

i.

REDEVELOPMENT OF THE NATIONAL TUBERCULOSIS AND
LEPROSY

TRAINING CENTRE, SAYE VILLAGE, ZARIA.

SPACE INTEGRATION AS A BASIS FOR HOSPITAL PLANNING.

BY

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AHMADU BELLO UNIVERSITY. IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF
M.SC ARCHITECTURE.

DECEMBER 2000.

DECLARATION

I, the undersigned, hereby declare that the work presented in this dissertation for the award of the degree of Master of Science in Architecture has not been wholly or partially presented for any degree other degree nor is it being submitted for any other degree.

It's an authentic research work conducted by me in accordance to the regulations of the POSTGRADUATE SCHOOL, Ahmadu Bello University, Zaria.

This is to further declare that all directly quoted materials and secondary sources are duly acknowledged.



FRANK - LAWALE, OLUWAFUNMILAYO

Date...*6th March, 2001.*

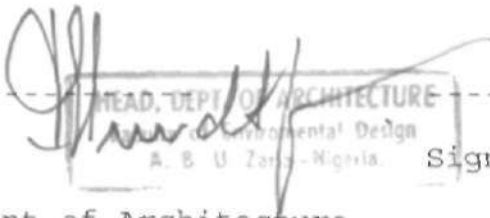
CERTIFICATION

This decertification title **REDEVELOPMENT OF THE NATIONAL TUBERCULOSIS AND LEPROSY TRAINING CENTRE, SAYE VILLAGE, ZARIA:**

(Space integration as a basis for hospital planning) by **FRANK - LAWALE, OLUWAFUNMILAYO** meets the regulations governing the award of the degree of Master of Science (M.Sc) in Architecture of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge.

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DEDICATION

This research is first and foremost, dedicated to God Almighty who is the author and finisher of our faith. It is by His ultimate grace and mercy that I exist; and I live to walk daily in His will.

To my mum, Ms E.O Frank-Lawale whose love and care has been a great encouragement to my life as a whole and in the course of this thesis work.

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ABSTRACT

The issue of space integration in hospital planning is one that should be considered to be of great importance.

The intent of this thesis is to underline the possibility of using architecture to integrate spaces in hospital design. The National Tuberculosis and Leprosy Training Center, Saye Village Zaria (N.T.B.L.T.C)_# is used as a case study to demonstrate such possibilities.

In doing this, an awareness of the type of Tuberculosis and Leprosy hospitals that are available in Nigeria, will be created. An attempt will be made in the redevelopment process to create a standard integration of space as a basis for hospital planning that will be effective for N.T.B.L.T.C; and its probable intended structures.

The N.T.B.L.T.C is presently undergoing some construction to meet the increasing demands of the centre that have arisen due to the gradual dilapidation of its structural facilities. It is based on this that a redevelopment process is being proposed to help achieve this goal thereby creating a well defined environment that will have a good order of space, as well as standard requirements, in terms of high temperature and ventilation, and standard, requirement, form and ventilation.

In order to achieve the desired integration of spaces in the proposed design, the following existing tuberculosis and leprosy hospitals will be studied;

- (1) The Leprosy and Tuberculosis Hospital, Bayara, Bauchi
- (1) The Leprosy Rehabilitation and Training Center Mangu, Jos
- (2) The Yadaquinya Leprosy and Tuberculosis Center
- (4) The Hansens Disease Center Ita Ilega, and Sacred Heart Hospital in Abeokuta.

A critical appraisal of these centres will be an excellent source of information towards the redevelopment process of the N.T.B.L.T.C, Zaria.

At the conclusion of this project, it is hoped that a workable design proposal that takes into consideration necessary conditions such as, the general size of the layout; the space, standards and the general arrangement, would be obvious. Thus, being helpful in the redevelopment process of N.T.B.L.T.C.

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CHAPTER ONE

1.0 INTRODUCTION

The National Tuberculosis and Leprosy Training Centre Saye, Zaria (N.T.B.L.T.C) started in 1927 as a leprosy camp. In 1965, it was developed into a Leprosy Training Centre. Following the National Tuberculosis and Leprosy Training control programme in 1988, the centre was upgraded to the National Tuberculosis and Leprosy Centre in 1991. The body responsible for the centre is the Federal Ministry of Health.

Financial and Technical support are given by the Netherlands Leprosy Relief and other relief centers in Nigeria.

The N.T.B.L.T.C which is the only one in West Africa focuses on the training of students from West African Countries. Presently four Gambian students are being trained; the patients admitted are mainly from Zaria, Kaduna, Sokoto and Katsina.

Apart from Leprosy and Tuberculosis, N.T.B.L.T.C is aiming towards integrating all other skin related diseases into the system and other general health services. The diagnosis of A.I.D.S (Auto-Immune Diseases Syndrome) is observed in about 40% of the Tuberculosis patients.

The training school is another aspect to be considered in the redevelopment proposal of N.T.B.L.T.C. The students are being trained to end up in Tuberculosis and Leprosy Control programmes in other institutions in places such as Kaduna, Kofa Gayan Zaria, Saminaka and many others. They are usually community Health Officers, Nursing Staff, Control Officers and Active Senior Tuberculosis and Leprosy Supervisors that come for the training courses at the center. The patients on admission at the centre

provide the opportunity for the practical aspect of the students training. Thus, this research would also entail a study on how best the training section of N.T.B.L.T.C can be merged effectively with the health dispensing services.

It is the researcher's overall goal to present an appropriate proposal to meet the demands of the center. The major aim is to synthesize the structures and their surrounding landscape to achieve an aesthetic but functional unit which will have good ordering of spaces and standard requirements.

1.1 PROBLEM DEFINITION

N.T.B.L.T.C is situated on the old Zaria- Kaduna Road. It is comprised of many units, and presently there is no sense of organization on the site as there were several additions over a period of time.

N.T.B.L.T.C has since its inception grown to a state of disrepair and dilapidation. Many fundamental facilities that are needed for efficient treatment are not available and thus the gradual decline of the center.

Fortunately, in recent years, the Federal Ministry of Health and other Non-Governmental Organizations such as the Damien Foundation of Belgium, German Leprosy Relief Association and the Netherlands Leprosy Association give financial and technical support. As at now, there is only one doctor and five nurses to care for the sixty five patients at the centre and because of the multifunctional role of the center, the present staff of one doctor and five nurses is not adequate. In addition to that, the training aspect has limited the attention the patients necessarily deserve that is in the issue of "direct involvement" with the patients.

Due to the increasing incidence of tuberculosis and other

ailments the influx of new patients is on the increase; therefore, more infrastructure is needed to cater for the patients.

Presently, an old laboratory is being used as the administrative block, thus, the need for a new one.

There is a need for an operation theater, especially as patients used to be sent all the way to Kano for amputation. Also there is need for laboratories, x-ray rooms and delivery rooms. The operating theater can also have some kind of glass screen so that students & relations can watch operations.

Based on many discussions with the authorities of the centre, there is need for :-

- (a) A canteen with a modern kitchen for the increasing number of trainees
- (b) A renovation of the old library to a rehabilitation unit
- (c) A conversion of the old rehabilitation unit
- (d) More rehabilitation units
- (e) Staff Quarters (Academic and non - academic staff)
- (f) Parking Lot
- (g) A sit out

The need to view other kinds of rehabilitation processes is another aspect to be considered in this research.

The number of cured leprosy patients that are left without any way of working for any income, due to their handicaps create the need to provide them with some kind of occupation that will be financially beneficial to them.

Additional services required include the need for more boreholes. At present water supply to the centre is not a problem

because the Netherlands Leprosy Relief Foundation (N.L.R) sunk a borehole which provides enough water for the present needs of the centre.

A small generator is also available which is used on only at night and during operations, thus a need for a bigger and more powerful generator to serve the centre and its quarters.

1.2 AIMS AND OBJECTIVES

The primary aim of this work is to evaluate the functions that are imperative to solving the problems associated with N.T.B.L.T.C, especially the enumerated problem of the lack of necessary infrastructure to meet the need of the centre.

The major objectives are;

- (a) to explore existing Leprosy and Tuberculosis Hospitals so as to derive possible alternatives that could be used in the redevelopment process
- (b) to explore how best to organize the site which will be efficient, economical and aesthetically pleasing.
- (c) to maximally use the site and its location in evolving a design solution for the center.
- (d) to explore the training institutions in Leprosy and Tuberculosis Hospitals to see how best an effective forum for training students and treatment of patients can be well combined enhancement of students and patients needs through this, and subsequently providing an effective venue for training.
- (e) to review the inherent need for reformation on health services in Nigeria to enhance equity and efficiency in hospitals.

The overall objective of this project is to document Leprosy and Tuberculosis buildings and there from extract relevant ideas which will be imbibed into the proposed redeveloped center.

1.3 MOTIVATION

Tuberculosis and Leprosy are infectious diseases that have plagued man. Tuberculosis has probably been responsible for the greatest morbidity and mortality in developing countries. It is found at the present time primarily in the developing countries of the world.

In recent years there has been improvement in understanding the host-parasite interaction in Tuberculosis. There is no doubt that HIV/TB co-infection has increased the tuberculosis burden in Nigeria 'Youmans (1979)'.

'Leprosy, on the other hand has been a disease set apart from all others, and in great many communities, its sufferers and even those who care for them have been rejected by society. For these and other reasons the enormous progress that has been made in medicine in this century, has until recently passed Leprosy by and the few who devoted their lives to these diseases have to make do with inadequate staff, money, research and acknowledgement. The attitude of society towards those suffering from leprosy has given rise to many unfortunate incidents of insults, rejection and even murder of patients, and in some societies, this will continue'.
"Bryceson et al (1979)" et'al.

This thesis is motivated by the need to redevelop the existing facilities at N.T.B.L.T.C so as to effectively treat and rehabilitate patients affected by leprosy, tuberculosis, and all other integrated diseases.

1.4 SCOPE OF THE RESEARCH

The fundamental design requirements, the provision of standard spaces, and the landscaping of the center will be the extent of my research.

To fully discuss the diseases, their rehabilitation programme, existing case studies, the design problem and its solution.

Another area of importance is the issue of air control in specific areas like the operating theaters, laboratories, and out-patients section; where a higher risk of cross infection is evident.

Further more, the scope of the design will include the administrative block, operating theater, laboratories, kitchen, wards, staff quarters, car park, and any other landscaped facilities. Finally the extent of the research will be the effective integration of the entire hospital site with emphasis on space allocation, planning, and parking.

An attempt will be made to minimize alterations as much as possible, thereby creating room for relocation of facilities where necessary.

1.5 RESEARCH METHODOLOGY - This method of conducting research are essential in achieving the best information available to make any literature worth while reading. The following are the steps I intend to take in my research

- (i) A review of existing and similar case studies and designs relevant to the area of study will be analyzed, so as to derive information on how best to effect the changes necessary for the center, especially with regards facilities that are not presently in place.
- (ii) Interview (formal/informal) of medical, academic and administrative staff could be necessary to obtain relevant information.
- (iii) Data collection, from published books, unpublished thesis, magazines, encyclopedia, newspapers on tuberculosis and leprosy.
- (iv) Exploring the site conditions for the effective exploitation in the proposal and proper analysis of all the data collected, with appropriate derivations made out to be used in the design proposal.

1.6 ARCHITECTURAL SIGNIFICANCE

The significance of this redevelopment process is to achieve the best means of space integration and organization; hence contributing to the information and knowledge available to the students of architecture and designers of our time.

1.7 CONSTRAINTS AND LIMITATIONS

In the course of this study, the researcher was restricted by the inability to travel to more leprosy and tuberculosis hospitals in the country.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 TUBERCULOSIS

Tuberculosis is defined as an infectious disease caused by micro-organisms called mycobacterium tuberculosis. The acid fast bacillus causing the disease was discovered by a German scientist - Robert Koch in 1882. "Workers Manual (1988)"

It may occur in persons that have had no previous exposure to the tubercle bacillus, or it may occur in those persons who have previously been vaccinated with BCG vaccine. "Guy P. Youmans, M.D (1975)."

