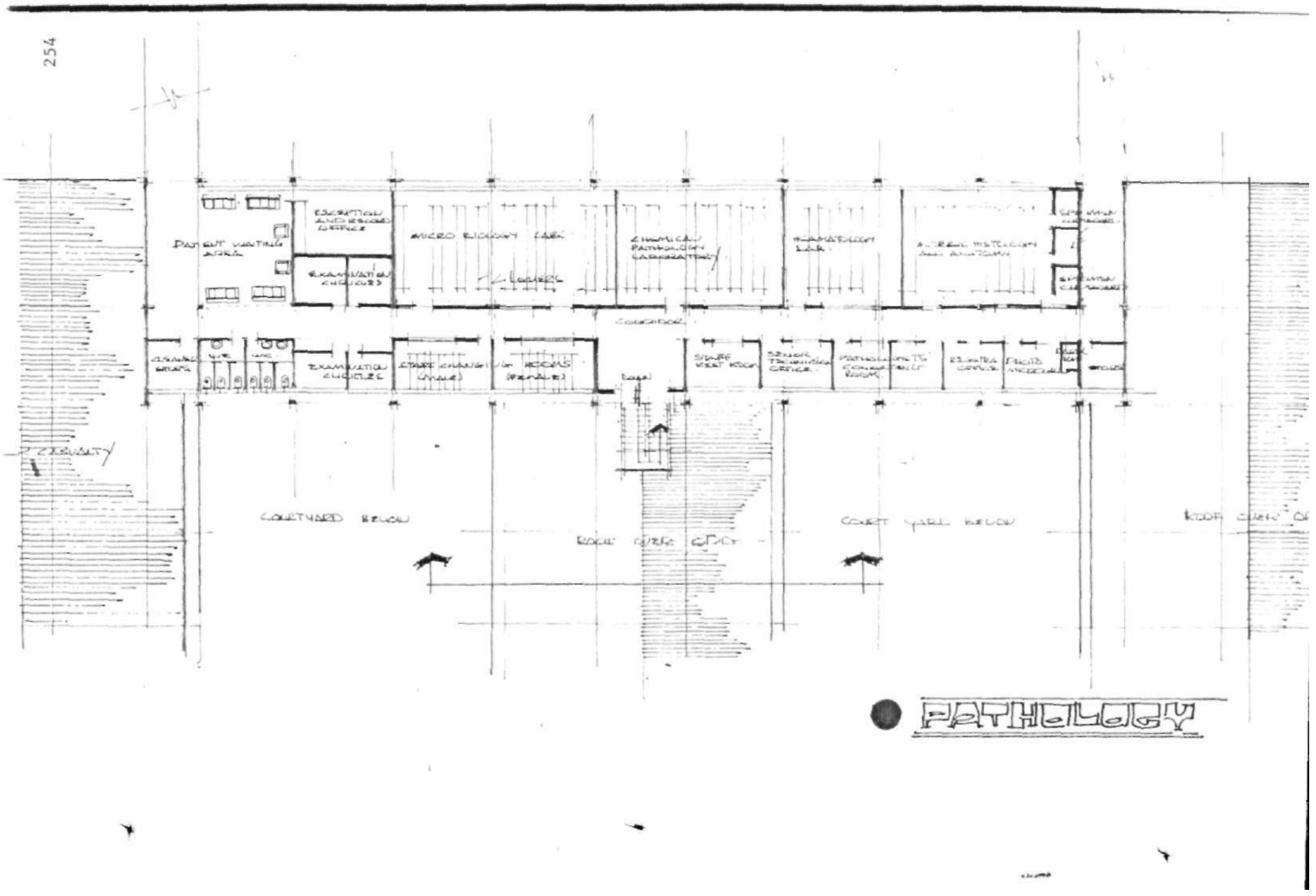
FRONT ELEVATION

GENERAL HOSPITAL
—ABUJA—

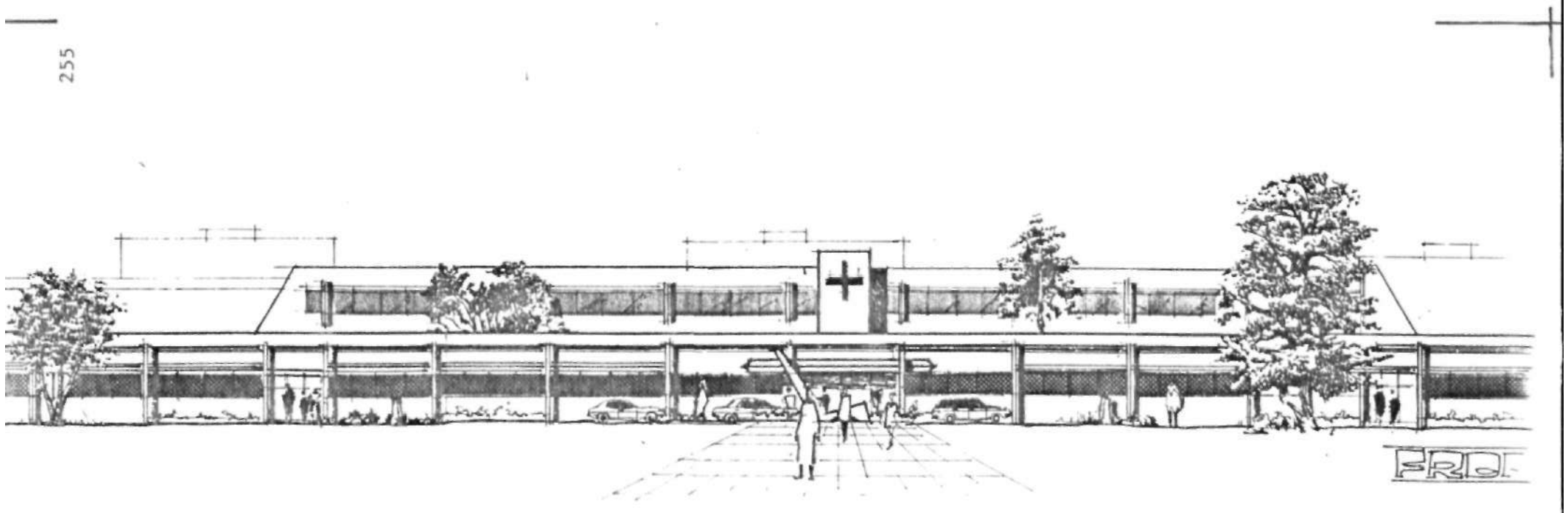
NAME
ODUL

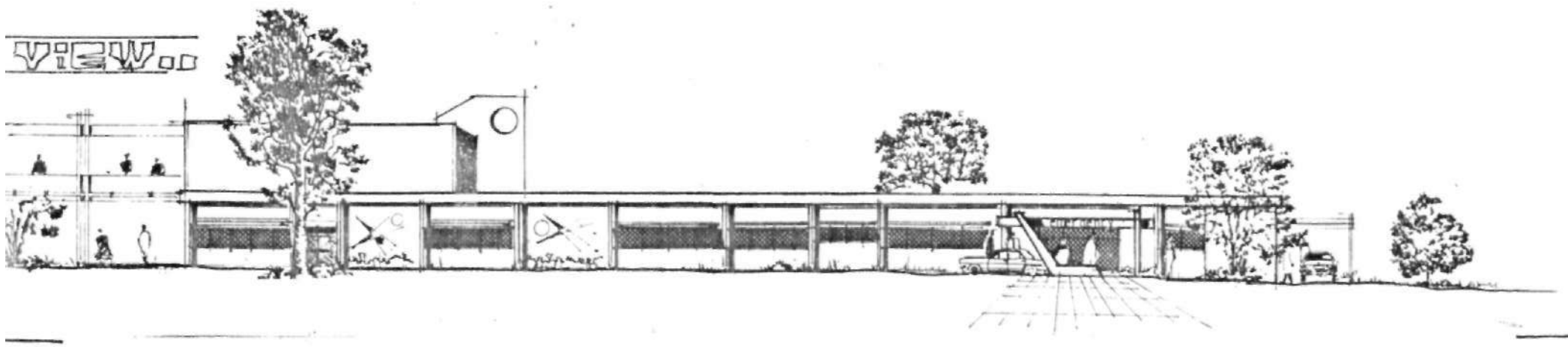
M.SC
THES




PATIENT WAITING AREA
EXCRETION AND BLOOD OFFICE
EXAMINATION CUBICLES
MICRO BIOLOGY LABS
CHEMICAL PATHOLOGY LABORATORY
HAEMATOLOGY LAB.
HISTOLOGY AND ANATOMY
CORRIDOR
EXAMINATION CUBICLES
STAFF CHANGING (MALE)
STAFF CHANGING (FEMALE)
STAFF REST ROOM
SENIOR TECHNICIAN'S OFFICE
POST MORTEM COMMUNAL ROOM
REGISTRAR OFFICE
CASUALTY
COURTYARD BELOW
COURT YARD BELOW

