

TITLE PAGE
DESIGN PROPOSAL FOR
WOMEN AND CHILDREN'S HOSPITAL, MINNA, NIGER STATE:
WITH EMPHASIS ON ERGONOMICS
M.TECH THESIS (ARCHITECTURE)

BY
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A THESIS SUBMITTED TO THE POST GRADUATE SCHOOL,
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGER STATE, IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD
OF MASTERS DEGREE (M.TECH IN ARCHITECTURE).

MARCH, 2010

DECLARATION

I hereby declare that this research has been carried out and this thesis written solely by me ABDUL ZAINAB (M.TECH/SET/2007/1791). It has not been presented before in any known previous application for a higher degree. All the sources of information are duly acknowledged in the references.



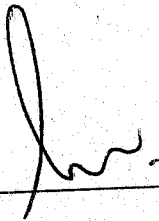
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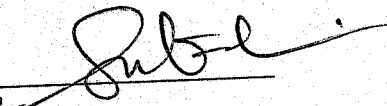
This thesis titled **PROPOSED WOMEN AND CHILDREN'S HOSPITAL, MINNA, NIGER STATE, A STUDY ON ERGONOMICS.** BY **ABDUL ZAINAB (M.TECH/SET/2007/1791)** meets the regulations governing the award of masters of technology(M.TECH)degree of the federal university of technology, Minna Niger state and is approved for its contribution to scientific knowledge and literacy presentation.



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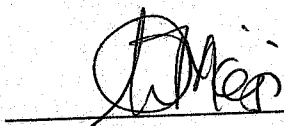
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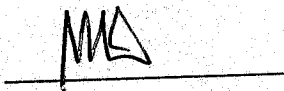
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DEDICATION

This project is dedicated to my parents; late Engr. S. B Abdul and Mrs. Amina M. Abdul, who have done every thing within their power to see me through the challenges of this life. May the Almighty Allah reward them abundantly for their relentless efforts. Amin.

ACKNOWLEDGEMENT

Firstly my acknowledgement goes to the almighty Allah for seeing me through this phase of life, to my supervisor Arc.C.Makun for his immense contributions to this research work ,to Dr Ifedayo of the General hospital Minna,Niger state , late Dr.Sanganuwa and Alh.Abdullahi B. Bello of the ministry of health ,Minna,Niger state. Ministry of lands and survey, minna, niger state, ministry of information and culture, national population commission of Minna, Niger state.

I would also like to acknowledge all my lecturers who have greatly influenced my life with the knowledge they have passed across.

Finally,My deepest appreciation goes to my family. My father, Engr. S.B Abdul who has made me who I am today; my loving mother Mrs. Amina. M. Abdul, my brothers and sisters, and to my friends .

ABSTRACT

This paper seeks to study "ergonomic hospital standards" according to the "Neufert architect's data" which is an international/ British standard guide for architects in the construction and planning of various building types and highlights the outcome of a field work carried out at the "General Hospital, Minna, Niger State" and other case studies. This is with an aim of comparing the obtained hospital standards with the situation at the time of visit of the study areas to assess the compliance of these hospitals with the studied standards (from the Neufert's architects data). It further discusses in detail the studied standards, the result of the field work carried out and draws up conclusion based on the findings and a recommendation (A women and children's hospital for Niger state). This was done by personal observations of the study areas by the author and a literature review of areas concerned. The implication and findings are to be of immense contribution to both the hospital designs and building team in their bid to design and construct efficient, safe and comfortable hospital environments and above all, to the government for further government hospital project constructions.

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DEFINITION OF TERMS

1. **Maternal Mortality rate:** The rate of women death through childbirth of a country or particular location ascertained by number of deaths per yearly number of births.
2. **Infant Mortality rate:** The rate of infant/baby death through childbirth of a country or particular location ascertained by number of deaths per yearly number of births.
3. **Maternity:** The period during pregnancy and childbirth / a ward, floor, or other section of a hospital where mothers and newborn babies are cared for.
4. **Immunization:** vaccination/inoculation/injection given to children between the ages of child birth to six years of age to fight against diseases which their age is vulnerable to.
5. **Antennal care:** Health care service rendered to expectant mothers to guide and help them prepare for the birth of their unborn babies.
6. **Post natal care:** Health care service rendered to mothers after delivery to guide and help them in caring for their babies.
7. **Obstetrics:** Branch of medicine which deals with pregnancy before, during and some period after childbirth.
8. **Gynecology:** branch of medicine dealing with female health and diseases.
9. **Pediatrics:** branch of medicine concerned with children's' health and diseases.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Hospitals can be seen in lay man's terms as a place where treatment and care is given to any sick or injured person. An institution operating under the supervision of a licensed physician primarily for the care and treatment of injured and sick person confined as inpatients, having organized facilities on the premises for diagnosis, major surgery and 24-hr a day nursing services.(hartshorn.colostate-edu/index.cfm).it is a building designed to diagnose and treat the sick, injured or dying with a staff of doctors, and nurses to aid in the treatment of patients. The term hospital encompasses all health facilities large or small urban or rural, complex or primary care centers. (www.searo.who.int (link files/hospitals)

It can also be put as a Medical institution where sick or injured people are given medical surgical or surgical care.(wordnetweb.princeton.edu/pearl/webwn).

Hospitals vary from place to place according to the strength of its staff in relation to the capacity of its patients. It also varies according to its function and ownership, whether government or privately owned; the government owned hospitals could either be for a state or for the nation as a whole. a hospital which handles all cases and general practices in the field of medicine is called a general hospital. They are government owned. Every state in a country has a general hospital located in its capital or its main town.an example of such hospital is the general hospital of Minna,Niger state of Nigeria,there are also federal medical centres(an example is the Federal Medical Center Onicha-Olona),district hospitals, national hospital (an example is the National Hospital, Abuja) ,teaching hospitals(an example is the University of Benin Teaching Hospital, Benin City).and private hospitals(an example is the Dayspring medical centre, Tanke, Ilorin).

Hospitals which focus on a branch of medicine are known as a specialist hospital. Examples of such specialist hospitals includes orthopedic, gynecology and obstetrics, paediatric, psychiatric, women and children, infectious diseases, and ophthalmology hospitals depending on the area of specialty. A women and children care hospital is an organization, either government or privately owned which renders health care services to women and children (from birth to five years) such as antenatal, labour, delivery, recovery and postnatal services to mothers before, during and after delivery , neonatal services to infants, and other women and children related problems .an example of this hospital type is the K.K womens and childrens' hospital,Singapore.

1.2 STATEMENT OF THE RESEARCH PROBLEM

The opportunity of in cooperating ergonomic principles(principles generally formulated by law from previous practical researches to be applied to building designs in order to achieve a user friendly environment, safety of workers and the building's efficiency) into a building design at its design stage avoids corrections after the building has been erected. According to the Ontario safety association for community and health care 2006, musculoskeletal disorders account for fifty seven percent of all lost time injuries in health care sectors. In addition, the case studies of some existing hospitals (like the General hospital Minna, and Dara medical care hospital, Abuja, Nigeria) carried out by the author has revealed that ergonomic principles are not applied to most Nigerian hospital designs,this is probably due to the carefree attitude ,failure to draw up such rules/guides and lack of policy implementation by the government and its law breaking subjects . This therefore poses a challenge for the design of a hospital which will take into consideration the appropriate ergonomic planning principles for it, thereby creating better and standardized medical facilities in the country and giving it a good enough name.

1.3 AIM AND OBJECTIVES

This research work is aimed at proposing a women and children's hospital which will take into consideration basic ergonomic principles according to a hospital environment while giving it an aesthetically appealing outlook with the following objectives

- I. To ensure Safety and comfort of patients and workers of the hospital.
- II. To produce performance/efficiency of the hospital as a system.
- III. To achieve a user friendly environment of the hospital by its end users.
- IV. To achieve a less sterile environment as is the general practice of hospitals.
- V. To reduce and educate people on the high infant and women mortality rate.
- VI. To provide access to health care service.
- VII. To Educate/create further awareness of the problem of high infant and women death rates.
- VIII. To create job opportunities to doctors, nurses, midwives, and other health workers.

4 RESEARCH JUSTIFICATION

The federation as a whole presently has the avoidance of women and children high mortality rate as a national problem (millennium development goals of the present administration, Nigeria state of Minna is not exceptional. Multiple studies carried out by organizations and researchers like the UNICEF (United Nations Children Emergency Fund) and the WHO (World Health Organization) reveal that Nigeria is one of the top most third world developing countries whose high mortality ratios arise mainly from early child death (children below 5 years of age) and

maternal mortality due to certain factors. These factors include insufficient medical facilities during obstetric emergencies, lack of/unfunctional ante-natal care clinics, absence of unspecialised maternity hospitals (hospitals are in most cases general and as a result cannot give focus to women and children care as a special health branch) lack of access to family planning and health care, unsafe and poorly induced abortions, obstructed labour/bleeding and poor funding of health care facilities, harmful cultural practises. Even though there are hospitals and other health facilities to tend to all these problems, they are obviously not sufficient and functional enough. This therefore calls for the provision of a facility which will strictly specialize in catering for only women and children care/ problems and apply laid down ergonomic standards (rules governing something) to women and children hospitals in order to cut down and possibly put a stop to high maternal/infant mortality rate. According to (Olalekan, 2008, Okonofia 1993) children with low birth weight, not breast fed, with risky birth interval, from households with more than four under-five children, and children with high birth order are basis for assessing childhood deprivation index. All these are issues addressed and attended to in women and children care hospitals.

Another point of justification is the fact that musculoskeletal disorders account for fifty seven percent of all lost time injuries in health care sectors (Ontario safety association for community and health care 2006),

This proposal is therefore viewed as a means to aid in the reduction of women/maternal and under-five/ infant mortality rate by the provision of its proposed facility to the women and infants within the area (Minna, Niger state) with the application of ergonomics as a field of study aimed at enhancing system efficiency, safety and comfort of its users. The proposed hospital is a

health facility specializing in the rendering of health care services for problems regarding children and women. It shall make provisions for well trained and qualified health personnel and equipment taking into consideration all possible measures for making the centre suit its occupant's use and systems.

1.5 SCOPE OF THE STUDY

Ergonomics is a broad field which deals with the design of machines, products and systems to maximize safety, comfort and efficiency. In order to do that, it uses principles of industrial engineering(study of industrial production by efficiency of machines, labour, and raw materials),anthropometrics(science of human measurements applied to decision makings of buildings) ,biomechanics(study which relates muscular activities to mechanical structures) and psychology(study of the minds and behavior).for the purpose of this study, the scope is narrowed down to ergonomics using the principle of anthropometrics: that is the part of ergonomics related to the architectural aspects/ requirements of the building facility in relation to the end user's body measurements.

The thesis shall comprise of a comprehensive write up on the study through a literature review and case studies of similar existing facilities. Limitations to be encountered shall be as a result of non-existent satisfying mother and child health care centers in the country to be used as sourceful information.

The design proposal shall make provision for the following activities in its facility:

- a. Out patient's /emergency and consultation services
- b. Diagnostic services
- c. Long term stay care
- d. Surgeries and baby deliveries

- e. conveniences
- f. Maintenance
- g. Mortuary services
- h. Back up power supply.

1.6 CONTRIBUTION OF KNOWLEDGE

The research work attempts to solve /reduce the problems of building inefficiency, user safety and difficulty in use of hospital facilities through the use of hospital ergonomic principles. It will also serve as a hospital which dedicates its facilities mainly to women and children health related problems which are a persistent issue today to the nation as a whole. The research work also reveals the importance of government implementation and subject's compliance of ergonomic hospital rules since if followed, can yield high building performance, user friendliness and safety.

CHAPTER TWO

LITERATURE REVIEW

2.1 REVIEW OF RELATED TOPICS

2.1.1 GENERAL HISTORY AND ORIGIN OF HOSPITALS

Babinski 2005 reported that hospitals were an Innovation of Christianity thus, its representation by the universal healing symbol of a cross. It existed in antiquity in Egypt and India and Became the state religion by the roman empire after Christianity. It existed in Christian nations and muslim countries after Islam arose. Encyclopedia Britannica online showed that religions identified certain deities with healing as early as 4000 B.C this was evident in places like Temples of Saturn and later Asclepius, Asia healing centres. some early traced hospitals includes the Brahmanic hospitals, srilanka, 431 BC, King Asoka hospitals, Hindustan, 230 BC, 100 B.C, valetudinaria hospitals by Romans for treatment of sick & injured soldiers.

Modern hospital concepts started about AD 331 when Constantine (Roman leader) converted to Christianity and abolished all pagan hospitals creating leading to opportunity of a new beginning for hospitals.

In AD 370, St Basil of Caesarea founded a religious foundation to include a hospital in Cappadocia. It considered an isolation unit for leprosy victims, poor people, elderly, and sick.

This concept of segregations for various categories by Christian foundations proceeded in the Roman Empire to include that of St. Benedict at Monte Cassino in the early 6th century it considered care for the sick before every other Christian duty. This led to the 1st medical school in Europe; salerno, it became of high repute by 11th century and further led to establishment of similar monastic infirmaries in West Empire.

Hotel Pieu of Lyon (542) and hotel pieu of Paris (660) were hospitals focused on well being of patient's soul than bodily ailment's curing. (Manner of care for the sick by monks) the monasteries had a pharmacy and frequently a garden with medicinal plants. It later was opened to not only the monks but to pilgrims and other travelers.

By the Middle Ages religion still influenced origin of hospitals. Hospital growth became rapid by crusades around 11th century.

Military hospitals erupted along travelled routes like the knights hospitalers of the order of St. John in 1099 founded in the holy land it was a hospital with 2,000 patients capacity. It was traced as the first specialized hospital since it was the first of its kind which focused on eye diseases. The order made it through the centuries as St. John's Ambulance Corps.

European hospitals grew rapidly in the 12th century of the Middle Ages.

Arabs established hospitals in Baghdad and Damascus, Cordoba in Spain admitting patients regardless of religious beliefs, race or social order.

Hospital of the holy ghost (1145) founded at Montpellier, France became of high repute and most important doctor training centre.

It was also in the Middle Ages (15th century) that hospitals became supported as institutions by secular authorities of cities/towns rather than by churches and religious foundations. After dissolution of monasteries in 1540 by Henry VIII, hospital buildings came to a halt for some 200 years. This further led to the provision of voluntary hospitals movement for the sick, injured and handicapped by secular authorities. Examples of such were the by Huguenots from France in 1718 and west minister hospital in 1719, Guy's hospital 1724, London hospital 1740. Between

1736 and 1787 hospital (at least) came into being outside London. The idea spread to Scotland with the first of its kind as the little hospital Edinburgh in 1729.

The First North American hospital was in Mexico City 1524 by Cortés. A French hospital established in Canada 1639 at Quebec City was 'Hotel Pieu du precieux sang"By 1644 Jeanne Mance (French noble woman) built a hospital of ax-hewn logs on an island of montreal; the start of the hotel-dieu de St. Joseph (out of which grew became the order of sisters of St. Joseph which is the oldest nursing group organized in North America).

The first hospital in the territory of the present-day united states is a hospital for soldiers on Manhattan Island established 1663. The early ones were mainly of almshouses like the one established by William Penn in Philadelphia in 1713. The first incorporated hospital in America was Pennsylvania hospital, Philadelphia with a charter from the crown in 1751.

Origin of hospitals from Egypt records reveal they were founded by private individuals and Independent of ecclesiastical institutions. Hospital as an independent institution for care and treatment of the sick can be traced from the third quarter of fourth century. It resolved major tensions in medical ecclesiastical and religious scenes of late antiquity.

Pinel, 1911 edition encyclopedia suggest that asylums were purposely set aside for the insane in temples of Saturn, ancient Egypt. This was considered an exaggeration, since the real historical facts leading to existence of medical schools in connection the with the temples generally, to knowledge that the priest possessed what medical science existed, and finally to the rite of "incubation" which involved the visit of sick persons to the temple, in the shade of which they slept, that the God might inform them by dreams of treatment they ought to follow the temples of

can be traced as far back as 4000 yrs B.C and that those temples were medical school in their earliest form is beyond question. However, no proof of these records because they were supposedly reported destroyed in a religious revolution clearing away the name "Saturn" from the monuments in the country.

Ebers 2007, observed that the most famous temples of Greece for cure of diseases were those of Aesculapius at Cos and Trikka while those of Rhodes, Miletus, Pergamum and Epidaurus were less known but frequented. This therefore shows that in Egypt and Greece, laying the sick in precincts of temples was a common and national practice. Harun Al-Rashid (A.D 763-809) attached a college to every mosque and also a hospital. He also placed an asylum at Baghdad open to all believers and infirmaries for sick free of payment. The Buddhists hospitals can be traced as far as 260 BC founded by Emperor Asoka of Hindustan. An example of such is the one at Surat made famous by travellers. These hospitals had provisions which were compared to modern institutions in China, what is left traceable are the records of books of early date dealing with medicine theory. According to the Islamic history, the capital of the Islamic caliphate empire changed from one dynasty to another. Each capital had important medical centres developed. By the end of the 13th century many of them spread through the Arab world. Some of the important institutions according to the regions are discussed below. Ash-Sham region comprised of Syria, Lebanon, Jordan and Palestine. Damascus and Palestine were most important. The first known Islamic hospital was in Damascus in 706 A.D by Umayyad Caliph Al Walid (Hamarneh, 1962). The most important hospital in Damascus in the middle ages was An-Nur hospital named after King Nur Adidin Zengi in 1156. It was during the crusade war therefore its importance was to fulfil the need for a well equipped and staffed hospital. It became a first class medical school. The

king donated a library of medical books to it. Many scholars such as An-Nafis (scholar who made the pulmonary circulation system discovery graduated from there). It still exist to date.

In 1055 A.D in Jerusalem, crusaders built St. John's hospitals which expanded by the 11th century to include a palace for knights, a hospital and a nursing sister convent. They had a large number of patients because of the daily admission of patients, pilgrims and wounded soldiers. The hospital became Al-Salahni in 1187 A.D after Jerusalem was liberated by Salah Ad-Din. He expanded it and it continued serving its people until its destruction by an earthquake in 1458 A.D.

In 750 A.D Baghdad(Irag and Persia) was elected to be the capital of Abbasid dynasty by Caliph Jaafar Al-Mansur. By 766 A.D, HE assigned the dean of medical school of Jindi Shapur, Judus Ibn Babtishu to be court physician and establish hospital proportionate to the glory and prosperity of Bagdad. When Harun Ar-Rashid followed (786-809 A.D) he ordered the grandson of of Ibn Babtishu and his court physician to build a special hospital named Bagdad Hospital which became an important medical centre. By 918 A.D, the Caliph Al-Mujatadir built 2 hospitals in Bagdad; As-Sayyidah named after his mother in the east side of the city and Al-Adudi hospital named after him in the west side. Al-Adudi was anothe important hospital built in 981 A.D. it was the most magnificent of its kind before modern times. It was built at the request of the Caliph who wanted to outdo his predecessors. It had interns, residants and 24 consultants.

Al-Fustat hospital of Al-Fustat, Egypt was built in 872 A.D, by Ahmed Ibn Tulun. It served the growing Cairo population for six centuries divided into separate wards. Patients were given special clothes while their own clothes, valuables and money were stored for them until their discharge.

In 1284 A.D King Al- Mansur Qalawun built the famous and important hospital, Al- Mansur. He was a muslim arabian army officer fighting the crusaders. He was admitted into An-Nur hospital and after then built a hospital to be better than that in Cairo, Egypt. His hospital served 4000 patients daily and was free for stay. The hospital is presently used for ophthalmology and is called Qalawun Hospital. Its magnificent ancient door is preserved in the Islamic Museum of Cairo.

In the north African part of Tunisia, Prince Ziyadat Allah I, built Al- Qayrawan hospital in 830 A.D at Ad-Dimnah District. The hospital was characterized by spacious separate wards, waiting room and female nurses, and a prayer hall.

Another large early hospital built in Africa was the Marakesh Hospital in 1190 A.D by King Al- Mansur. It was huge, beautifully landscaped with fruit trees and flowers. Its patients also had special apparels for winter and summer. Its pharmacy was cared for by specialists and it also had a private section for patients who were charged higher.

In 1366 A.D, Prince Muhammad Ibn Yusuf Nasr built the Granada Hospital in Granada of half a million population. This hospital represented the beauty of Islamic-Arabic Architecture in Spain and served the people until the fall of Granada in 1492 A.D.

2.1.2 NIGERIAN HISTORY AND ORIGIN OF HOSPITALS

www.control-data.com proposed that Western medicine was formally introduced in Nigeria by 1860s when Sacred Heart Hospital was established by Roman Catholic Missionaries in Abeokuta. From then all through the colonial period, religious missions influenced modern health care facilities. Roman Catholic Mission accounted for about forty percent of the total mission based hospital beds by 1960. They even exceeded government hospital beds in no; 118 mission hospital by 101 government hospitals by 1954 almost.

In the southeastern and Midwestern regions, mission based facilities were dominant even up to 1954. Other larger sponsors of the mission hospitals were the Sudan United Mission which focused on the middle belt areas and the Sudan Interior Mission which worked in Islamic north. They both handled twenty hospitals or other facilities in the country (northern half part) these mission hospitals were still very much of important health care networks of the north as of 1990. Advanced medical trainings mostly in Europe for the most first generation western educated Nigerian doctors. This also expanded and publicized modern medical care.

British colonial govt started providing formal medical care services by constructing some clinics and hospital in Lagos, Calabar and other coastal trading centres in 1870s. compared to the missionary facilities these were only for the use of Europeans. The services later then became extended to African employees of European concerns. As European activities reached other areas of the country thereby their hospitals and clinics also expanded there. For example, Jos hospital was established in 1912 after initiation of tin mining there.

The World War I made disastrous effect on Nigerian medical services since large numbers of medical personnels (Europe and African) were pulled out to service in Europe. Afterwards

medical facilities expanded greatly and some medical schools (government sponsored) were set up. Nigerian physicians training in Europe were stopped from practicing in government hospitals unless they were serving African patients. This led to the nationalist movement of protesting and involvement by doctors and medical personnel. By the World II, the colonial government responded to the previous nationalist movements by extending modern health and education facilities to much health and education facilities to much of the nations population. A ten year health development was announced in 1946.

In 1948 University of Ibadan was found and included the country's first¹ Faculty of Medicine and University hospital. There were also some nursing schools and 2 schools of pharmacy. By 1960 there were 65 govt nursing/midwifery training schools. In 1946 the health plan formed the Ministry of Health to co-ordinate health services throughout the country to include those of the govt, private companies and by budgeted fund for the hospitals & clinics: most of these were in the main cities rural health centres got little funding. There was a huge difference of facilities to south areas compared to the north. By 1979 there were 562 general hospitals backed up by 16 maternity and/or pediatric hospitals in armed forces hospitals, 6 teaching hospitals & 3 prison hospitals.

They were all collectively 44,600 hospital beds, there were 2,740 clinics 930 maternity homes and 1,240 maternal health centres health ownership establishments coasted of federal, state & local government and private owned. The majority was of government ownership.

Through the 1980s, private hospitals grew in number, by 1985 government hospitals were 84 (13 percent of hospital beds); 3023 owned by state government (47 percent of hospital beds; 6,331 owned by local government (11 percent of hospital beds; and 1,436 privately owned

establishments (providing 14 percent of hospital beds. In hospitals, the problems of geographic misdistribution of medical facilities among regions and inadequacy of rural facilities continued. By 1980 the ratios were estimated 3,800 people per hospital bed in the north (Borno, Kaduna, Kano, Niger and Sokoto States); 2,220 per bed in the middle belt (Bauchi, Benue, Gongola, Kwara and Plateau States); 1300 per bed in the southeast (Anambra, Cross River, Imo & Rivers States); and 800 per bed in the southwest (Bendel, Lagos, Ogun, Ondo, and Oyo States). Records also revealed that there were significant contradictions within each region. An example is that there were an estimated 2600 people per physician in Lagos State, compared with 38,000 per physician in the much more rural Ondo State. A comparison study on distribution of hospitals between urban and rural areas in 1980 by Dennis Ityavyar reveals that whereas 80% of the population of those states lived in rural regions, only 42% of hospitals were situated in those areas, this was more obvious because trained doctors with choices preferred to live in urban areas. Majority of the ones in rural areas were there as youth corp members of the required (National Youth Service Corps established in 1973) the other few remained in remote areas exceeding their required term. Hospitals were split into general wards (providing both out and inpatient care for small fees) amenity wards (which charged higher fees but provided better conditions) general wards were usually very crowded and with long waits for registration and treatment. The patients most often didn't see doctors but nurses instead or other practitioners. Most drugs weren't available at hospital pharmacies, the available ones were usually dispensed without containers. The inpatient wards had beds on corridors and on floors. There was free food for the very poor patient with no one to attend to them. Those who had were given food by their relatives, friends staying in the hospital with them.

By contrast, in the amenity wards everything was more available to wealthier & elite patients; food, better care, drugs. Highest level of Nigeria elites frequently travelled abroad for medical care, especially serious ones.

In 1980 much medical equipment couldn't be used due to fuel shortage, and spare parts. By 1986 it became worse due to currency devaluation and structural adjustment. Government and private hospital and health care centres got affected by rising cost, government budget costs and material shortages by imported goods in the late 1980s. All these made private health care facilities more important medical health care facility demands exceeded its availability. Medical personnels, drugs, equipment diverted to the private sector as the government hospital got worse. Government health policies were debated proposals were made for new constitutions. The old one had a clause specifying free and adequate health care for the younger children (below 18 years of age older people of 65 years and above and physically disabled and handicapped. This was deleted by the president and governing council of the time (1991).

2.1.3 HISTORY OF MATERNITY HEALTH CARE

Mother and child care can be traced as far back as the days of our fore fathers since the earth itself began and developed by procreation. As times changed, so did mother and child health care services improved and also changed. Today it can be seen as a great challenge posed to the life of children and mothers. Mortality rates of various countries show that women and children have been made most vulnerable to death due to child birth, lack of efficient health facilities, poorly trained health professionals and ignorance.

According to record of the (world health organization 2006), Nigeria has one of the highest infant and maternal rates amongst the developing nations. As at the year 2004, infant

mortality rate was 197 million/1000 live births and maternal mortality rate at the year 2000 was 800 million/1000 live birth cases. Some of the most common efforts to improve mother and child care health facilities and conditions include that of the international health bodies; W.H.O, and UNICEF and the Nigerian organizations ;F.S.P(family support programme) which was established by the one time first lady of Nigeria Mrs. Maryam Abacha and the Better life programme for rural women by another one time first lady of Nigeria Mrs. Maryam Babangia. Another mother and child health care promotion concerned body is the maternal and child health bureau under the HRSA (health resource and service administration) of the united states department of health humanitarian service established in 1982(Microsoft Encarta 2006). "Nigeria" was one of the very first African countries where the united nations children's fund (unicef) established a program me of cooperation. unicef's work for the survival, protection and development of Nigerian children has continued ever since. today unicef is still working in partnership with many stakeholders including children and families to achieve national and international goals instrumental in the fulfillment of children's rights".(about unicef Nigeria history of unicef in Nigeria).unicef was formed in December 1946 by the united nations to provide help to European children exposed to famine and disease after the second world war. the organization started expanding its activities to other continents. In 1952, unicef executive board approved aid for sub-Saharan Africa for the first time. in 1953, unicef's mandate was extended to become the un development agency for children. that same year, in October, the first basic agreement was signed to establish unicef presence in Nigeria and later ,an office was opened in Lagos. Unicef also backed up the development of basic rural health services for mothers and children.

In 1954, the unicef executive director recommended an apportionment of us \$6,600 to Nigeria for the provision of 500 midwifery kits and training of personnel to encourage the expansion of domiciliary delivery within the expanding maternal welfare services. This constituted the first unicef assistance of this type to Nigeria. This very first project is a good example of the strategies used by unicef to develop 'maternal and child welfare' services: training, pilot projects and supplies.

By 1972-1980, during the post civil war period, UNICEF provided training of traditional birth attendants, midwifery kits and improved health service management; immunization programmes for children and disease control including women focused community development strategies. 1982, introduction of child growth monitoring; oral rehydration therapy; breastfeeding; immunization to eliminate common infections of early childhood by these simple medical techniques. In 1988, unicef got a report that 25 cases were found sero positive of AIDS (acquired immune deficiency syndrome) and of which 12 had developed the disease and of which women and children were most rampant victims. This led to concern of rigorous sterilization of needles and syringes to prevent the spread of the disease through child immunization. At the same year period, UNICEF decentralized its operation by producing zonal offices in different Nigerian zones; northwest zone (Kaduna), North east zone (bauchi) 1986, south east zone (Enugu) 1988.

In 1990 Nigeria recognized children's' rights by taking part in the world summit for children organized under the auspices of United Nation in Newyork, United states of America and signed a 10 point plan of action and development goals for the year 2000. By 1991, UNICEF reported that under five mortality rate of Nigeria was 145/1000 births which led to 60% immunization coverage by 1989, over 12000 health facilities and 2400 outreach sites provided expanded

programme on immunization. By the early 1900s immunization dropped drastically leading to increased under five mortality rates due to political uncertainties and deteriorating economic situations.

Today, there are child and mother health care centres distributed all over the 36 states and federal capital territory of Nigeria partly due to the unrelenting efforts of the UNICEF and other concerned bodies. A study conducted by (Olalekan A .2008) shows that in 1999-2003 The (U5MR) under five mortality rate was higher in Northern parts of Nigeria and lower in the southern parts of Nigeria. Among the 37 states of the country(Nigeria),13 states belonged to low risk zone and 12 states each belonged to intermediate and high risk zone. Below is a map Nigeria indicating the various risk zones of U5MR.