It's occurrence is world-wide, and due to high standards of living and widespread preventive and curative measures in the last forty years, has shown downward trends in immortality and morbidity. However, in developing countries it still remains a big problem.

In Nigeria, it is established that there are about 100,000 new sputum cases each year giving the annual risk of infection of Tuberculosis in Nigeria as approximately 2% (National Tuberculosis and Leprosy Control Programme, Revised Workers' Manual, 1998). Figures 1 and 2, show the statistics of Tuberculosis cases in Nigeria.

About 200,000 cases of all types of tuberculosis occur annually in Nigeria.

All ages, from infants are affected. Individuals between 15-35 years of age are most affected. Both sexes are affected, but there are more males than females. Revised Workers' Manual, (1998). (Fig 3)

There is no doubt that the H.I.V/TB co-infection has increased the TB burden in Nigeria. In The Analysis Report (1995/96) H.I.V sentinel sero-surveillance in Nigeria of the national IDS/STD control programme, the prevalence rates among the sentinel groups for 1995/1996 were as follows:

- (a) Patients with tuberculosis (TB) 13.17% as against 2.2% in 91/92
- (b) Commercial sex workers, 35.6% as against 17.5% in 1991/92
- (c) Patients attaining STD clinics 15.1%, as against 4.6% in 1991/91
- (d) Antenatal collaboration of NTBL control programmes and National AIDS/STD programme will be developed to tackle this dual epidemic.

2.1.1 Spread of the Disease

Although tuberculosis can affect almost every organ and tissue of the body, the chronic form of the disease is predominantly pulmonary. The bacilli are most frequently

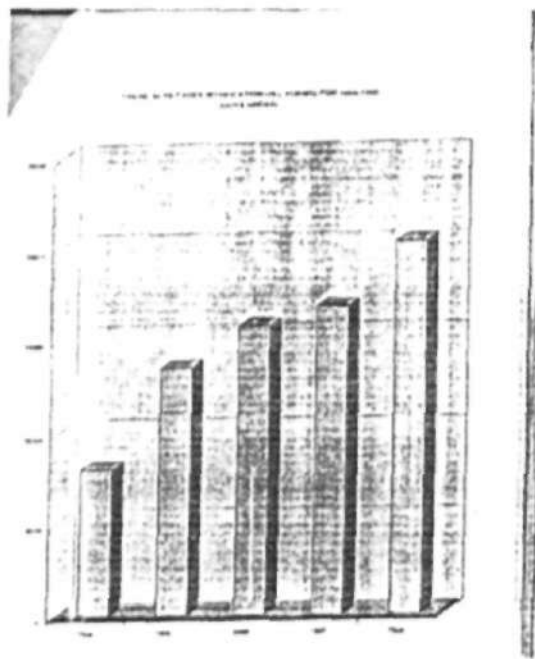


Fig. 1

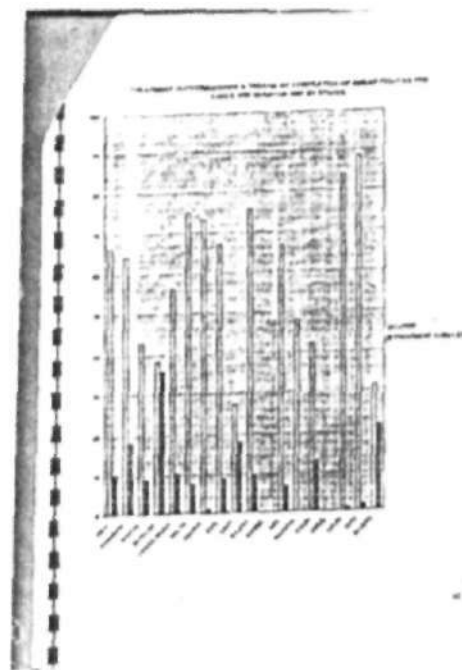
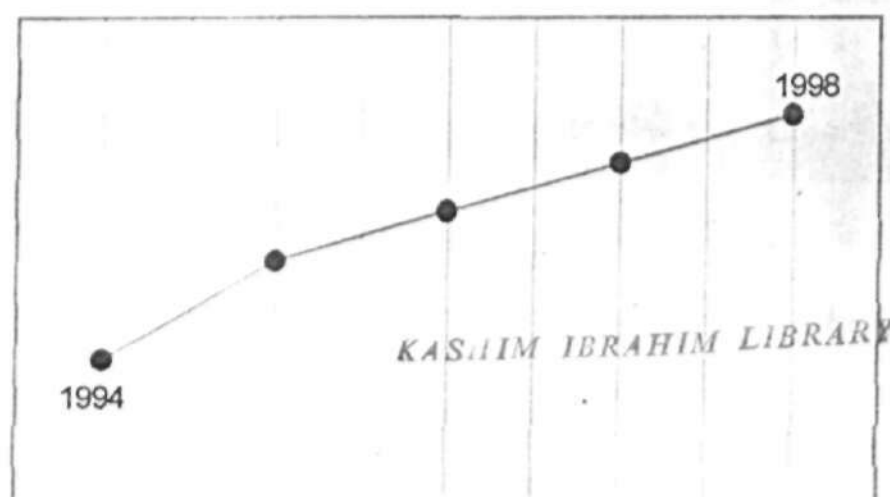
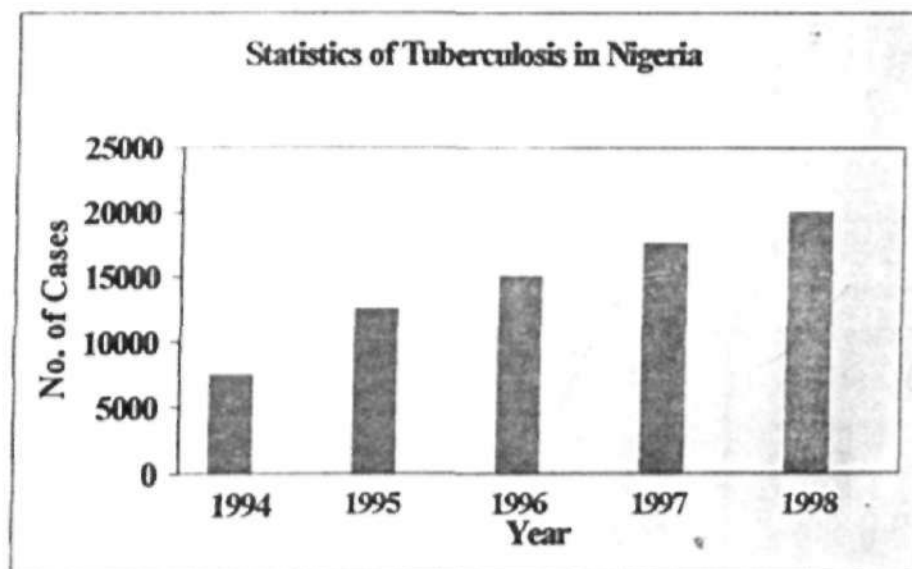


Fig. 2

Fig. 1 and Fig. 2 show statistics of tuberculosis cases in Nigeria, in 1998.

SOURCE: "Analysis Report of National Tuberculosis and Leprosy Specialist Hospital" (1988).



STATISTICS OF TUBERCULOSIS IN NIGERIA.

Source: "Analysis Report Of National Leprosy And Tuberculosis Specialist Hospital" (1998).

Fig S. 3

discharged from a pulmonary focus and reach the upper respiratory tract, where they are either swallowed or discharged to the outside by spitting, coughing or sneezing.

Therefore, the causative micro-organism is most commonly transmitted from an open case of pulmonary disease to other persons by a way of infected droplet nuclei which are airborne. One cough may produce 3,000 droplet nuclei. Transmission mainly occurs indoors.

Ventilation removes droplet nuclei, and direct sunlight quickly kills tubercle bacilli, but they can survive in dark areas for several hours.

An individual's risk of infection depends on the extent of exposure to droplet nuclei and the individuals susceptibility to infection. Prolonged closed exposure to an infectious case may lead to infection of contacts.

An infected person stays infected for many years probably for life. A vast majority of people (about 90%) of those initially infected with M. Tuberculosis do not develop the disease. The only evidence of infection in these healthy, but infected individuals may be positive tuberculin skin test.

With tuberculosis, an individuals risk of infection depends

on the extent of exposure to droplet nuclei and the individuals susceptibility to infection.

2.1.2 Treatment of Tuberculosis

A wide choice of effective and reasonably safe anti-tuberculosis drugs that can be combined in several configurations are available. Some of which are:

(a) Isoniazid - 300mg, administered once daily for a period of one year for the adult patient. It has become the standard regimen for "preventive therapy" of patients with positive tuberculosis skin tests and no evidence of active disease.

It can also be used for tuberculin-negative persons exposed to tuberculosis, and is continued for three months. If the tuberculosis test remains negative at the end of that period, but should the previously negative test become positive, treatment will continue for a year.

The situations above are virtually the only circumstances in which single drug-therapy should be chosen

(b) Isoniazid and Ethambutol - The currently preferred treatment in many institutions is a program of 18 to 24 months administration of Isoniazid (300mg once daily) combined with Ethambutol (15mg/kg once daily). A high degree of efficiency, as measured by rate and promptness of sputum conversion, control of

symptoms, and clearing of roentgenographic shadows on the chest film, can be anticipated in all stages and types of active pulmonary tuberculosis.

(c) Isoniazid, and Streptomycin - The combination of the two should produce excellent results if continued for eighteen to twenty four months. Streptomycin however, is least desirable because of cumulative toxic effects during administration and its discomfort and expense.

(d) Rifampin, Isoniazid and Streptomycin - These are combined together in an intensive triple drug therapy during the initial weeks or months of treatment when bacterial level is high.

When bacilli disappears from the sputum, a more conservative and better tolerated two-drug program may follow.

Youmans (1979)

2.1.3 Prevention of Tuberculosis

With the knowledge of the etiology of tuberculosis, preventive measures have been compiled to prevent the spread of disease they are:

(a) Sanitorium Treatment - Patients with tuberculosis are immediately housed with the hope that the patients would be prevented from transmitting disease, while they receive the benefits of the medical treatment that are available. This can have the disadvantage of creating a social stigma for the patients, but at least, it helps to prevent the immediate spread.

(b) Chemotherapy- This method is better than the sanatorium treatment because there is no need to isolate patients with the active disease for extended periods of time. The effectiveness of chemotherapy is such that patients with active disease can be rendered non-infectious to other people within a few days or weeks after treatment has begun.

(c) Raising the level of Resistance of the Population at Risk

There is no effective way in which the control of a respiratory infectious disease can be accomplished except through raising the level of resistance to infection of the population at risk. With the use of B.C.G vaccine, it is generally assumed that there is no possibility of an individual getting the disease. Unfortunately this is an assumption because, the vaccine only reduces the risk of infection.

However, research is still being carried out to see if it is possible to prevent tuberculosis from even springing up in the first place.

2.2 LEPROSY

Leprosy is a chronic, mildly infectious disease that principally affects the peripheral nerves, the skin and the mucous membrane of the upper respiratory tract.

Leprosy is a curable disease. In some cases, the disease may cause deformity and disability as a result of nerve damage, which is preventable, if the disease is detected and treated early.

Leprosy is caused by *Mycobacterium Leprae*, an acid fast bacillus discovered in 1873 by a Norwegian doctor called Armauer Hansen in Bergen, Norway. The organism multiplies mainly in the macrophages of the nerves and skin.

The average incubation period, the period between infection and the appearance of disease is between two and five years. It may vary from three months to twenty years. Fig. 5 and Fig. 6 show "Registered Leprosy Cases (1992-1998)" and "Cumulative number of Leprosy cases cured in Nigeria (1992-1998)" respectively.

In Africa, there has been a drastic reduction from about twenty million in 1998, to 5.5 million in 1991 and 1.8 million in 1995. (Fig 4b)

According to the Revised Workers Manual (1998), Nigeria too, has seen a vast reduction in leprosy cases, beginning from 200,000 cases in 1989 to 12,878 cases in 1997, showing a drastic decrease in the trend.

The distribution of leprosy is of all ages, from infants to

elderly. The peak age of onset is between ten to twenty years.