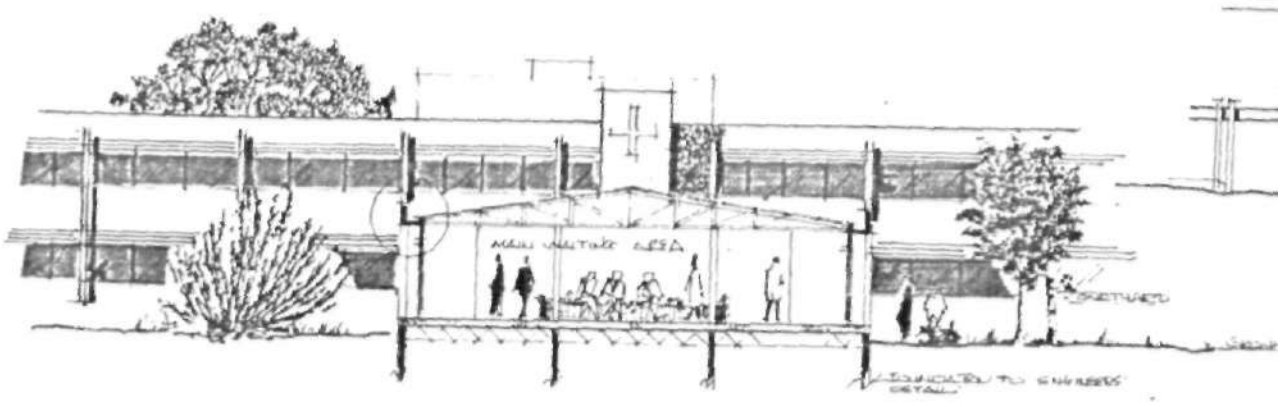
PATHOLOGY


FRD

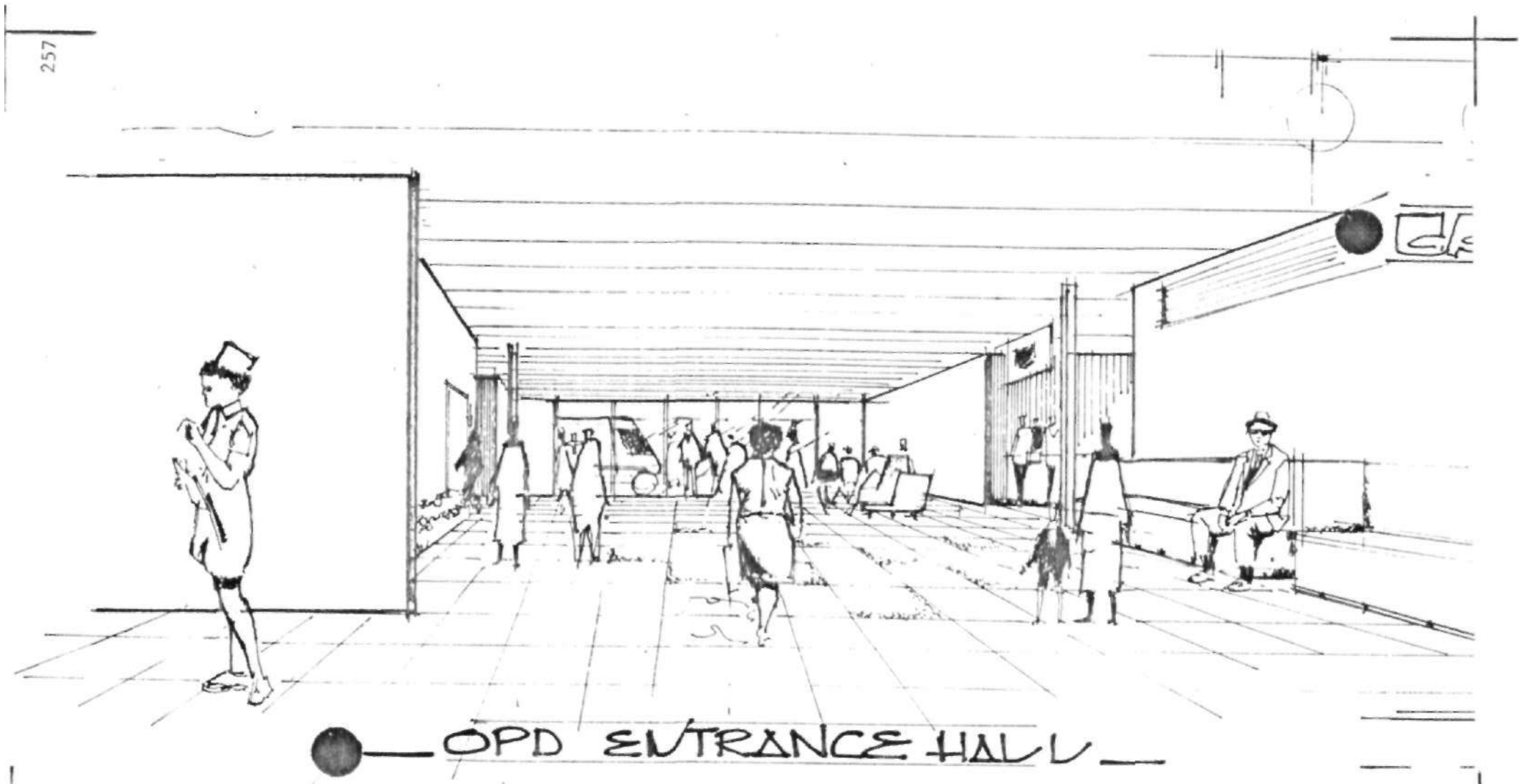

VIEW 00



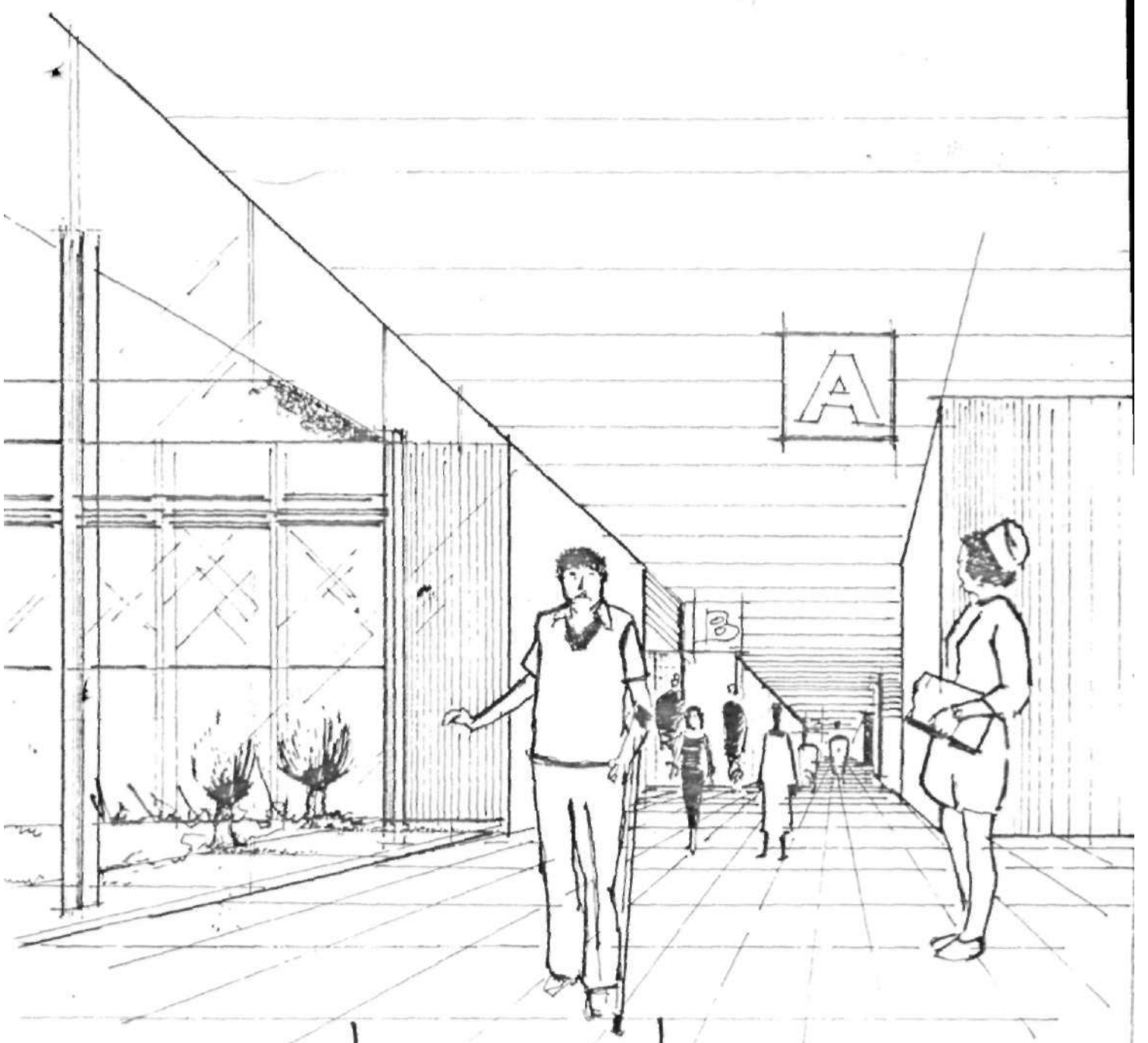