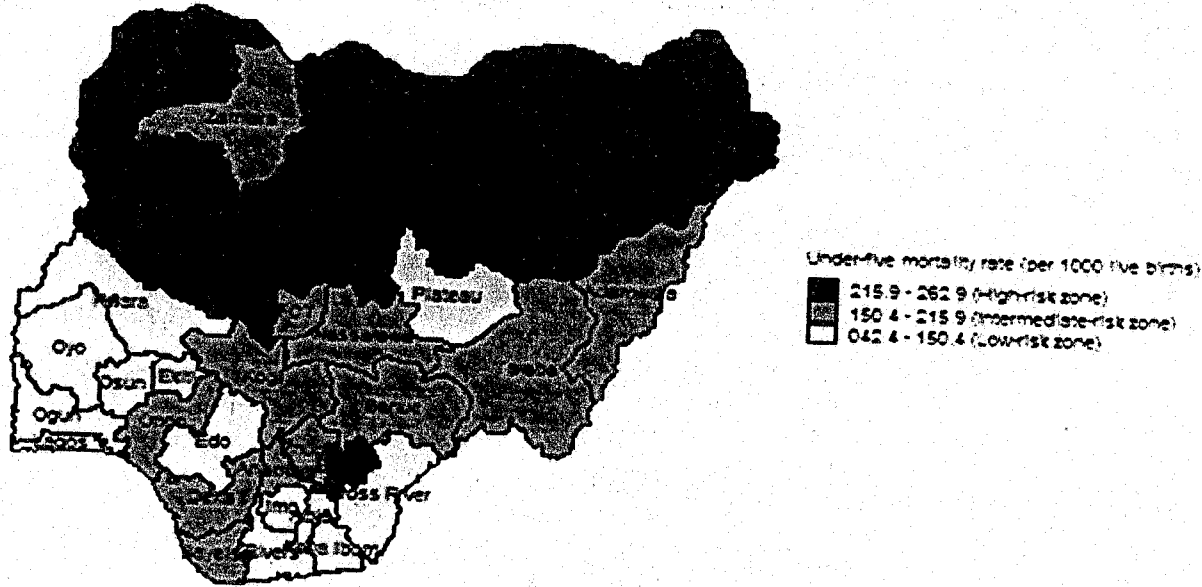


Fig 1 : map of Nigeria indicating the various risk zones of U5MR.

Source: Olalekan A .2008

In Niger state of Nigeria, the estimated maternal mortality rate is 1130/100000 live births yearly and the under five infant mortality rate is 114/1000 live births per year(Sanganuwa, M.O.H 2008). Another organization concerned with the care of mother and under five children is the National health insurance scheme (NHIS). According to the 7 point agenda plan of the present(2008) head of state of the federation(president umaru musa yar adua),maternal and child health care is the 3rd millennium goal development plan being conducted by the NHIS. It selected Niger state as one of the opportune states to be given free access to maternal and under five health care services by the federal government of Nigeria .The launching of this NHIS programme was launched on the 11th of November 2008 in Minna Niger state of Nigeria.

2.1.4 DEFINATION AND COMPONENTS OF A WOMEN AND CHILDREN'S HOSPITAL.

A maternity hospital is a health system which provides health services to women and children to include diagnostic and treatment services of women and children diseases,skilled birth attendance, antenatal care, post natal care, neonatal care; baby care and provision of recommended vaccinations at The appropriate age schedule for infants from the Expanded Program on Immunization set by the WHO ; BCG at birth, DPT and Polio at 2, 3 and 4 months and measles at 9 months.

In order to achieve optimum efficiency in such a hospital, it is very important to understand the various stages/components of the maternity hospital. The components of a maternity hospital are based on the activities of such a centre which are the antenatal, labour/delivery,

postnatal and child care activities as they proceed each other respectively. These activities are further subdivided as various units/components of the health facility.

The antenatal section comprises of the Reception area, waiting hall, card/record room, medical consultant offices, observation/examination/ultra sound scanning areas, diagnostic laboratories, antenatal wards(for special bed rest pregnancy cases),exercising/pregnancy training classes, lecture halls, nursing station, dispensary, stores, lockers and other conveniences.

The labour/delivery areas comprise of labour wards/suites (plate. 1) for normal deliveries, labour exercising units, supervising midwife unit, doctor and nurses' lockers, scrub up areas, sterilization units, and operating theatres for abnormal deliveries/caesarean section.



Plate 1 :labour/delivery room.

The postnatal activities have sections such as the recovery rooms/post natal wards



Plate 2: post natal room.

Child care activities have units made for it such as nurseries for keeping babies, incubating sections or premature and special case babies, nursing stations and conveniences. Other activities in a maternity Health centre are the laundry and food service activities. The units for these include the laundry and kitchen areas respectively.

There are utility service departments also which includes the laundry department for the cleaning /maintenance of the hospitals laundry and the nutritional departments concerned with the feeding and preparation of food for the hospital.

2.1.5 EQUIPMENTS OF A WOMEN AND CHILDREN HOSPITAL.

The following are the some of the various equipments used in a women and children's hospital:

- I. Autoclave: this is usually used in laboratories and operating theatres for sterilizing laboratory and surgery equipments. Plate 5 below shows an autoclave used in operating theater. Fitness equipments: These are exercising equipments safe for use of expectant mothers for their physical and mental well being. They also prove to be very useful to pregnant women during the labour process. This is shown in plate 5.
- II. Ultrasound Scanner: Ultrasound, or sound waves with frequencies above detection by the human ear, is commonly used in obstetrics to diagnose both the age and health of the developing fetus. An ultrasound-emitting device called a transducer is placed against the skin of the pregnant woman's abdomen. The sound waves reflect in varying degrees when they contact tissues of different density and elasticity. The pattern of echoes is detected by the transducer and is converted into a moving image seen on a monitor. Ultrasound is also

used in procedures involving the sampling of amniotic fluid or placental tissue. (Encarta 2006.) They are usually found in examination rooms /medical consultants offices (plate 6).

- III. Hospital beds: They are long narrow beds used by admitted patients in hospital wards as can be seen in plate 7. they can be found in the antenatal, postnatal and labour wards of a mother and child care centre for use by mothers. Another type of bed used here is the examination bed (plate 8) used for examinations by an obstetrician/doctor to examine patients. There is also the birthing bed used in the delivering room by mothers giving birth (plate 9).
- IV. Baby Resuscitator: This is a machine used in the delivery room just after delivery to help/revive a baby's respiration by sucking away obstructing mucus, it is shown in plate 10 below and can be used along side an oxygen/respiratory cylinder (plate 11). This can also be found in an operating theatre.
- V. Baby scale: It is a scale used in weighing babies at birth and also in the postnatal areas to monitor their growth. Plate 12 shows a baby scale.
- VI. Infant Incubator: An infant incubator (plate 13) provides a controlled environment for newborns needing special care, such as those born prematurely or those unable to maintain a healthy body temperature. By placing an infant in an incubator, doctors and nurses can set and monitor different aspects of the child's environment in order to create ideal conditions for survival. In addition to regulating oxygen, temperature, and humidity levels, incubators protect infants from pollutants and infection. Portholes in the side of the glass-walled incubator box allow handling of the child, while smaller holes allow for monitoring cables and tubes, such as intravenous and respiratory tubing.

VII. Theatre bed/table: This is a bedlike table used in an operating theatre where the operated patient lies on while performing surgeries. It is always used along with an operating lamp for more lighting which is ceiling mounted, wall mounted or standing independently. It is shown in plate 14.

VIII. Stretcher: It is also a bed like structure with wheels and without a mattress and made of metal which is used for bringing in patients that cant walk due to whatever condition they are in from an ambulance into the hospital as shown in fig.2.

IX. Wheel chair: A wheel chair (plate 15) is used to also transfer patients from one place to another due to their certain present condition which could be labor or any temporal situation. It is also used by physically handicapped patients.

X. Nursery Bed: It is a bed made to fit the size of babies and is normally found in children wards and nurseries. This is shown in plate 16.

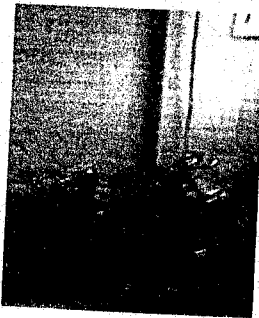


Plate 3 : Autoclave

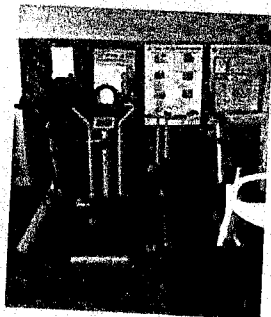


Plate 5: fitness equipments.



Plate 6: Ultra sound Scanner

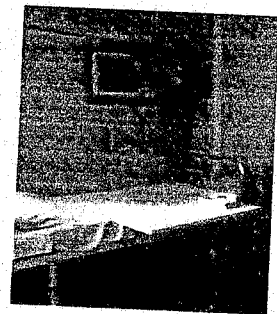


plate 7: Hospital bed



Plate 8: Examination

Bed



plate 9: Birthing

bed.

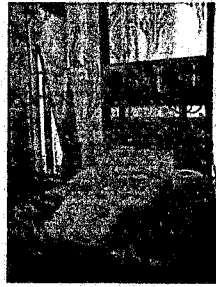


plate 10 : Baby

Resuscitator



plate 11: oxygen

cylinder



Plate 12: Baby

Scale



Plate 13:Baby

Incubator



Plate 14: operating

table

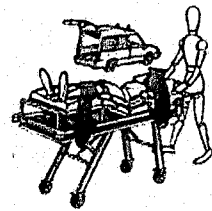


Fig.2: stretcher

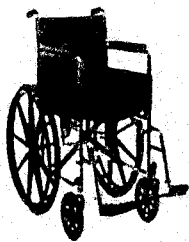


Plate 15: Wheelchair



Plate 16:Nursery bed

2.1.6 GENERAL LOCATION CONSIDERATIONS OF HOSPITALS.

There are general planning factors to be considered for the carrying out of any kind of facility for a hospital, they are as follows:

- 1) It should be located in a less noisy environment and sufficing for residents of its environment.
- 2) The site should have no future predictive intrusive developments no recommended by regulatory boards.
- 3) The land for the site shouldn't be contaminated.
- 4) There should be provision for future development of the hospital.

2.2 RESEARCH AREA

2.2.1 DEFINATION OF ERGONOMICS.

Ergonomics is a word which was originated from the Greeks; "ergon" meaning work and "nomos" meaning laws; laws of work. It has to do with he application of various principles to adapt design of products, systems and workspaces to fit people's sizes and shape. Ergonomics in other words known as "human factor" can also be said to be a science which is concerned with performance optimization/efficiency of a system with the use use of various principles to make the systems' user safe and comfortable. It takes into cognizance a users need for the system, limitations and capabilities to achieve "fit" of worker/user to equipment, information and environment.

Ergonomics applies principles of industrial engineering(study of industrial production by efficiency of machines, labour, and raw materials),anthropometrics(science of human measurements applied to decision makings of buildings) ,biomechanics(study which relates muscular activities to mechanical structures) and psychology(study of the minds and

behavior).for the purpose of this study, the scope is narrowed down to ergonomics using the principle of anthropometrics: that is the part of ergonomics related to the architectural aspects/ requirements of the building facility in relation to the end user's body measurements.

Anthropometrics data is used to produce user friendly buildings\in ergonomics. It concerns the study of human body measurements in relation to decisions made as regards making a building user friendly. An example of such is the consideration of how human reach, height, width, weight, eye height hand side, stride length including other body measurements and shape influence corridor width, stairs, ramps door, and window sizes and position in a building's design. It is the effect of human dimensions on sizes, proportion and room arrangement, space arrangement, furniture, equipment and their co-ordination.

Ergonomics also known as human factor is also known as the study of humans in relation to their work and environment. It also takes into account studies like illuminations, colour, temperature, noise, vibration, dust and fumes of a working environment.

2.2.2 ARCHITECTURE AND ERGONOMICS

This simply refers to how ergonomics as a field can be integrated into the architectural design processes particularly the hospital design projects.this goes a long way in organizing the participation of end users of the building and therefore ensures a good building system performance ,user safety and adaptability as researched and confirmed by Remijin 2007. The various consideration aspects of ergonomics related to architecture of buildings and which are applied in this research are as follows:

- a. **SAFETY:** This has to do with the health of a buildings occupants and how ergonomics sees to the functional guidance of health of a building's user. An example of how this is achieved in a building is the use of bright colours on nosing of stair cases to make it more

conspicuous to the user especially in low lited places. Adequate lighting of staircases and ramped areas is also an application of safety ergonomics.

- b. **COMFORT:** Another area in which ergonomics plays an important role is in the comfort of a building user. This is achieved by the use of ergonomics in determining window and door sizes and placement positions, minimum space limit standards for number of design of specific number of people, ventilating, cooling and heating of buildings for thermal comfort, control of noise coming into buildings by specific use of building materials, distances between noise source and buildings and use of noise barriers.
- c. **PRODUCTIVITY/PERFORMANCE:** Ergonomics plays a vital role in the performance of building is only productive if it fulfils the needs of its user. This can only be done by making a building safe, comfortable, and efficient for its user; taking consideration of activities of the building's user and their relationships.
- d. **AESTHETICS:** This area has to do with beauty and pleasing effect a building creates in it user making it more appreciated. This is applicable when the right certain colours and building forms are being used to include other aesthetic features. An application of this is the use of bright colours like red, yellow and orange to stimulate and create warmth in a building for the user.
- e. **EASE OF USE:** Ergonomics also has to with making a building easy to handle/use .This can be through the use of signs, graphics and letters to aid in giving directions to an unfamiliar user. It also includes the provision of lifts, escalators and artificial lighting in a building making it easy to use.

2.2.3 ERGONOMICS AND WOMEN/ CHILDREN HOSPITALS

In order to apply ergonomics, it is very important to understand the needs advantages and limitations of a building's user. A women and children hospital caters for women and infants/children, therefore, they are the people to be mainly considered in this research

A typical scenario example could be the case of a pregnant woman and one who isn't.

some considerations of pregnant women include increase in reach distances than a normal person. For example a normal reach distance can be 15cm and that of a pregnant woman can be 20 cm due to her condition. This can limit her to strains in the upper arm, shoulders and low back

If not taken into consideration during the planning of her surroundings (like the labour rooms and antenatal areas) miscarriages and some other accidents can occur.

Some needs/requirements of infants include noise control, proximity to their mothers on admission with them, play areas to make the hospital less sterile for them, easy access and views from nursing stations for excellent supervision. The size of babies should also related to their environment and equipments to be used. All these need to be addressed in planning their hospitals.

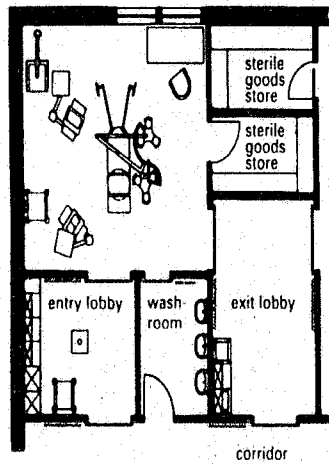
2.2.4 ERGONOMIC HOSPITAL STANDARDS

ergonomic hospital standards are those requirements/criteria/recommendations set according to the neufert architect's data (international/ British standard guide for architects in the construction and planning of various building types) to be accomplished by a hospital's planning and construction in order to achieve safety and comfort of its user and optimum performance of the building. Below is a chosen list of some of such standards and their illustrations for the purpose of this paper:

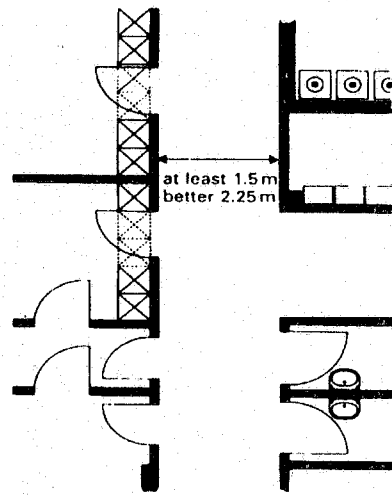
- I. The various units should be planned in relation to their next proceeding stage according to their functional relationships as shown in table 1 below, for example an operating theatre is expected to be sited next to the labour/delivery and emergency department area for easy access in case of a decision to carry out surgery.
- II. The hospital site should be located within a quiet location.
- III. Staircases should be provided with hand rails on both sides and should be naturally lighted by sunlight. they should have a minimum flight /landing width of 1200 and 1950 respectively as shown in fig.11
- IV. The ante natal area is to be placed in such a way it can be accessible by the public (out patients) while its activities do not interfere with the postnatal section.
- V. Doors, windows, furniture and all fittings should be made to correspond to their standard specifications according to table 2 below and be hygienically cleanable and to withstand cleaning agents and disinfectants. They should also prevent sound transmission, odours and draught.
- VI. Operating rooms should face North-West/North-East directions and follow the specified standards size/requirement according to table 2 below. They should be made up of materials, surfaces which are easily cleaned and durable for repeated washing. There should be provision for staff and patient lobbies and they should be in accordance with the functional flow requirement as in table 1 .it should have an entry and exit lobby of 15000-20000 mm² area each. It's wash room and equipment rooms should be a minimum of 12000-15000 mm² and 10000-15000 mm²respectively.the height of the operating room should be a minimum of 2960mm and an extra 960mm for lighting /air conditioning services as illustrated in fig.8 .

- VII. Nursing areas and patient wards should be made to face south or south east directions to achieve the use of less shading devices and should be a minimum of 25-30mm².
- VIII. Corridors should avoid obstructions, columns and building materials. Their edge corners should be curved for easy stretcher manoeuvring as in fig. 10.
- IX. General area access corridors should be at least 1500mm wide as in fig.2 while corridors to be accessed by patient stretchers should be at least 2250mm to accommodate 2 stretchers at a time as illustrated in fig. 10.
- X. Wards should have a minimum distance of 2400mm in-between bed rows/as isle width and each bed and bedside cupboard should be contained within at least 2400mm width of space as illustrated in fig.9they should also have a minimum of 16-24 beds/ward for easy supervision and care.
- XI. Minimum space for ultrasound scanning of patients is 2.5 x 3.6m(2500x3600) as illustrated in fig. 4
- XII. Minimum space for examination of reclining patient is 2.0 x 3.0m(2000x3000) as illustrated in fig. 6
- XIII. Minimum space for doctor consultation is 2.0 X 3.0m(2000 x 3000) as illustrated in fig.3

Source:Neufert's architect's data.



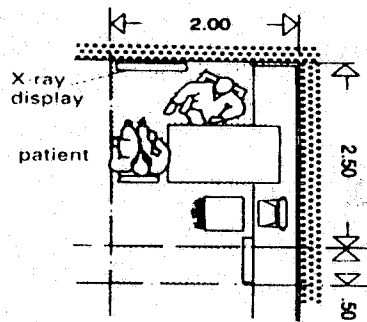
3) Arrangement of an operating theatre with adjacent rooms Architects



) Medical services corridor

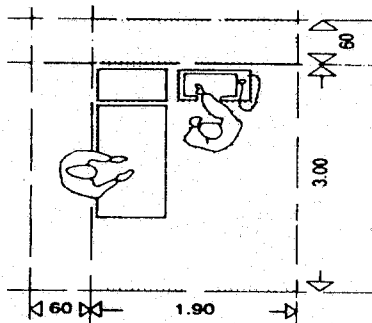
Fig. 3

Fig.4



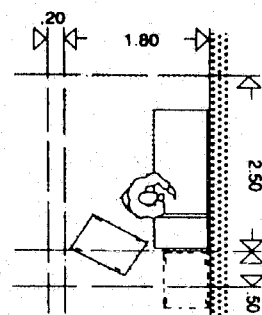
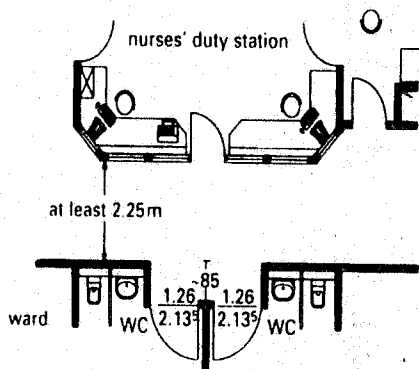
2) Minimum area: doctor's consultation

Fig.5



Area requirements: ultrasound examination

Fig.6



Minimum area: examination of reclining patient

Fig7.

Fig.8

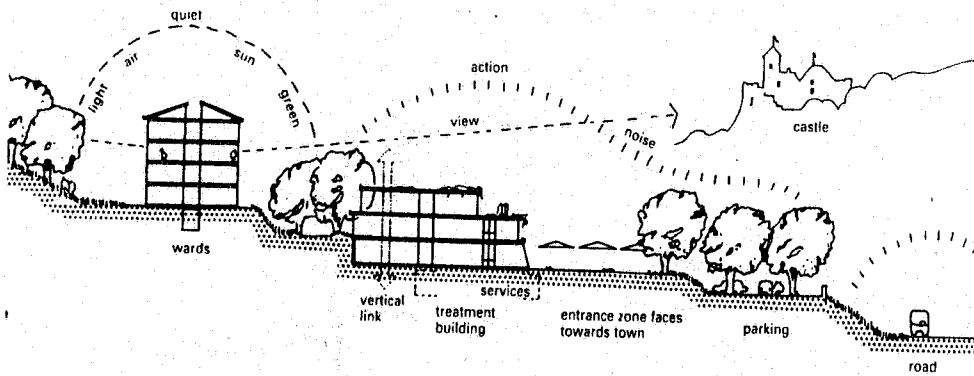
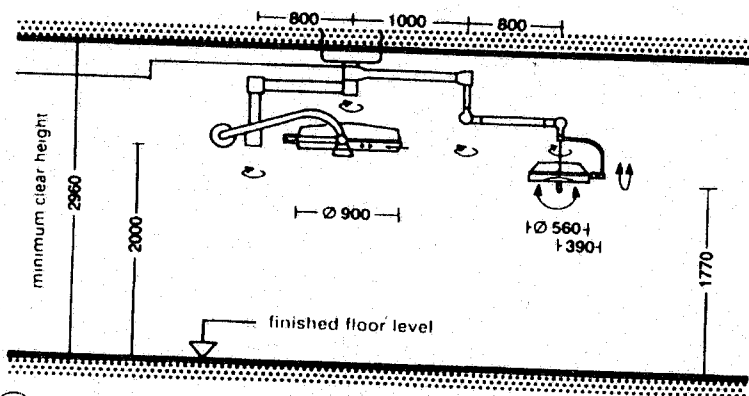


Fig 9 ; tree planting /park noise control for hospitals.



④ Surgical pendant lamp with satellite

Fig.10 ; standard minimum clear height of an operating theatre

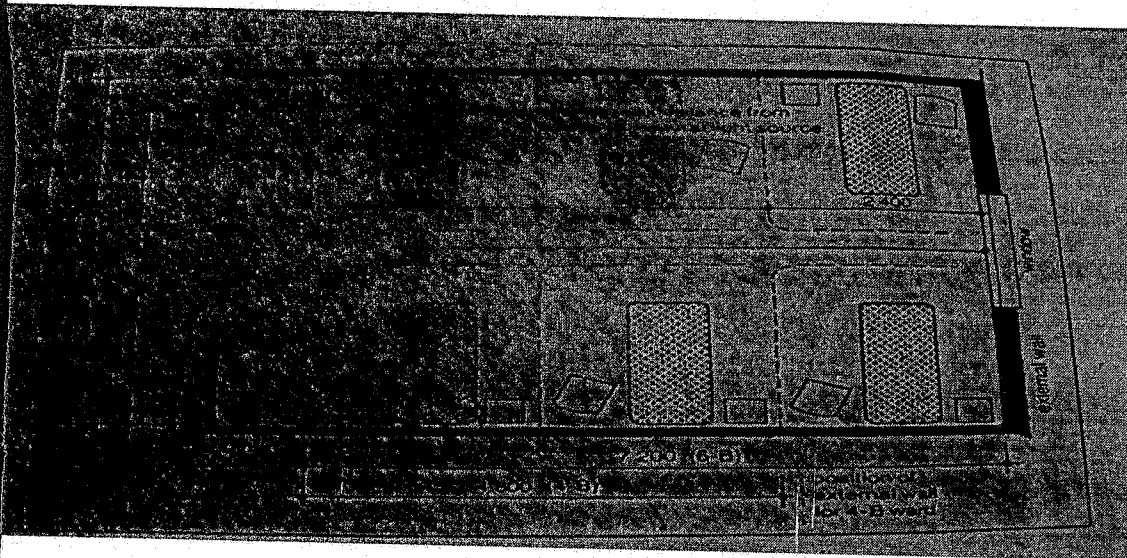


Fig.11 minimum distance for ward isle width

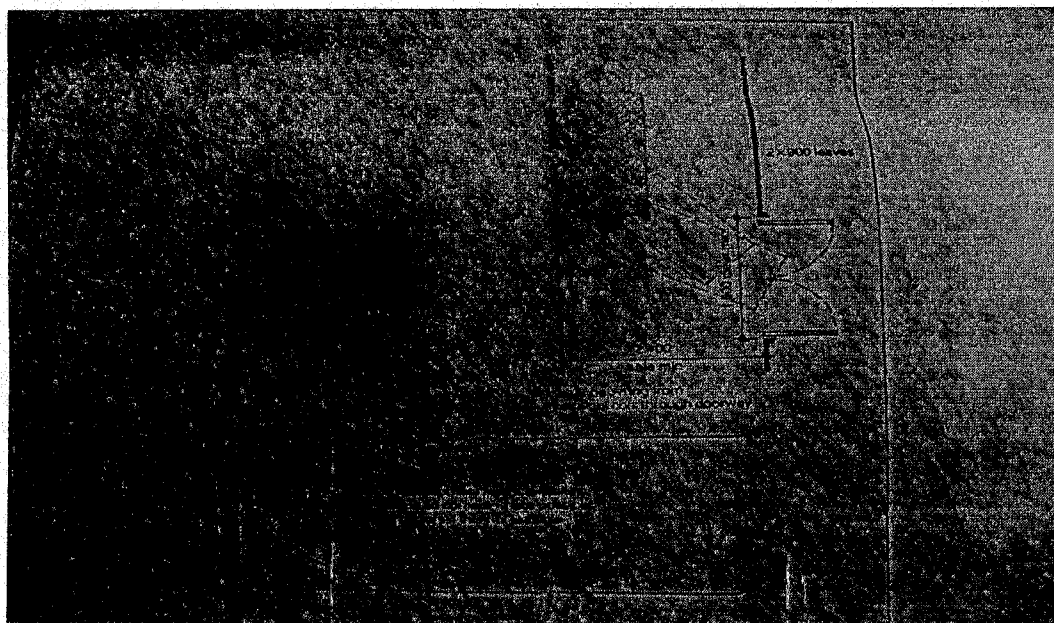


Fig.12: General access corridors

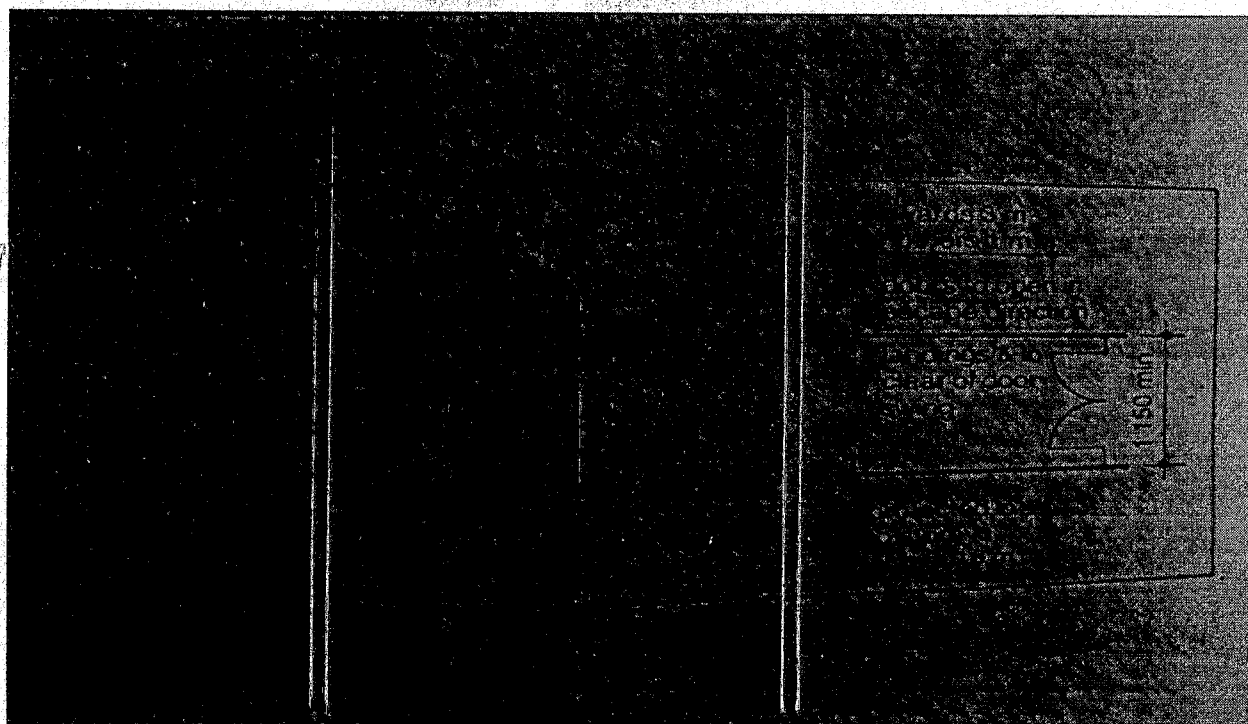


Fig.13: Staircases

Fig 1-13 ; Sketch illustrations of some ergonomic hospital standards.

Source: Neufert's architect's data

Below is a table showing the recommended functional relationship of some hospital units.

	nursing	operating	intensive care	sterilisation	maternity	emergency	laboratory	radiology	examination	X ray	out patients
nursing			□		□			□		◇	
operating			○	○	○	◇	◇				○
intensive care				◇		◇	◇			◇	
sterilisation											○
maternity						◇			□		
emergency							◇			○	○
laboratory									□		□
radiology											
examination										◇	◇
X ray											◇
out patients											

○ very good connection required

◇ good connection sensible

□ connection desirable

Table 1; Hospital units functional relationship table

Source: Neufert's architect's data

Below is a table showing some ergonomic hospital minimum space/dimension standards

	HOSPITAL COMPONENTS/UNITS.	ERGONOMIC HOSPITAL MINIMUM SPACE/DIMENSION STANDARDS(MM).
1.	General area access corridors	1500mm wide
2.	2 trolley Patient corridors.	2250mm wide
3.	Corridors with suspended ceilings.	2400mm height
4.	Light and ventilation windows	2500mm distance apart
5.	Normal doors	2100-2700mm height
6.	Vehicle entrance, oversized doors	2500mm height
7.	Transport entrances	2700-2800mm height
8.	Approach roads	3500mm height
9.	Staircase landing	1950mm
10.	Stairs flight width	1200mm
11.	Thread of stairs	250mm
12.	Recommended riser/thread ratio	150:300mm
13.	General pedestrian corridors	1500mm
14.	2 patient stretcher corridor width/height	2400/2400mm
15.	Operating theatre entry lobby	15000-20000mm ²
16.	Operating theatre size/ total clear height	40000-48000mm ² /2960mm
17.	Operating theatre exit lobby	15000-20000mm ²
18.	Operating theatre washroom	12000-15000mm ²
19.	Operating theatre equipment room	10000-15000mm ²
20.	Ward Isle width	2400mm
21.	Ward bed and bedside cupboard space width	2400mm
22.	Ultra sound space requirement	2500 X 3600mm
23.	Doctor's Consultation room	2000 X 3000mm
24.	Patient Examination area	2000X 3000mm

Table 2; Ergonomic hospital minimum space/dimension standards

Source: Neufert's architects data.