Both sexes are affected, but in most areas, there are more males than females; roughly in the ratio 2:1 In children there is little sex difference.

Nigeria, ranks among the ten endemic countries for leprosy in the world, but this is mainly due to the size of the population. There has been significant reduction in the registered prevalence since the inception of the N.T.B.L Programme in 1995. In 1998, there were 1534 cases on register giving a prevalence rate of 0.6/100,000 population, thus Nigeria achieved the WHO Leprosy Elimination Target of less than one in ten thousand. (Fig 4a)

2.2.1 Types of Leprosy

There are three major types of Leprosy:

- (a) Tuberculoid Leprosy:- This is a granulomatous form of leprosy, and the host expresses vigorous cell-mediated immunity against the bacillus leprae and its products. (Bralow, S.P).

In the skin, cellular infiltration may extend up to the epidermis, and the disease is localized to one or a few sites in the skin & the peripheral nerves. Skin lesions are solitary and well defined. They tend to heal spontaneously from the center.

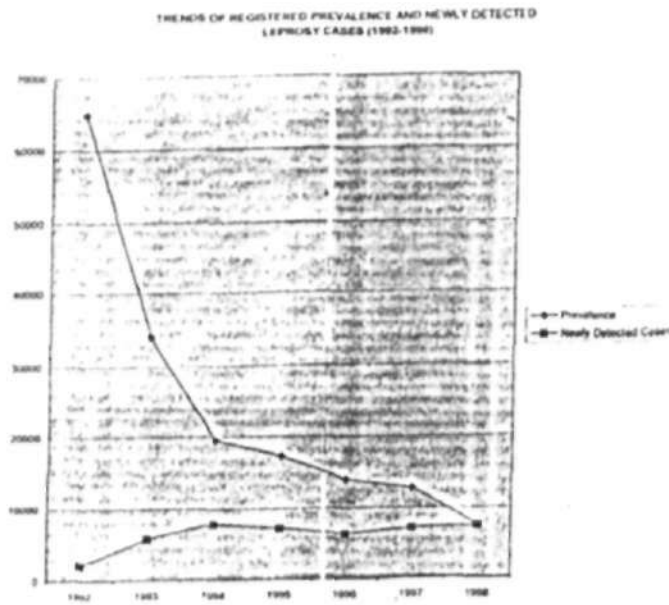


Fig 5

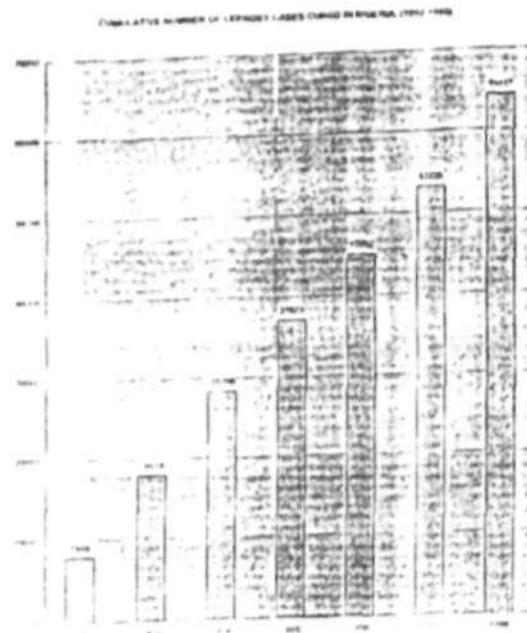


Fig. 6

Fig. 5 and Fig. 6 show Leprosy statistics in Nigeria in the year 1988

Source: "Analysis Report Of National Tuberculosis and Leprosy Specialist Hospitals (1988)".

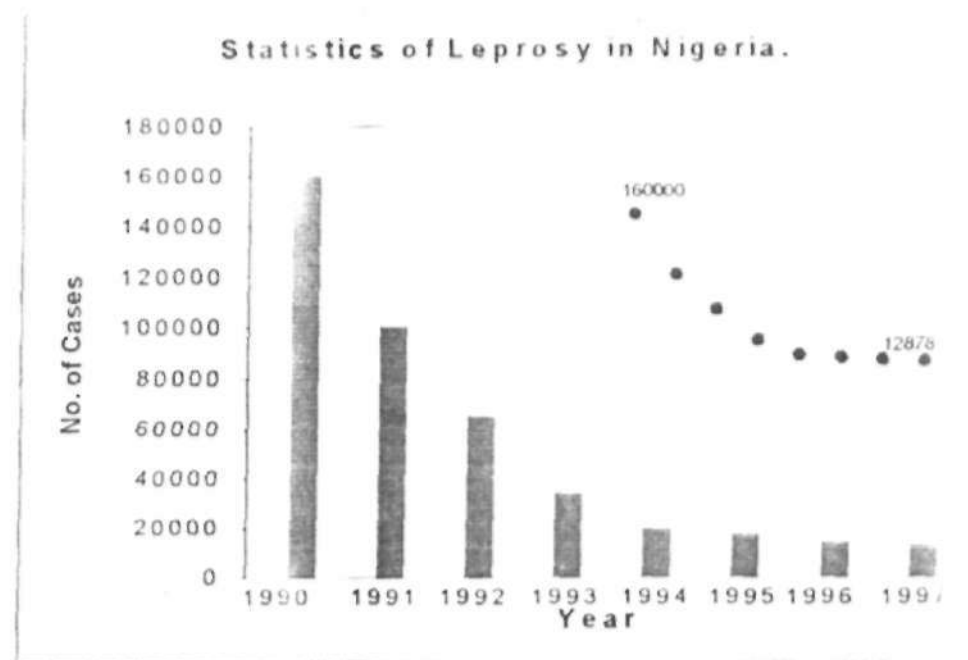


Fig. 4a

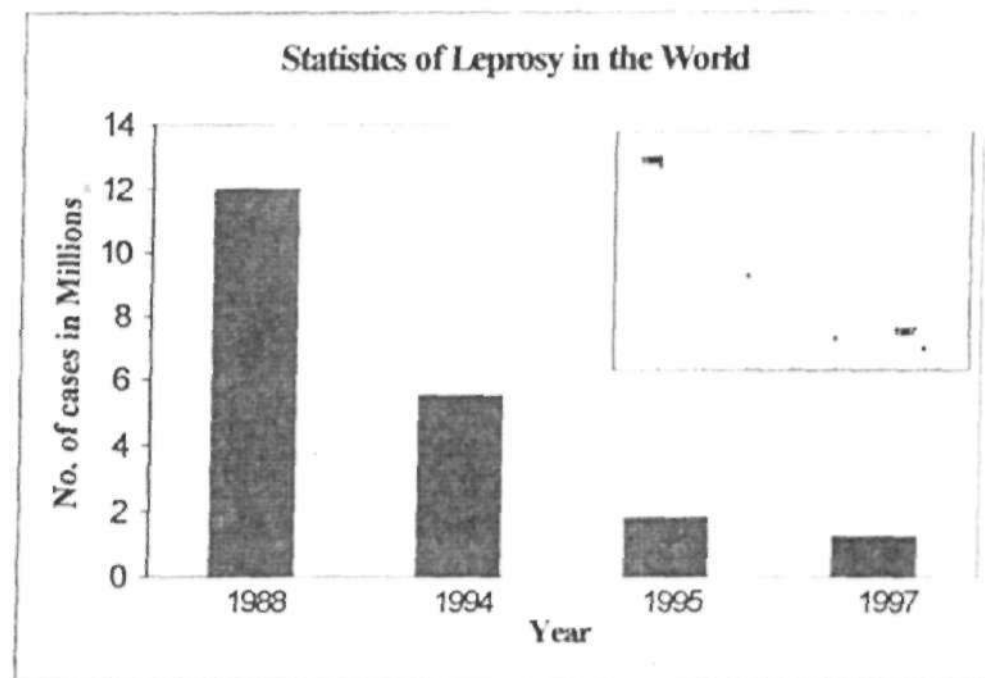


Fig. 4b

Source : "Revised Workers' Manual (1988). National Tuberculosis and Leprosy Control Programme."

Nerve damage may be rapid, there is numbness in nerve distribution leading to weakness and wasting of muscles. Automatic damage is manifested by sweating, "Bryceson and Pfallzgraff (1970)."

(b) Lepromatous Leprosy:- This occurs when cell mediated immunity fails to develop, thus reflecting enormous bacterial growth.

The host shows little evidence of immune response to these organisms. In this case, patients have minimal effective immunity, especially towards the *Bacillus leprae* and its products, and as the disease progresses, the tubercle cell mediated immunity is lost.

In a normal situation, the lymph nodes of an individual must have T.- Lymphocytes but once an individual has lepromatous leprosy; lymphocytic in-filtration is minimal and lymph nodes are filled with foamy histiocytes clogged with leprosy bacilli.

"Schaffer", demonstrated that droplet infection is a distinct possibility by showing that active lepromatous cases could be expelled by speaking, coughing and sneezing a very considerable number of bacilli in a few minutes.

"Many studies show that contacts of tuberculoid cases have a much lower risk of developing leprosy". (W.H.O Expert Committee 1979)

Lepromatous leprosy spreads rapidly, both locally and by the blood to other parts of the skin, to nerves, to the mucosa of the upper respiratory tract and to all the organs of the body, affecting particularly the eye, the testes, lymph nodes, the liver, and spleen.

(c) Borderline Leprosy This is in between the tuberculoid leprosy and the lepromatous leprosy, the two extremes.

Many nerves are involved, though not symmetrically as in lepromatous leprosy, nor does the patient have the complications as associated with bacillary invasion.

It is always important to determine whether the patient lies in the middle of the spectrum, towards the tuberculoid end or towards the lepromatous end.

2.2.2 Treatment of Leprosy

Leprosy and its complications produces a wide range of disorders, and their management involves different disciplines of medicine ranging from psychotherapy to reconstructive surgery.

The following drugs are used for treatment:

(a) Dapsone - "This was first synthesized in Germany in 1908, and after years of experimenting on animals, Guy Faget tried it on patients with leprosy and it was effective". Bryceson and Pfaltzgraff (1979).

Dapsone has proved to be cheap, safe and effective and

eminently suitable for out-patient care, but in the past ten years two major problems have emerged; Dapsone resistance and microbial persistence.

To prevent Dapsone resistance, the treatment should be maintained in full dosage, continued regularly, without interruption and if possible daily.

(b) Streptomycin - This is an antibiotic that is bacteristatic against *M. Leprae* and is rapidly effective in controlling invasion of mucous membranes of the upper respiratory tract, and lepromatous ulceration of the skin.

When improvement begins, the drug can be given on alternate days instead of once daily as is the case in the beginning.

(c) Rifampicin - An antibiotic that is the only available bactericidal drug which brings down the morphological index in lepromatous (extreme) leprosy to zero in about five weeks.

Rifampicin has two drawbacks; it is very expensive, and if used intermittently patients may become allergic to it and may develop fever, haemolytic anaemia and hepatitis.

(d) Clofazimine - This drug has a bacteriostatic action equal to Dapsone. It interferes with bacterial nucleic acid metabolism. Its dosage is one 100mg capsule three times weekly.

The drawbacks are its cost, the development of skin pigmentation and abdominal symptoms. The skin first becomes red, then brown, then eventually blue black.

Clofazimine is also of value in patients who are to undergo Surgery and in the treatment of patients with Dapsone resistant leprosy, for which it is cheaper than rifampicin. Resistance to clofazimine has not so far been reported.

- (e) Thiambutosine- This is the only compound commonly used. It is bacteristatic, free of toxic effects, and as effective as Dapsone, but it is expensive. It is of value in starting treatment in borderline patients who have large or tender nerves, if clofazimine is not available. The dosage is 500mg orally on alternate days. If no reaction develops after three weeks, the dose is increased to 500mg daily. When the patients' disease has become more stable, Dapsone should be begun and thiambutosine stopped. Leprosy bacilli becomes resistant in about two years and the drug should not be used on its own in borderline patients. (Bryceson, and Roy E. 1979).

2.2.3 Spread of the Disease

An infected human being is considered to be the only known source of infection. The untreated patient with the Lepromatous type of leprosy usually harbors many viable bacilli, and thus constitutes the main source of infection.