MAIN WAITING
-AREA-



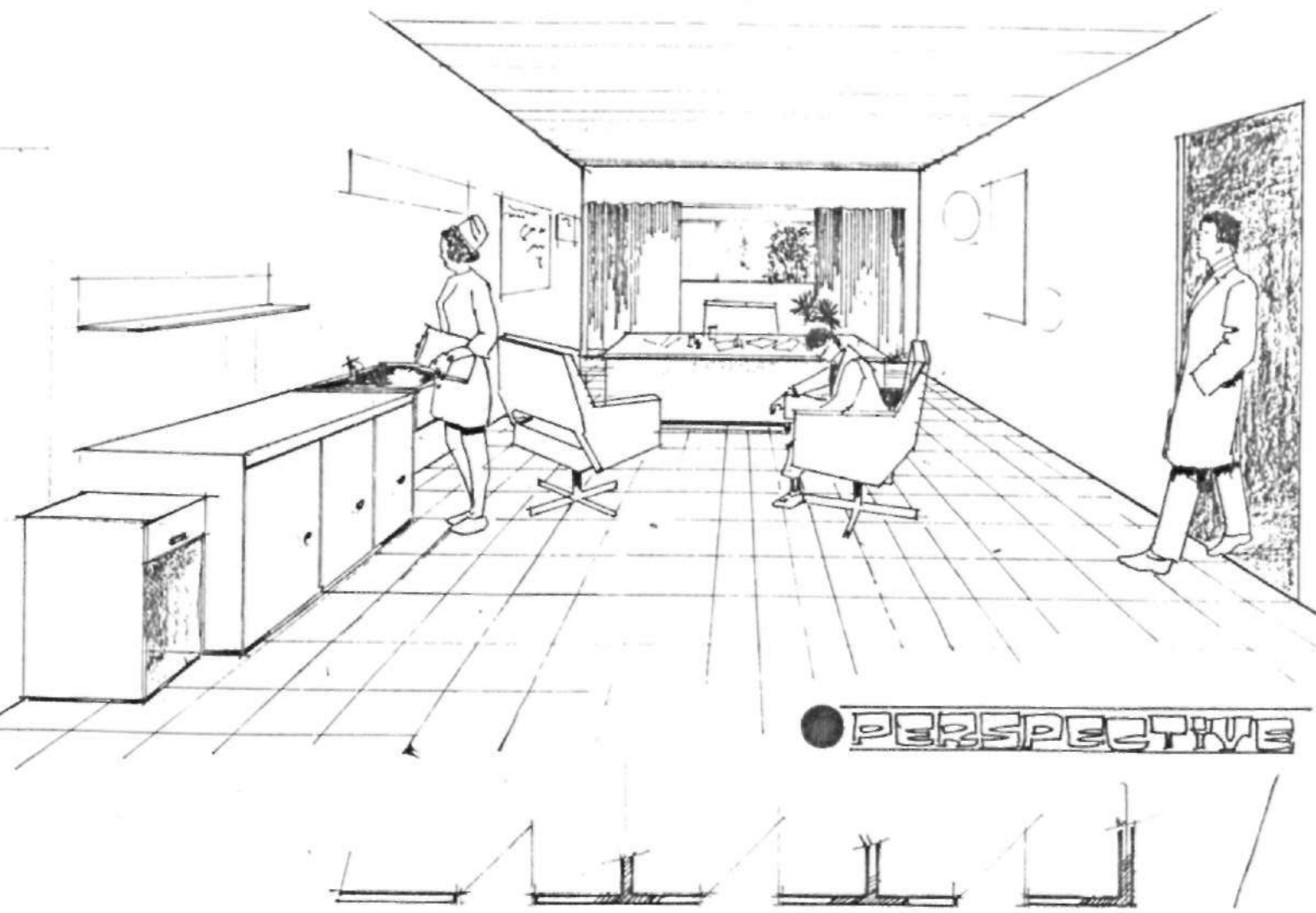
SECTION Y-Y



OPD ENTRANCE HALL

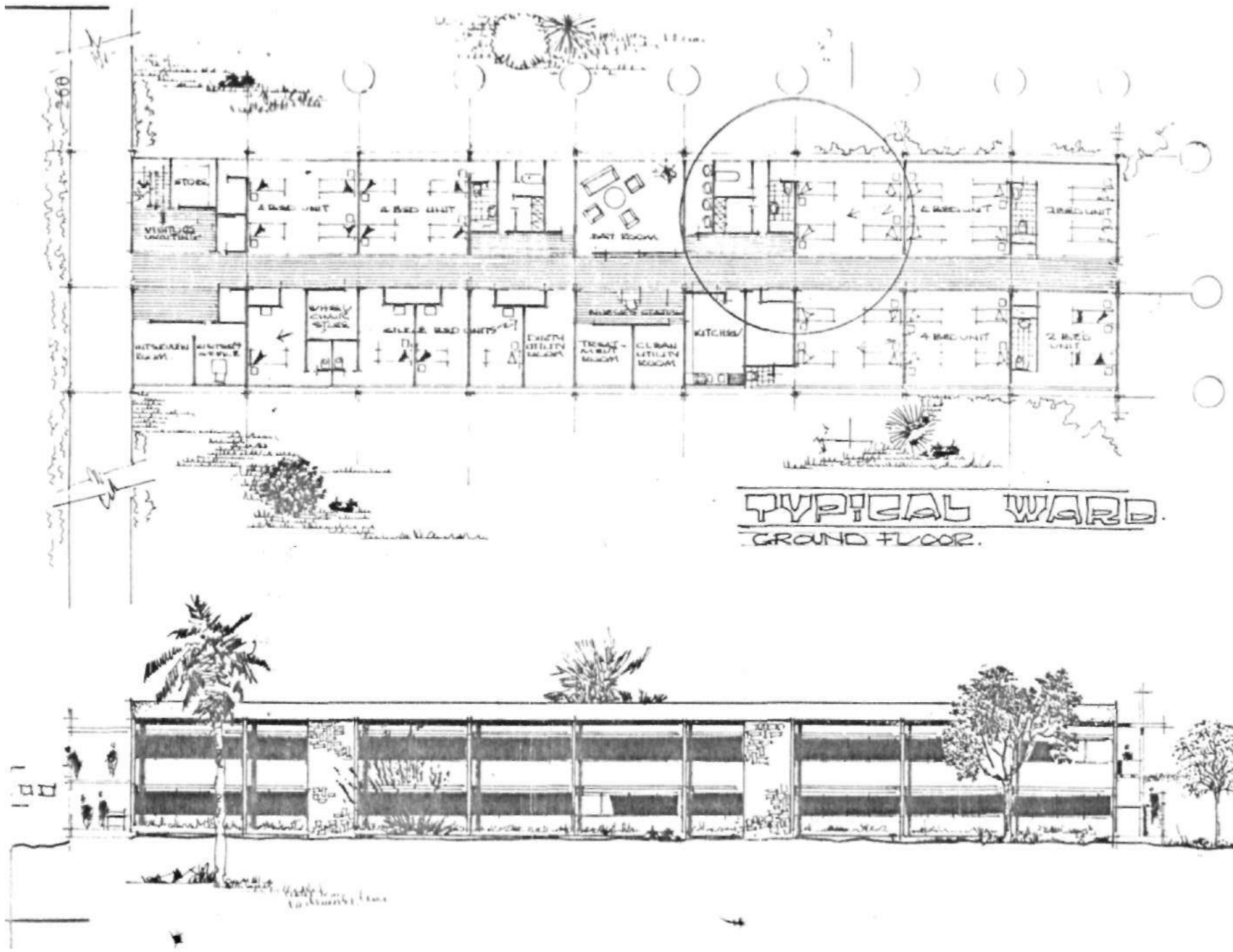


● TYPICAL CORRIDOR.