2.2.5 ERGONOMIC HOSPITAL EQUIPMENTS

These are hospital equipment designed with considerations of limitations of previous existing ones to improve on their observed problems while providing comfort, safety and efficiency. plates 17- 26 shows various ergonomic theatre operating and gynaechology tables.

Applications of ergonomics hospital equipments and patient usage are illustrated in fig.14-

22.

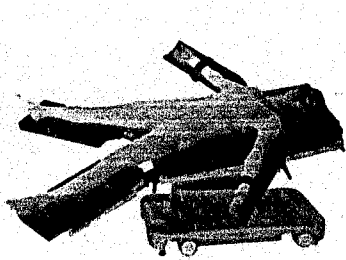


Plate 17



plate 18

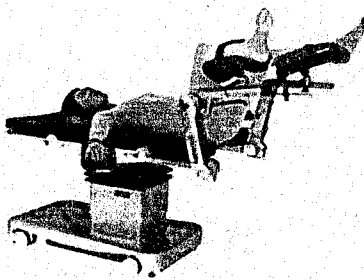


Plate 19

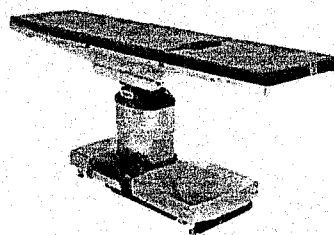


plate 20

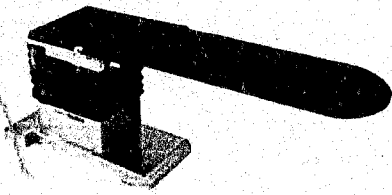


Plate 21

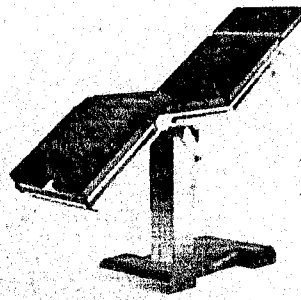


plate 22

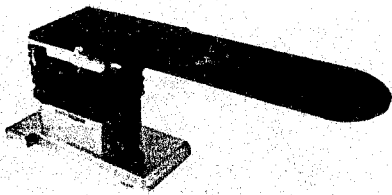


Plate 23

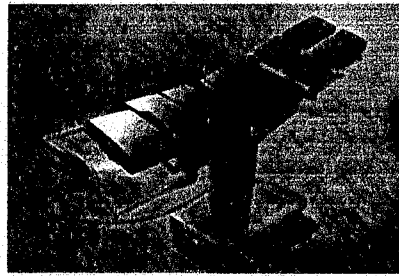


plate 24

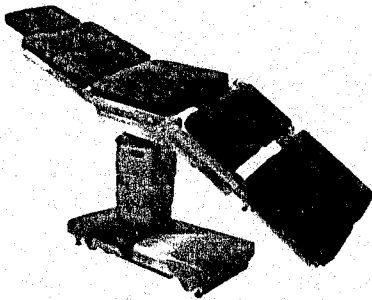


Plate 25

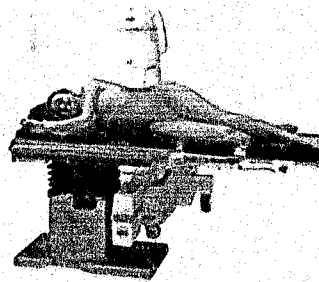


plate 26

Plate 17-26 : ergonomic maternity /surgical tables

Source: : linak group 2008.

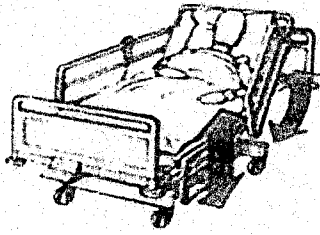


Fig14:HOSPITAL BED

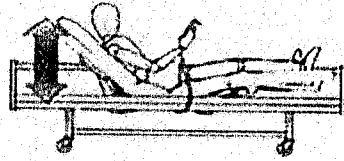


fig 15: CARE BED

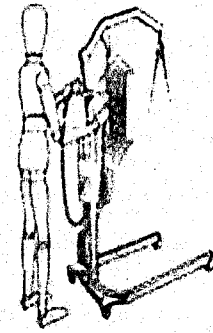


fig 16:PATIENT LIFT

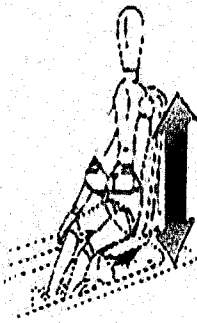


fig 17:BATH SEAT

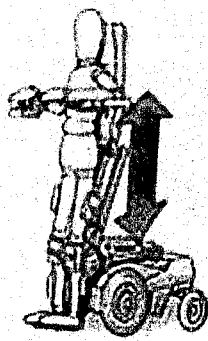


fig 18:WHEEL CHAIR

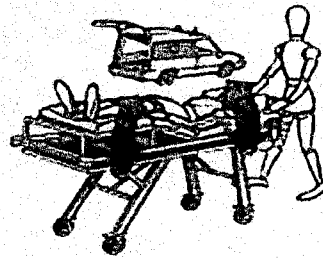


fig 19:STRETCHER

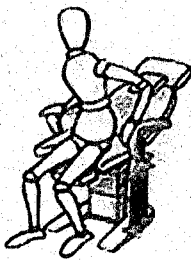


fig 20:GYNACOLOGICAL CHAIR

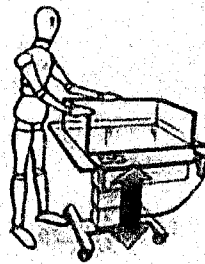


fig 21:INCUBATOR

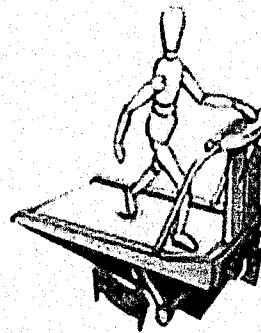


fig 22:THREADMILL

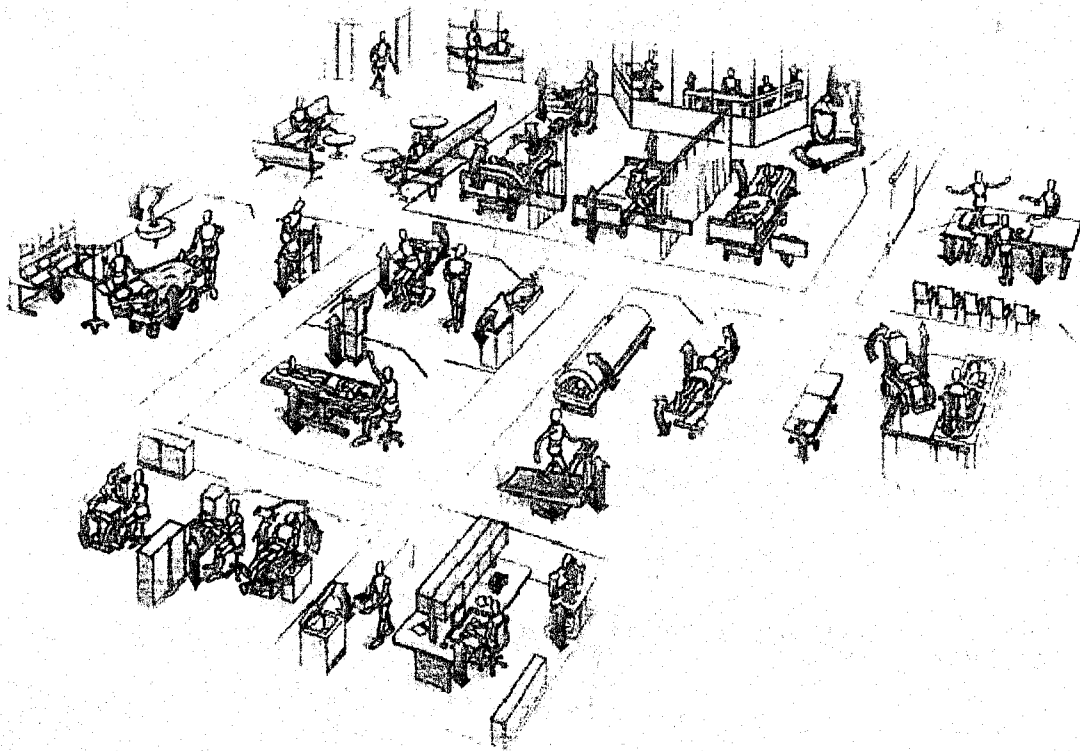


fig 23: Hospital environments

fig 14-33: APPLICATION OF ERGONOMICS TO MATERNITY HOSPITAL EQUIPMENT AND ENVIRONMENTS

SOURCE: linak group 2008.

Below is a table (table 2) showing hospital components/units and their various ergonomic minimum space /dimension standards.

	HOSPITAL COMPONENTS/UNITS.	ERGONOMIC HOSPITAL MINIMUM SPACE/DIMENSION STANDARDS(MM).
1.	General area access corridors	1500mm wide
2.	2 trolley Patient corridors.	2250mm wide
3.	Corridors with suspended ceilings.	2400mm height
4.	Light and ventilation windows	2500mm distance apart
5.	Normal doors	2100-2700mm height
6.	Vehicle entrance, oversized doors	2500mm height
7.	Transport entrances	2700-2800mm height
8.	Approach roads	3500mm height
9.	Staircase landing	1950mm
10.	Stairs flight width	1200mm
11.	Thread of stairs	250mm
12.	Recommended riser/thread ratio	150:300mm
13.	General pedestrian corridors	1500mm
14.	2 patient stretcher corridor width/height	2400/2400mm
15.	Operating theatre entry lobby	15000-20000mm ²
16.	Operating theatre size/ total clear height	40000-48000mm ² /2960mm
17.	Operating theatre exit lobby	15000-20000mm ²
18.	Operating theatre washroom	12000-15000mm ²
19.	Operating theatre equipment room	10000-15000mm ²
20.	Ward Isle width	2400mm
21.	Ward bed and bedside cupboard space width	2400mm
22.	Ultra sound space requirement	2500 X 3600mm
23.	Doctor's Consultation room	2000 X 3000mm
24.	Patient Examination area	2000X 3000mm

Table 2; Ergonomic hospital minimum space/dimension standards

Source: Neufert's architects data.

2.3 DEDUCTIONS

The following deductions were obtained from the above chapter:

- A. General ideas of hospital's origin, its transformation over time, and its present day situation generally and in Nigeria from related topics.
- B. What ergonomics means and its importance as a safety guide and system performance enhancer.
- C. Some important ergonomic hospital standards.
- D. Its relation to architecture and how it can be applied to a women and children's hospital.
- E. How ergonomics can also be applied through hospital equipment specifications.

CHAPTER THREE

MATERIALS AND METHODS

3.1 THE STUDY AREA

The area of study for the research, Niger State, previously Niger Province was part of the North western State under the Gowon administrations twelve State structure in 1967. On the 3rd of February 1976, when a further state creation exercise was embarked upon by the General Murtala Mohammed administration, the previous North-western state was bifurcated into Sokoto and Niger States. The state however came into being on 1st April that same year. At the inception of the state administration in 1976, there were only eight (8) Local Government Areas namely: Chanchaga, Rafi, Gboko, Etswan, Abuja, Mariga, Magama, Lavun Local Government Areas.

3.1.1 LOCATION

Niger State is located between latitudes 8°20'N and 11°30'N and longitude 3°30'E and 7°20'E.

The state is bordered to the north by Zarnfara State, to the northwest by Kebbi State, to the south by Kogi State, to southwest by Kwara State; while Kaduna State and the Federal Capital Territory border the state to the northeast and southeast, respectively. Furthermore, the State shares a common international boundary with the Republic of Benin at Babanna in Borgu Local Government Area of the state. Currently the state covers a total land area of 76,000 sq. km, or about 9 percent of Nigeria's total land area. This makes the state the largest in the country.

3.1.2 MINNA TOWN

Minna is the capital of the state and it lies on latitude 9⁰37 N and longitude 633E on a geographical base of undifferentiated basement of mainly queiss and magnetite.the town enjoys a climate typical of the middle belt zone.

3.2 RESEARCH METHOD

The method of this research is the descriptive method of research .

3.2.1 METHOD OF DATA COLLECTION

Primary Sources

The research data was obtained by direct observation of existing hospitals and this resulted in the taking of some pictures of the structures; Oral interview with hospital staff and administrative officers of the various case study hospitals. These methods were used to get acquainted hospital designs in practice and problems associated with the existing buildings in a bid to correct those problems in this design proposal.

Secondary Sources

The secondary Methods of data collection for this research includes the use of books,thesis and dissertations of past similar projects, past journals and periodicals and through internet surfing for books, articles and web links.

3.3 CASE STUDIES

Case studies are usually the visitation/studying of various live studies (examples of similar existing samples in relation to what the researcher is working on) conducted by the researcher

in order to equip him/her with a background first hand information of the topic in question in relation to its present state, what is lacking and is a possible common problem within such various case study areas. This will go a long way in pinpointing focus areas for the researcher and help him/her in suggesting various solutions to the problem as regards to this research, the case study areas are hospitals with reference to women and children in which the general ergonomic factors considered,observed/appraised were the corridor ,stair, and ramp widths, size of doctor's consulting/examination areas, size of wards, operating theatres,lifts\ and functional relationships/arrangements of units in each of the hospitals visited compared to laid out guidelines/rules regarding user comfort and building's efficiency as discovered by the researcher. Below is a list of hospitals visited/ studied by the researcher as case studies:

- i. General hospital,Minna, Niger state,Nigeria.
- ii. Bazza jassim clinic and maternity,minna, Niger state,Nigeria.
- iii. Dara medicals, Abuja,F.C.T ,Nigeria.
- iv. K.K womens' and childrens' hospital,Singapore.
- v. District General hospital,Eastbourne,England.

3.3.1 CASE STUDY ONE; GENERAL HOSPITAL,MINNA, NIGER STATE,NIGERIA.

This is a hospital owned by the government and located at the city centre "mobil" area of minna, which covers all general aspects of a hospital. the facilities it provides includes records department, outpatients, pharmacy, laboratories, doctor consultation units, amenity wards, gynaecology (gynae) wards ante natal and postnatal clinics and wards, incubators/nursery, accident/emergency, children and surgical wards, pharmacy, eye clinics, mortuary and other

wards, operating theatres, scanning and radiology departments. plate 27-34 shows some of the facilities present in the hospital. The survey was conducted by the researcher on the 6th of November, 2008 between the time of 2-4 p.m. the following are the findings of the survey: 3.3.2

OBSERVATIONS

The following observations were made during the researcher's case study visit:

- I. Window sizes/placement for the wards are up to specific required size. (see plate 33/35). The hospital is located in the busiest/noisiest part of the town (city centre) as seen from the site location sketch in fig.34. which is contrary to the previously stated standard regarding hospital location and can have an adverse disturbing effect on the recovering ward patients.. This is probably due to an effort made to make the hospital easily accessible.
- II. The stair cases of the children/female surgical ward and children/female medical wards have a flight/ landing width of 1500 as in fig.35, which is up to the specified minimum standard earlier mentioned (fig 21) .
- III. The height of the operating theatre is 3200mm as shown in fig 36, which is above the specified minimum standard earlier mentioned . Size of the operating theatre is not up to the required minimum size as specified by the Neufert's architect's data. The two theatres are the only ones serving the whole departments of the hospital. There is no provision for equipment storage in the operating theatres; therefore its lobby was used for the purpose (see fig. 37) .The operating theatre is not directly accessible by the labour and gynae (gynaecology) wards as can be seen in fig.38. this might have been as a

result of trying to centralize it and therefore minimize cost. The labour ward should have been provided with its own abnormal delivery theatre.

- IV. The spaces for doctor's consultation in the emergency out patient department is 3600 by 3000 as is indicated in fig.15; meets up to requirement of consultation as in fig. 38.this is predictably as result of trying to make the doctor comfortable in his working space.
- V. Examination unit in the emergency out patient department is 1800 by 2000 as illustrated in fig.39; does not meet up to requirement of examination spaces . this is predictably as result of trying to minimize cost by using the exact space needed regardless of space for comfort allowances of user.
- VI. The space for patient's ultrasound examination in the scanning and x-ray department is 1800 by 2000 illustrated in fig; it does not meet up to requirement of ultrasound space as in fig.37,this is predictably as result of trying to minimize cost by using the exact space needed regardless of space for comfort allowances of user.
- VII. The matron station has no direct access /supervision view of the postnatal ward this can be seen from the illustration in fig.41.this is maybe due to the negligence on the part of the design team for the hospital. The wards have two door openings and window openings at bed intervals as required by the earlier stated standard for wards.
- VIII. The circulation corridors for stretchers do not meet up to the specified width for hospital stretcher circulation to allow for passage of two stretchers at a time as they are 1800mm wide allowing for passage of one stretcher at a time,as shown in fig.40. This is maybe due to the negligence and a result of trying to minimize cost by using the exact space needed for passage of one stretcher on the part of the design team for the hospital according to maybe specification by the government.

IX. Below are pictures and sketches carried out during the case study visit:

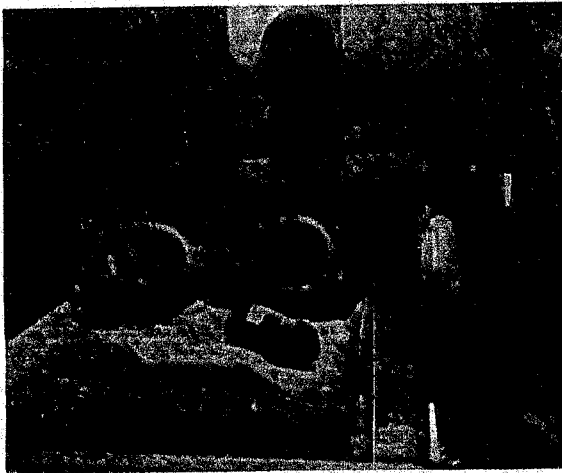


Plate 27: incubator/nursery

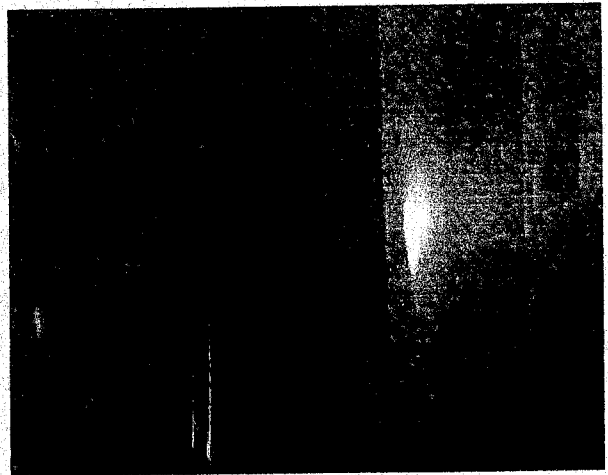


Plate 28: waiting lobby of operating theatre

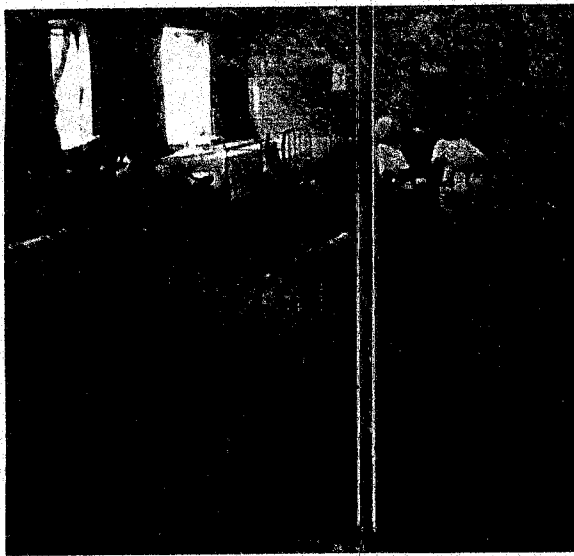


Plate 29: post natal ward

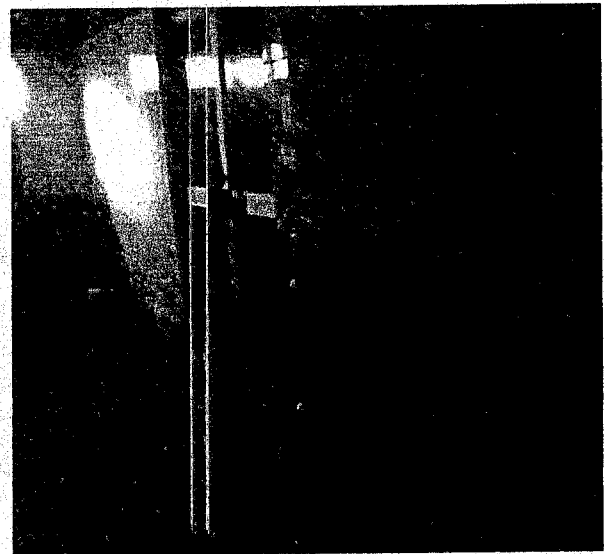


Plate 30: lobby of the operating theatre

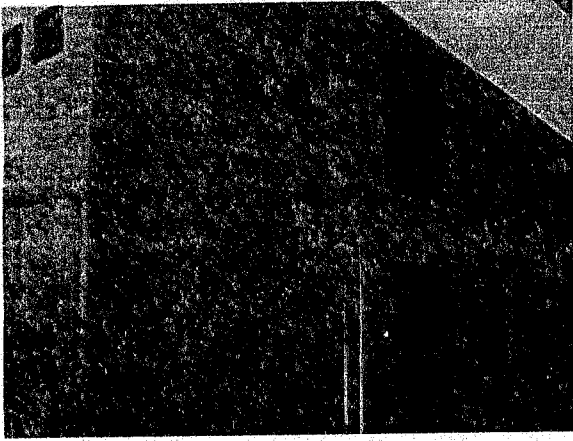


Plate 31: children/women ward

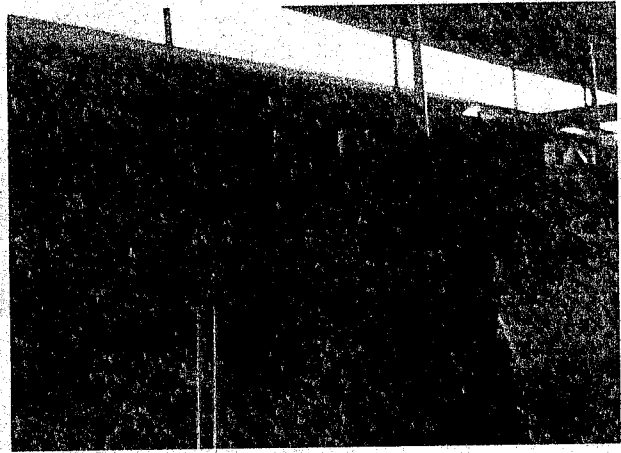


Plate 32: main circulation corridor

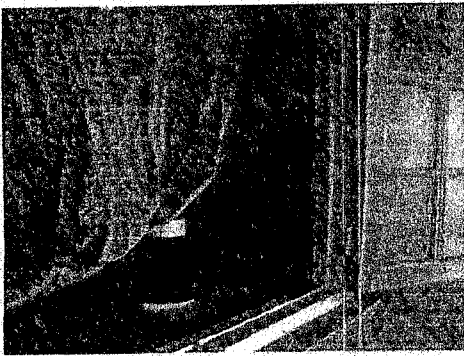


Plate 33: window of the post natal ward.



Plate 34: ward circulation corridor

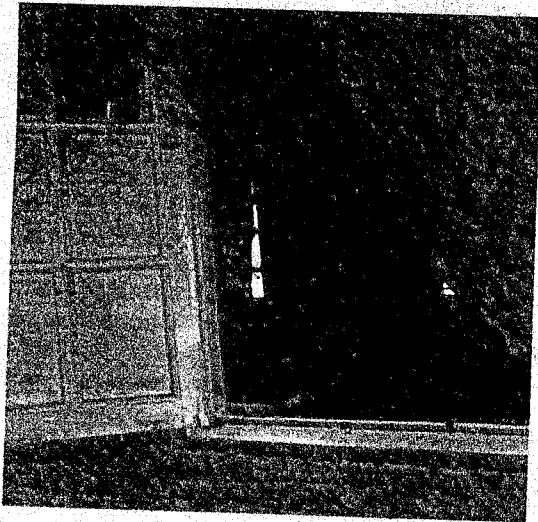


Plate 35: window of the post natal ward.



Plate 36: matron station of the post natal ward.

Below are sketch illustrations of the research findings during the time of survey by the author.

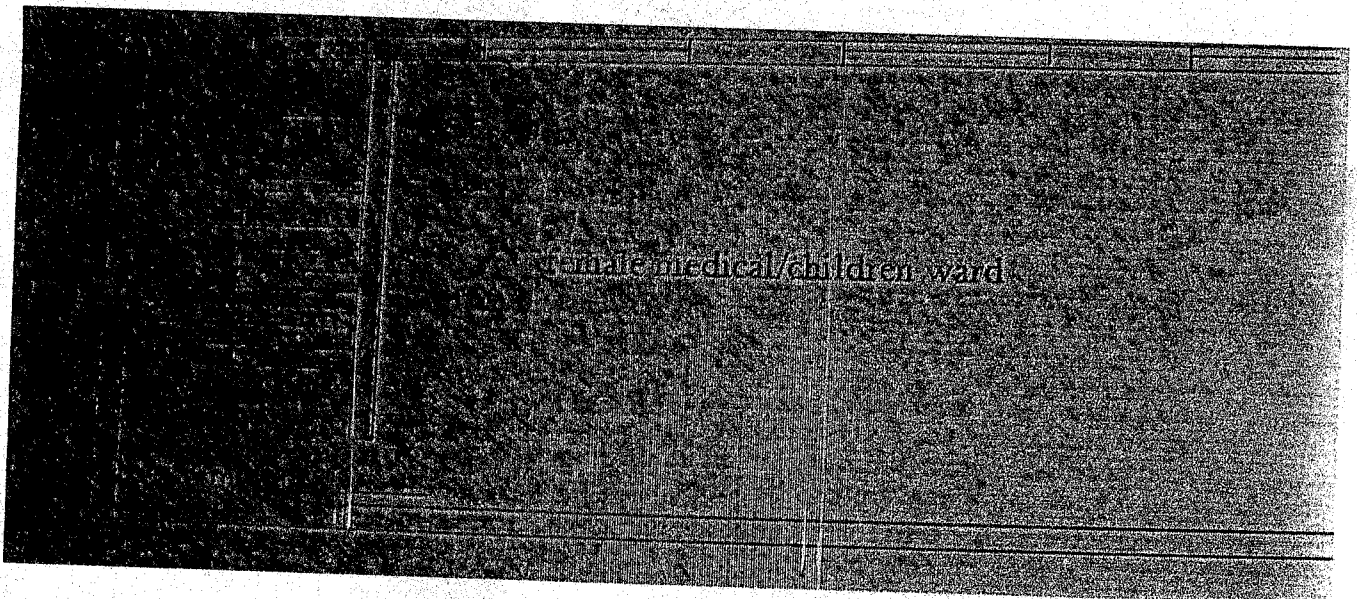


fig.24:staircase dimension of the children/female medical and surgical wards.

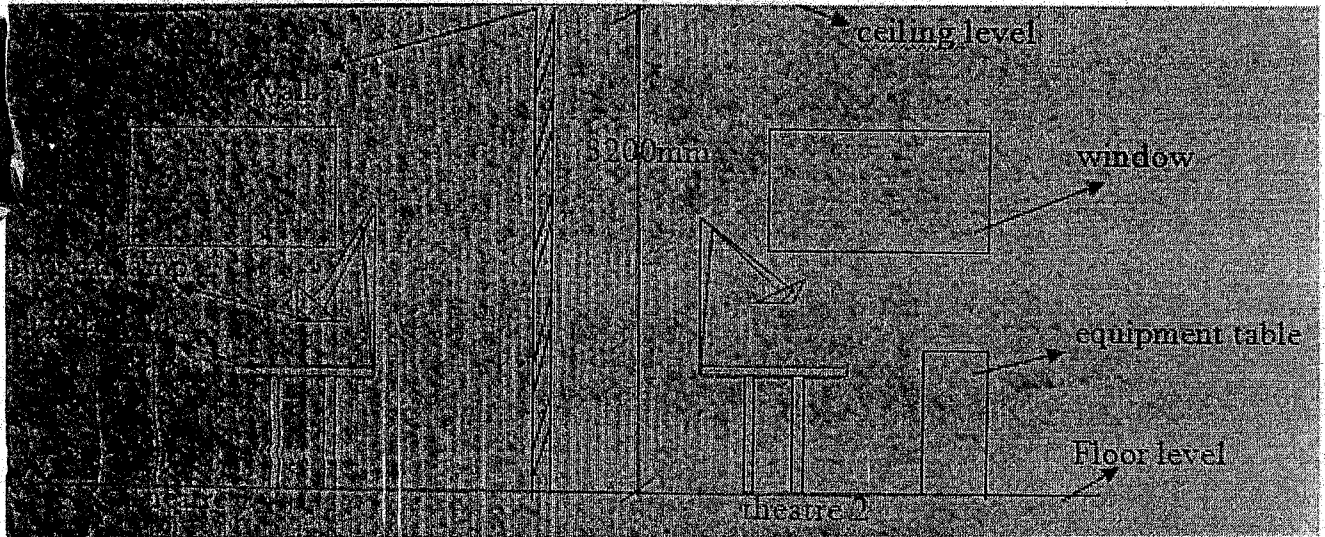


fig.25 ; height of the operating theatre.