Multibacillary cases may discharge as many as ten million viable organisms per day when they sneeze or cough. The most important route of exit of the bacilli from a leprosy patient is through the nasal discharges. The portal of entry of the bacilli is through the upper respiratory tract ; by inhalation of the suspended droplets laden with the bacilli. (National Tuberculosis and Leprosy Control Programme, Revised Workers' Manual, 1988)

2.3 REHABILITATION

Rehabilitation is the restoration of the patient to his former physical and social state so that he resumes his place in his home his society and his work.

To achieve this, treatment of the disease it self as well as the physical disability (physical rehabilitation) is necessary. This must be accompanied by education of the patient, the patients' family and the public, so that not only can the patient take his place in society, but also that society accepts the patient and assists him positively to do so.

It is important to note while the patient who looks grotesque although the disease process may be burnt out, is better off than the patient who is infectious and goes unnoticed, as the physical signs of leprosy are so slow to appear. For this reason, the isolation of leprosy patients is of little or no public health value, and only increases stigma.

2.3.1 Social Rehabilitation

Education is the basic need. To educate the family and society to accept the patient as having simply a disease which is treatable and which is less contagious than most others they are familiar with.

On the other hand, society must not, out of fear, overprovide for the patient and ultimately deprive the patient of self respect and ability to care for the individual and the individuals' dependants.

2.3.2 Psychological Rehabilitation

In a society where stigma is high, patients accept themselves as being outcasts, even sometimes after treatment, they live in constant fear that they will transmit their disease.

Therefore the disease affects the patients psychologically, and the best way to erase the stigma is by giving the patients maximum psychological support. The family should be visited and reassured and its help solicited. In this way the education of the public as a whole is furthered.

2.3.3 Vocational Rehabilitation

Methods vary with the setting, with the attitudes of the people, with the opportunities for work for the able bodied and for the disabled.

In many situations the greatest hurdle is that of acceptance for employment of those who have or have had leprosy.

For vocational rehabilitation to be effective, the patient

- (a) must learn to live with anaesthetic extremities, that is work without destroying the individuals hands, feet and eyes.
- (b) must have the physical ability to work and have retained the initiative to do so.
- (c) should train for a new job if it not possible to resume their old job.

2.4 SOCIAL INTEGRATION

This is a programme that N.T.B.L.T.C is already undergoing. It involves the integration of leprosy and tuberculosis services with other health services, and should only occur when;

- (a) the incidence of leprosy has been reduced to an acceptable level.
- (b) adequate medical and nursing staff are available, and have been educated in diagnosis and treatment.

The graph below shows the comparison between the following cases in the months of January and February 2000

- (a) Tuberculosis Cases
- (b) Leprosy Cases
- (c) Dermatological Cases
- (d) General Cases (Table 1 and Table 2)

Table 1: Comparison between General Leprosy and Tuberculosis Cases

January 2000 (End of Month)

New Cases		Old Cases	
M	F	M	F
276	193	185	152
TB. 19	38/469		
Lep. 10	14/469		

Dermatological (Old / New) 466/469
 General (Old / New) 396/469

Table 2

February 2000 (End of Month)

General	277cases / 480
Tuberculosis	13cases / 480
Leprosy	16cases / 480

Source : "National Tuberculosis and Leprosy Training Centre " Hospital Records,
 Saye Village, Zaria-

3.0 CHAPTER THREE - SPACE INTEGRATION AS A BASIS FOR HOSPITAL PLANNING

3.1 INTRODUCTION

Buildings that provide for health care fulfil many different functions; they shelter services for the promotion of health and the prevention of illness; for the assistance of natural functions like child birth and the support of those who are in a variety of ways afflicted or incapacitated (Cox and Philip, 1981).

Although all hospital buildings share similarities, the buildings will reflect the nature of the organization and culture, economy and geography of the place in which it is situated.

In N.T.B.L.T.C there is development towards integrating all other related diseases into the system. This has already begun with the treatment of skin disorders and the diagnosis of AIDS evident in about 40% of the tuberculosis patients.

A hospital, or as in this case a centre, should be the last resort - not the first line of defence for treatment. This is due to the cost associated with hospitals. This means that the control of diseases is better than the treatment.

Although, the care of the patients count a great deal, it is

important to note that the buildings that provide shelter and various degrees of sophistication can either help or hinder the tasks to be performed within, therefore it is necessary to design appropriately.

Before the subject matter of this chapter is considered, a brief knowledge of hospitals, the type of health care and the types of hospitals need to be discussed.

3.1.1 Hospitals and its historical development

Hospitals are institutions which provide medical services to ensure or meet the health needs of a community. The professionals who work with the equipment found in hospitals try to restore health to sick and injured people; while at the same time preventing the outbreak of disease.

Over the years, hospitals have been shaped by various cultures and aspects of life, thus developing into a significant place and form in the human society.

The evolution of hospitals to modern standards dates back to the early periods of the ancient Egyptians and Greeks, where medicine and healing were associated with the gods and consequently, the existing hospitals then had forms closely resembling the forms of temples and in some cases the temples of gods became healing centres.

Other examples that show the evolution of hospital design can be seen in the following periods:

- (a) 3rd Century (India) Where the need for an area that included wide planning of medical facilities, the attendants were instructed to give gentle care to the sick, provide food, prepare medicines, give messages and maintain a high level of personal hygiene.
- (b) 835 A.D Due to the emergence of Christianity, Emperor Constantine adopted christianity as a State Religion which led to the building of christian hospitals. Example, "Basiliade" built in honour of Constantine.
- (c) 316 A.D (Rome) Emperor Chartemagne proposal that hospitals were built near cathedrals, thus within reach of clergymen. This also led to the building of monastries near hospitals. The allocation of the size of a hospital, the standard spaces and the general arrangement of any hospital must be of importance if health care is to be administered appropriately. This is because the better organized a hospital is, the easier it is for the hospital to be run effectively.
- (d) The 14th Century - There was an evidence of the development of hospitals due to
 - (i) the church edict which forbade clergy from performing operations
 - (ii) the indiscriminate lumping of patients together irrespective of the type or seriousness of their

illness

- (iii) municipal hospitals grew in number and gradually replaced the monastic hospitals of the middle ages
- (iv) the progress of the medical profession due to the printing of the ancient and Greek medical writings leading to anatomy being a recognized study.

(e) The 19th Century Here, in the first half of the century, there was a relapse in hospital development to the intolerable conditions of the hospital, bad hygienic attitude of medical staff, the use of laymen to perform operations.

Fortunately the mid 19th Century witnessed a positive leap forward in hospitals with discoveries of

- (i) Anaesthesia
- (ii) Electric equipment to record blood pressure, heart rate, respiration and temperature
- (iii) The principles of antiseptic
- (iv) Steam sterilization

3.1.2 Types Of Health Care

Most health care systems, no matter the source of finance, the administrative structure, e.t.c comprise of a range of institutions which are graded according to their degree of complexity, specialization and level of care that they provide.

There are three main types of health cares that can be

identified, namely;

(a) **Primary Health Care**

This is mainly a community based health care service, which is relatively accessible to the patients. The services provided here are preventive health care such as ante-natal and child care diagnosis, treatment and immunization programmes. In this category are health care units dispensaries, and clinics that are relatively small in number and close to homes. Thus medical and other staff can contact with their patient's habitual environment.

(b) **Secondary Health Care**

At this level is the general hospital, to which patients from a wide surrounding area or district are referred for more sophisticated diagnosis or treatment.

(c) **Tertiary Health Care**

This includes highly specialized services, which are not usually found at the secondary health services. Examples of specialities here are cardiology, plastic and neuro-surgeries; teaching hospitals, specialist and specialist-teaching hospitals

3.1.3 Types of Hospitals

There are different types of hospitals, with a wide range of health services offered. They are :

- (a) **General:-** These are large hospitals that provide for all but specialist services. Their size varies, and is measured in

terms of bed number which could range from 200 to 1000 beds. Patients of all ages and ailments are admitted here.

- (c) **Teaching Hospitals:-** These provide for the training of undergraduate medical students and may contain significant research facilities. It may also contain university medical academic departments in addition to the above-mentioned facilities.
- (d) **Community Hospitals:-** These are small hospitals of about 50 to 150 beds, which are intended to serve a small neighbourhood, containing non-acute and long stay beds; limited diagnostic and treatment departments and staffed by general care. They provide for patients transferred from a general hospital, for medical cases where home circumstances prevent domiciliary care and for long-stay geriatric patients.
- (e) **Specialist Hospitals:-** These type of hospitals deal with one category of patients only. They provide post-graduate teaching and research in their speciality. Many of these hospitals are large and remote.

The allocation of the size of a hospital, the standard spaces the general arrangement and the form and ventilation of any hospital must be of importance if health care is to be administered appropriately. This is because the better organized a hospital is, the easier it is for the hospital to be run effectively.

3.2 Size of Hospitals

This is categorized by the number of beds they contain, the ancillary departments necessary to support the beds and to deal with out-patients, have greatly increased in size and sophistication in the last quarter of a century, (Anthony Cox and Philip Groves, 1981).

Hospitals contain three basic categories of accommodation ;

- (a) The beds themselves organized in wards and accommodation necessary for its day to day clinical and domestic servicing.
- (b) The departments that provide the diagnostic, surgical, medical and therapeutic services needed to support the wards and minister to out-patients.
- (c) The departments that look after the establishment as a whole, providing it with medical and domestic supplies, food and energy, and maintaining the physical fabric and equipment.

The relative space occupied by these categories of accommodation varies somewhat with the type of hospital and the country in which it is situated.

3.3 Space and Standards

Space standards for individual parts of a hospital vary from one country to another. Besides cultural factors and different methods of working they can reflect the funds allocated for

construction and equipment and the money that will be available for the recurrent costs of staff and supplies and for keeping the facility operational.

The space that is genuinely appropriate for the various components of a hospital is not always easy to determine. Sometimes it is related to the dimensions of machines or pieces of equipment, static or mobile, and to the activities performed by people around such equipment. For many such areas there are universal guidelines to follow.

Other factors for allocating space are:

- (a) Estimations of minimum distances for the avoidance of cross-infection and social acceptability as in the spacing of beds.
- (b) It may be unnecessary and unrealistic to plan for the arrangement of beds with curtains round each bed for privacy.
- (c) It might also be unnecessary for each patient to have both a locker and a bed side chair.

These and many other procedures need to be thought through and determined in principles as a part of the designers' brief.

3.4 General Arrangement

Wherever a hospital is situated, whatever the culture and whatever its size and detailed operational policies, it will

contain both wards and supporting departments.

The supporting departments will be characterized by their speciality and the particular services they perform; each discharges a different function with its own staff and a certain amount of its own administration.

The separate departments that should be considered in a general arrangement are;

- (a) Central administration
- (b) Receipt and administration of stores for distribution, preparation and cooking of food.
- (c) Stores for maintenance of building and its service department and equipment, for heating, ventilation, and other mechanical plants.

The form and arrangement of the building and its relationship to other departments is fundamental and will have a major effect on the form of the whole building.

3.5 Form and Ventilation

One of the fundamental factors to be considered in designing a hospital, and subsequently the derivation of its form, is ventilation.

The ability to control the air temperature both above and below the ambient temperature, and also the humidity with sterile

filtration is of great importance in some specific areas of a hospital eg. Like in an operation theater.

Air conditioning, is important in temperate and tropical countries. Apart from the medical resources, some areas may be noisy and polluted thereby there may be the need for air-conditioning in tropics, and hot desert areas where there are dust storms for half the year.

Air movement can have an important bearing on the incidence of infection, especially if air removed from an infected part of the building through ventilation or duct systems.

It is important to note that, even with the installation of full air treatment, it does not always achieve a reduction of the incidence of outbreaks of infection.

Indeed, many hospitals which are dependent on their ventilation by throwing open windows and doors, have less frequent out breaks of disease than those with full air-conditioning. Further more, air-conditioning is expensive and a constant consumer of energy.