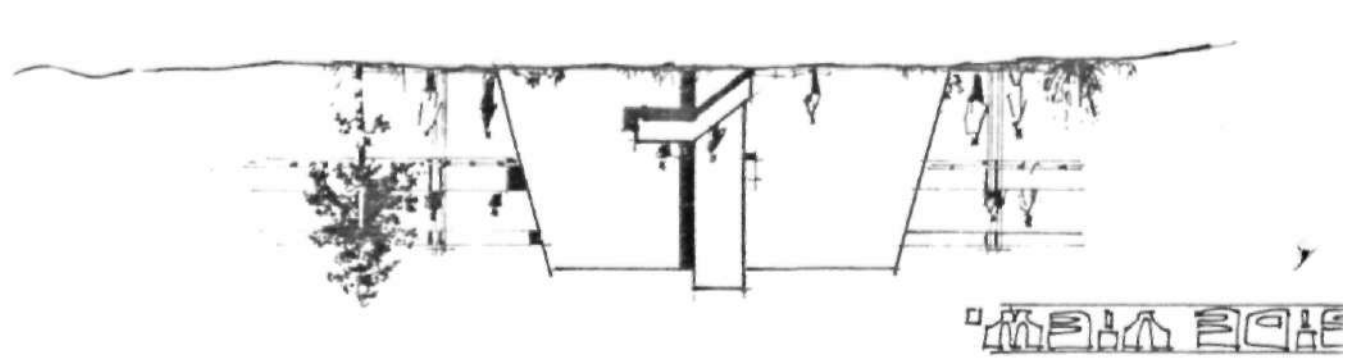


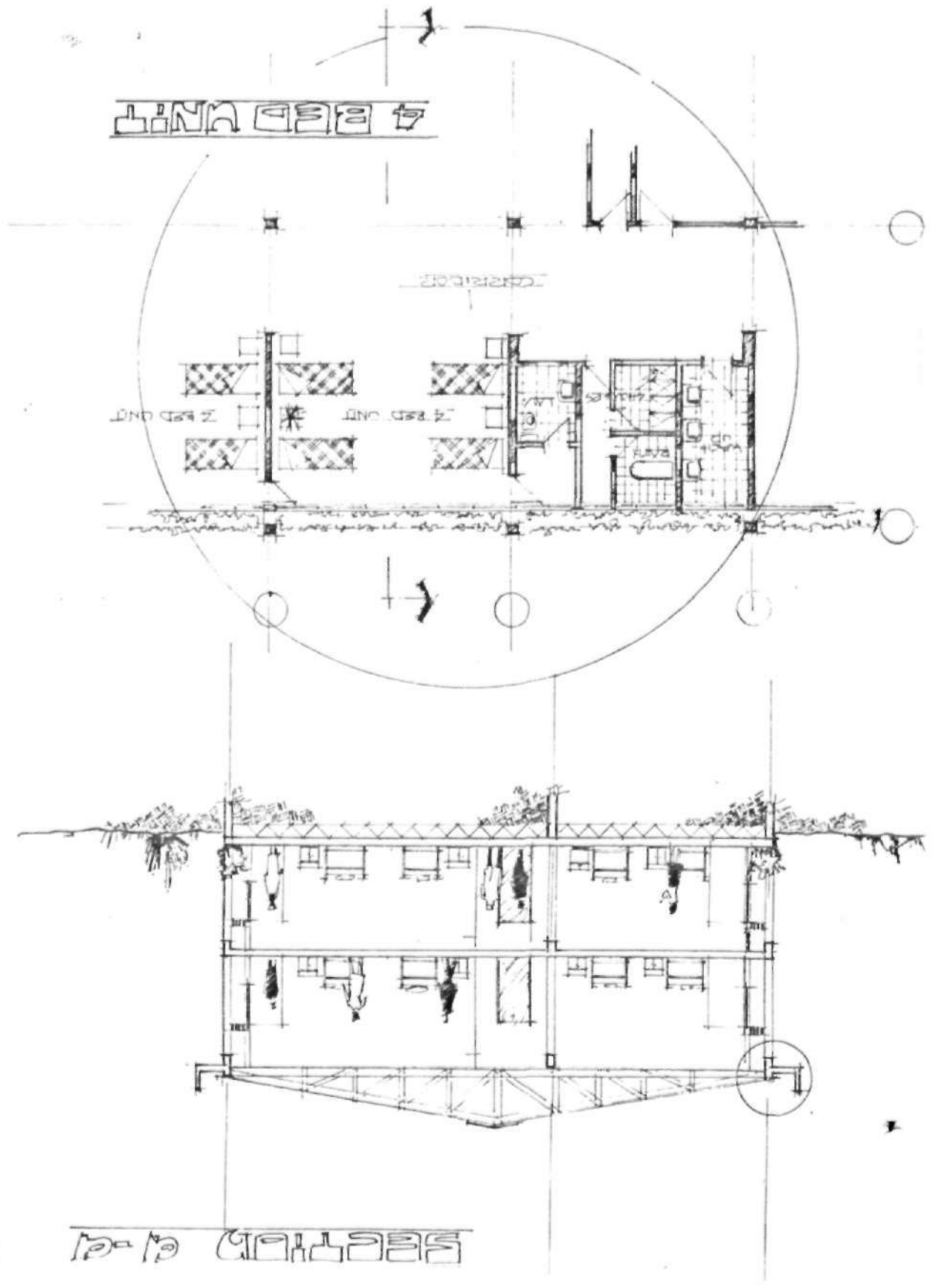
PERSPECTIVE

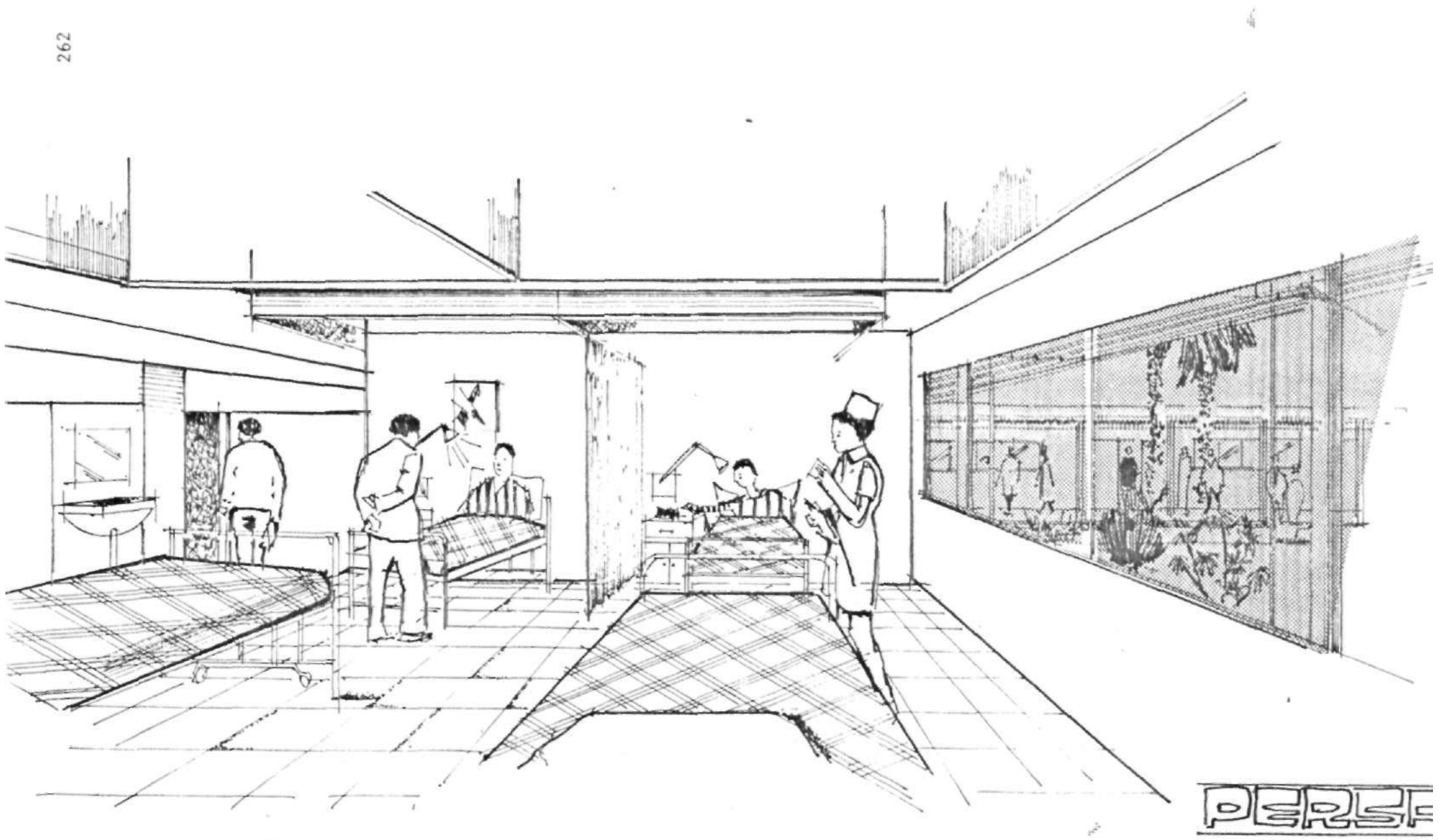
X-RAY
UNIT 000



TYPICAL WARD.
GROUND FLOOR.