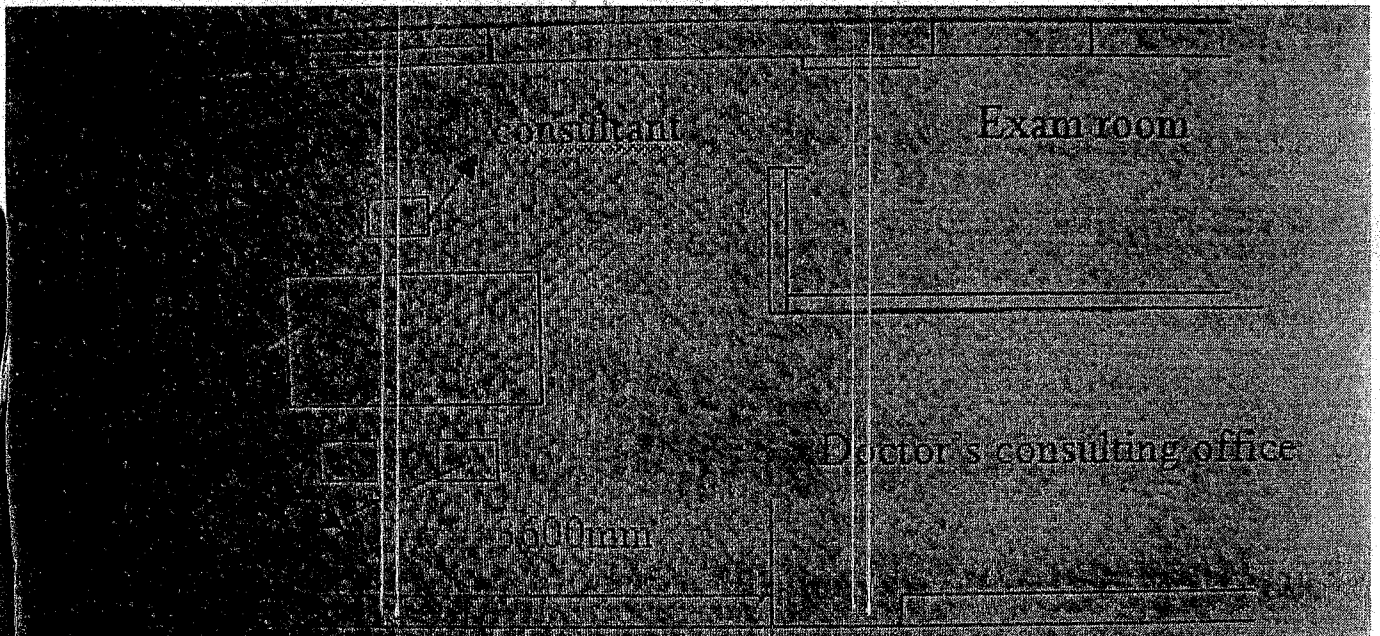


fig.26 ; Space for doctor's consultation in the emergency out patient department (floor plan)

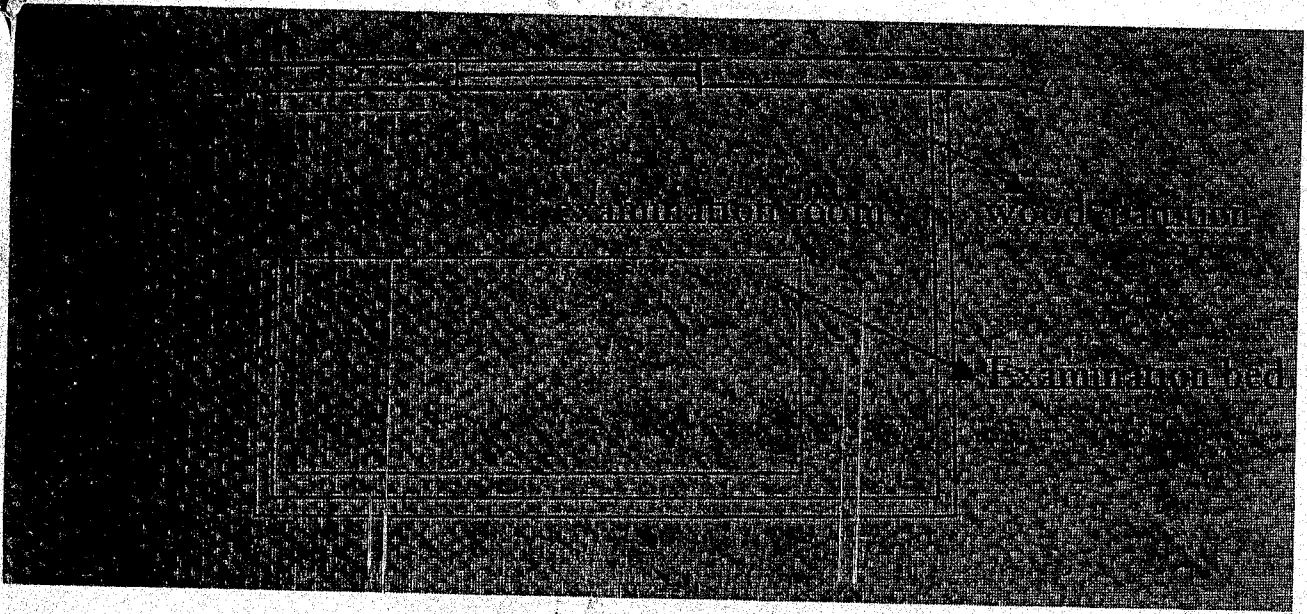


fig.27; Space for patient's examination in the emergency out patient department

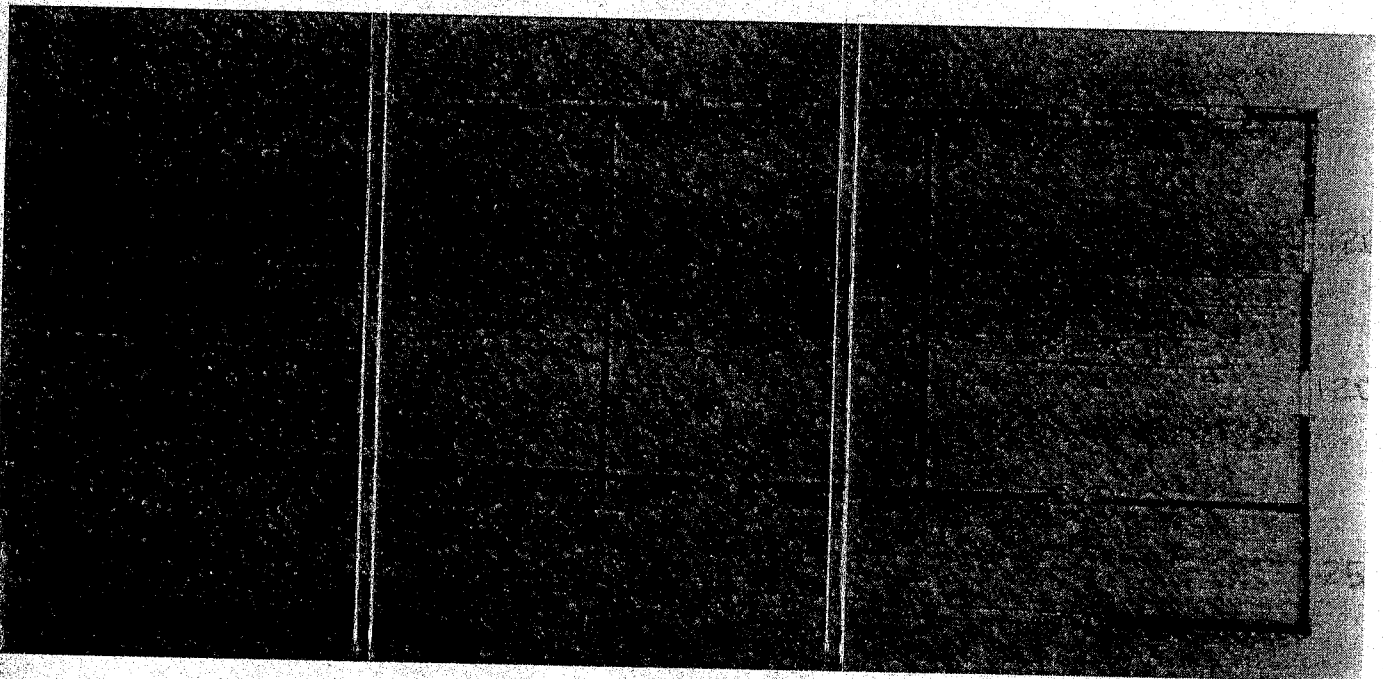


fig.28 floor plan of operating theatre

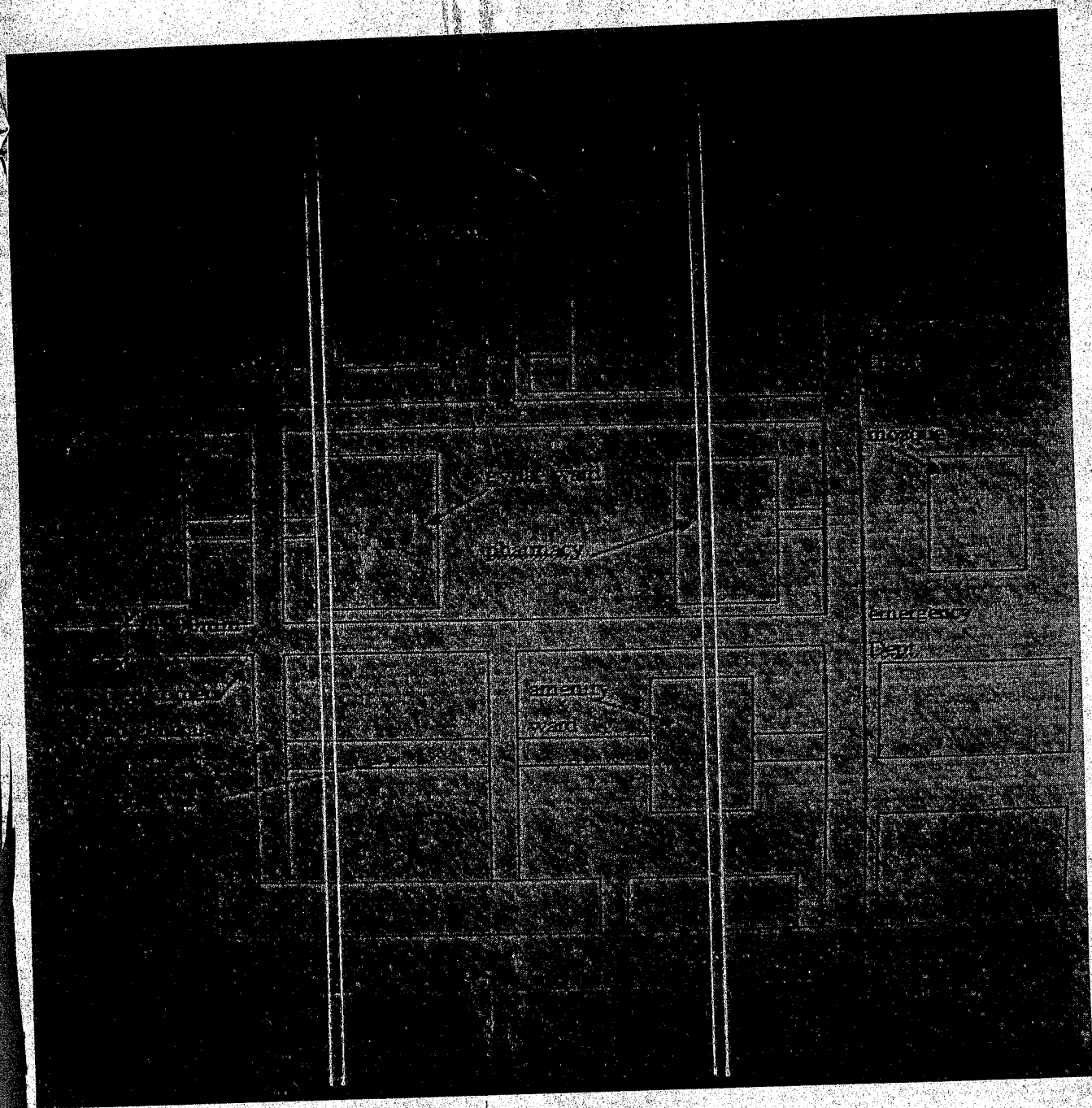


fig.29 ; site layout of some departments of the hospital

fig 24-29 ; sketch illustrations of case study findings.

3.3.3 CASE STUDY TWO ; DARA MEDICALS, ABUJA, F.C.T , NIGERIA.

The hospital(plate 41) is a privately owned and managed by the medical director "Dr Umana E.". it is located at no.6, ihiala street, area 2, Abuja of Nigeria. it provides and deals mainly with gynaecology and obstetric services. the facilities it provides includes antenatal, consultation ,treatment, reception/waiting, dispensary, laboratory and care services (fig.43), nursery/incubator, post natal, labour and female wards (fig.44), male, kitchen/dinning, eye and dental clinics exercising class, (fig.45).The following are observations noted during the case study visits to the hospital conducted by the researcher on the 7th of November, 2008 between the time of 2-4 p.m:

3.3.4 OBSERVATIONS

- i. Corridor, ramp and staircase widths are not up to the required specification.(fig 44)
- ii. The corridor also serves as a storage space for stretchers.(plate44)
- iii. The postnatal ward is too small to accommodate the number it is providing for. (fig44)
- iv. The post natal private suite is well linked to the labour room.(fig 44)
- v. The theatre has provisions made for scrub up, equipment sterilization and changing, and is easily accessed by the labour room.(fig 44)
- vi. The hospital also has fitness/exercising equipments for pregnant women(see plate.40 and fig.45)
- vii. Consulting area is not up to specified functional size to allow for consulting and examination.(fig.43)

Below are pictures and sketches carried out during the case study visit:

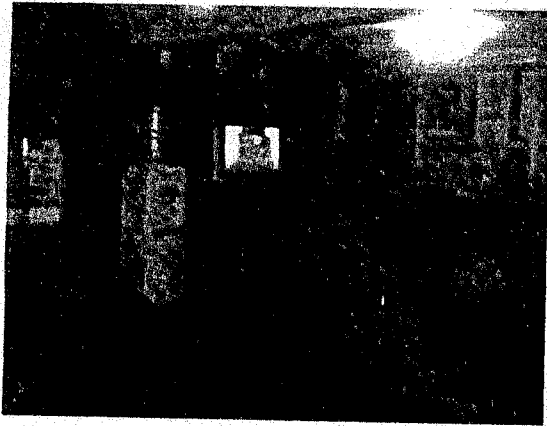


Plate 37:waiting/reception

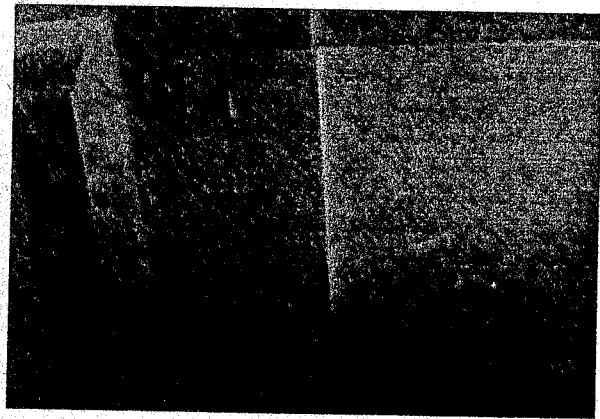


Plate 38:equipment sterilization unit of theatre

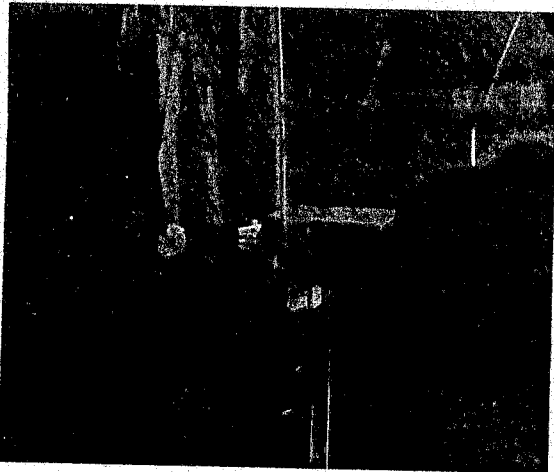


Plate 39:labour ward

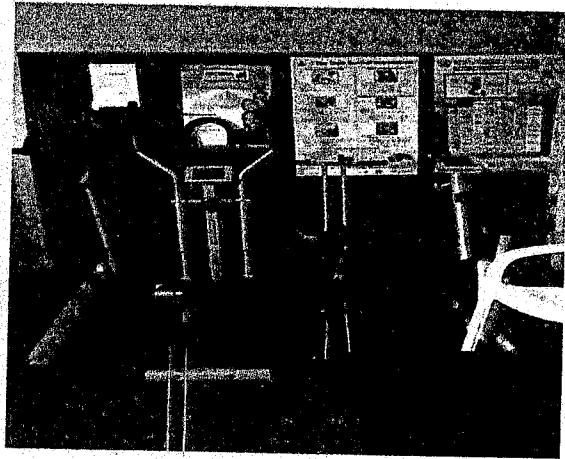


Plate 40:exercising unit

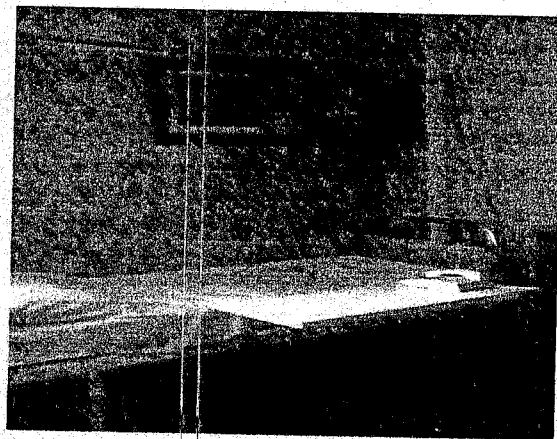
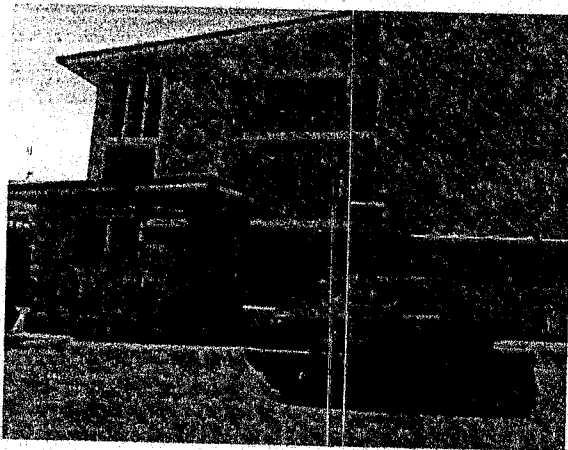


Plate 41: Approach façade of hospital

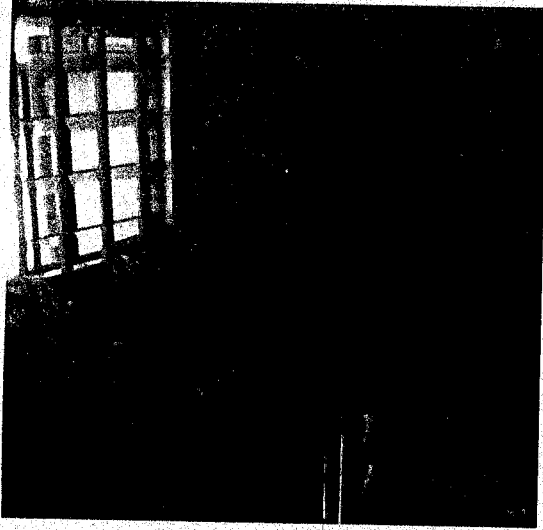


Plate 42: private ward

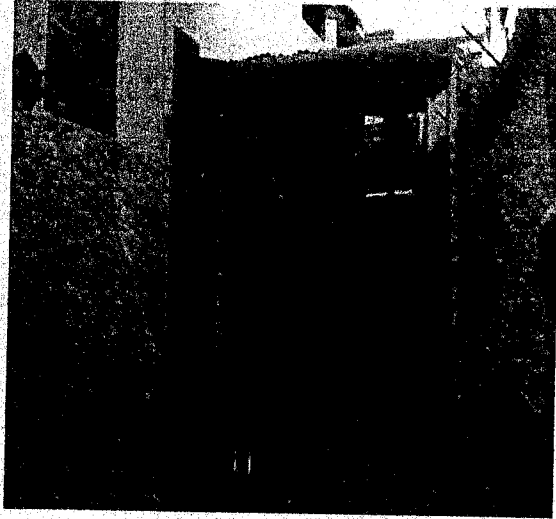


Plate 43: laboratory

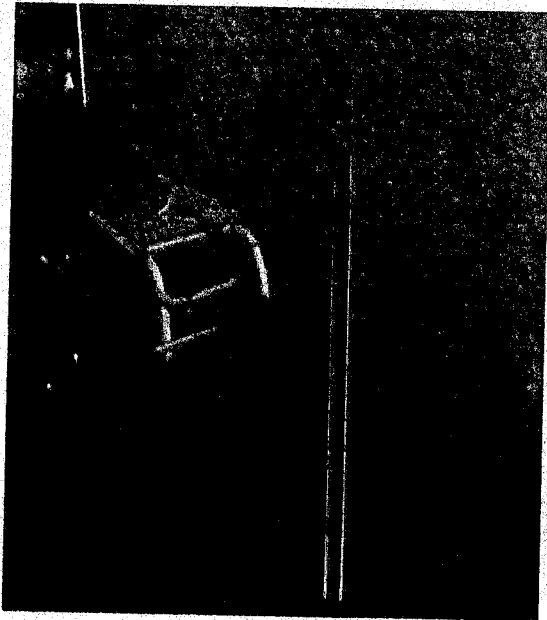


Plate 44: ramp/staircase



Plate 43: circulation corridor

Plate 44: operating theatre

Plate 37-44: present facilities.

Source: author's case study visit

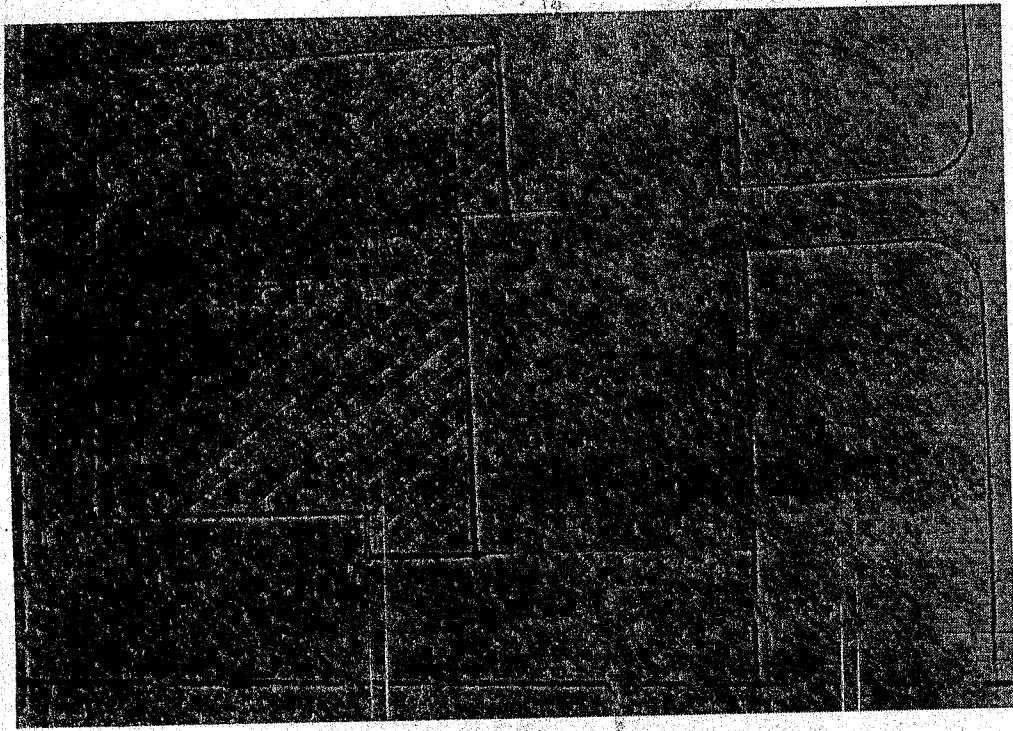


Fig.30:hospital site plan

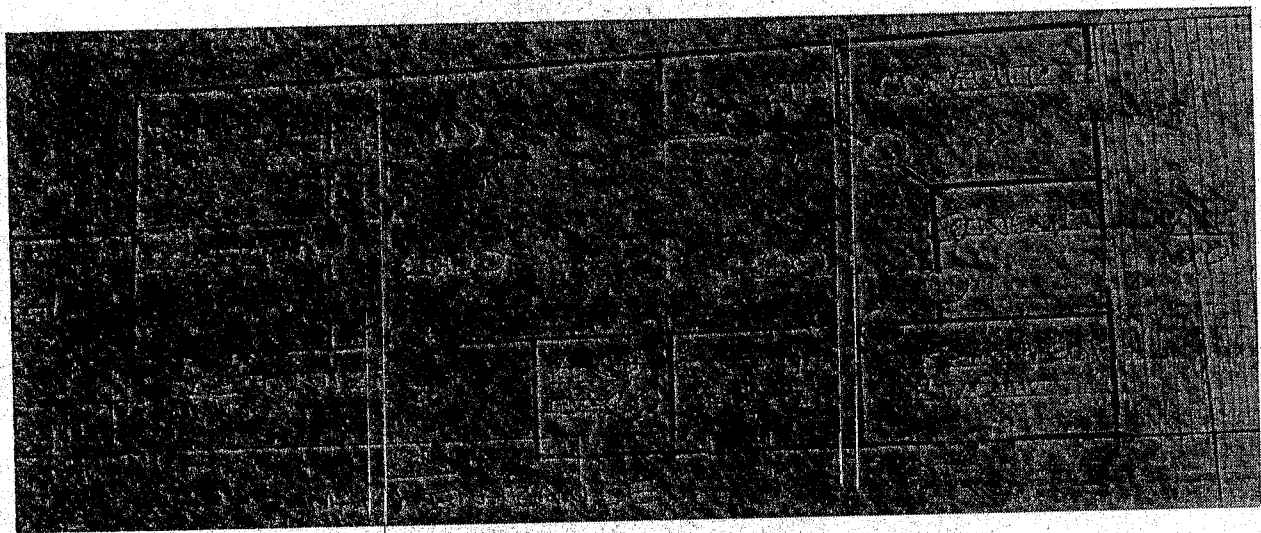


Fig.31: basement floor

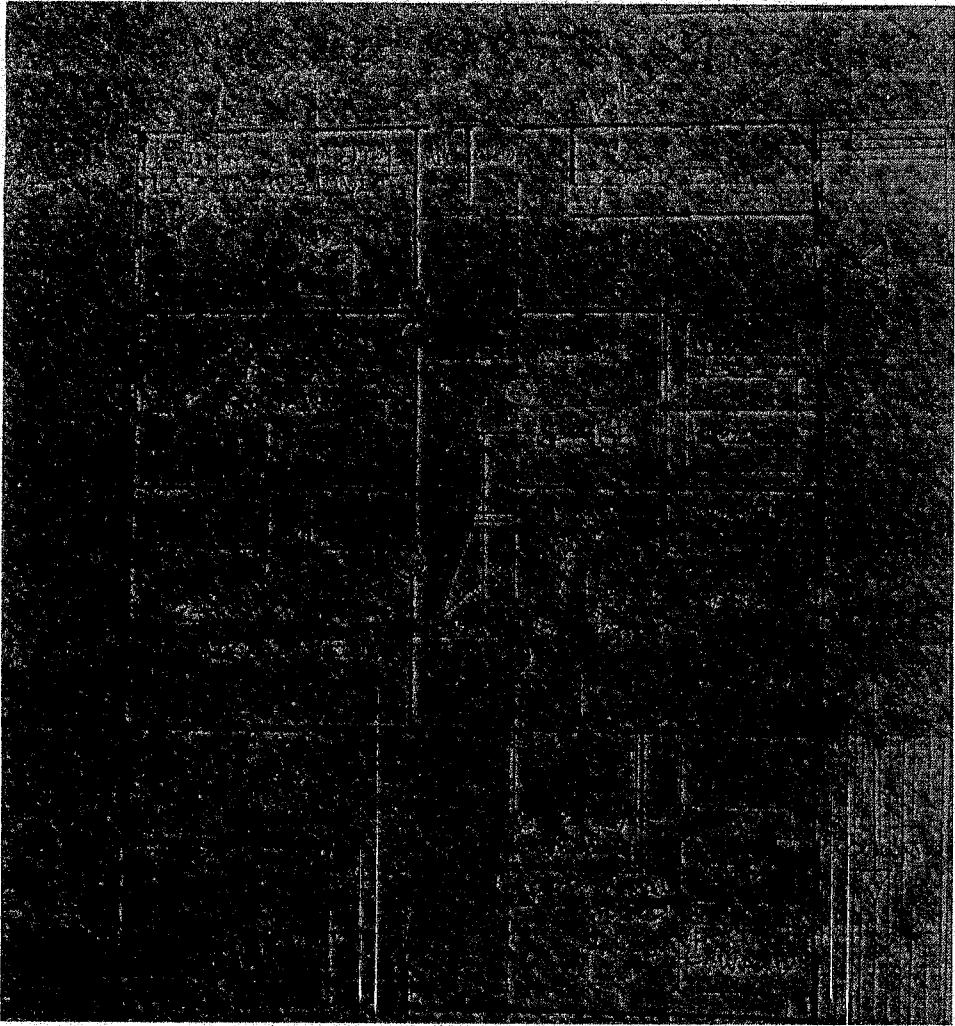


Fig 32:ground floor

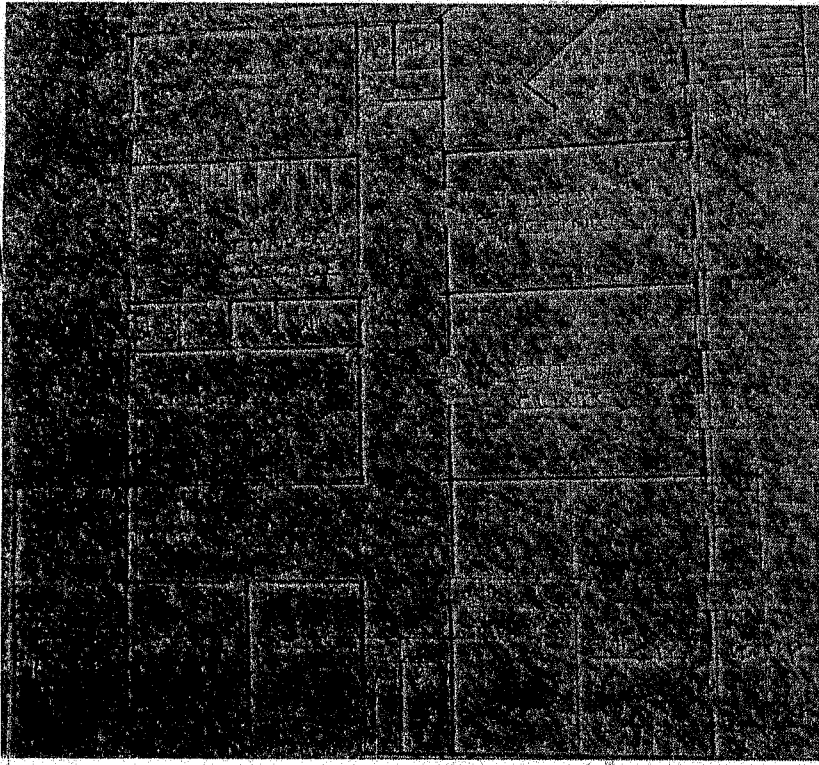


Fig.33: first floor plan.