Whether in a temperate or tropical climate, air conditioning makes possible a high ratio of internal space to external wall and permits a compact building that would be entirely

impracticable without it. Air conditioning may thus, reduce the site area that is necessary, and will tend to lead to economy in the cost of the actual fabric of the building, but not that of its artificial lighting, other services or of its maintenance.

Conversely, the reliance on natural ventilation will impose inescapable constraints on the shape that the plan will take. This is because natural ventilation will produce a relatively high ratio of external wall to floor area, thus likely to increase the cost of the building fabric although reducing that of its services and running costs. The form the building will take will be affected by the climate; therefore, it is important to decide what effect the climate would have on the design so as to design appropriately. Whether or not surfaces should be exposed to the prevailing wind or not depends on the climatic factors that is compatible with the shading from the sun.

All these factors must be considered when designing a hospital.

3.6.0 GROWTH AND CHANGE

There seems little reason to suppose that medicine will cease to produce unforeseen demands and it is arguable that new hospitals will be subject to similar pressures. This is particularly so in developing countries where, although the initial accommodation may have to be relatively simple, the

provision of facilities is likely to be rapidly extended in the future.

Cox and Groves (1981) stated that

"As the inevitability of growth and change has come to be recognized, views have been expressed during the last few decades which maintain that, wherever it is situated, a hospital is never likely to be complete. As the building will inevitably require alterations and additions during its working life, from the onset, its physical organization should be conceived with this in mind".

It is in view of this statement, that I base my proposal on space integration, because during every exercise on alteration and addition, the newer facilities need to be properly connected to the original existing structure; thus the need-for a workable integration.

3.7 CONCLUSION

It can therefore be deduced that there is a need for space integration when planning hospitals because the size of hospitals and the ease with which ideal movement is attained depends on the standard requirements of space and the general arrangement of the site.

A realistic analysis of functions should be imperative in the mind of the researcher in the redevelopment process so as to prevent the escalation of cost to its limit; since ordinarily any building for health care is expensive and complicated.

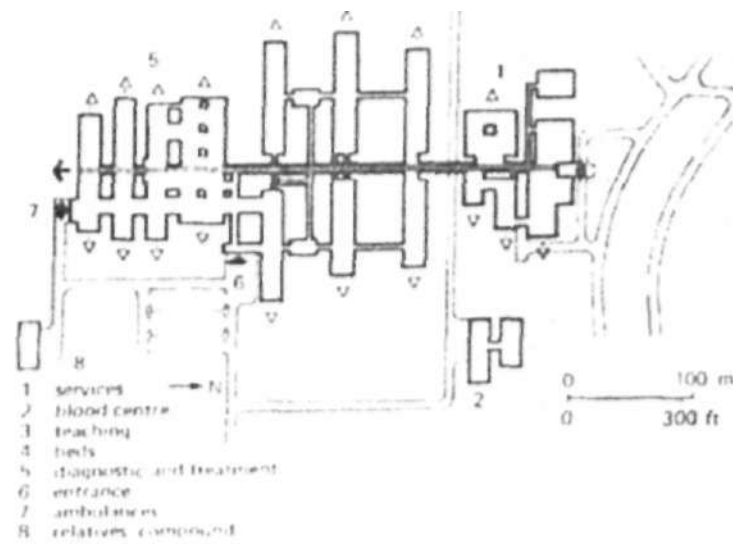
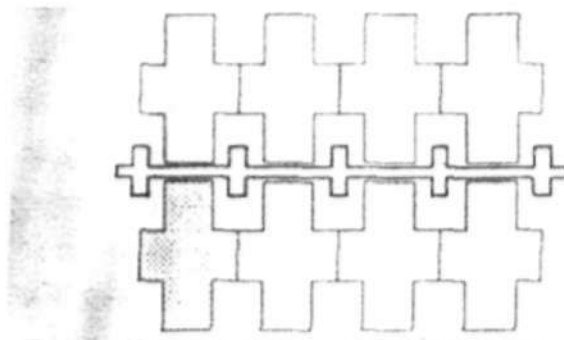


Fig. 9



Fig 10



The basic 'Nucleus' is a cluster which contains wards, departments

Fig 11

The three figures above show various types of arrangements in hospital design.

SOURCE : Cox Anthony and Groves Philip (1981).
"Design For Health Care, Butter Worth and Co. Publishers Ltd

Based on the information in this proposal, the proposed "redeveloped centre" is meant to stand out as a landmark of excellent health standards and training, after having satisfied the above listed criteria for a hospital building.

(Fig 12) shows three plans at different phases of space integration at the Northwich Park Hospital and Clinical Research Centre.

A linear hospital street forms the backbone to which ribs can be attached with relative freedom.

Construction was carried out in phases over a period of nine years and during this time alterations and extentions to the original brief were made without disturbing the basic design.

Architects: Llewelyn - Davies Weeks.



Fig. 12

Integration at 'Norwich Park Hospital and Clinical Research Centre'.

43

Source: Cox Anthony, et al.
'Design for Health Care'.

4 CHAPTER FOUR - PROBLEMS ASSOCIATED WITH PHYSICAL EXPANSION IN HOSPITAL DESIGN

4.1 INTRODUCTION

"The subject of health care is one which is being given increasing attention throughout the world, as developing nations realized the importance of preventive medicine as well as medical treatment the effectiveness of such care is clearly apparent in the rapidly falling birth rate in many parts of the world and the greater life expectancy" (Mills 1981)

Therefore, it is the role of the architect to produce buildings for health care which will be efficient, economical and pleasant.

Cox and Groves (1981) explained that in developing countries of the world, where there are greater problems and usually lower resources, the deliberate organization of health care is expanding rapidly. The extent and sophistication of hospital design depends not only on the country's attitude to social welfare and its administrative structure, but more fundamentally on the level of its economic development, i.e on what it can afford.

The physical expansion of hospital buildings is an exercise that can be observed in hospitals that may have been smaller and need to be enlarged; or in cases where facilities are insufficient thereby encouraging the need for newer equipment; thus larger spaces.

Considering the expansion of hospitals, it is necessary to

underline the problems that will be associated with physical expansion in various hospital designs, so that there will be an awareness in the mind of the designer when expanding a hospital.

A strategy of planning has to be devised during the conception of the brief so that there is a possibility of making additions without interfering with other parts of the hospital.

This chapter therefore will include mainly the problems associated with physical expansion in hospitals.

4.2 HOSPITAL DESIGN

In the planning of hospitals; because of its complexity of design, it is usually impossible to assemble a design team, although according to Wheeler (1955), "The most efficient means of accomplishing unity is through the mind of one man; a master planner".

However, the problem thus associated with hospital planning "almost always exceeds one man's knowledge and experience. Thus it is necessary to assemble a design team" wrote Todd (1955).

In physical expansion, growth will probably anticipate three roles;

- (a) An increase in the curative treatment of out-patients.
- (b) The provision of beds

- (c) Co-ordination of public health services in the improvement of general health and preventive action against social diseases.

The type of provision that is made for the development of the hospital will largely depend on the

- (a) Nature of the catchment area
- (b) The living conditions of the community and their particular demands.
- (c) Prevalence of specific diseases.
- (d) Cultural acceptability.

For example, in most areas, it is likely to be the out-patient clinics or in cases where rate of infant mortality is high, the provision of wards for infants may come first; or where living conditions and social habits particularly endanger child birth, a maternity ward may be important.

The design therefore should allow not only for expansion, but should also permit some flexibility for changes in use.

4.3 Problems associated with physical expansion in hospitals.

The expansion of hospitals is a pressing and delicate problem because of the problems that are related with additions to a design.

A concise compilation of the possible problems that could be

observed with the expansion process has been outlined below.

(4.3.1) Cost

More than any other building for health care, a hospital is an expensive and complicated installation and costs a great deal to keep in operation (i.e maintenance). Its design should spring in the first instance, not from a convenient schedule of customary accommodation but for a realistic analysis of the functions it is intended to fulfil.

According to Drummond (1980), "Conference speakers repeatedly emphasized that nucleus designs was not the complete answer to inadequate hospital facilities".

A nucleus design is a term applied to a standard hospital design based on a cruciform shape which serves the purpose of any department. There are two phases; the first which is the original hospital and the next phase, which has the capability of further expansion after a period of years.

The major problem associated with the expansion is that; there is a considerable required expenditure on a link hospital supplying support facilities for the nucleus.

Therefore, it is always better to avoid a design that would need expanding physically as much as possible, and plan in the

earlier stage of design.

Problems of low budgets have led to the use of cheap solutions in certain areas of hospitals. This happens when members of the project team sometimes make expensive choices for their department without being aware that there are cost limits on the whole project. It may mean that cost cutting has to go on elsewhere to allow medical and nursing personnel to have the unit they have chosen.

(4.3.2) Duplication of Facilities and Staff

Although the evidence of inadequate non - clinical space for consultants or inadequate space for other departments might lead to the expansion of a hospital, there is the possibility of duplicating the facilities in the new design.

Staff and Equipment

The right number of staff and equipment is also significant in the physical expansion of hospitals because in some cases skilled maintenance will not usually be available.

Cox and Groves (1981) stated that

"Usually, in developing countries, out-patients departments in rural areas are likely manned by several auxiliaries but only one doctor, so if there is no possibility of the increase in the staff, it might be more difficult for the single doctor to manage if hospital is expanded".

Also, if the required equipment for the intended structure can not be obtained, then the possibility of expansion could be

a problem, since there would be a "new large space" lying in waste for large staff to run or equipment to fill it up with.

(4.3.3) Design and Construction Problems

According to Cox and Groves (1981), "When expanding, there is further complication that the hospital has to be built in stages, or in a phased extension of other buildings that are already in use. Usually the first stage and each subsequent enlargement must constitute a viable operational unit. The progressive work of construction must interfere as little as possible with the function and amenity of the accommodation already occupied"

The following are some problems related to design and construction.

(a) Fire Safety

Here, the standard fire precautions package should be adequately met. In the expansion of buildings in hospital design this could be difficult to achieve especially if it had been carried out in the original design. Thus the ability to merge the old and new design and consider the natural fire regulations could be very demanding and difficult to achieve.

Care must be taken to allow for horizontal travel in wards so as to enhance the movement of bedfast patients in case of fire.

(b) Change in Architectural Style

In the construction of hospitals nowadays there is a

possibility of visualizing the finished building within a short period of time due to the new methods of design available.

Unfortunately this could lead to evident problems such as

(i) Larger Hospitals, but with shorter life span.

Drummond (1980) discussed in her article "Survey of Structural Defects" that 'instead of the pointed or pitched roof being used, they became impracticable for large surfaces, therefore flat, felt covered roofs were used instead sometimes covering acres'.

Although felt has been used for years, the combination of increased area, temperature gradient and thermal movement of the material resulted in an insufficient water proof covering.

Thus, felt covering although cheaper in the first instance was far more expensive in the long run because complete re-roofing with asphalt had to be carried out after seven to ten years.

(ii) Time Constraints For Emergencies Leading To Poor Design

Experimentation in new floor screeds have resulted in some poor designs. The traditional sand and cement mixture placed over reinforced concrete floor slab took a long time.

This resulted in the use of new screed using chemical mixtures to fasten up drying process. Some times they worked well and other times they failed. Thus water penetration of floor slab

occurs.

Designers therefore tried out new technologies some which led to rapid obsolescence in structures, and consequently enormous maintenance costs once the hospitals were a few years old.

(iii) Improper Fixing of Claddings and Other Fittings

In the final stages of building, cladding and fittings have sometimes been fixed in a hurry, in order to meet up completion dates.

Although the new methods have led to problems, Hill in Drummond (1980) stated that "it's a calculated risk, there has to be new technology or else there is no progress. Of course, mistakes happen and people get spooked. But you learn from mistakes. It's bad to reject new methods".

(iv) High Risk Blocks

When going high-rise, many structural difficulties are experienced, along with the on-cost connected with the addition of lifts and services.

(c) Circulation Pattern

In planning or expanding a hospital, care must be taken to ensure that there is correct planning to avoid;

- (a) Inability to locate facilities in the hospitals, thereby reducing complicated patient flow.
- (b) Unnecessarily long distances that patients or staff have to

travel.