PERSP

268

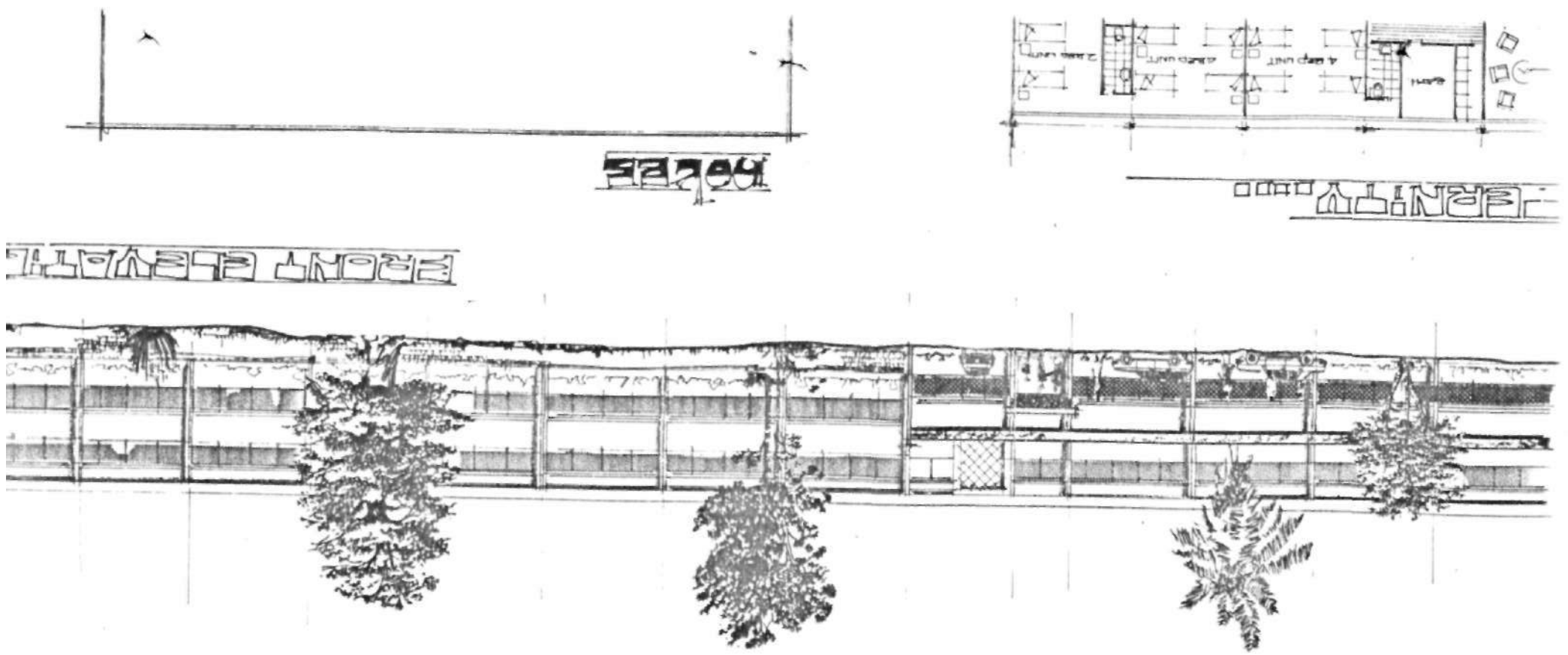
FIRST FLOOR PLAN

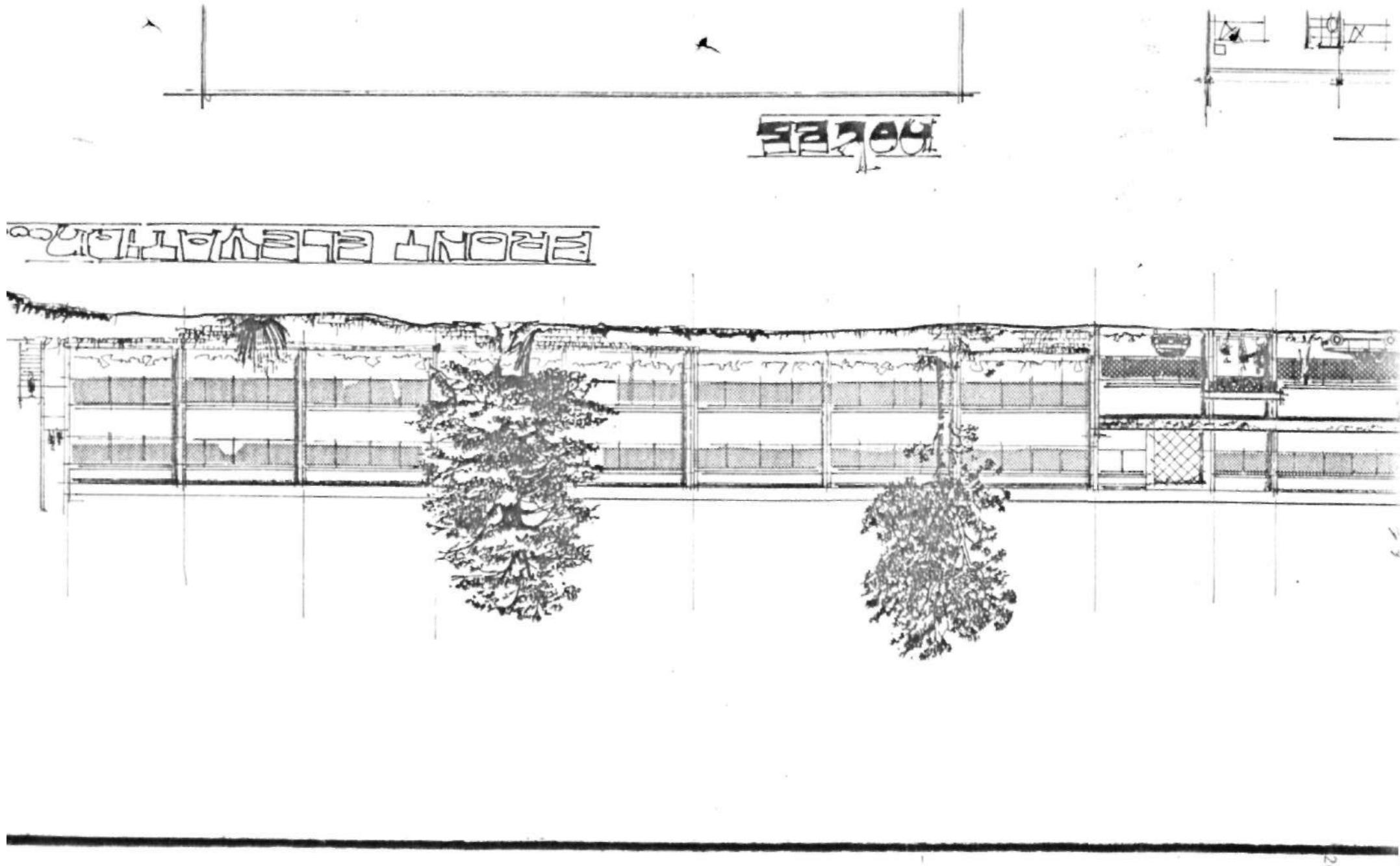
MATERNITY

GROUND FLOOR

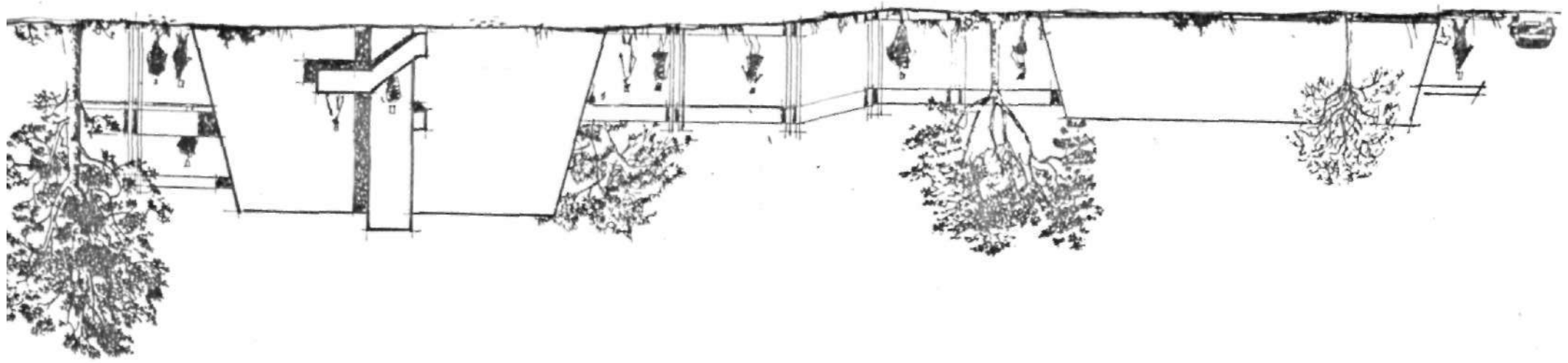
ANTE-NATAL CLINIC

GROUND FLOOR