3.3.5 CASE STUDY THREE; BAZZA-JASIM CLINIC AND MATERNITY, MINNA, NIGER STATE.

The hospital is located along the old airport road of Minna, Niger state as shown in fig.46 . It is a private, Islamic based, non-profitable/charity organization providing obstetric, gynaecological and general health services to the public. Some of its facilities includes the reception/waiting area, card room, dispensary, male and female 1-bed wards, mother and child 1-bed ward, labour room, operating room central sterilizing unit and 2 laboratories. The following are observations noted during the case study visits to the hospital conducted by the researcher on the 6th of November, 2008 between the time of 2-4 p.m:

3.3.6 OBSERVATIONS

- i. The clinic provides for a small number of patients at a time.
- ii. The corridor width does not meet up to the required minimum width for general access corridors as in fig.47.
- iii. The clinic has no provision at all for a nursing bay as shown in fig.47.
- iv. The doctor's consulting room meets up to the required minimum space for consultations and examination of patients and is illustrated in fig.47 .
- v. There is no provision for ramp as seen in plate 47.
- vi. The labour room is ensuite with its theatre and w/c facilities. But has no change room and equipment store (see fig.47)
- ii. The equipment sterilization is not directly linked to the operating theatre.(fig 47)
- ii. The hospital has provisions for borehole and generator plants.(fig.47)

Below are pictures and sketches carried out during the case study visit:



Plate 45: approach view of clinic.

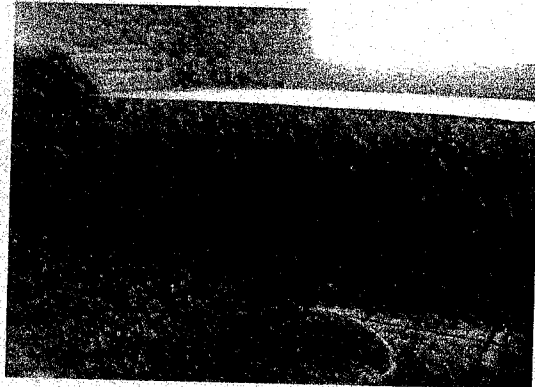


Plate 46: delivery suite.

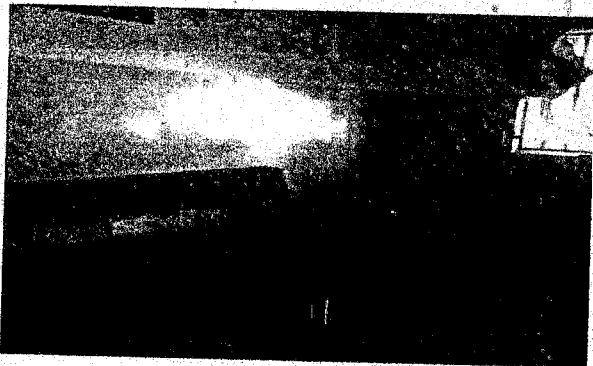


Plate 47: waiting room.

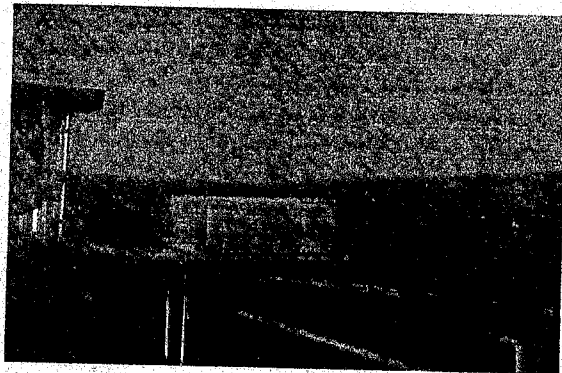


Plate 48: central sterilizing unit.

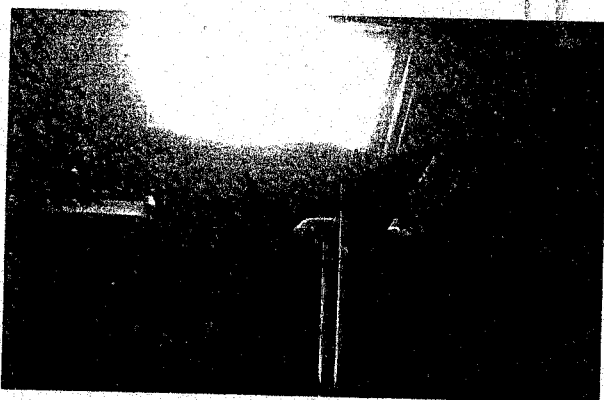
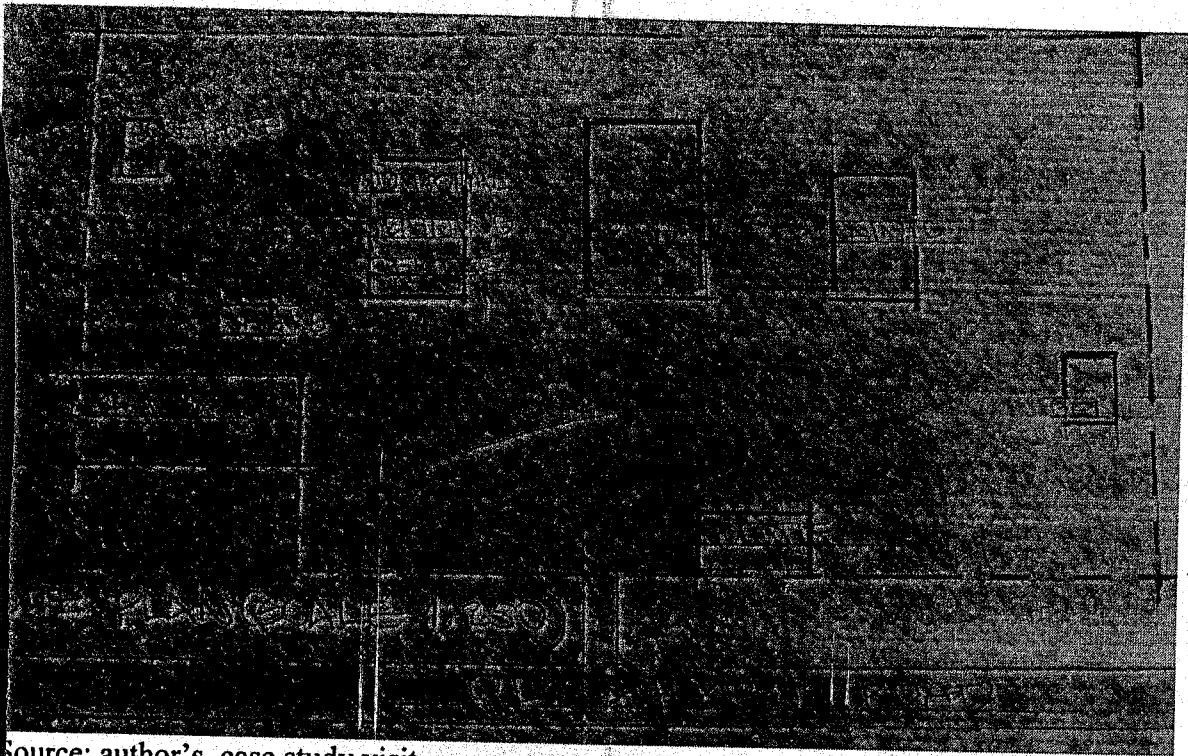


Plate 49: operating theatre/labour suite.



Plate 50: female ward

Plate 46-50: present facilities.



Source: author's case study visit

fig.34:site plan of the clinic.

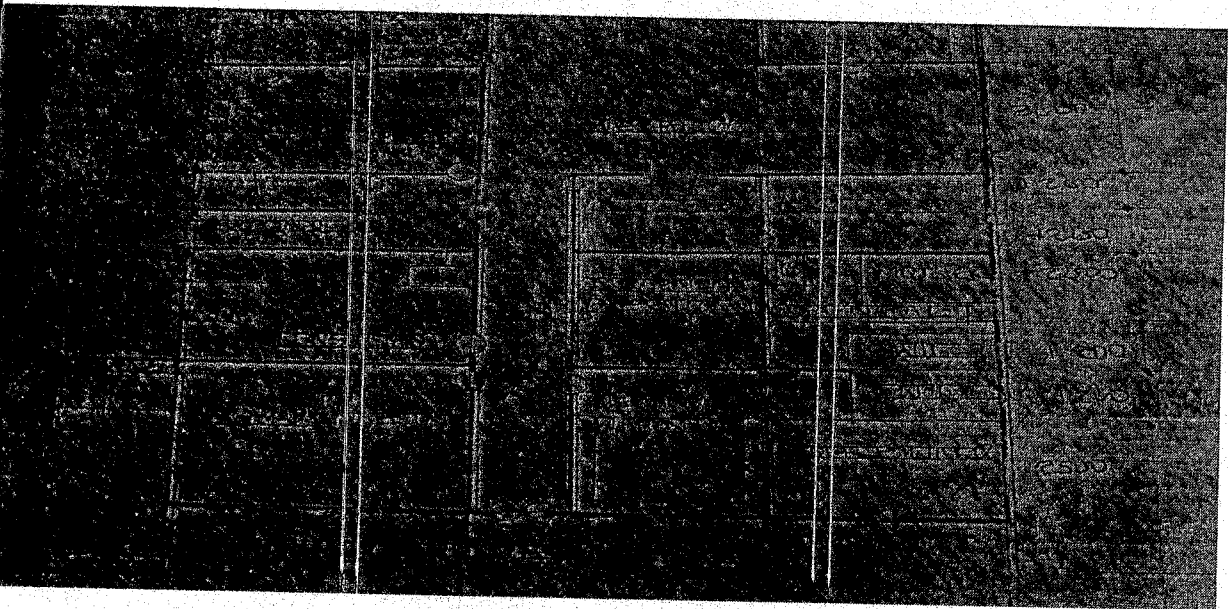


fig.35:floor plan of the clinic.

Source: author's case study visit.

3.3.7 CASE STUDY FOUR; DISTRICT GENERAL HOSPITAL, EASTBOURNE, ENGLAND.

The district general hospital, Eastbourne is a government owned hospital concerned with various aspects of medicine .it is a 100 bed hospital providing for 3000 deliveries per year. Some of the facilities it provides includes the maternity department, mother and children private rooms, labour suites(labour, delivery, recovery and post partum rooms),delivery rooms, postnatal wards, incubators, nurse stations and abnormal delivery rooms (plate 52-57).The following are observations noted by the researcher as regards the case study:

3.8 OBSERVATIONS

- i. The width of the circulation corridor is 4000mm which meets up to the minimum required width for hospital corridors as seen in fig.48
- ii. The hospital sees to the comfort of its users and its efficiency by planning and equipment provision for the exact amount of number it was designed for such as laundry services, catering services and conveniences for both staff and patient.(see fig.48 and 49).
- iii. The abnormal delivery theatre is not directly linked to the doctors and nurses scrub rooms, change room and equipment storage as shown in fig.49.

Below are pictures and sketches carried out as a case study visit:



Plate 51: main/emergency entrance of hospital at

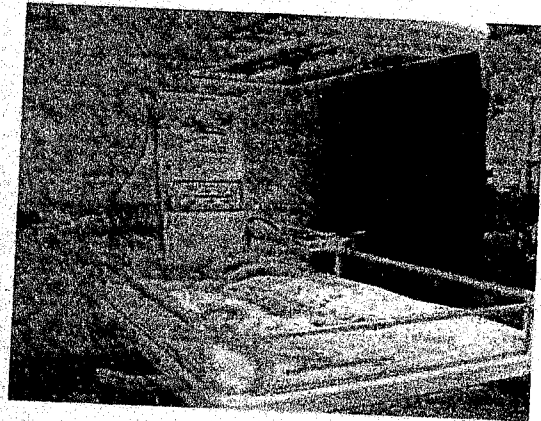


Plate 52:nursery



Plate 53: waiting lounge



Plate 54:labour room

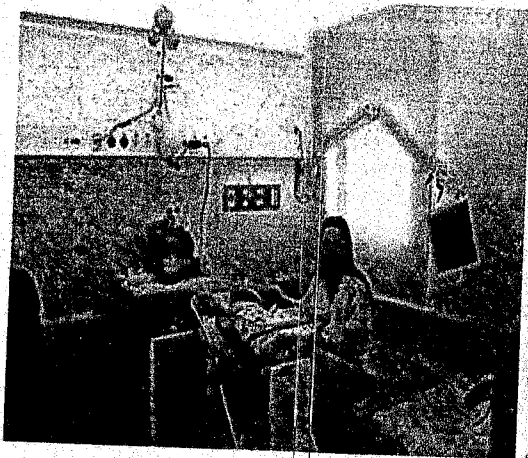


Plate 55: mother and child private suite

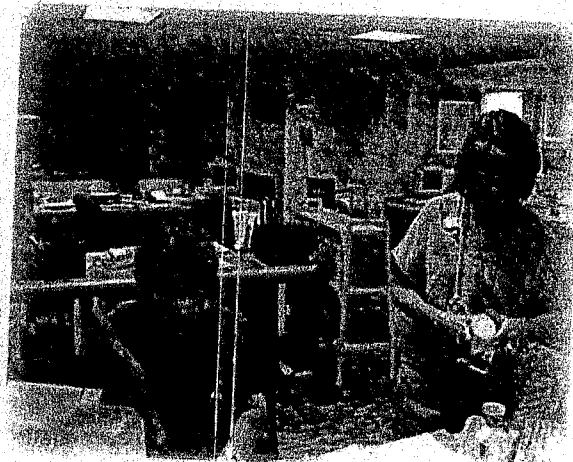


Plate 56: records/reception

Plate 51-54:some present facilities of the DGH, Eastbourne, England.

Source:www.eastbornedistrictgeneralhospital.com

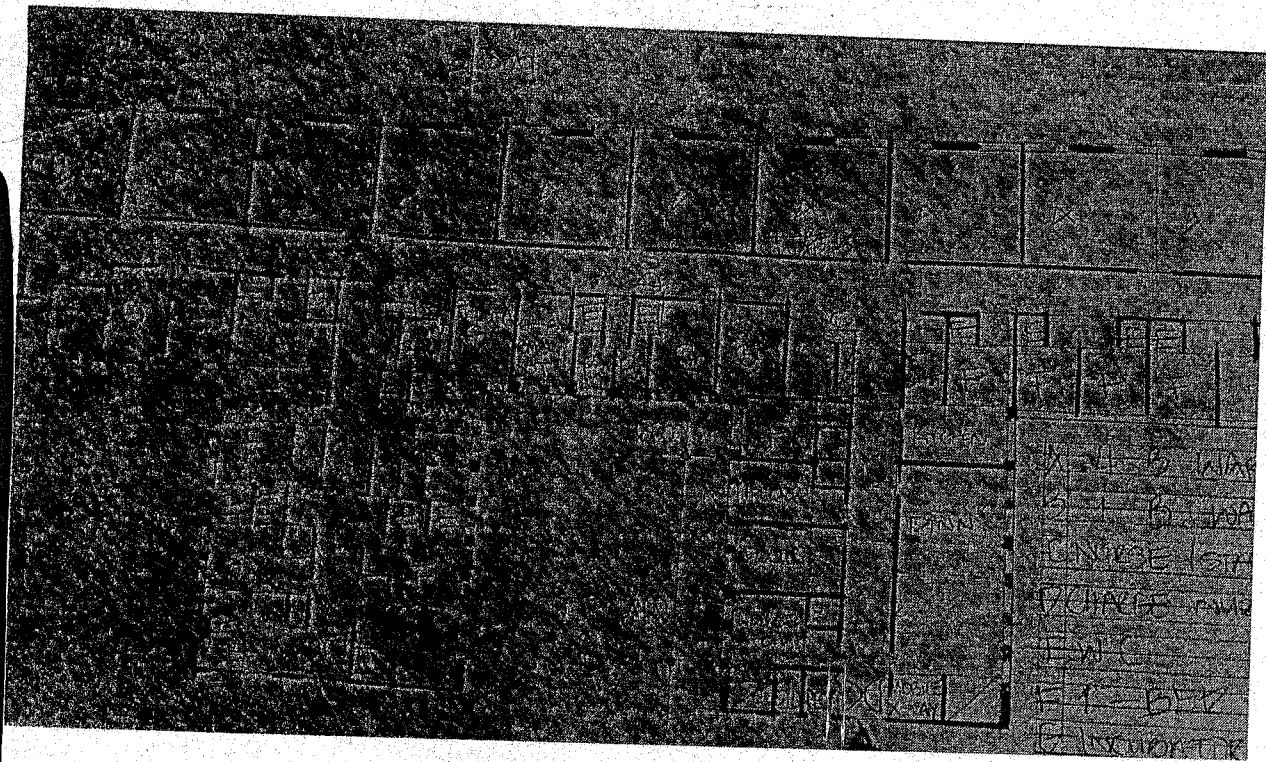


fig.36: floor plan of postnatal ward.

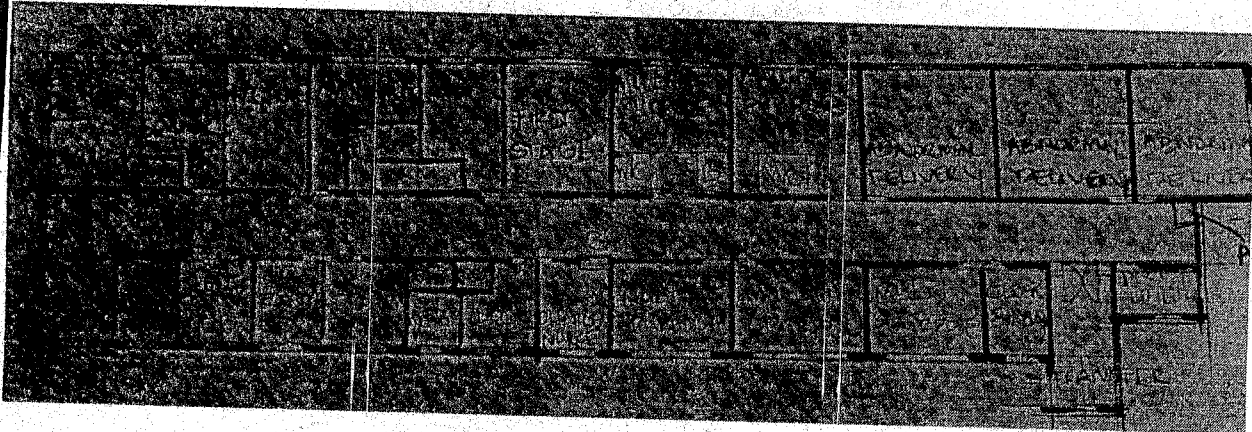


fig.37; floor plan of the maternity ward.

Fig 36-37 :case study sketches for DGH, Eastbourne, England.

source: Neufert architect's data.

3.3.9 K K WOMEN'S AND CHILDREN'S HOSPITAL, SINGAPORE.

K k women's and children's hospital, is located at the Bukit-Timah and kampong Java road junctions of the central business district of Singapore as shown in fig.50 . The facilities it provides include gynecology, pediatric and obstetric waiting hall, consultancy and convenient facilities.(plate).

The following are observations noted by the researcher as regards the case study:

3.3.10 OBSERVATIONS

- i. The hospital 's ergonomic circulation services includes 10 lifts,2 escalators,2 stair cases, conveniences, telephone ,and ATM services, n as shown in fig 51.
- ii. The children area is separated from the women section.
- iii. Some parts of the corridors are dark without natural day lighting.
- iv. The sizes of the corridors are not within the minimum corridor width for hospitals as can be seen in fig.51.
- v. The hospital adapted a very interesting interior and exterior environment to suite its users and staff.

Below are pictures and sketches carried out as a case study:

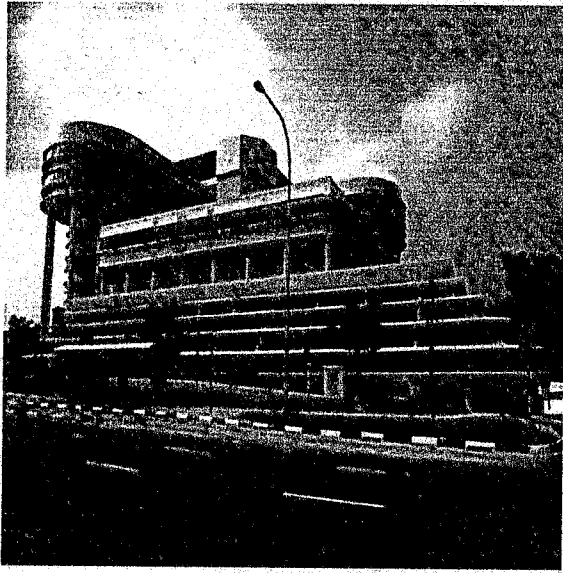


Plate 57: approach view of the hospital



Plate 58: reception hall

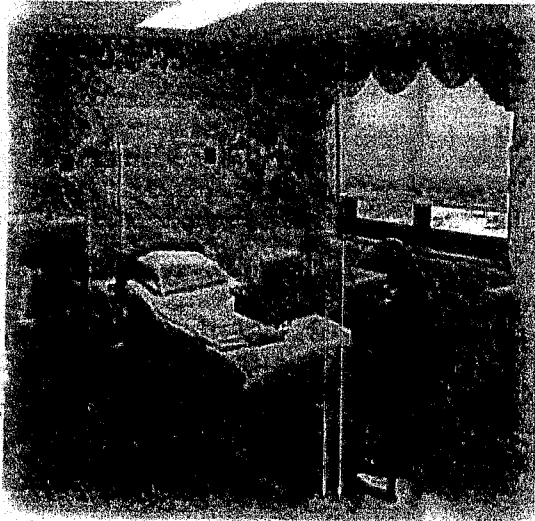


Plate 59: mother and child private suite



Plate 60: nursery

Plate 55-58: some present facilities of the k k women's and children's hospital, Singapore.

Source: K. H. Tan & S. M. Chern (2003)

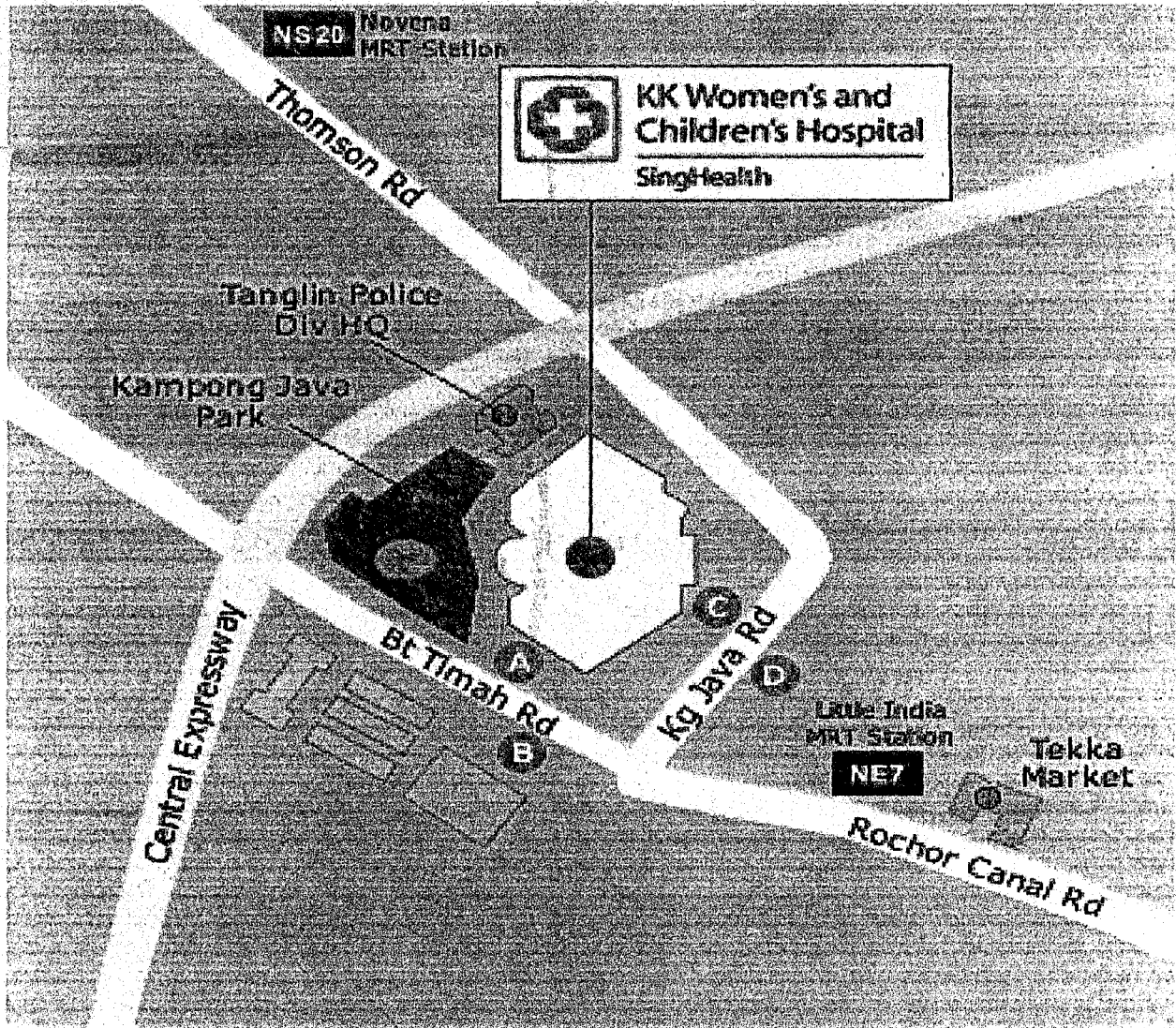


Fig.38: Site location map of the k k women's and children's hospital, Singapore.

Source: K. H. Tan& S. M. Chern(2003)



KK Women's and Children's Hospital

SingHealth

Level 1 Floor Plan

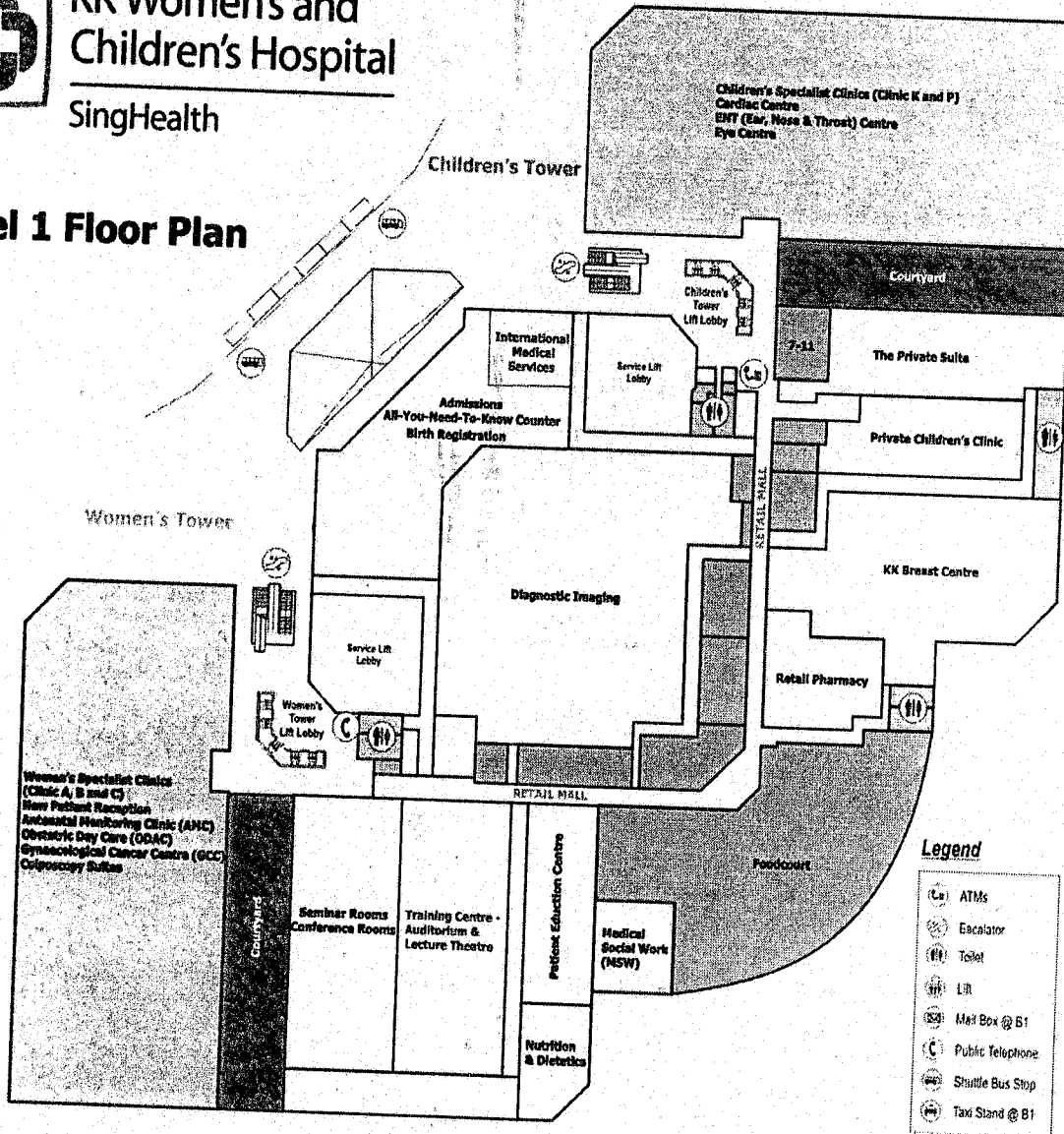


Fig.39: ground floor plan of the k k women's and children's hospital, Singapore.