Thus, in expansion, the overall plan form of the building, whatever its size, must exhibit simplicity and clarity in the circulation flow of patients.

(d) Space and Standards

The space that is genuinely appropriate for the various components of the hospital is not always easy to determine. Some times it is related to the dimensions of the machines, static or mobile, and to the activities performed by people around such equipment.

Maintenance of adequate space for departments that need to be separated from the rest of the hospital are in

- (a) Obstetrical ward there is the need to have obstetrical delivery suite, surgical operating suite, diagnostic and treatment facilities close by.
- (b) Pediatric wards the places of support facilities should be integrated.
- (c) Out-patients department -This area is usually fixed i.e it is supposed to be the first point of call in a hospital design.

It is evident therefore, that in the expansion of a hospital design, it is important to evaluate those facilities that should be fixed, and those that are movable, otherwise the design would turn out to be in a "massive state of confusion".

(e) Delays in Completing Projects

Added to design problems are long delays in completing projects; some have been held up for fifteen to twenty years; thus the old hospitals are ultimately modified substantially to meet requirements of new legislation.

Some times, the delay of payment to the builders from the health authorities could add to the delay in completing projects.

(f) Litigation

In the building stage; there could be litigation problems from courts. This is mainly against construction companies, whereby the courts feel that there are building defects in expansion problems.

(g) Wards and Service Rooms

Service rooms or facilities include pipe borne water outlets, drainage systems, road network, telephones, postal services, etc. These should also be well incorporated into the new expanded design otherwise there would be lapses in these areas.

The wards should be organized such that cognisance will be taken in the relationship of the central department to one another and in the relation to the wards.

The shape of the ward could also affect efficiency of nurses, taking into consideration the distance between nursing

stations and the most remote bed.

(h) Size and Topography of Site

When site is restricted and the room for manoeuvre is very limited, it could be difficult to expand the facilities.

4.3.4 Obstruction, Overcrowding, and Inadequate Ventilation

In expanding hospitals, it very important when designing to take note of the following.

- (a) Building and parking structures should be incorporated into the design without blocking views from patients rooms in existing hospital.
- (b) Construction should be phased in such a way that new buildings do not disturb operations of existing hospitals i.e is the space patient friendly?
- (c) The issue of lighting eg, in operation theaters and ventilation in hospital design, especially in tropical countries.
- (d) Overcrowding of the design should be avoided so as not to create room for confusion.

4.4 Conclusion

The challenge of this research has benefitted the authors' knowledge in hospital design, the problems associated with hospital design, its intricacies and complexities, and thus deducing the necessary precautions that need to be observed when expanding a hospital.

It is the authors' recommendation that special care must be taken to make a thorough appraisal of the facilities that need expanding and determine whether or not it is necessary, realistic and cost effective to carry out the exercise.

5.0 CHAPTER FIVE - CASE STUDIES

5.1 THE NATIONAL TUBERCULOSIS AND LEPROSY TRAINING CENTRE, SAYE VILLAGE, ZARIA (N.T.B.L.T.C)

5.1.1 Introduction:

This hospital started as a leprosy camp under the Zaria Authority in 1929, but over the years, due to the integration of other health services, it is gradually becoming a general hospital.

The responsible body for the centre is the Federal Ministry of Health and financial support is given by the Netherlands Leprosy Relief and other National Governmental Organizations (N.G.O'S) working in Nigeria.

The Hospital comprises:

- (a) Patients facilities
 - (i) In-Patient Facilities (Plate 5.1 and Plate 5.2)
 - (ii) Out-Patient Facilities
- (b) diagnostic facilities
 - (i) Operation theatre (Plate 5.3)
 - (ii) Bacteriological Laboratory
 - (iii) X-Ray Department
- (c) administrative units
- (d) A training school (Plate 5.4)
- (e) Service Departments (Plate 5.7 and Plate 5.8)
- (f) Religious Facilities



Plate 5.1
In-Patients facility

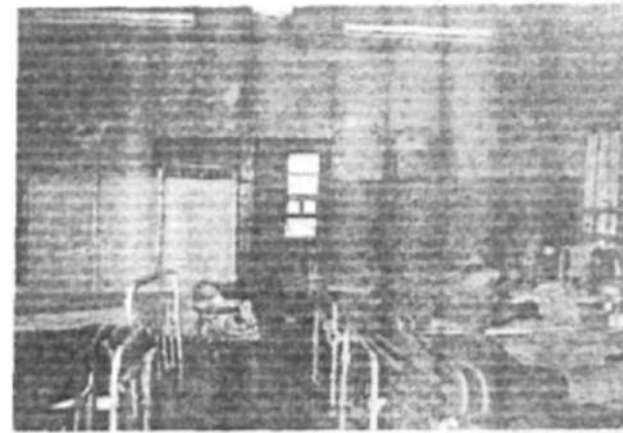


Plate 5.2
In-Patients Facility



Plate 5.3
Operation Theatre

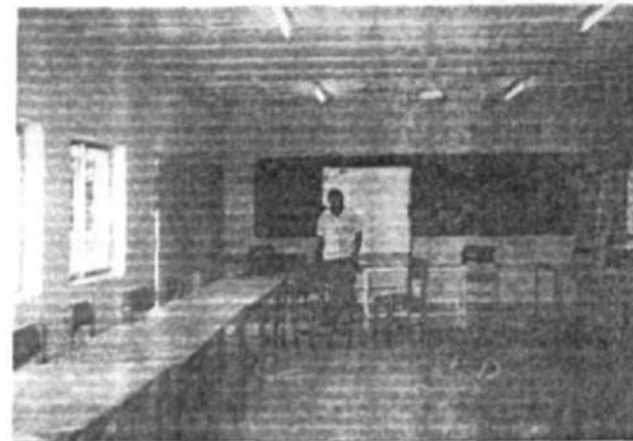


Plate 5.4
Interior Classroom Block

National Tuberculosis and Leprosy Training Centre, Saye Village, Zaria.

- (g) Rehabilitative Units (Plate 5.5)
- (h) Multipurpose complex with phisiotherapy Unit
- (i) Residential buildings

The training school is meant for the training of private or N.G.O sponsored students that will end up in Tuberculosis and leprosy control programmes in various local governments and institutions.

5.1.2 Location

The hospital is located in the Zaria and Kewaye Local Government in the "Sayen Kutare" Village ("Village for the Lepers" translated from the Hausa Language).

The site is large with an area of about 26.45 ha, and it has a relatively flat land with some rocks of about 2300km above sea level, with ground level at 2150km.

5.1.3 Owner

It originally belonged to the "Church Missionary Society", but is now owned by the Federal Ministry of Health with financial support from Non-Governmental Organizations.

The N.G.O'S are

- (A) The German Leprosy Relief Association (GLRA)
- (B) Damien Foundation (DFB)
- (C) The Leprosy Mission International (TLIMI)



Plate 5.5
Rehabilitation (cloth) Unit

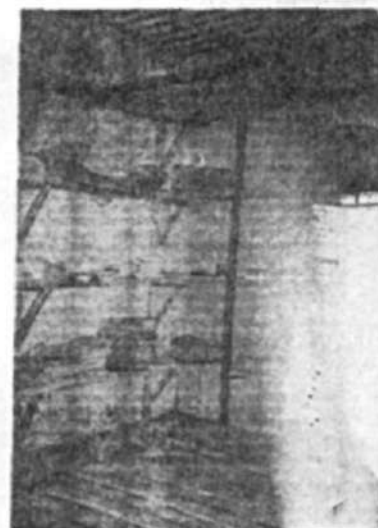


Plate 5.6
Storage (for cloth)



Plate 5.7

KASHIM IBRAHIM LIBRARY



Plate 5.8

Service Departments

N ational Tuberculosis and Leprosy Training Centre, Saye Village, Zaria

(D) The Netherlands Leprosy Relief (NLR)

5.1.4 Accessibility

It is accesible from the Old Zaria-Kaduna road by vehicle or motor cycles. The village is about twenty minutes from the major Zaria-Kaduna express way, and it costs =N=100.00 to go to and from the Hospital by motorcycle.

The road is in a deplorable condition, making it extremely difficult for the hospital to have quick access to A.B.U Teaching Hospital and other hospitals during emergencies.

In addition, access to the centre by patients, students, staff and visitors is greatly hampared.

Furthermore, the condition of the road contributes to high maintenance cost of vehicles.

There is an urgent need for rehabilitation.

5.1.5 Circulation

There is no defined pattern for pedesrtians circulation. Man made footpaths can be found all round the hospital grounds that reduce walking distance.

Vehicular circulation is from the entrance to the

administrative unit, and from the secondary road by the New Koranic Mosque, that leads to the student hostel. All the roads are dirt roads.

5.1.6 Architectural Layout

The present layout of the hospital is a scattered planning with the concentration of wards in one area.

Each ward has a small verander for sitting out during the day time.

5.1.7 Design Concept

The design concept employed is the horizontal planning concept with most of the buildings being bungalow-type.

Noted also is the segregation of various bulding blocks especially in the ward section, which gives adequate lighting and vetilation.

5.1.8 Merits and Demerits

- (A) Merits
- (b) Adequate daylight and ventilation especially in the male Leprosy and Tuberculosis wards.
- (b) Horizontal planning very good, and change in levels are minimal, in the case of irregular level change, ramps have been used eg. The male tuberculosis ward.

- (c) Angle of inclination of ramps within the open ended covered corridors and ground cover are gradual.
 - (d) The hostel block for the students has a very cool micro-climate due to the open courtyard system.
 - (e) The make-shift mortuary that was recently constructed has prevented the placement of the dead in the the dilapidated ward unit which did not have any specialized cooling system.
 - (f) The presence of boreholes, generator house and water tank helps to maintain the centre in times of N.E.P.A cuts or water shortages.
 - (g) The rehabilitation unit helps to provide training or rehabilitative services for the P.A.L.S (People Affected with Leprosy), and income for them eventually.
 - (h) O.P.D located at entrance is ideal
- (B) Demerits
- (a) Conveniencies in very bad state except in the student hostel, where they are better maintained
 - (b) Departments with key relationships are far from each other, like the administrative unit and the outpatients department, the X-Ray Department and the laboratory are far from the entrance and O.P.D.
 - (c) No covered walkway from wards to the operation theatre
 - (d) No proper treatment of surrounding environment
 - (e) Location of shoe workshop opposite female leprosy ward acts a source of noise to the patients
 - (f) Old nature of most of the hospital buildings.

- (g) Most facilities not labelled thereby leading to confusion by visitors on the site.
- (h) The X-Ray Room, Laboratory and Operation theatre are small and inadequate for services required.
- (i) The library is situated in an old building which is dilapidated and very unsuitable.
- (j) The Female Leprosy ward is dark due to the presence of small windows.

5.1.9 Space Integration as a Basis For Hospital Planning Application

Although the hospital has had a few additions over the years, it has not had any definite integration pattern that can be adopted in this redevelopment proposal.

The challenge of this integration process will require an adequate planning concept to include all the inevitable alterations and additions that will be made in the course of the redevelopment programme.

The method of connecting the new facilities with those already existing will produce a possible basis for the planning of hospitals in this day and age.

5.2 THE BAYARA GENERAL HOSPITAL, BAUCHI

5.2.1 Introduction

This hospital like the N.T.B.L.T.C, started off as a leprosy and tuberculosis hospital, but it has over the years become a General Hospital. This is due to the integration of other health services into the hospital system.

Its name "Ba yara" means "No Children" in hausa language. This is as a result of the social stigma that was associated with the diseases, thus children where not taken near the hospital. Fortunately the stigma has been gradually lifted over the years, thus its function as a general hospital.

The cases admitted here are mainly leprosy and tuberculosis cases, but general cases are treated as well.

The buildings on the site are spaced out, with a central Out-patients department, also acting as an Administrative unit ; and other facilities are linked to it.