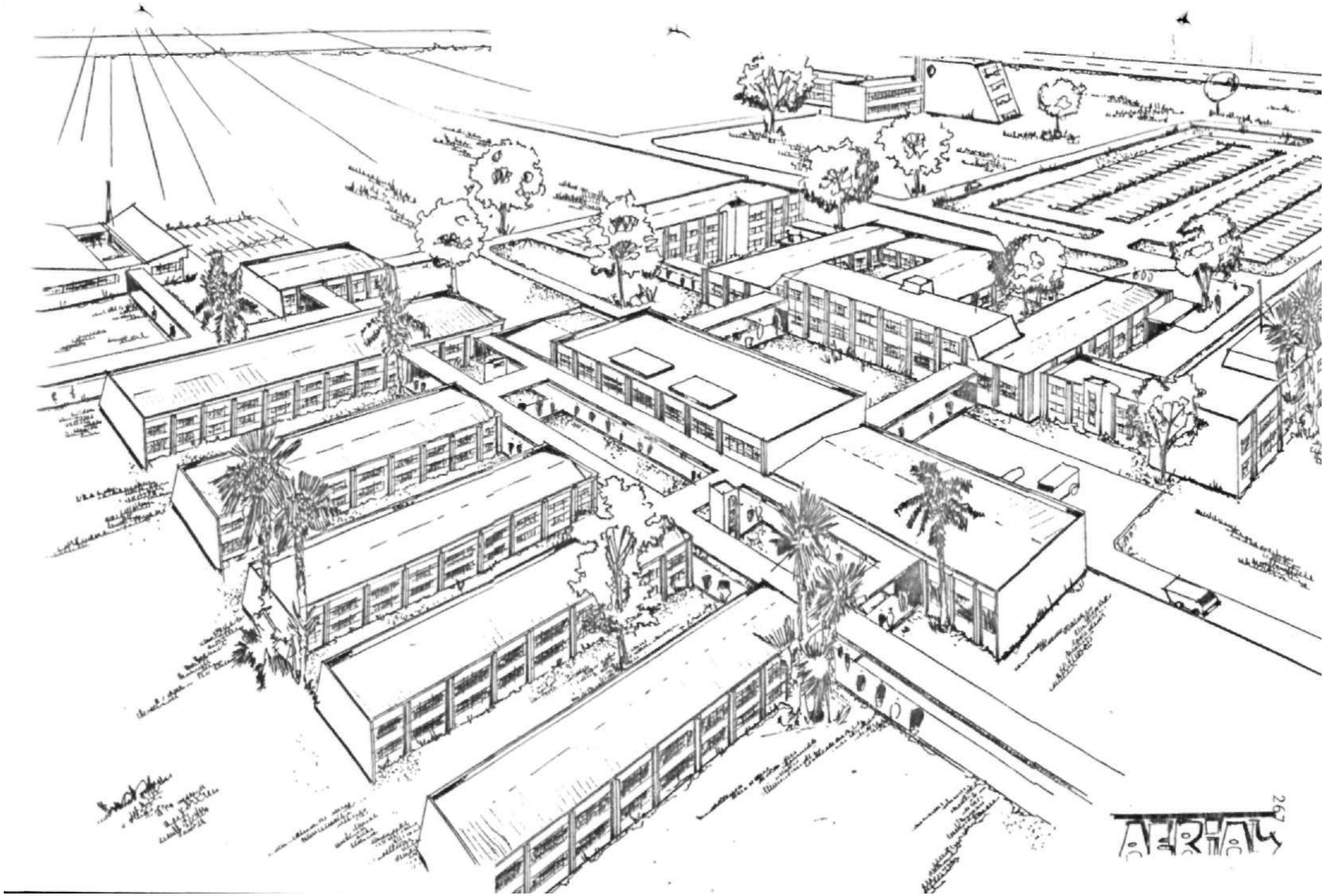


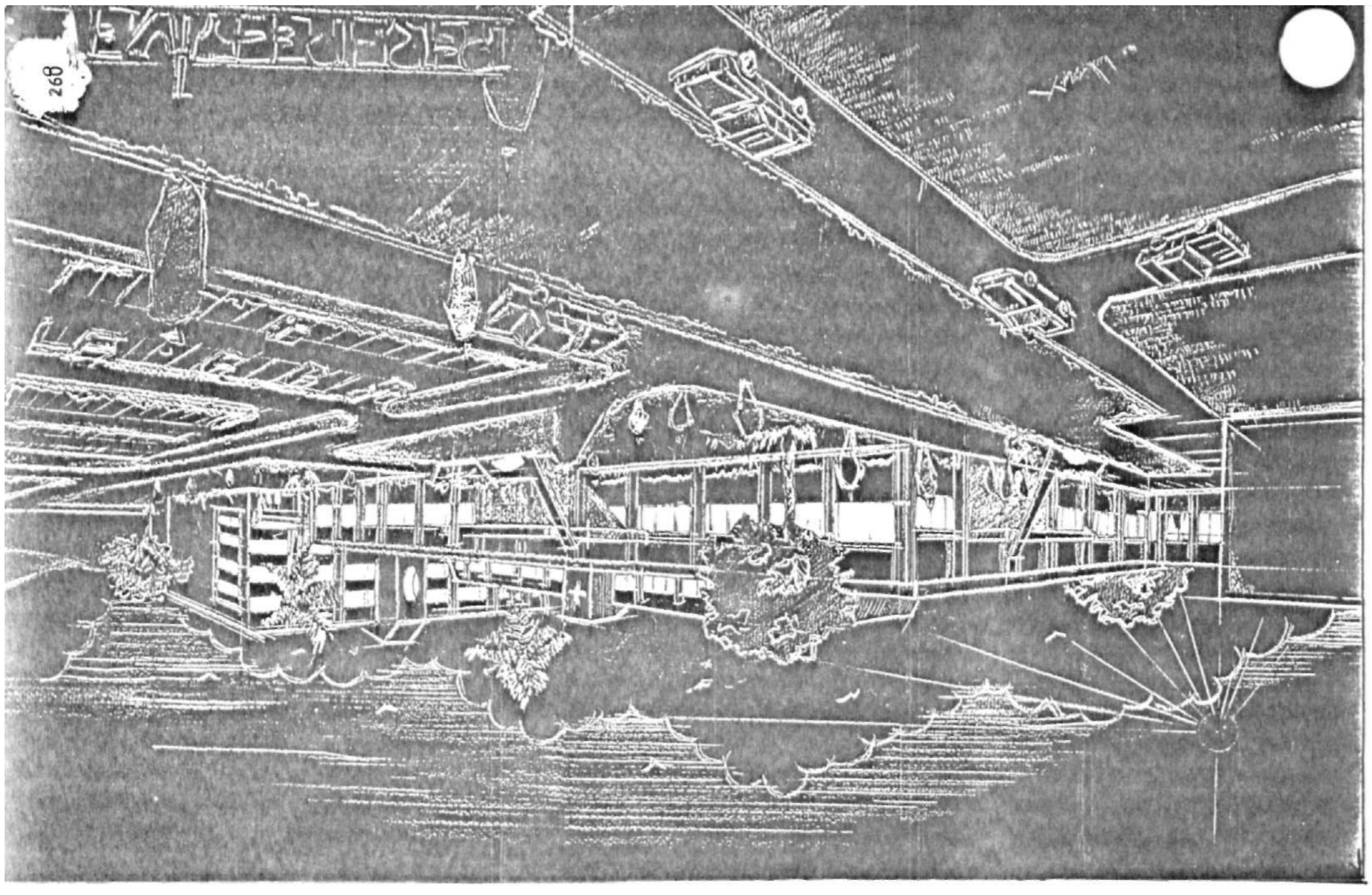


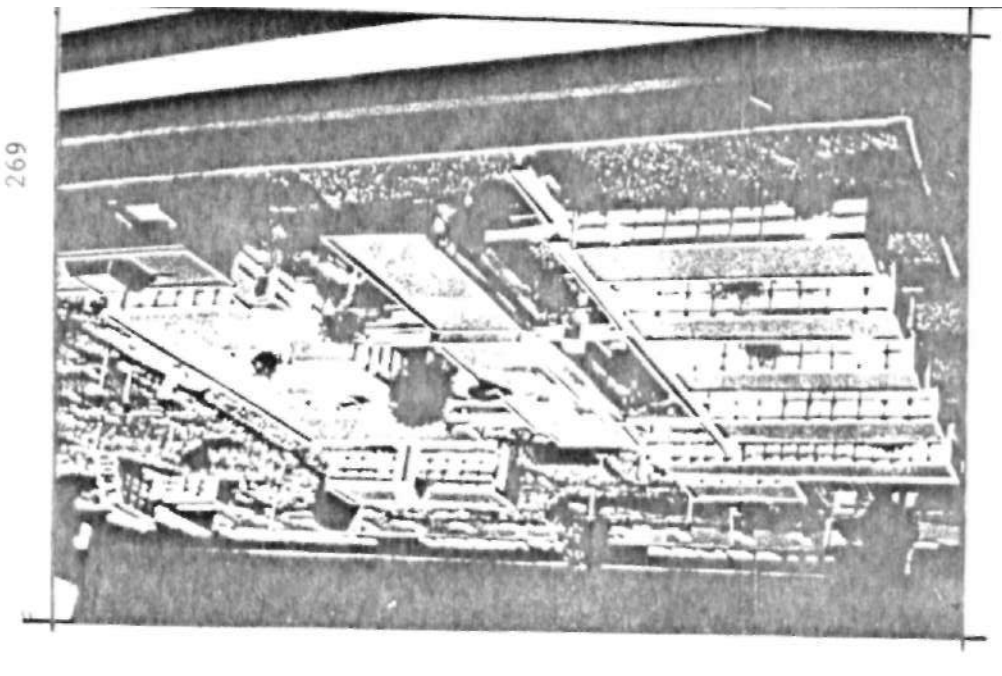
SIDE ELEVATION

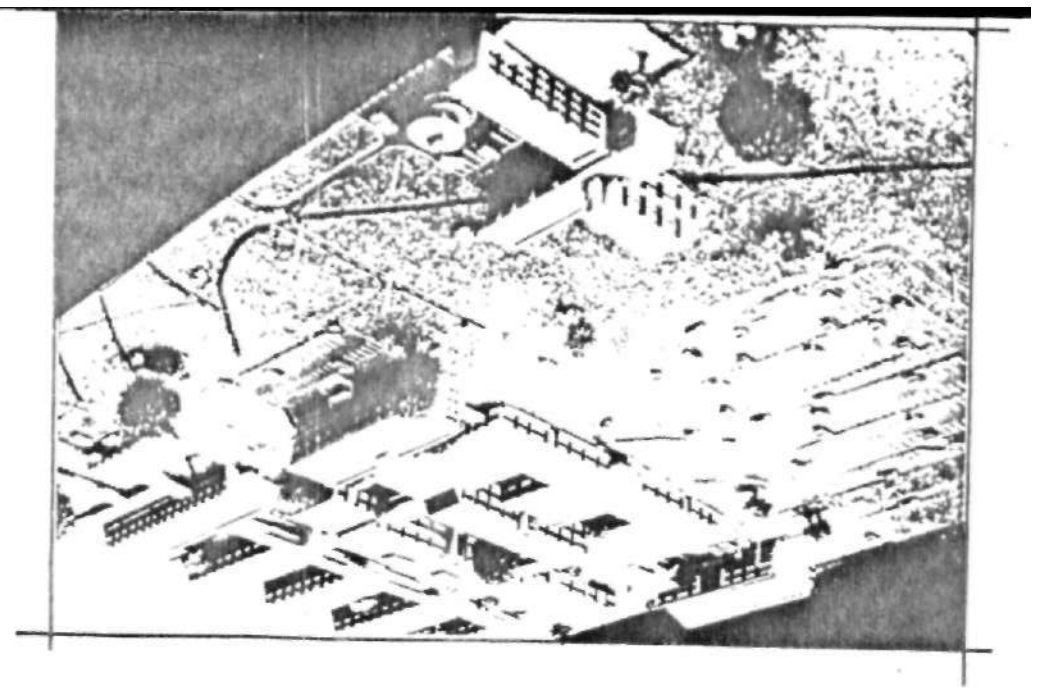