Source: K. H. Tan & S. M. Chern (2003)

3.11 DEDUCTIONS
From the above stated case studies it can be said that the Nigerian case studies (general hospital, Minna, Dara medicals, Abuja and Bazza jassim clinic, Minna) don't make use of

ergonomic standards in most cases while the other vase studies(k k women's and children's hospital, Singapore and DGH, Eastbourne, England.)take the ergonomic considerations more seriously. therefore, these will be put into consideration in the proposed women and children hospital, minna.

3.4 DATA COLLECTION AND ANALYSIS

3.4.1 POPULATION

The population of the state in 1963 was 1,194,508. With the release of the 1991 population figure by the Federal Government; Niger state has a provisional figure of two million, four hundred and twenty-one thousand, five hundred and eighty-one people (2,421,581). The steady growth of the Federal Capital Abuja is also influencing the factor in the increasing population of the State in its position as a satellite territory.

3.4.2 LAND AREA

Niger state covers a land area of 76,000 sq. km ,covering 8% of the total land area of the country, 65% of the land is arable which represent about six million hectares of land.

3.4.3 CLIMATIC CONDITION

RAINFALL

minna has annual rainfall of 1334mm taken from an exceptionally long record of 54 years. The mean annual rainfall is 1334mm(52 inches) with September recording the highest rains of 200mm(11.7 inches).The rainy season starts on average between 11th and 20th April and lasts between 190-200 days of the year. The rainy season is characterized at the starts by windstorm

and slight drizzles, which terminates by May ending. By mid October, the windstorm returns again. The implication here architecturally means having a site and durable structure or building that can overcome the rainfall effect. Windscreen bracing and parapets would be used to protect the building from storms.

TEMPERATURE

The mean monthly temperature is highest in March at 30.5°C (85°F) and the lowest in August at 22.30°C (72°F). The town experience very hot and comfortable weather between late Februarys to early April. The temperatures falls during the rainy season due to cover, increased vegetation, thereby causing cooling effect. Temperature variation dealt with architecturally by means of natural cross ventilation and artificial ventilation. Landscaping elements apart from aesthetics function were also used to achieve temperature balance.

HUMIDITY

The State records a relative humidity of some 20 per cent in the dry season in the more northern locations and about 30 in the extreme south. During the rainy season the afternoon relative humidity rises everywhere to about 50 per cent. Human Comfort ability therefore is thus best achieved in the Gwagwa zone where the Niger State is being built since this high relative humidity gives other areas a heat trap effect.

VEGETATION

The main vegetation of the Minna, Niger State is guinea savanna. Few other areas in the state however can be classified as woodland savanna and park and shrub savanna. These synthesis are

a reflection of the true transitional nature between the southern forest and the northern grass land condition.

WIND

Minna town is characterized by two air masses. The tropical maritime and the tropical continental air masses. The tropical maritime dominates over the Atlantic ocean to the south of the country there by making it moist and warm. It flows inland from the south west to the North West. The changes in seasonal weather condition are attributed to the two air masses. The tropical maritime brings about wet season and is termed the south west trade wind. The tropical continental is associated with dry season and is termed North West trade wind which brings about harmattan. The duration and intensity of each wind over area is a function of the interface between the two air masses. Orientation of building and use of landscaping tree are used as screens against the wind. This however is determined in the type, size, position of windows and also the roofing materials.

GEOLOGY AND TOPOGRAPHY

Minna is underlined by undifferentiated basement of mainly gneiss and magmatites. The igneous rock is mainly granite while the metamorphic sediment is made up of quartzite and schist. Igneous rock is mostly common in the north-eastern part of the town, which has limited urban development in this area. The metamorphic sediments are found around rivers and streams areas these factors of geology are necessary for foundation design of structures and landscaping.

3.4.4 SOCIO-CULTURAL LIFE

ETHNIC GROUPING

Major ethnic groups in the state include nupe, gwari and hausa. Others tribe in the state are kadara, koro, baruba, Fulani, gana-gana, dibo, kambari, kamuku, pangu, dukkawa, gade and ingwi belongs to the minority group in the state. Tribes from other states of Nigeria also settle in the state.

RELIGION

The state consists of Christians and Muslims with very few traditionalists.

OCCUPATION

The main occupation of the indigenes of Minna is farming. It is a predominant occupation which occurs through out the year with a cultivation of different crops by the people. Since the colonial era Minna has become a cosmopolitan city with most of the residents engaging in white cola jobs. As a state capital, majority of its inhabitants are civil servants.

ECONOMY AND COMMERCE

Niger states having one of the lowest population densities, the land represent the main asset of the state. Very little is realized by way of internal revenue although provisions are been made to change the situation of things presently.

Quite a number of industries are in small scale consisting mainly traditional craft work, food processing repair and service workshop. Most people in the state depend on agriculture as a means of livelihood but the farmers are small and mode of cultivation is manual, which makes

the work laborious. There has recently been concerted effort by the government to assist the local farmers by providing input at standard rate and loan with low interest rate there are only a few known deposits of mineral resources in commercial quantities. It is hoped that the clay around Abuja and Bida, the sand and silica around Bida, and the marbles in Kwakuti will be in the nearest future exploited and provide a base for the development of ceramics, glass and terrazzo tile industries.

The major commercial areas within Minna town are central, gwari, and gwadabe market.

3.4.5 DEMOGRAPHIC DATA

Like every other city in Nigeria, Minna is growing in population at a fast demographic survey carried out by the united agencies (1988) and national population commission (1986) have shown that there has been increase in the mortality rate estimated based on 1962 population census.

The 1992 census figure shows that the Niger state has a population of 1,194,508. And the annual growth rate of 5% for local government headquarters and 2.5% for other towns and villages. The population density as at 1963 was estimated at 16 persons per square kilometers. With the resent growth in population, this figure was nearly double in 1995 with an average density of 31 persons per kilometer.

The 1995 figure shows that Niger state population has increased to 2,239,225 which are about 92% increase against the v1963 figure.

3.4.6 TRANSPORTATION AND TRAFFIC FLOW

Minna is characterized by widely dispersed major road that runs from Chanchaga in the south being referred to as Piako road, to Maikukele in the North, and known as Bosso road. It covers a distance of approximately 16 kilometers.

It is divided into by railway line running east to west separate the Tudun Wada and Tunga Housing area from Bosso in the north. The railway line creates a traffic conflict between the train and the motor vehicles, which is solved by the provision of level crossing. There are three level crossings in the town ; one at the town center (Mobil), the second in Maitumbi across Kuta road and the third in Kpakungu close to the Muslim cemetery.

Initially the roads in Minna suffered a slow pace of development, which may be due to lack of high demand for the use of roads in the town. But after the change from a divisional headquarters to a state capital in 1976, more people were attracted into the town and the demand for road usage gradually increased leading to a massive township renewal programme.

There is one major road, which runs across the town from Bosso to Chanchaga via city centre known as Mobil. Other minor routes that branch off from Bosso road include Keterin Gwari road, Sabon Gari/Kuta road, Airport road and the western and Eastern bye-passes.

Presently the town is not facing congestion. Great percentage of the traffic flow is along Bosso road, which is a dual carriageway.

There are however some problems that are worth mentioning. One of such is in the market area where the one way road divides the market into two parts thereby creating much traffic hold ups. The amount of parking along this road reduces its performance below the practice capacities.

Another problem is in the part of the road where the primary and secondary schools are located. The conflict observed between pedestrian school children and motor vehicles is dangerous despite the overhead bridges that are within this area.

The major means of public transportation in the state are the motor taxis which navigate only along the bosso-maikunkele road and okada road-mobil roads. Other means of transport is the bike means of transport also known as the "okada" transport and is the sole means of transport of the state. Presently, there are also the new "Niger state metro bus service" which is an initiative of the present government, under the administration of the chief servant of the state ;Dr. Mu'azu Babangida Aliyu, which runs goes around almost all the corners of the state.

3.4.7 EXISTING LAND USE AND FUTURE TRENDS

HOUSING

The major housing areas in Minna are:-

G.R.A Bosso Housing Estate, Bosso Low-cost, Tudun Wada, Sabon Gari, Mitunbi, Dutsen Kura, Bosso, Kateren Gwari, Tunga, Chanchaga, Old Airport. Every of these area are easily accessible due to the good roads available.

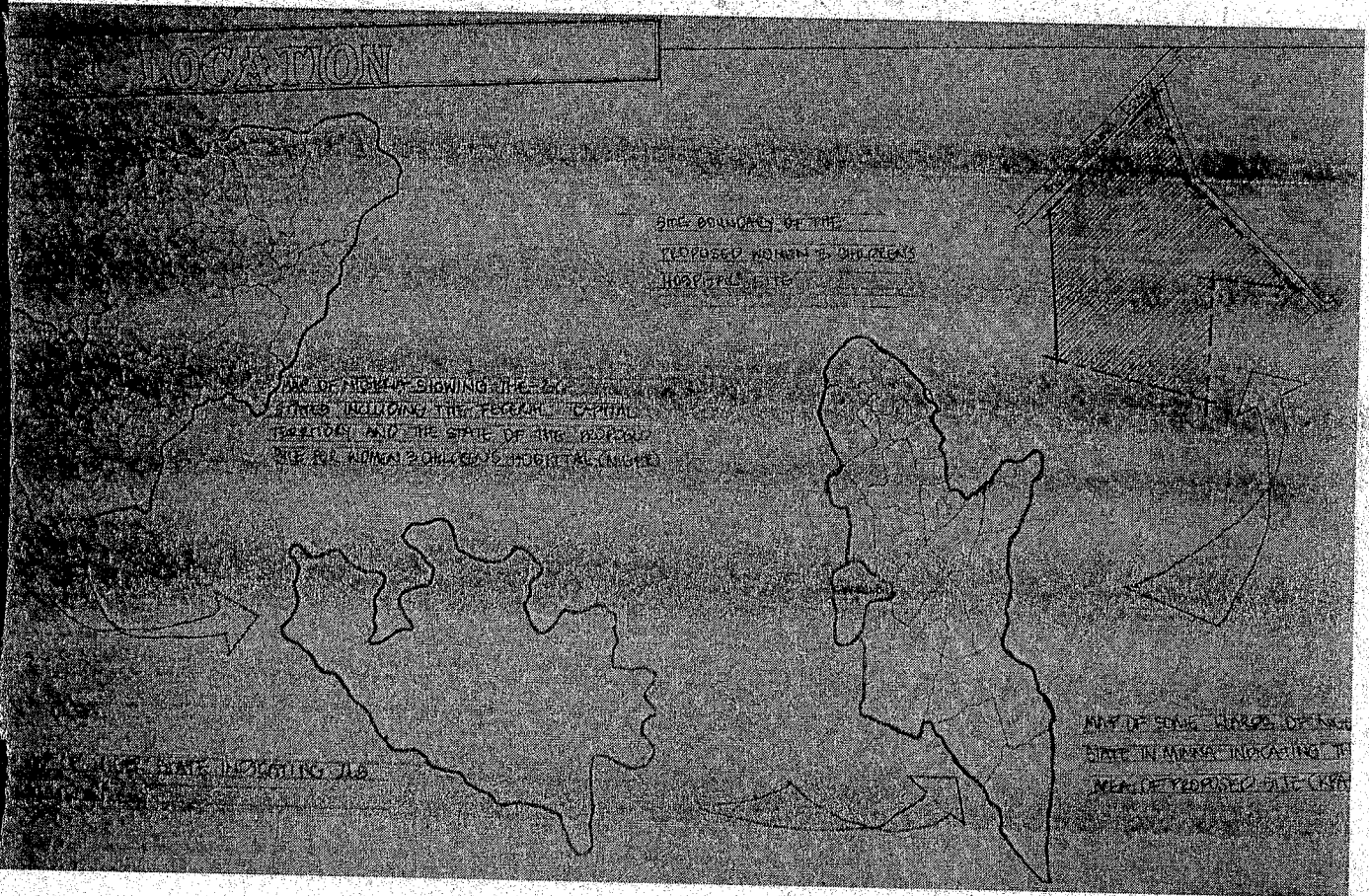
Housing condition within the town has greatly improved by the effect of both government and private developers.

Sources: ministry of lands, ministry of information 2008, Niger state background information 2003.

4.8 SITE ANALYSIS

LOCATION OF SITE

The proposed selected site is located along the Minna – Bida major road almost opposite the ongoing NECO headquarters building in Minna, Niger State. It falls within “Kpakungu” and “Gidan Mangoro” village of Minna as shown in fig .52.



40; site's state location map.

ce:Niger state ministry of lands/author's field work

SITE INVENTORY

The proposed site is blessed with a relatively flat, average sloped ground surface. It is covered with tall grasses, scattered trees and shrubs. The site is bounded on its northeast by the Minna – Bida road with the on-going NECO headquarters building on the other side of the road, it is bounded on the north east by a block industry and little hut settlement, on all other sides are bare lands and spaces. an inventory of the site is shown in fig. 53 and plates 62 and 63 below.

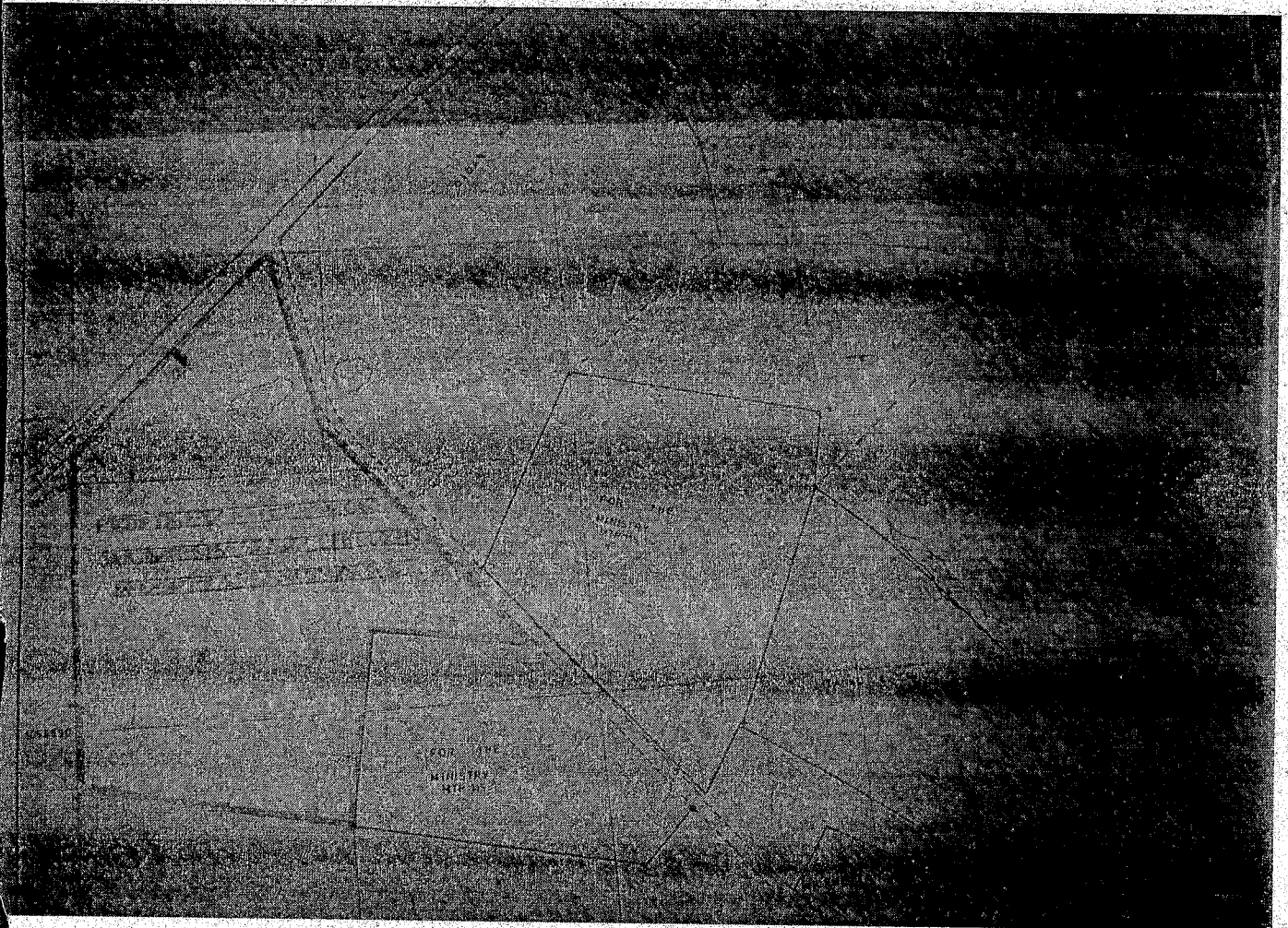


Fig. 53: site inventory sketch.

Source: Niger state ministry of lands and survey.

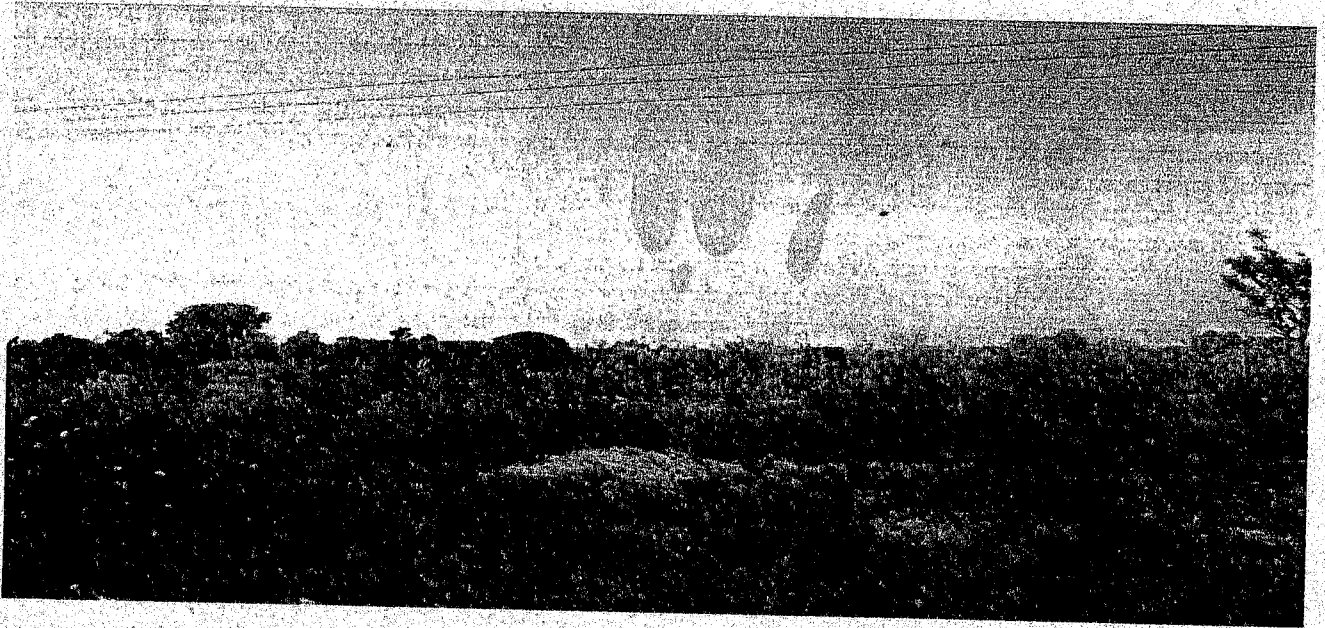


Plate 61: A view of the site.

Source: author's field work.



Plate 62: A view of the site with the minna-bida road and NECO headquarters background.

Source: author's field work.

ACCESS AND CIRCULATION

The proposed site can be accessed along its proposed access road on its north east axis. It is also accessible from the major highway (that is Minna-Bida road) by its north east axis as seen in figure 53.

UTILITIES

The only utility available on site are the electric poles/cables leading to Maizube Farms which was tapped directly from the Shiroro hydro power station of which the Gidan Kwano campus of F.U.T Minna, Gidan Kwano village, Gidan Mangoro village, NECO Headquarters, civil servants quarters, are also benefiting from.

SCENERY/MANMADE FEATURES

The site does not possess any special natural feature except the terrain, trees, grasses and shrubs.

The man made features include the border of the adjacent site which shares a common fence with the site. Other features include the utility electric poles/cables along the h

CHAPTER FOUR

DESIGN REPORT

4.1 DESIGN BRIEF

The design brief is a short explanatory description of the proposed design. The proposal is made to the Niger state government as a response to the need for a women and children hospital as part of the millennium development goals of the state in order to solve/reduce the threats posed on child and maternal health as reported by their mortality death rates. The proposed facility shall be situated in Minna, the state's capital. It shall make provision of the following for the institution;

- I. Out patient's /emergency and consultation units.
- II. Diagnostic units
- III. Wards for in patients
- IV. Surgical and delivery units.
- V. conveniences
- VI. Maintenance units
- VII. Mortuary.
- VIII. Generator house.

4.2 SPACE REQUIREMENTS

The units needed in the design of the hospital are its spacial requirements. These were achieved by taking into consideration, the functions of the hospital, its supposed activities, anthropometrical factors such as area required by a hospital bed, a person, human reach positions, hospital capacity, clearances and allowances. The human factor / Ergonomics which anthropometrics comes from are the main consideration applied to the hospital design in order to come up with its spacial requirement. Other factors considered are the function of each space, its frequency of usage and its user. Below is a table of some spaces and their floor areas:

Table 4: Space requirement of the hospital units

Spaces	Floor area (m²)
Waiting rooms	1400
Consultant offices	650
Laboratories	500
Scanning units	400
Pharmacy	100
Administrative offices	1000
Corridors	3150
Conveniences	1600
Lecture rooms	200
Ante-natal gym	120
Treatment rooms	200
Children's play units	170
Staircases	224
Ramps	350
Care wards	3000
Delivery units	1000
Operating units	150
Operating theatres	1500
Laundry area	400
Maintenance area	400

Source: Author's proposed design drawings

4.3 PLANNING PRINCIPLES/CONSIDERATIONS

The planning principles/consideration of this research work is based solely on the ergonomic hospital planning principles as earlier discussed other things considered as follows:

- i) The availability of Land space that will suite the proposal conveniently.
- ii) Land use/Recommendation of the concerned government /authority (Ministry of Lands).
- iii) Ease of Accessibility (its location on major highway Bida – Minna and in case of emergencies).
- iv) Location of the site and its neighboring facilities.
- v) Sources of water supply

4.4 DESIGN CONCEPT

The conceptual development of the design (proposed women & children' hospital Minna) is derived from the outline/shape of a nurse's face dressed in a nursing cap. This facial outline is in developmental stages as demonstrated in fig. 54.

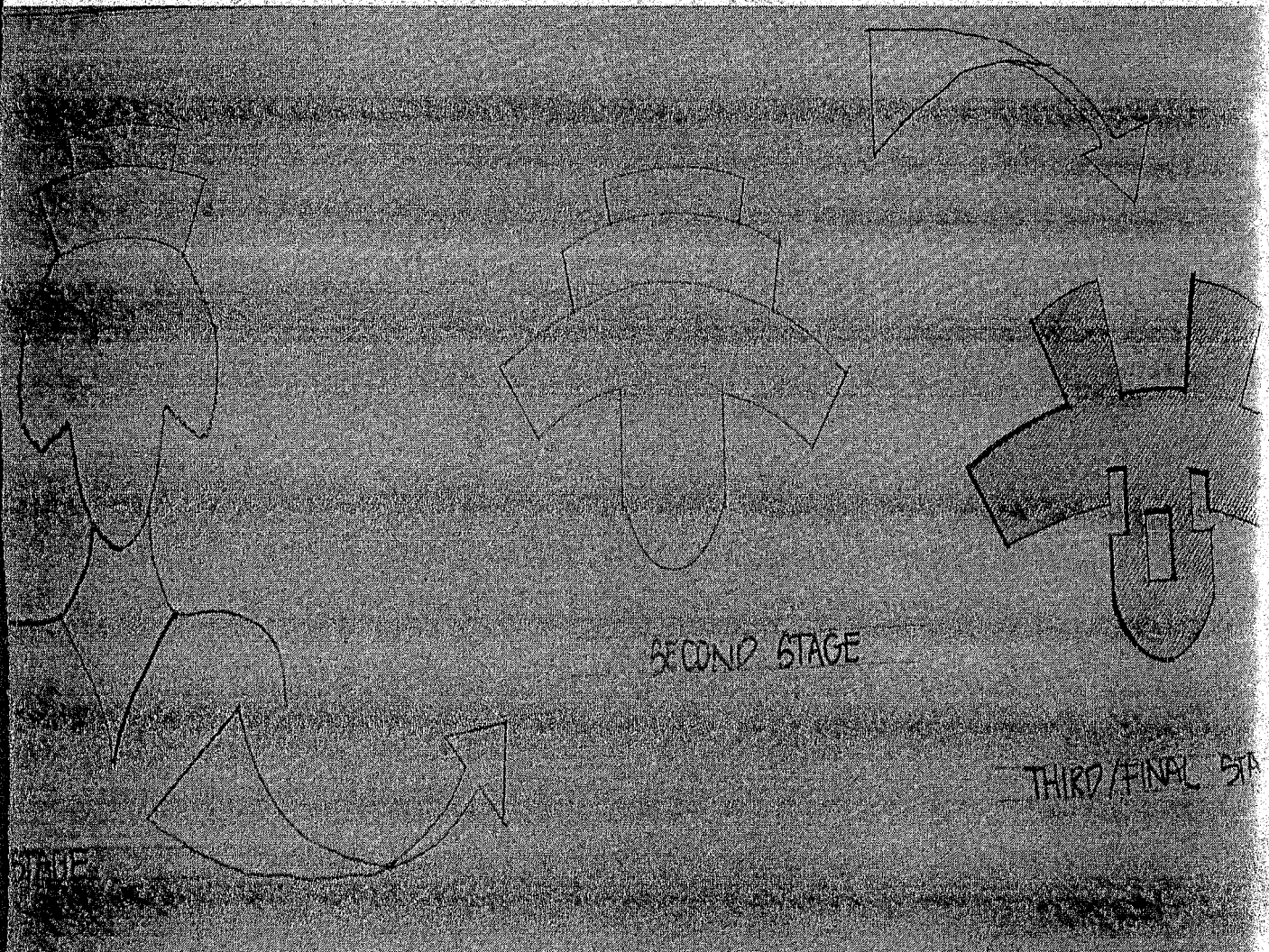


Fig.42; conceptual development.

Source; author's proposed design drawings.

The concept of the design is the analogic concept (where the building functions follow a form) which is the shape /outline of a nurse's face. After the form was achieved, the units of the hospital design is then arranged in relation to related units to conform with the conceptual form. As the building is being approached (on the site) one sees the gate house, generator house, parking lot, hospital building and the mortuary building re-enclosed by its own fence on the main site. The hospital building consists of 4 storeys which have been zoned respectively according to their functions. The ground floor consists of the out patient's Department with functions / units like the waiting areas, consultant offices, diagnostic departments (Laboratories, pharmacy, scanning unit, Radiology, ante-natal services, administrative areas, and conveniences). The first floor consists of the in-patients / care departments, that is the hospital's wards, (Gynecology, private, children and post natal wards, incubators, nursing units and conveniences). The second floor is the surgical department / restricted access floor. It has the operating theatres, Recovery / intensive unit and delivery suits and conveniences. The third floor which is the building maintenance floor consist of units like the laundry, maintenance departments and conveniences.

4.5 DESIGN CHARACTERISTICS

The design is characterized by a serene looking environment on entering into the site, it will implement the use of warm vibrant cool colours (white and warm blue) to keep and give a cheerful feeling to its users thereby livening up the place with its park like exterior of trees, flower beds and walkways. On entering the hospital, one is greeted by a courtyard of water fountain, seats, trees flowers and shrubs. This can at least loosen up a patient's (especially children) tensed up fears of being in a hospital as this is far from the usual hospital environment where one walks in greeted by a lot of sick and injured people waiting in the reception areas

usually the first units on entering the waiting areas are along the corridors or the courtyard to avoid the general overcrowded waiting hall. Conveniences like toilets, ramps, lifts and stair cases are provided to achieve building service efficiency. There will be graphical and theoretical boldly written and illustrated directions provided every where to achieve easy usage and a user friendly facility. there will be provision for a twenty four hour routine maintenance service to ensure the regular up keep (cleaning, refuse collection and disposal,)of the hospital. the facility will be characterized by wide enough access corridors, while consist of naturally lighted and well ventilated areas.

4.6 MATERIALS AND CONSTRUCTION

In the course of choosing suitable materials of construction for this proposal the factors considered were Durability of the materials, its economic, aesthetic and maintenance values. All these basically led to the use of concrete, glass, aluminum sheet and steel as materials of construction. Below is a table stating some building materials used and their Places of Application.