The hospital comprises:

(a) **Patients Facilities**

(i) Out-Patients Department (O.P.D)

(ii) In-Patients Facilities

Tuberculosis Wards (1 Male and 1 Female)

Leprosy Wards (1 Male and Female)

Maternity Ward (Pediatric) - Not fully Operational

Maternity Ward - Not yet Commissioned

- (b) Administrative Unit - Not Operational Yet and statistics office
- (c) **Diagnostic Facilities**
 - (i) Tuberculosis and Leprosy Laboratory (Plate 5.13)
 - (ii) Eye Clinic
 - (iii) Physiotherapy Unit
 - (iv) Multi Drug Theatre (M.D.T.) Clinic
 - (v) Operation theatre (Plate 5.14)
 - (vi) X-Ray Unit
- (d) **Training School**
- (e) **Service Department**
 - (i) Laundry
 - (ii) Kitchen
 - (e) Conveniencies
 - (f) Residences

The wards as seen from list are six in number ; the leprosy and tuberculosis wards being well ventilated with many windows, while the children's and maternity wards are more closed-up.

The hospital is undergoing a little redevelopment but not enough to cater for the hygienic needs of the hospital.

5.2.2 Location

The hospital is located on the outskirts of Bauchi, which is

about 20 km from the Central Business District (C.B.D.) the site measures about 447.29 ha, although only a small portion has been used for the facilities. (Fig 13)

5.2.3 Accessibility

It is assessible by the Ahmadu Bello Way Road, which is a straight road from the Central Business District C.B.D. Landmarks on the major road are the Abubakar Tafa Balewa (A.T.B.U) University and the Bauchi State Polytechnic.

5.2.4 Circulation

There is no clear-cut or defined means of circulation that distinguishes between pedestrian or vehicular movement.

The road that is accessed into the hospital is a dirt road that ends in a 'round-about' right infront of the Out-Patients department.

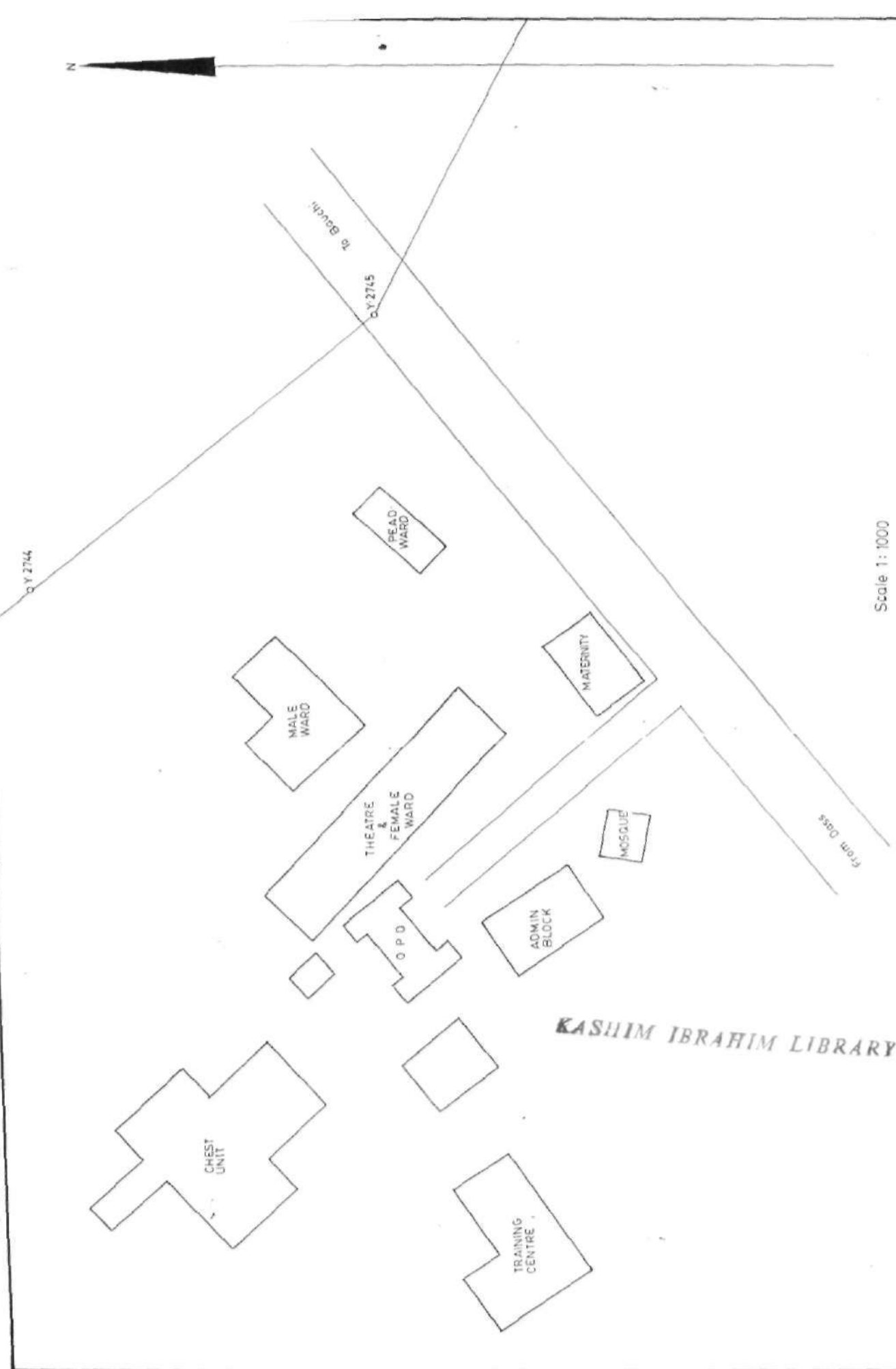
Apart from that, there is another link road to the training center. Man-made paths have been created on the site.

5.2.5 Architectural Layout

The buildings within the hospital are sited seperately with no direct linkages.

The only form of linkage can be seen in the following

LAYOUT PLAN OF GENERAL HOSPITAL BAYARA BAUCHI STATE.



Scale 1:1000

Fig. 13



Plate 5-9
Female Chest Unit, Bayara Bauchi



Plate 5-10
Female Leprosy Ward, shows
corridor space beyond windows



Plate 5-11
Open Male Tuberculosis ward corridor



Plate 5-12
Covered walkway between theatre
and Leprosy ward

BAYARA HOSPITAL, BAUCHI.

structures which are linked together by a covered walkway:

- A Physiotherapy Unit
- B Operation Theatre
- C Eye Clinic
- D Leprosy Ward
- E Laundry

Plates 5.10 and Plate 5.12

5.2.6 Design Concept

The design concept is scattered planning across the site. Each structure is of bungalow-type and is spread out horizontally.

The horizontal orientation has helped to achieve natural ventilation, and adequate lighting in certain areas like the tuberculosis and leprosy wards.

5.2.7 Merits and Demerits

Merits:

- a. Travel distance from main entrance to Out-Patients department is ideal.
- b. Horizontal Bungalow type planning is ideal in the sense that the orientation takes into cognisance the dire need for ventilation in the building.
- c. There is adequate lighting in the Tuberculosis/Chest Unit
- d. Operation Theatre is adequately linked to leprosy wards (male and female) by a covered walkway.

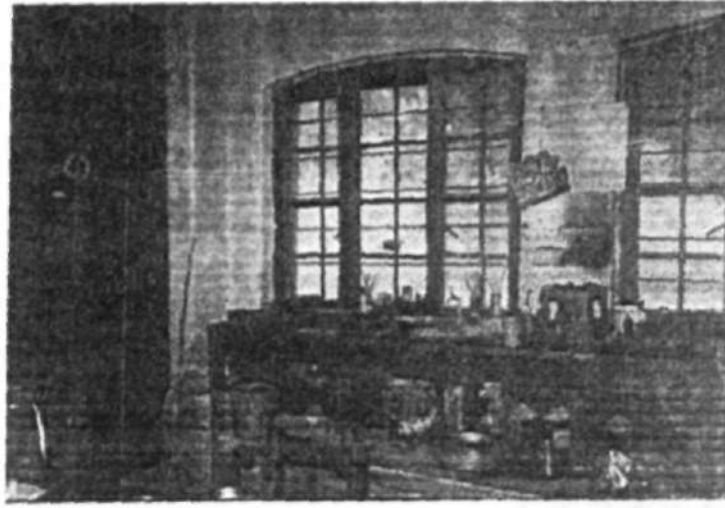


*Plate 5.13: Tuberculosis and Leprosy Laboratory,
Bayara Bauchi(standing section)*



*Plate 5.14. Major Section of Operation Theatre, Bauchi
(Operation table and operation lights)*

Bayara Hospital , Bauchi

- e. Training centre is at a distance from the rest of the hospital enabling study periods to be unaffected by the running of the rest of the hospital.
- f. Administration Block is close to main entrance and Out-Patients Department.
- g. The presence of covered corridors space at the Leprosy and Tuberculosis wards help to create usable patient space in times of overcrowding.
- h. Out-Patient travel distance to diagnostic facilities is ideal.

Demerits:

- a. Tuberculosis patients have to be carried or wheeled in the open air, due to lack of covered walkway from ward to operation theatre
- b. Multidrug Therapy Unit (M.D.T) is far from main body of the hospital. It is quite a distance from patients to travel if they are in the Out-Patients Department.
- c. No privacy guaranteed in wards due to its open ward nature.
- d. Conveniences in very bad shape.
- e. There is a general lack of hygiene in the hospital.
- f. Tuberculosis and Leprosy Diagnostic Laboratory is in the Out-Patients Department. This would have been adequate except that it is too close to consultation room and not well ventilated.

There is thus a high risk of cross-infection.

5.3 THE MANGU LEPROSY AND REHABILITATION CENTRE, JOS

5.3.1 Introduction

This centre has gradually become a General Hospital, due to the need to erase the stigma of leprosy.

In 1976, it became a general hospital, and in 1979, the Eye (Ophthalmic) Ward was incorporated.

It treats leprosy and tuberculosis cases along with other diseases.

It runs a school for Normal and Disabled Children, and Rehabilitative Programmes are highly encouraged so as to help provide a means of income for the cured leprosy patients.

The facilities in the hospital include:-

(a) **Patients Facilities**

- (i) Out-Patients Department
- (ii) In-Patients facilities - These are three in number wards A,B, and C; All patients are placed together, and are only distinguished as male and female. (Plate 15)
- (iii) Maternal & Child Health Clinic - Has only two (2) beds and two (2) nurses.

(b) **Diagnostic Facilities**

- (i) Normal Operational Theatre
- (ii) Eye Operation theatre, Scrub Unit (Plate 5.16 and 5.17)

- (iii) Eye Clinic
- (iv) Tuberculosis and Leprosy Unit (T.B.L) (Plate 5.18)
- (v) X-Ray Room (Plate 5.19 and 5.20)
- (vi) Bacteriological Laboratory
- (vii) Physiotherapy Unit (Plate 5.21 and 5.23)
- (c) **Rehabilitative Facilities**
 - (i) Metal Workshop - Including Automobile Department (Plate 5.22)
 - (ii) Carpentry Workshop (Plate 5.24)
 - (iii) Orthopaedic Workshop (Plate 5.25)
 - (iv) Optical Workshop (Plate 5.26)
- (d) **School For Disabled and Normal Children**
- (e) **Tuberculosis Village**
- (f) **Mini Market**

5.3.2 Owner: It belongs to C.O.C.I.N (Church of Christ In Nigeria) and the body is financially responsible for the affairs of the hospital.

5.3.3 Location :

It is located in Mangu Local Government, which is about 100km from Jos (Approximately an hours journey). The area of site is 118.40 Ha.

5.3.4 Accessibility:

It is accessible by the Jos-Panshi Road



Plate 5-15
In-patient facility (Male and Female)



Plate 5-16
Operation Theatre

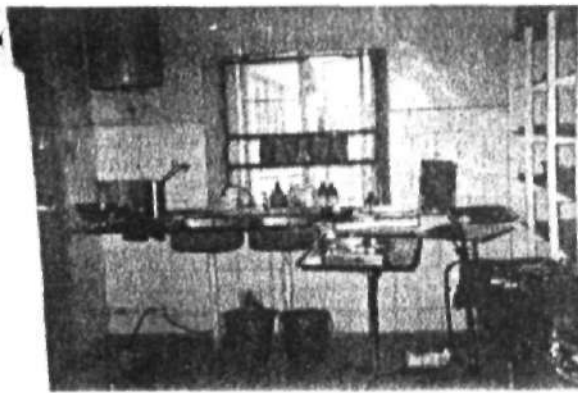


Plate 5-17
Scrub Unit



Plate 5-18
Tuberculosis stain section
and equipment

MANGO, JOS.