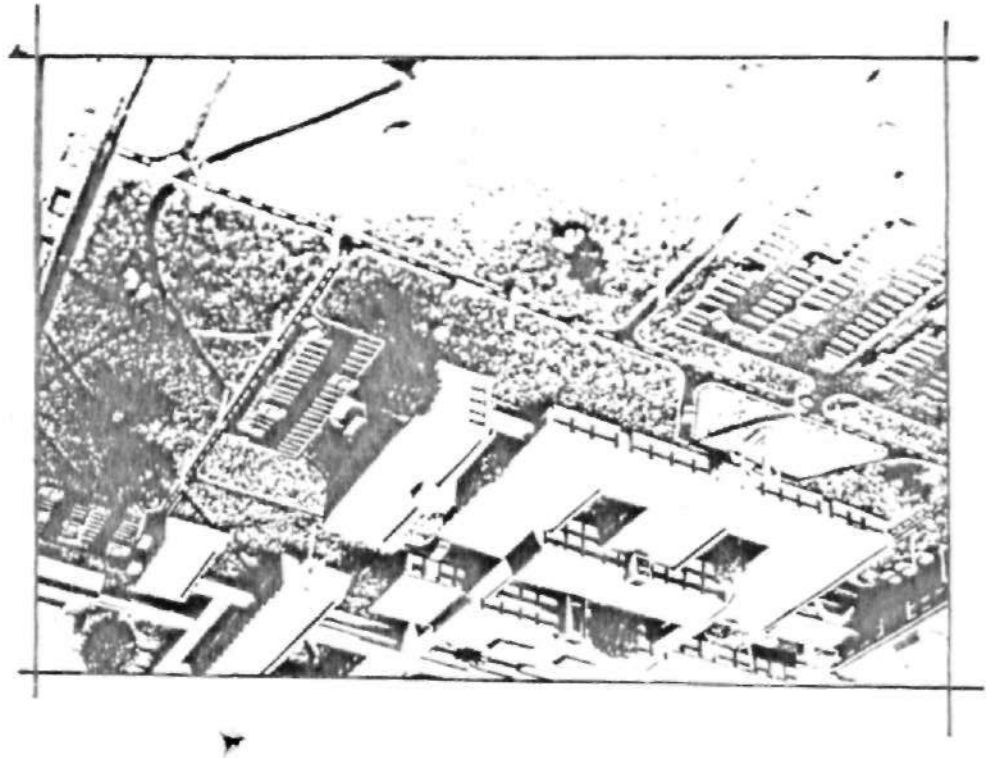
PERSPECTIVE

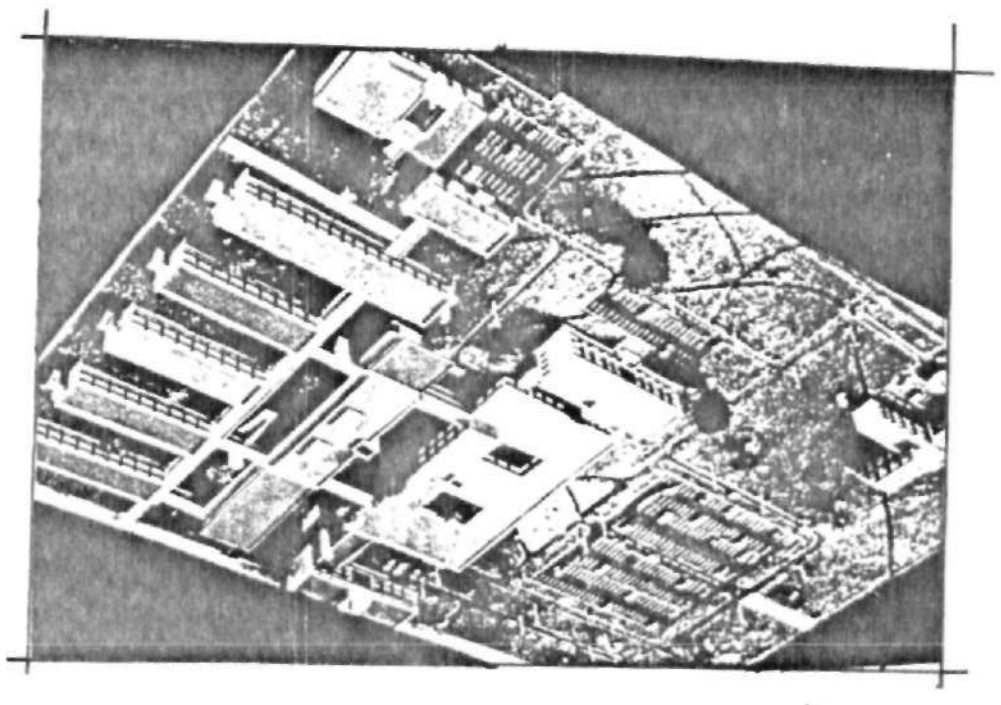


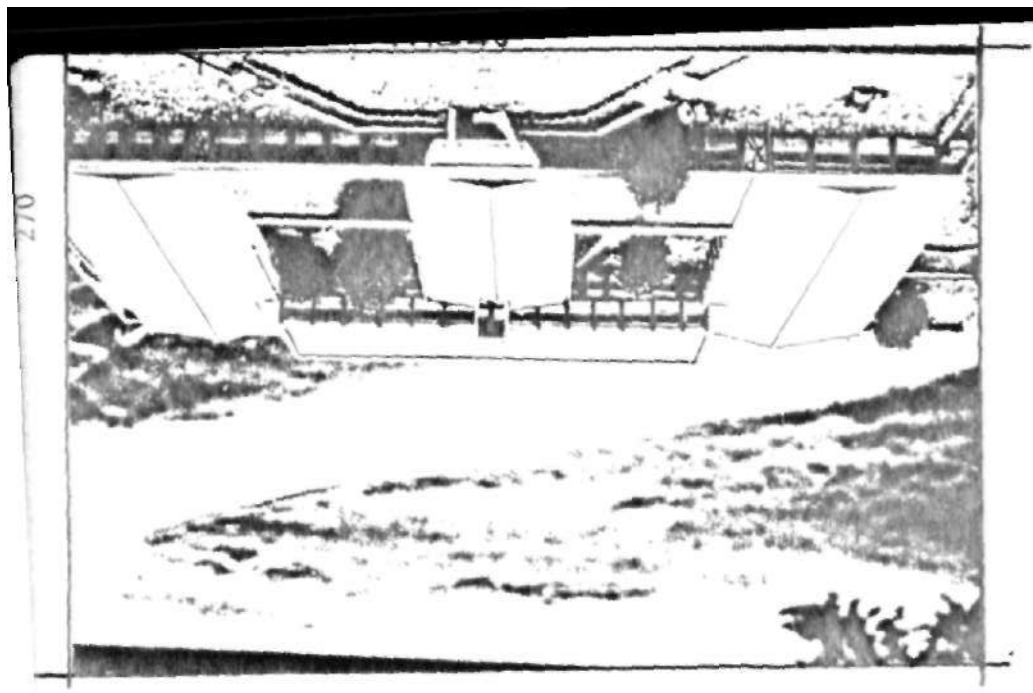


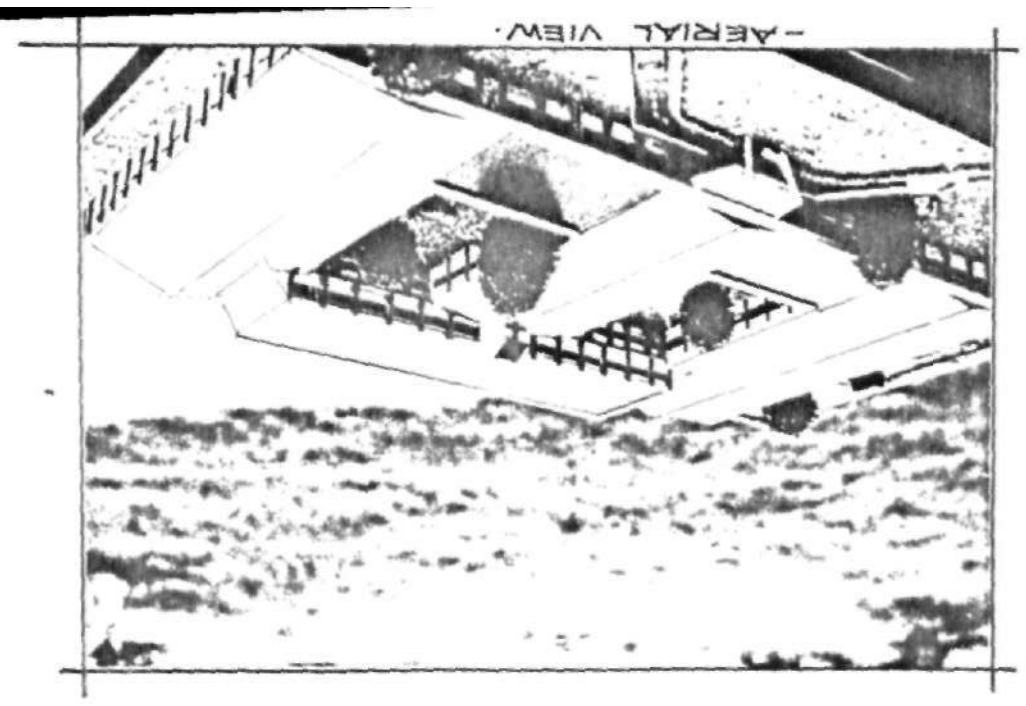




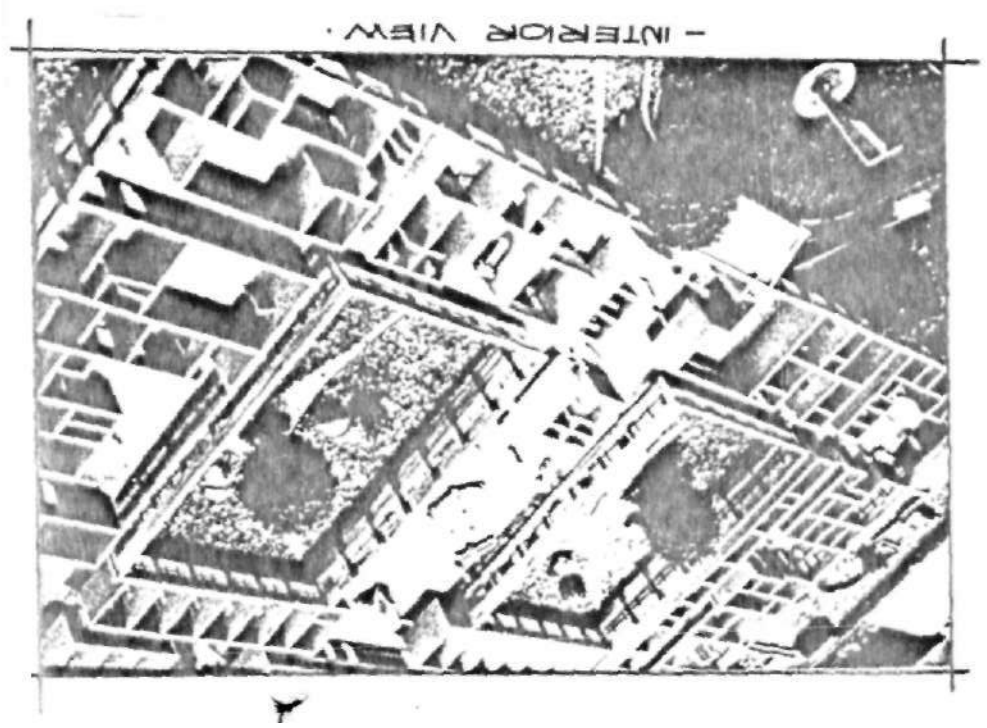