Table 4: Building materials used in design and their places of application.

Building materials	Places of application in design
Concrete & reinforced concrete	Columns, beams, foundations, lintels, staircases, roof gutters, roof.
Sandcrete blocks	Walls and foundation walls.
Marbles	Floor tiles.
Marble chippings	Used for terrazzo floors finish.
Steel	Reinforcements, roof trusses, door and window frames.
PVC	Ceiling coverings, underground pipes, wall pipes.
	Window panes, partitions.
Different glasses	Used as binding agent for concrete and mortar mix.
Cement	For mixing and binding in concrete and mortar mixes.
Water	Roof coverings, window and door frames, and partitions.
Aluminum	

Source: Author's design proposal

4.7 LANDSCAPE AND EXTERNAL WORK

The landscape works of the design consists of hard and soft landscaping works; the hard landscaping elements can be found in places like road access networks of the site, parking areas and footpaths, the elements for this will include gravels/late rite, kerbs and concrete slabs. The soft landscape elements shall consist of flower beds, carpet grasses, shrubs trees and water for a serene and peaceful looking environment. These can be found in places like the walkways, road sides, green areas and main courtyard of the hospital. other external works shall include the following explained below:

WATER SUPPLY

The Niger State Water Board is the concerned authority as regards water in the state therefore it shall be in charge of connecting the hospital to the mains for provision of well treated water for the hospital's needs. However, boreholes shall be provided along with pumps and over head tanks and reservoirs which will be channeled to areas where they will be used.

DRAINAGE AND SEWAGE DISPOSAL

The site shall generally be drained of storm water by the means of roof sheets, and gutter and pipes channeled down into the central rain and surface water drainage system. This will be channeled into the main sewer which collects water sending it into the main sewer system of the town.

The sewer to be channeled includes discharges from water cisterns of various units, that is from the laundry unit, operating theatres and delivery suites. They are collected from different points and channeled from different points and channeled to the site's central sewer system for

their required treatment and disposal for a clean/sterile hospital environment and avoidance of health hazards.

REFUSE DISPOSALS

The hospital shall be provided with waste bins (well covered) at strategic points which will be collected and emptied by janitors. There shall also be an incinerator / treatment point at a strategic corner of the site which will be emptied by refuse vans of the hospital's maintenance department.

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CHAPTER FIVE

5.1 CONCLUSION

From the case studies carried out in this research work, hospitals in the country do not conform to ergonomics hospital human factors in their design. The research findings can be used as a guide in our hospital constructions as applied in the proposed hospital design to achieve optimal building performance, safety and comfort of users which are necessities to our daily health and life especially in a health care facility (hospital) which should be a pace-setter as in this regard.

5.2 RECOMMENDATIONS

It can be recommended that the government of the state and nation as a whole should enforce policies against the conformity of health care facilities to laid out human factor / ergonomic standards (which should be formulated or adapted from the ones already existing countries like ergonomic British Standards of hospitals and the American Institutes of Architect's guidelines for hospitals and health care designs. They should not only make those rules / policies (as has been in most other previous cases with the Nigerian government) but to go a long way making sure they are being followed.

5.3 IMPLEMENTATION

This research work could be implemented by the Niger state government in as there is an immediate call for and need of a maternal and child health care facility as realized by the millennium development goals. This can not only be applied in the state only but, inS the federation as a whle in oder to bring Nigeria to an up to date status of the world and give it a better reputation

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LIST OF APPENDICES

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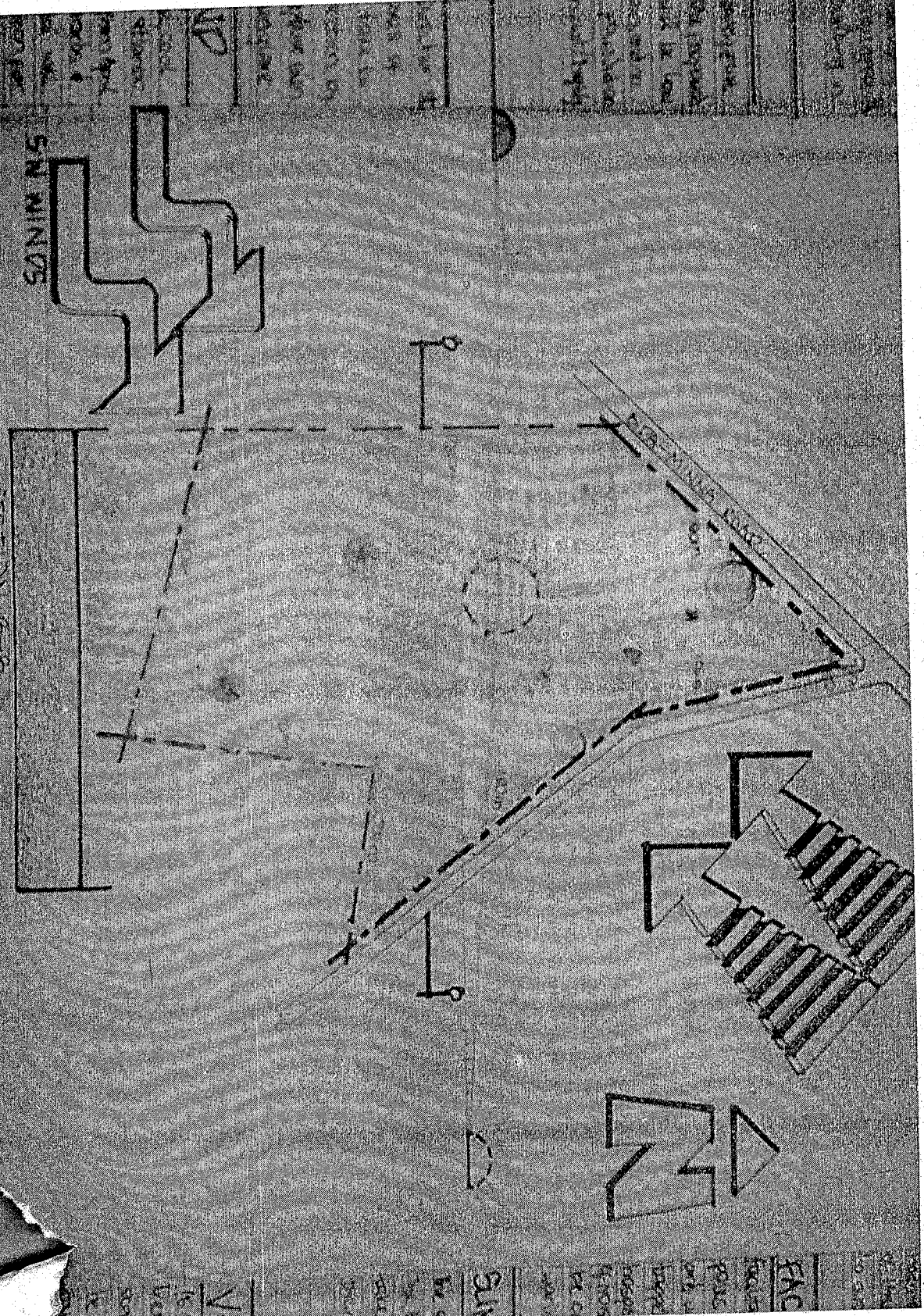
Roof plan.

Sections.

Elevations

Perspectives.

SECTION 2-B
WOMEN & CHILDREN'S HOSPITAL



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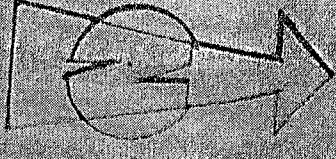
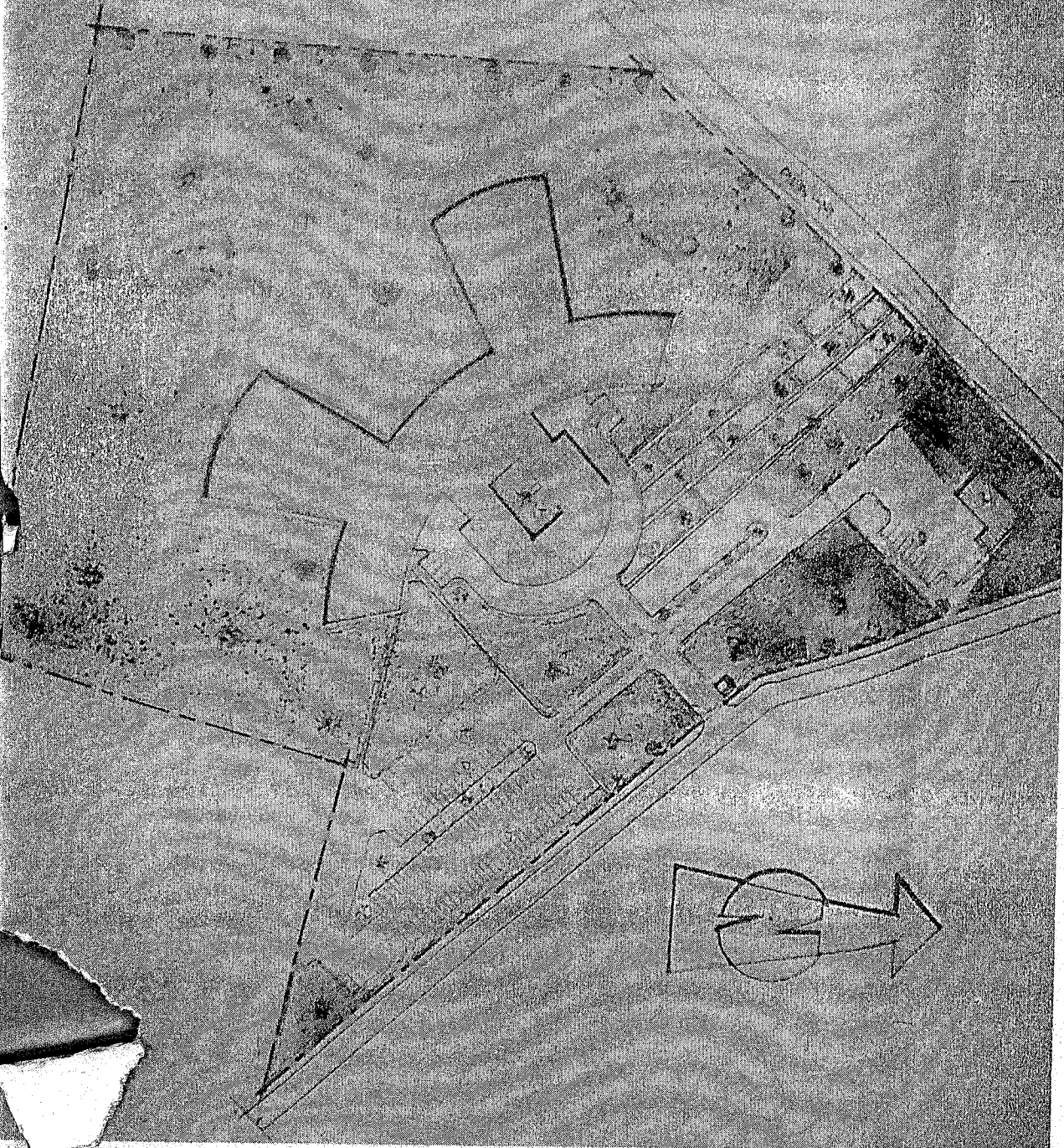
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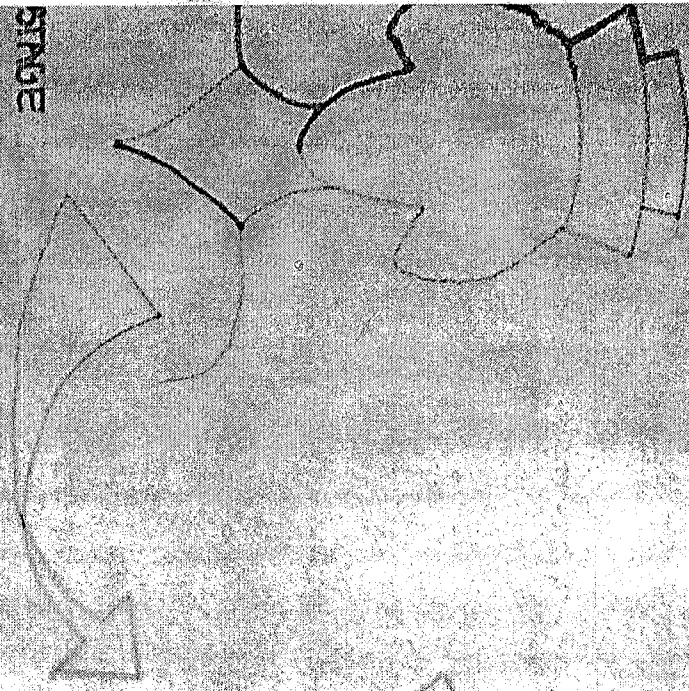
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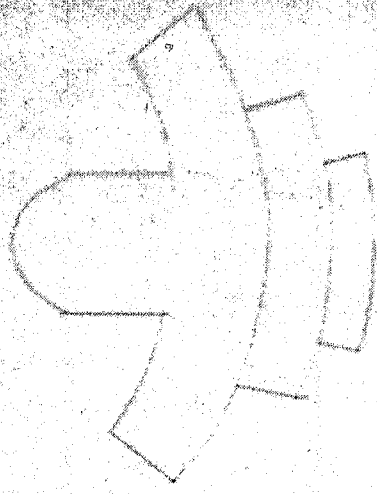


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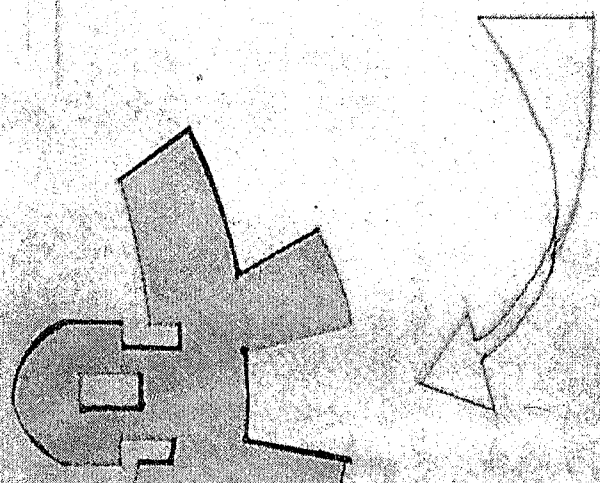
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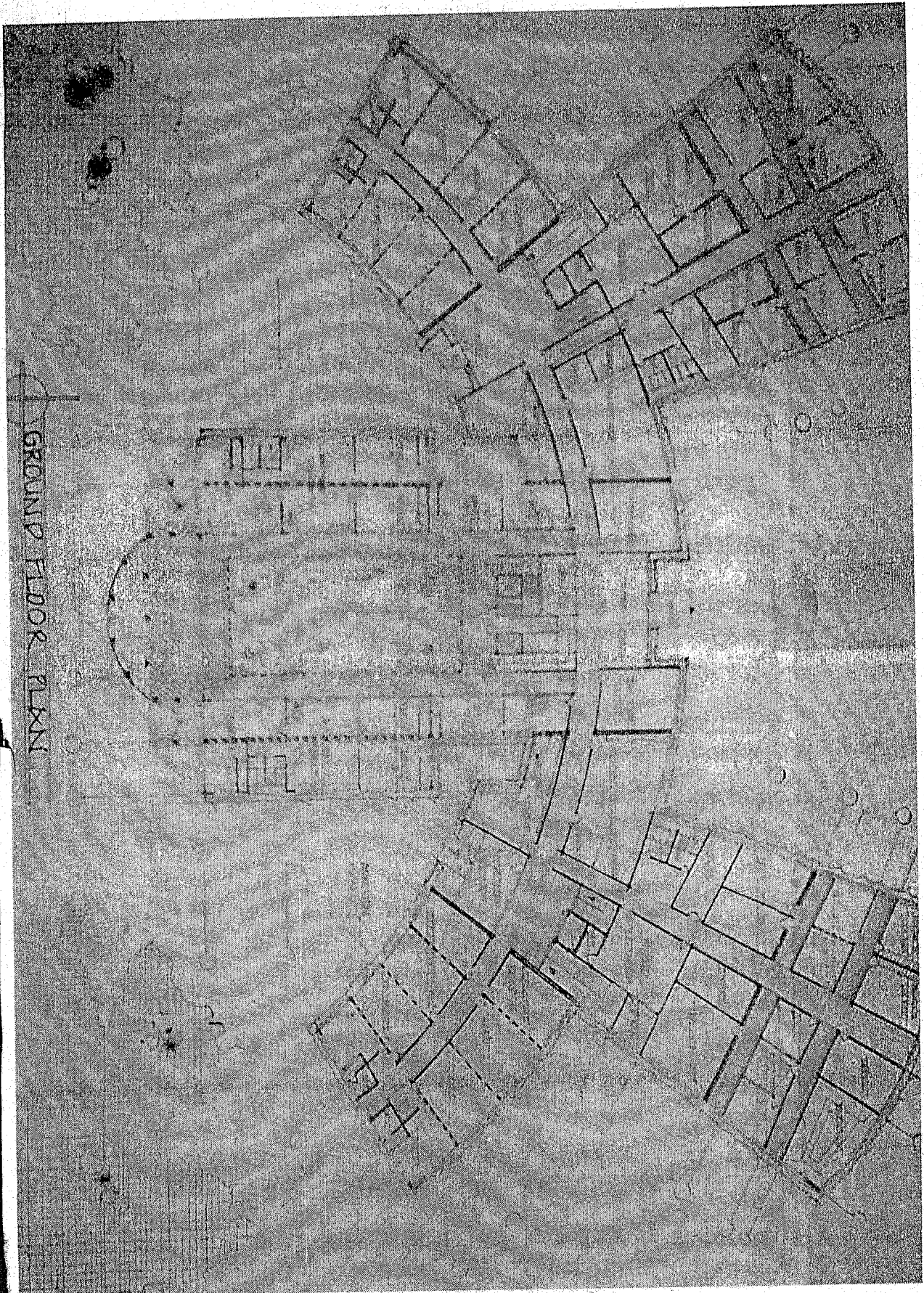
SECOND STAGE



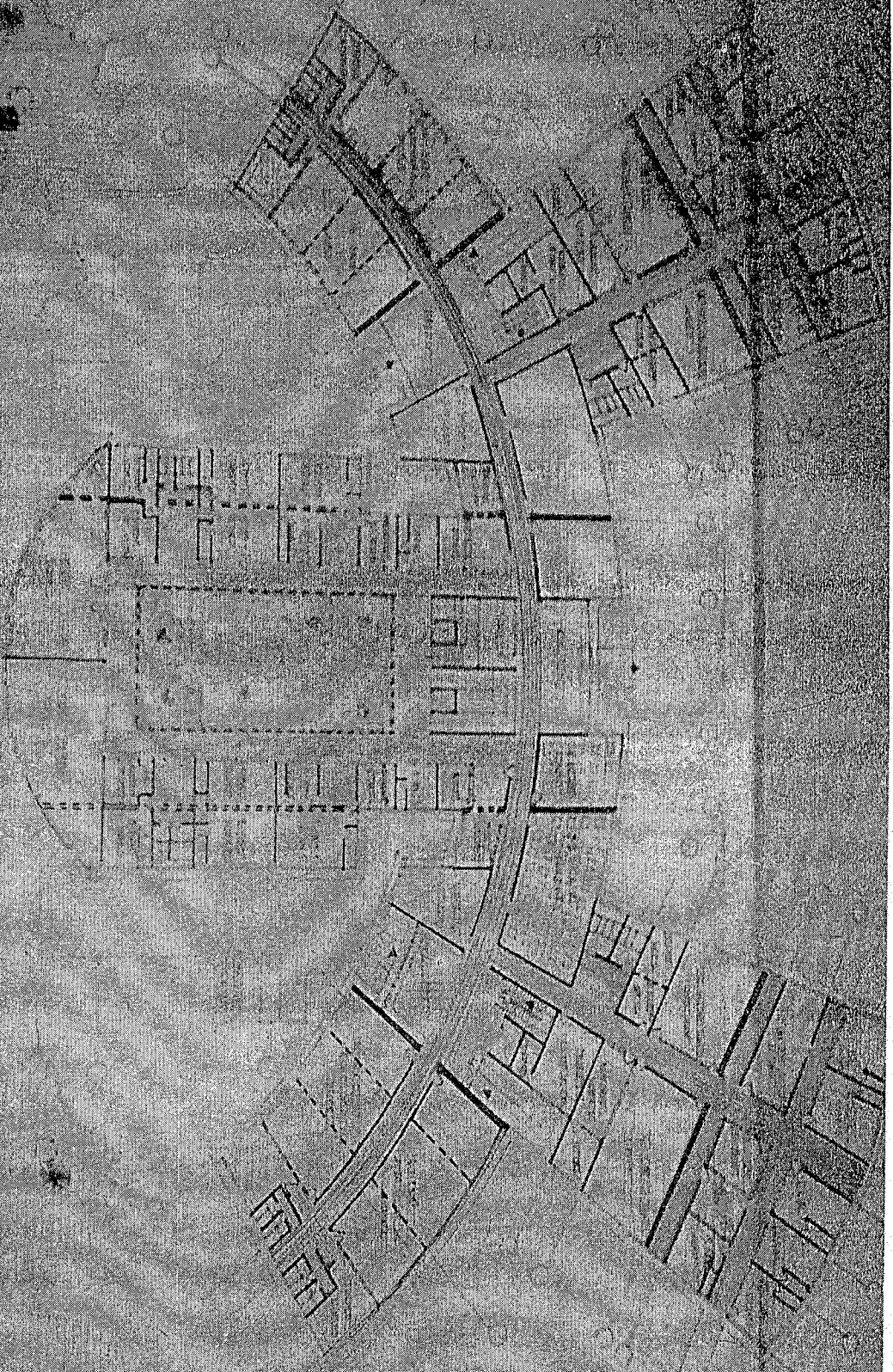
THIRD / FINAL STAGE



WOMEN & CHILDREN'S HOSPITAL
ERGDNOMICS
MIRNA



FIRST FLOOR PLAN



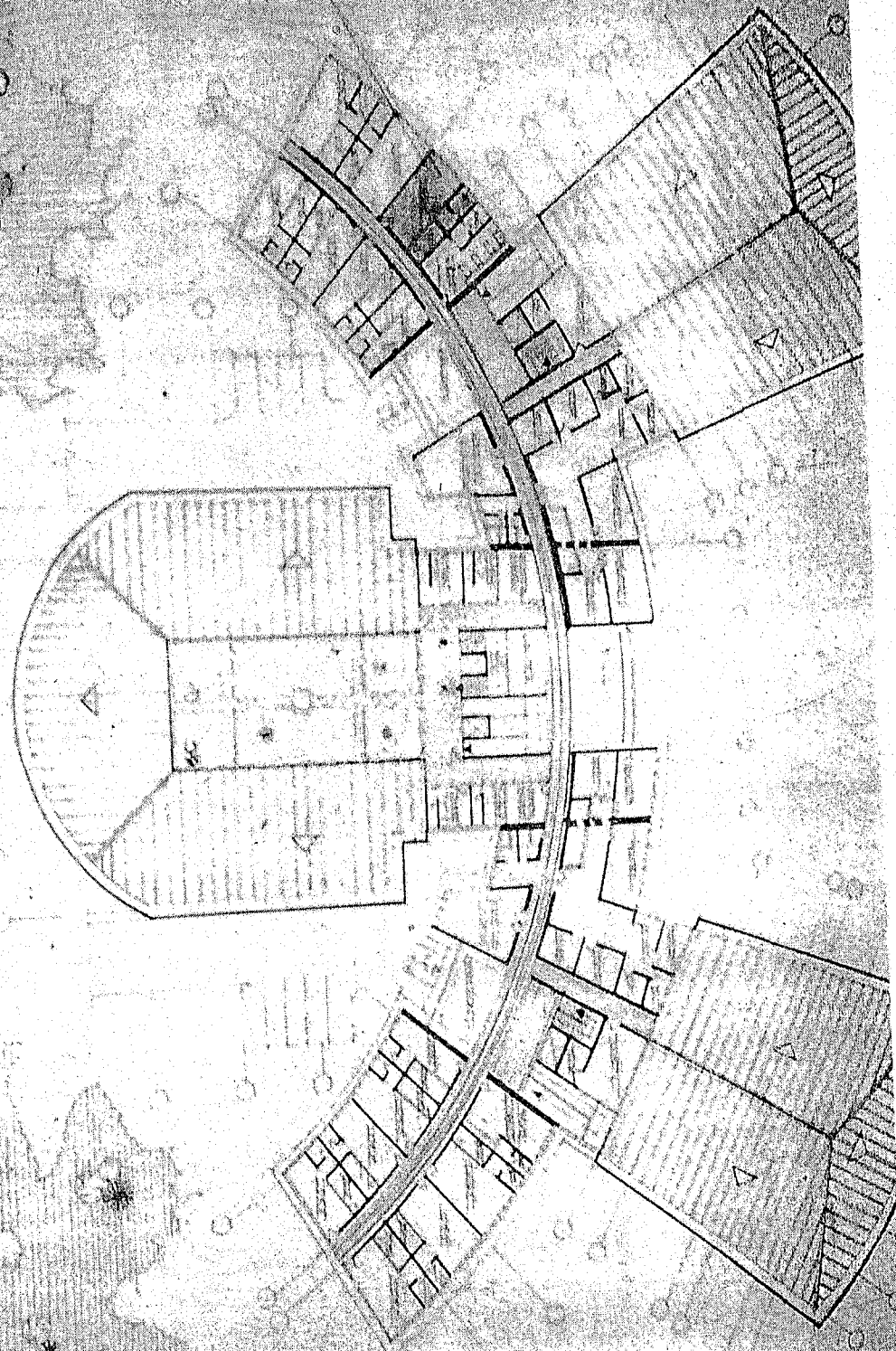
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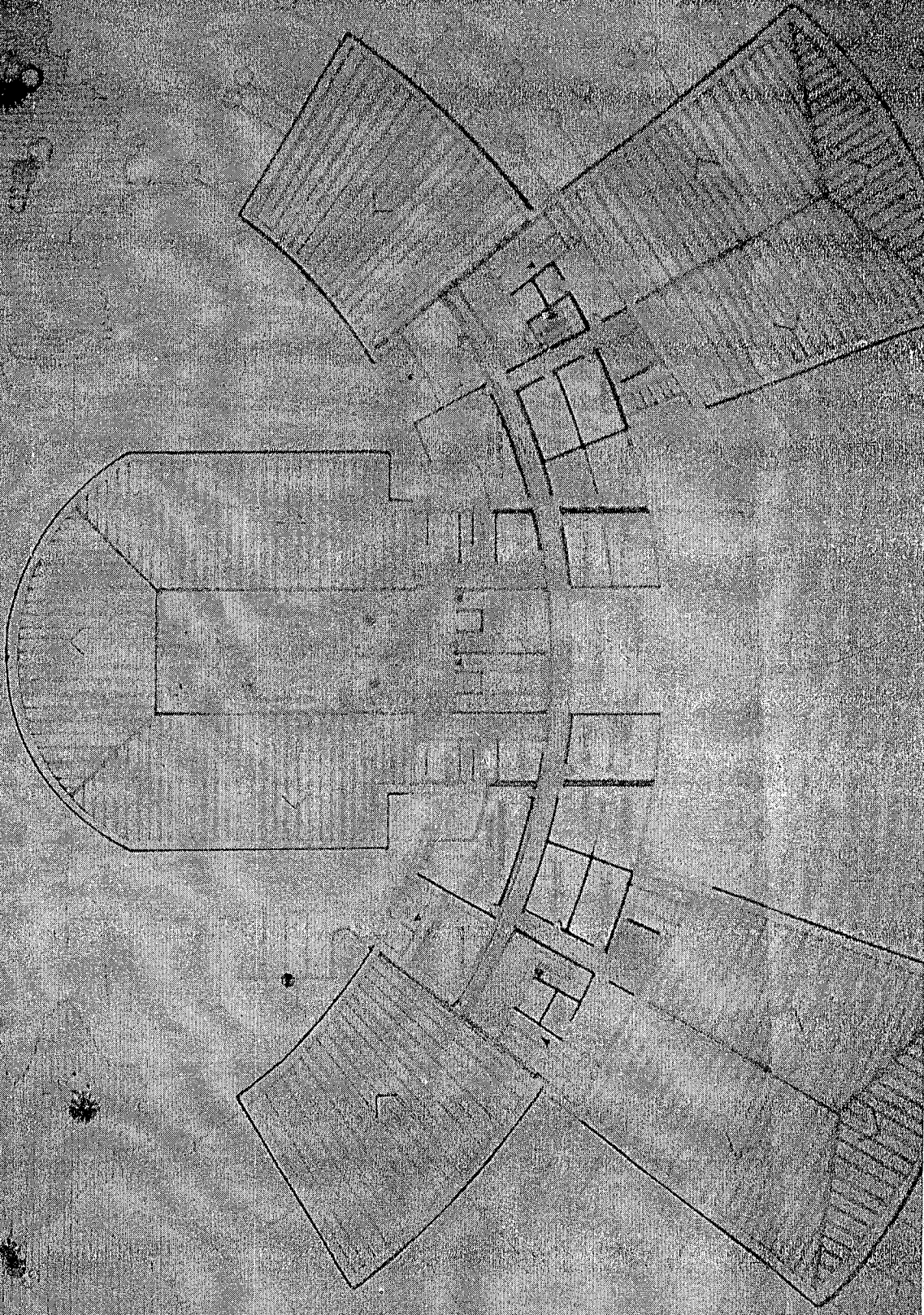
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L. G. ANDRZEJCZAK