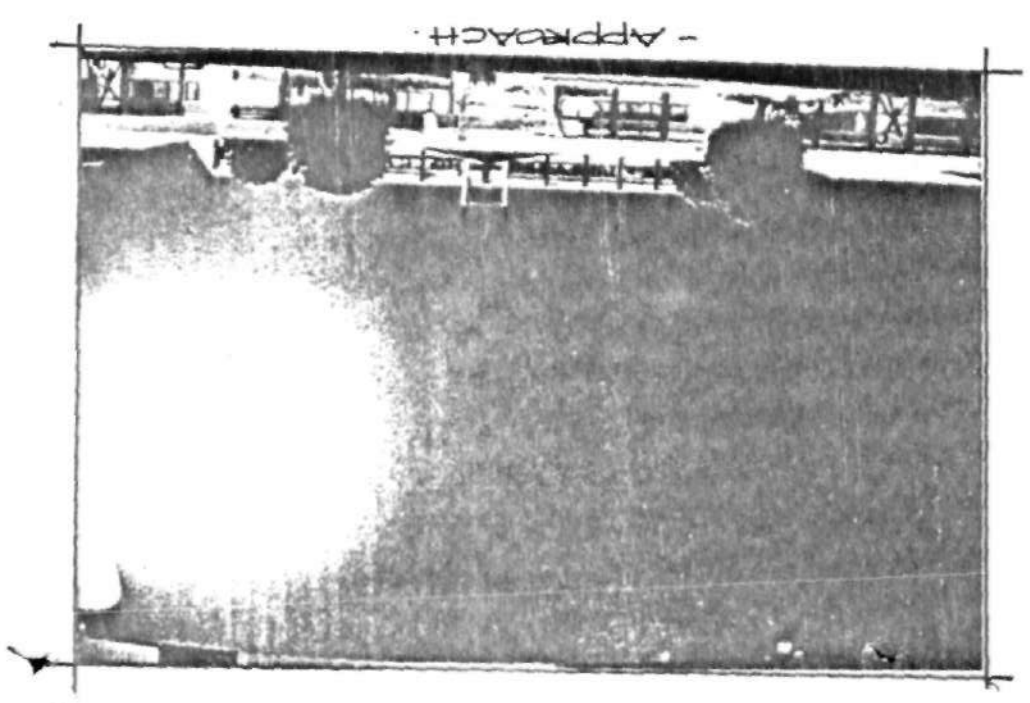




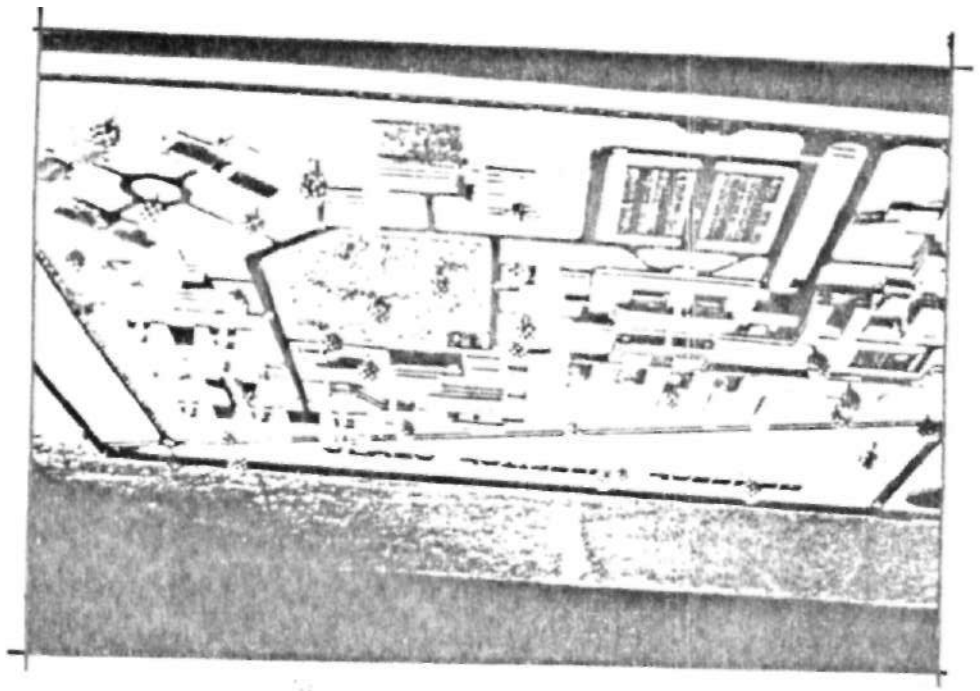
– AERIAL VIEW.

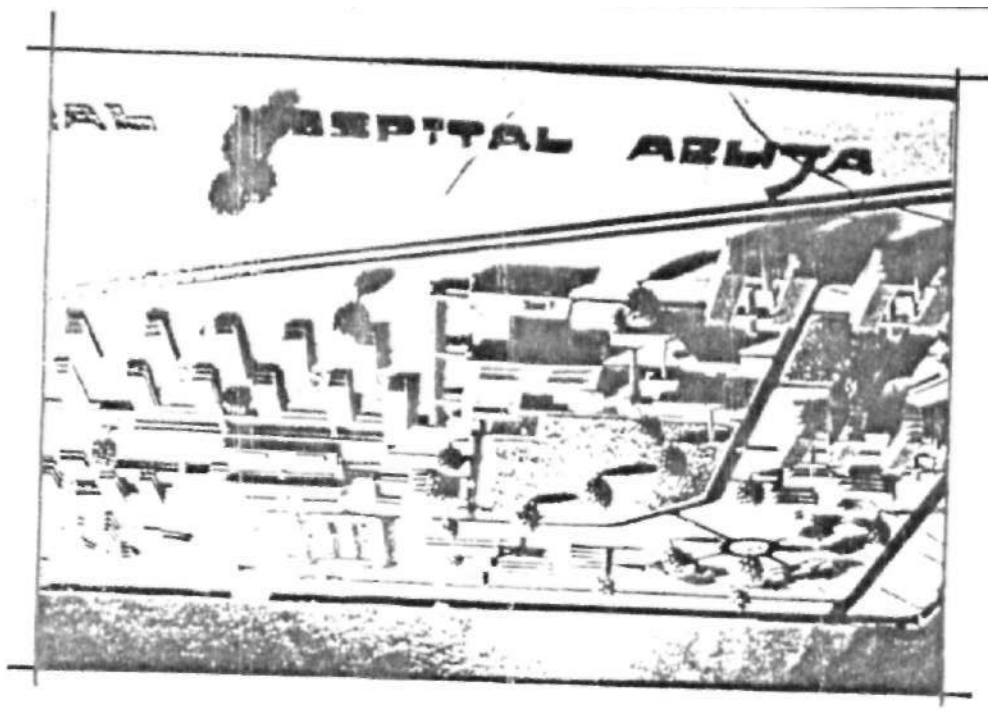


– INTERIOR VIEW.



– APPROACH.




SPITÁL ARLTA