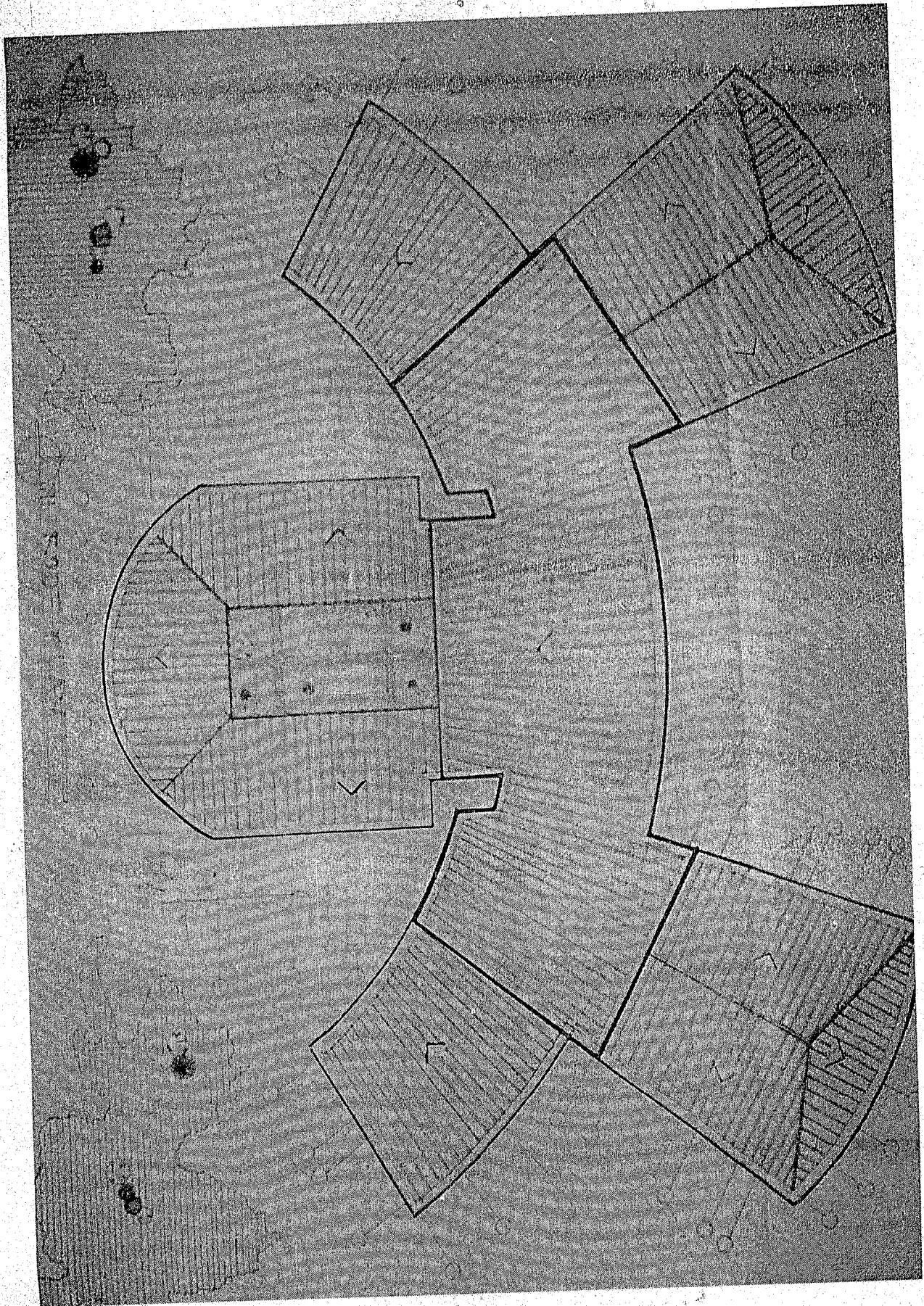
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SECOND FLOOR PLAN

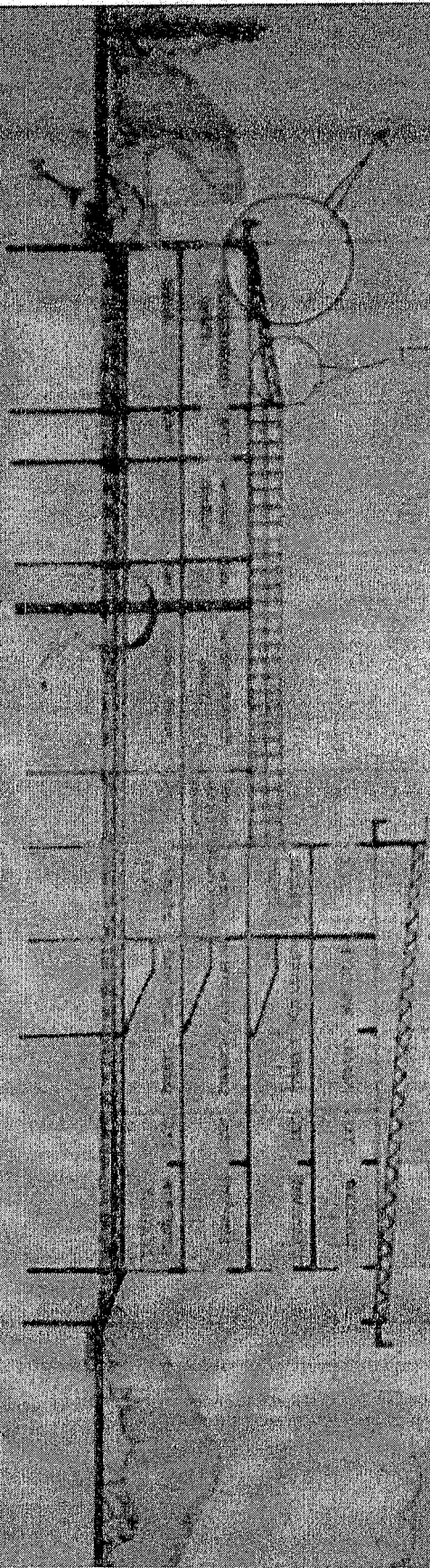


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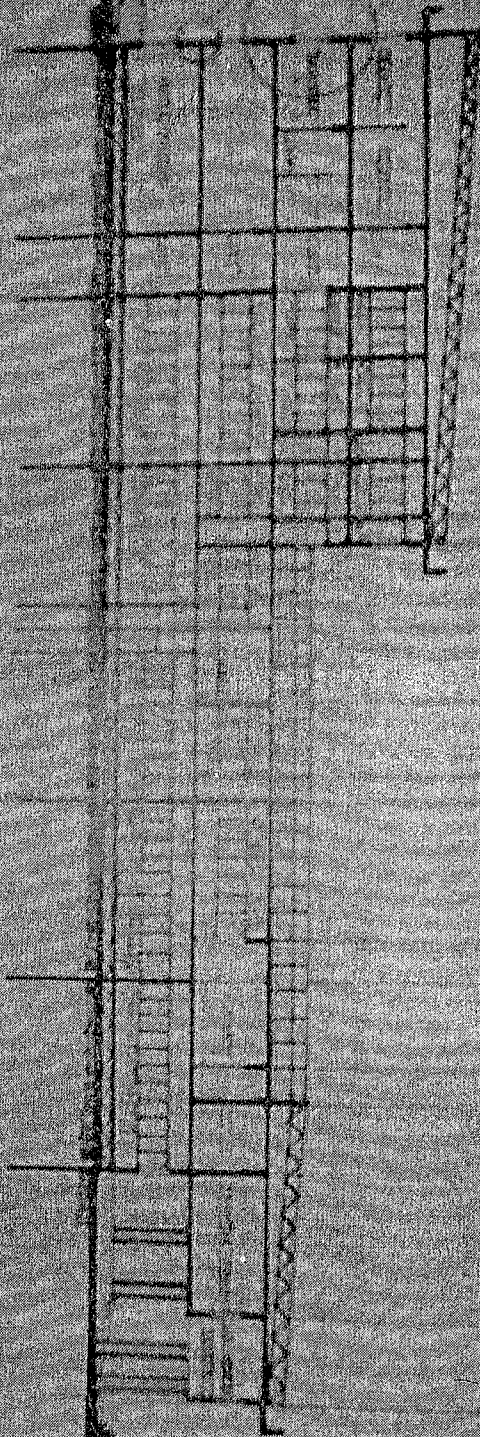
SECTION A--A

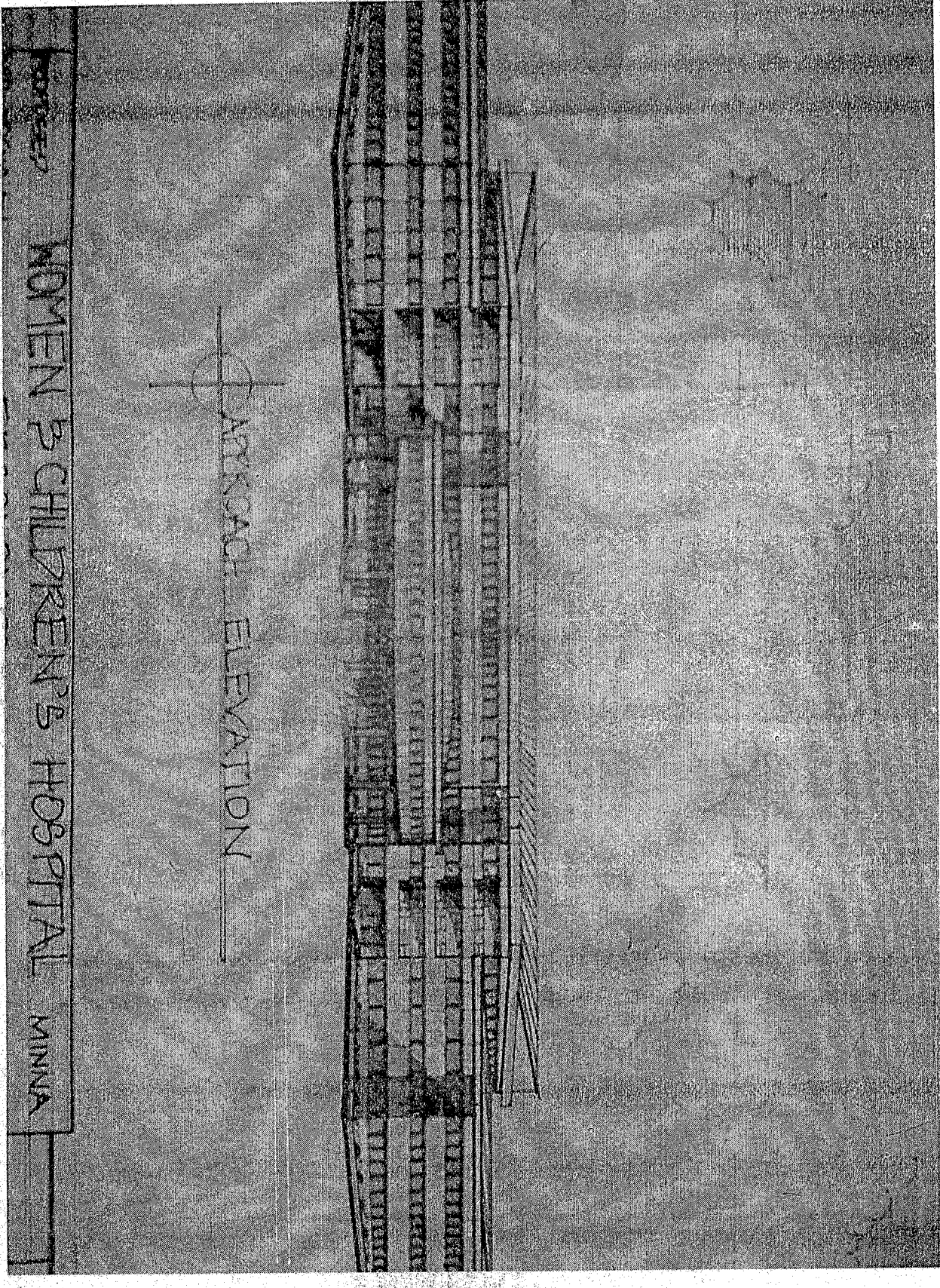


JOHN S CHILDRENS HOSPITAL

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SECTION B-B





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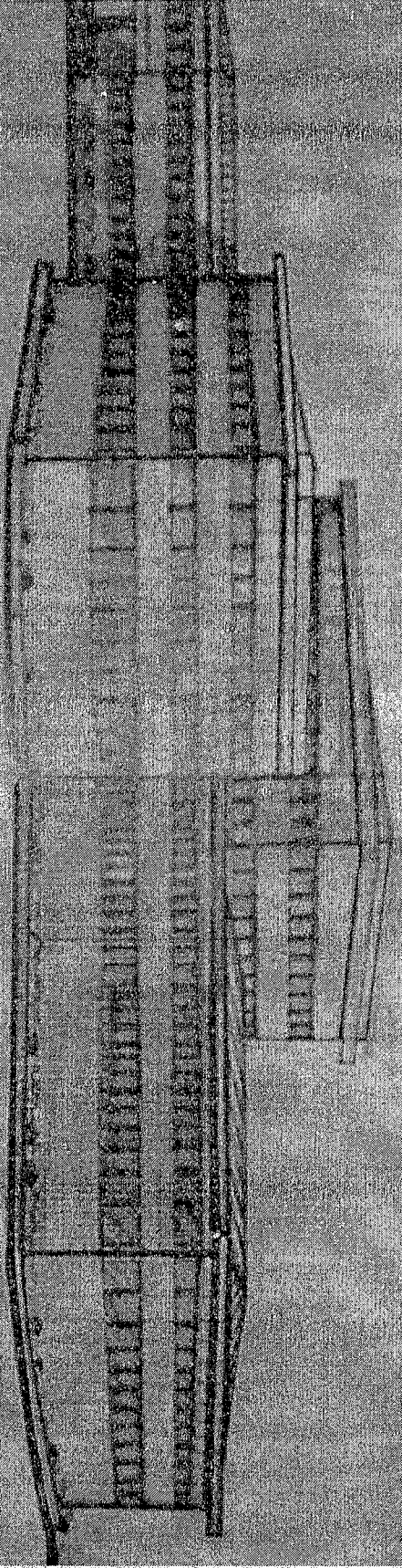
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PARKADE ELEVATION

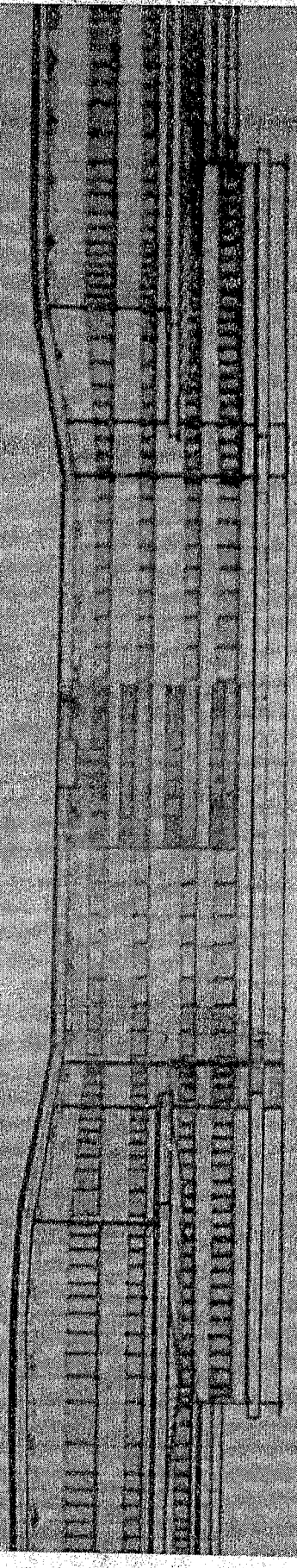
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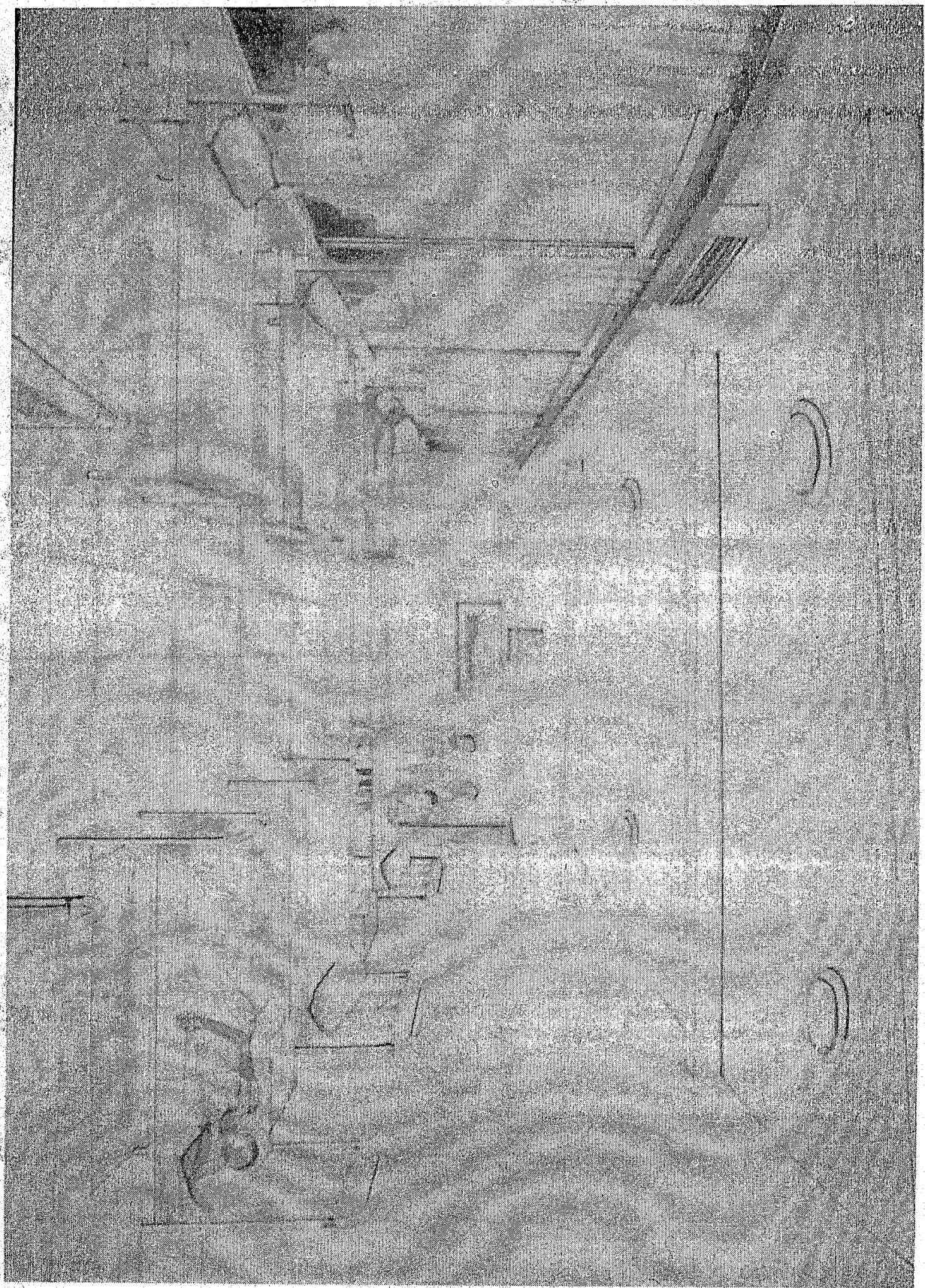
TYPICAL SIDE ELEVATION

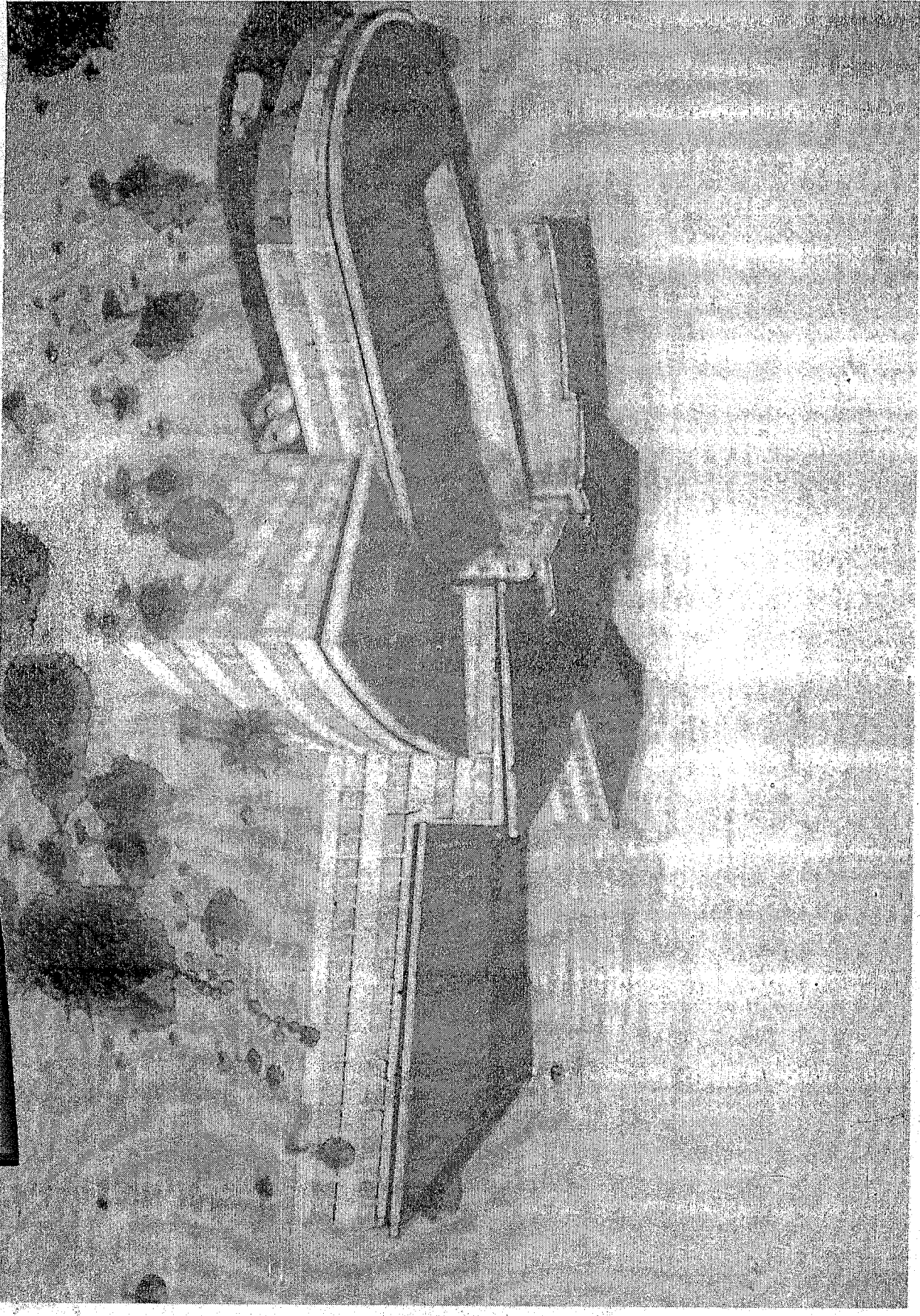


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REAR ELEVATION



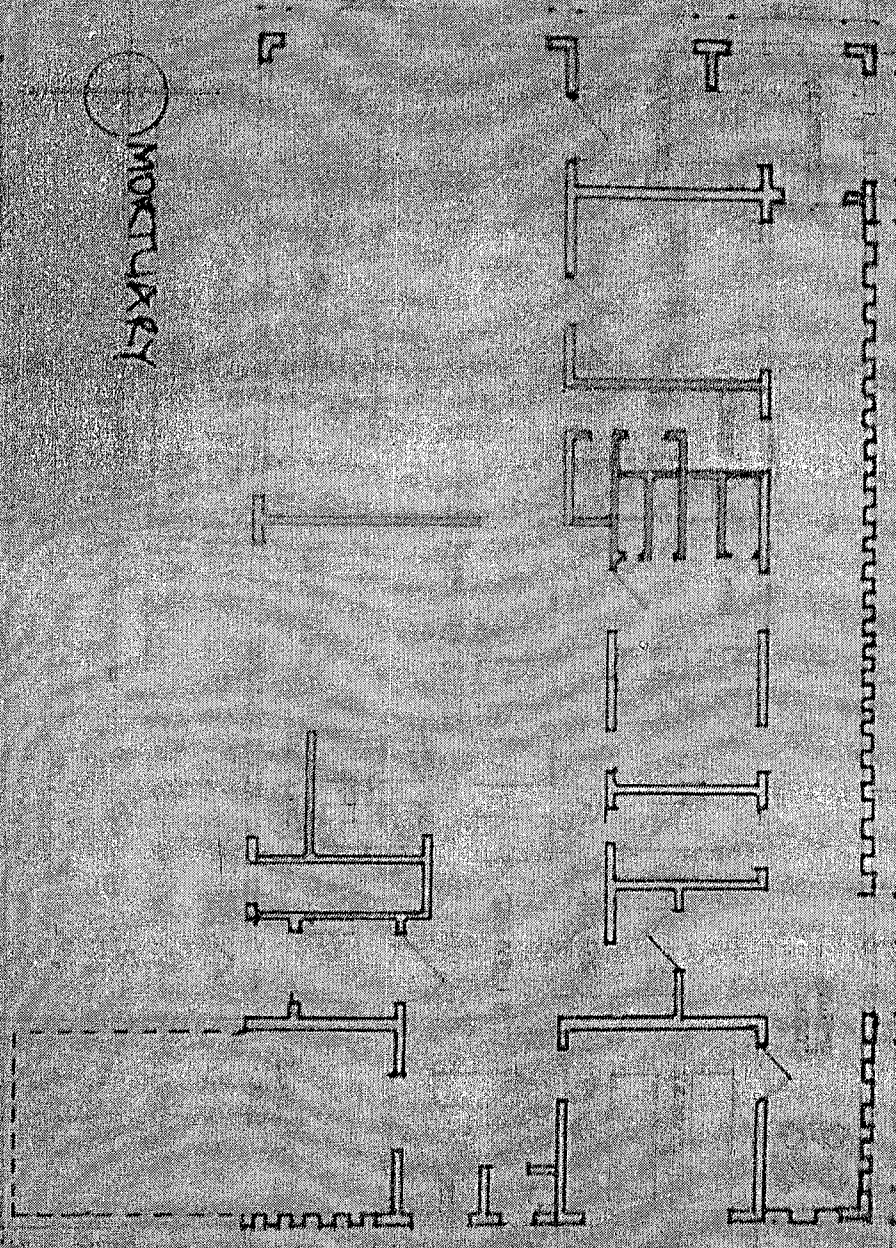




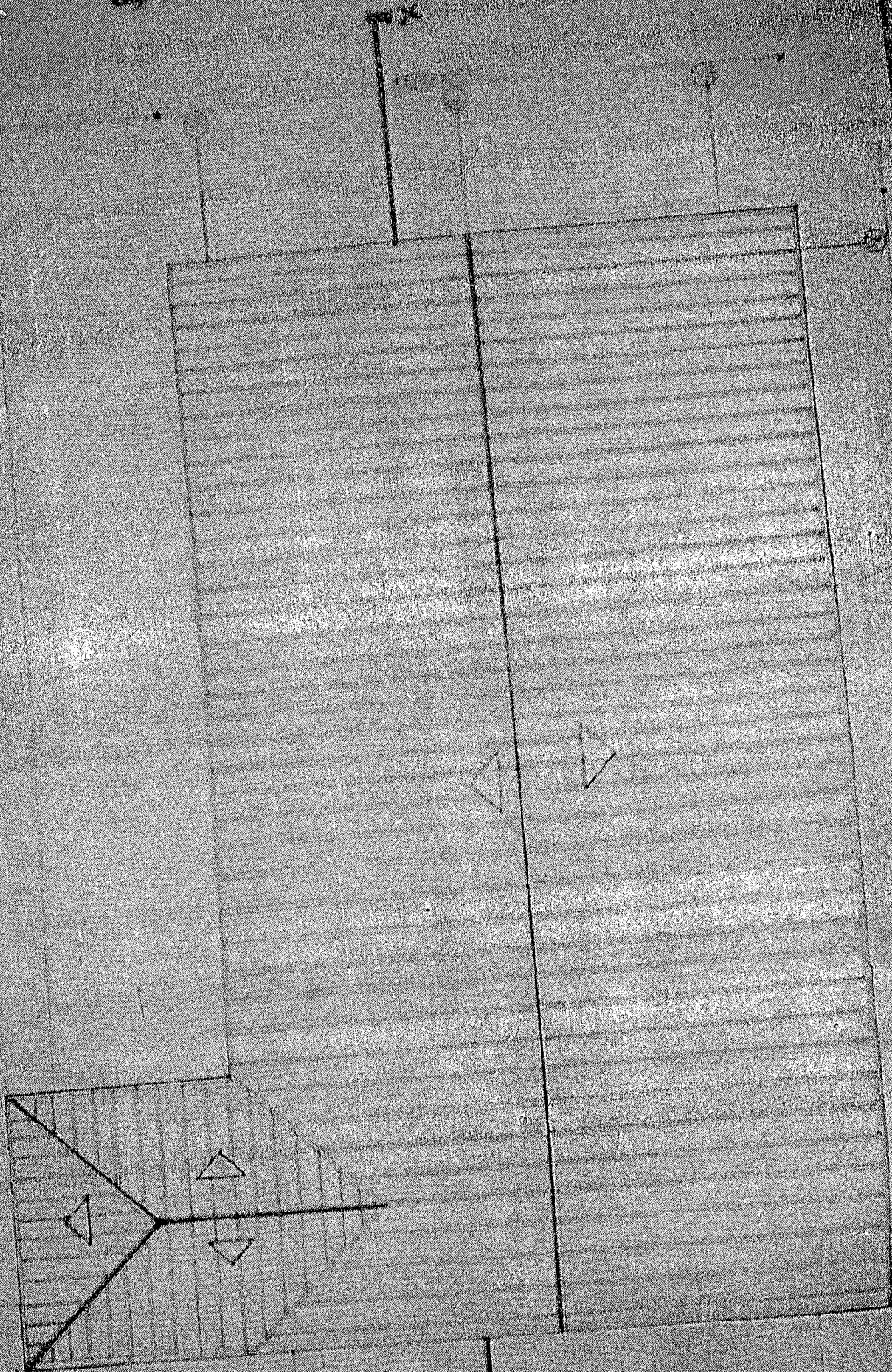
FLOOR PLAN



MOCKUP KEY



SHOULDER PLAIN



WOMEN & CHILDREN'S HOSPITAL
ERGONOMICS MINNA

APPROACH ELEVATION