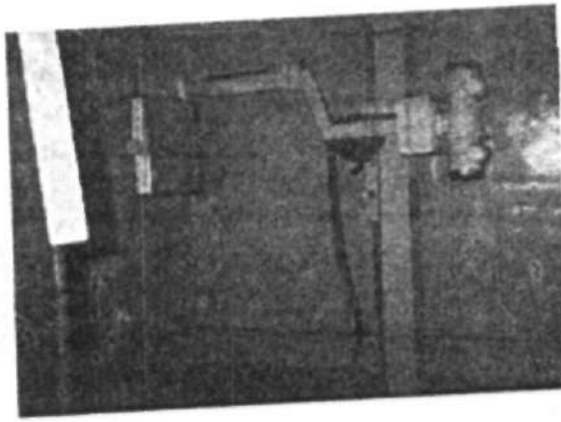


Plate 5.19
X-ray equipment



Plate 5.20
X-ray equipment (Control Panel)



Plate 5.21
Physiotherapy Unit (Metal
calipers, wall bars, hand bars)

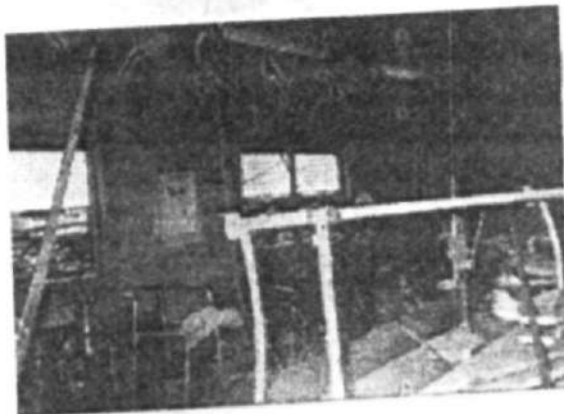


Plate 5.22
Metal Workshop

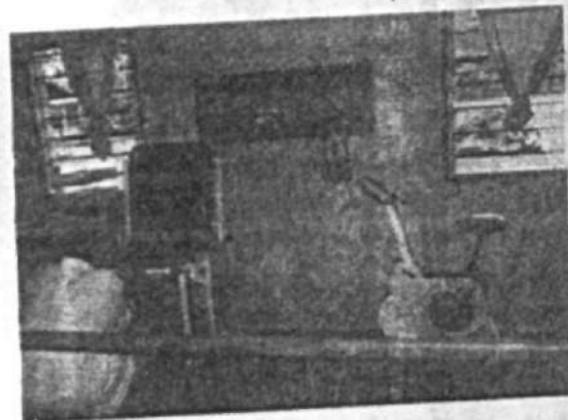


Plate 5.23
Physiotherapy Unit (Quadriceps
chair, bicycle ergometre)



Plate 5.24
Carpentry workshop



Plate 5.25
Orthopaedic
workshop(saws,
wooden artificial
limbs)



Plate 5.26
Optical workshop(Lansometer, Manual smoothner)

The Mangu Leprosy and Rehabilitation Centre, Jos.

5.3.5 Circulation:

There is a well defined vehicular and pedestrian route.

5.3.6 Architectural Layout:

The buildings here are of bungalow-type. The wards being well connected by a series of covered walkways at the open ends of corridors.

Each structure that is not linked to the O.P.D by a covered walkway has its own individual balcony

5.3.7 Design Concept

Well defined organization of space. Hospital is clearly divided into hospital, residential and training facilities.

Orientation of buildings has helped achieve natural lighting and ventilation.

5.3.8 Merits and Demerits

(a) Merits

- (i) Travel distance from entrance to Out-Patient Department is ideal.
- (ii) Adequate ventilation and lighting in wards.
- (iii) Width of walkways large enough.
- (iv) Operation theatre well linked to wards by covered walkway.

- (v) Departments with key relationships well linked as regarding space relationship.
- (vi) Well designed and adjourning ward connected to operation theatre.
- (vii) X-Ray room and adjourning ward connected to solar panels for emergency electricity.
- (b) **Demerits**
 - (i) Accessibility from major road is quite a distance (about 20 km) and mostly accessed by bikes.
 - (ii) No distinct landscaping elements.
 - (iii) Site is very large, so some of the diagnostic facilities are far out, namely:
 - Eye Clinic
 - Eye Operation theatre
 - Physiotherapy Unit
 - Rehabilitation Workshops

5.4 THE HANSENS DISEASE CENTRE, ITA-ILEGA, ABEOKUTA.

5.4.1 Introduction

The Hansens Disease Centre, Abeokuta, is a leprosy settlement about 20km from the city. It does not operate as a Hospital, but has a clinic for Tuberculosis and Leprosy patients.

The settlement is for the leprosy patients alone ; especially those who have been long-term patients.

The effect of stigma associated with the disease led to the leprosed individuals (Patients affected with leprosy; P.A.L.S) settling in.

Apart from this, the centre is used for referral Out-Patient cases only. Thus the only people living in the centre are the very old who had been plagued with leprosy for many years, but have been totally cured (some of which are still being treated). The only evidence of the disease being through their handicaps.

There is a Chief (Ba'ale in Yoruba Language) of the Lepers, and so there is an organized pattern of living among the people.

The facilities existing in the settlement are:

(a) **Patients Facilities**

- (i) Out Patients Facility - Leprosy and Tuberculosis Clinic
- (ii) In Patients Facility - Housing facility of rooms in a

stretch ; where lepers dwell with families.

(b) **Diagnostic Facilities**

- (i) Laboratory
 - (ii) T.B.L (Tuberculosis and Leprosy) Section
 - (iii) Rehabilitative Facility - Gari and Cassava Flour Processing Factory.
- (c) Rehabilitative Block
- (d) Training Centre - Still under construction since 1994

5.4.2 Location

It is located in Ita-Ilega, about 20km from the Central Business District of Abeokuta.

5.4.3 Owner

It is owned by the Federal Government (Ministry of Health) and a Medical Control Officer For the State Of Abeokuta runs the settlements along with the Baale of the Lepers.

5.4.4 Accessibility

The settlement is accessible from the Iberekodu-Ita-Ilega road which is in the outskirts of Abeokuta.

5.4.5 Circulation

Most of the site is motorable, except for areas with dense vegetation and rocks. There is no fixed vehicular or pedestrian pattern.

5.4.6 Architectural Layout

The Buildings are sited separately with no definite linkages between them.

5.4.7 Concept

Bungalow-type architecture is the concept used here, except for the wards for the few referral patients which are in courtyard form.

5.4.8 Merits and Demerits

(a) **Merits**

- (i) Large expanse of land with flexible planning.
- (ii) Adequate ventilation and sunlight.
- (iii) Compartmentalization of patients allows for natural family environment and privacy.
- (iv) The Factory though quite small, is a source of livelihood for the settlement.

(b) **Demerits**

- (i) Administrative block too far from entrance
- (ii) Poor maintenance factor in most of the buildings
- (iii) Confusion as to what buildings are on site
- (iv) Clinic in housing facility advantageous due to proximity to entrance, but disadvantageous to family next to it.
- (vi) There is underutilization in the courtyard ward only one room out of eight is occupied.

5.5 THE SACRED HEART HOSPITAL, ABEOKUTA.

5.5.1 Introduction

This is a General Hospital divided into two major sections:

- (a) The General Hospital (Main Site)
- (b) The Tuberculosis/Chest Unit

Both being on different sites but only about 2km from each other and obliquely opposite. Therefore some functions have to be carried out in the main site.

The facilities existing in the Tuberculosis Unit are:

- (a) **Patients Facilities**
 - (i) In-Patient Facilities - 5 wards in number
 - (ii) Out-Patient Facility (O.P.D) (Plate 5.28)
- (b) **Diagnostic Facilities**
 - (i) Bacteriological Laboratory (Plate 5.29)
 - (ii) Pharmacy
- (c) **Service Department**
 - (i) Generator House (Plate 5.30)
 - (ii) Kitchen
 - (iii) Bore-hole
 - (iv) Laundry (Plate 5.31)
 - (v) Filling Station
- (d) Residential Unit (for Doctor Only)

5.5.2 Owner

The Sacred Heart Hospital is owned by the State Missionaries of the E.C.W.A Church.

5.5.3 Location

It is located in the Centre of the town, the Chest Unit being added in the second phase due to need for a chest unit.

5.5.4 Circulation

Well defined vehicular pattern. Adequate parking and easily recognisable functions on site.

Straight driveway from entrance to the end of the site.

5.5.5 Architectural Layout

Buildings well linked on site, especially with the covered walkways connecting the wards. The buildings are bungalow-type and are well oriented to achieve good ventilation and sunshine.

5.5.6 Design Concept

Linear arrangement of facilities with organized pattern.
Prototype arrangement of wards.

5.5.7 Merits and Demerits

(a) **Merits**

- (i) Out-Patient department at entrance
- (ii) Wards well Linked (Plate 5.32)
- (iii) Well equipped Bacteriological Laboratory.
- (iv) Beautiful Landscape.
- (v) Good ventilation in all buildings.
- (vi) Diagnostic facilities well grouped.

(b) **Demerits**

- (i) Conveniences in bad state, could be better if well maintained
- (ii) X-ray department not functional. Test have to be done at "Main Site"
- (iii) Operation theatre at Main Site.



Plate 5.28
Out-Patients Department



Plate 5.29
Bacteriological laboratory

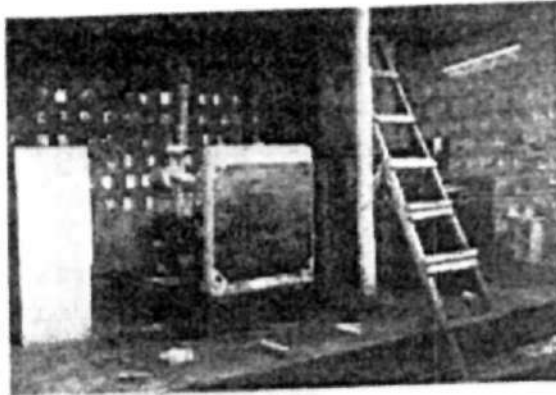


Plate 5.30
Generator house



Plate 5.32
Covered walkway



Plate 5.31
Laundry

The Sacred Heart Hospital,
Abeokuta.

5.6 CENTENARY OUTPATIENT BLOCK, KOTHARA.

5.6.1 Introduction

This is an outpatient clinic in India that comprises:

(a) PATIENT FACILITY - OUT PATIENT DEPARTMENT

(b) DIAGONISTIC FACILITIES

(i) physiotherapy Unit

(ii) X-Ray room

(iii) Treatment room

(iv) Ultrasound room

(v) Laser room

(vi) Refraction room

(vii) Dispensory

(viii) Drug Stone

(viii) Minor Operating theatre

(c) SERVICE DEPARTMENTS

(i) Clean Utility room

(ii) Dirty Utility room

(iii) Equipment room

(d) ADMINISTRATIVE DEPARTMENT

(i) Medical records

(ii) Data Processing

(iii) Accounting

(iv) Hostel Administration

(v) Medical staff

(vi) Financial control

5.6.2 Location

Kothara India

5.6.3 Owner

The Leprosy Mission International

5.6.4 Architect

Tulzapurkar and Assos.

5.6.5 Merits and Demerits

(a) MERITS

- (i) Courtyard planning helps to prevent cross-infection in patients
- (ii) Waiting area well located to cater for patients
- (iii) Toilets in good area
- (iv) Adequate number of consultation rooms
- (v) Horizontal arrangement seems to favour circulation pattern for the handicapped
- (vi) Location of minor operation theatre by side entrance seems to be adequate.

(b) DEMERITS

- (i) Drainage of courtyard could be a problem

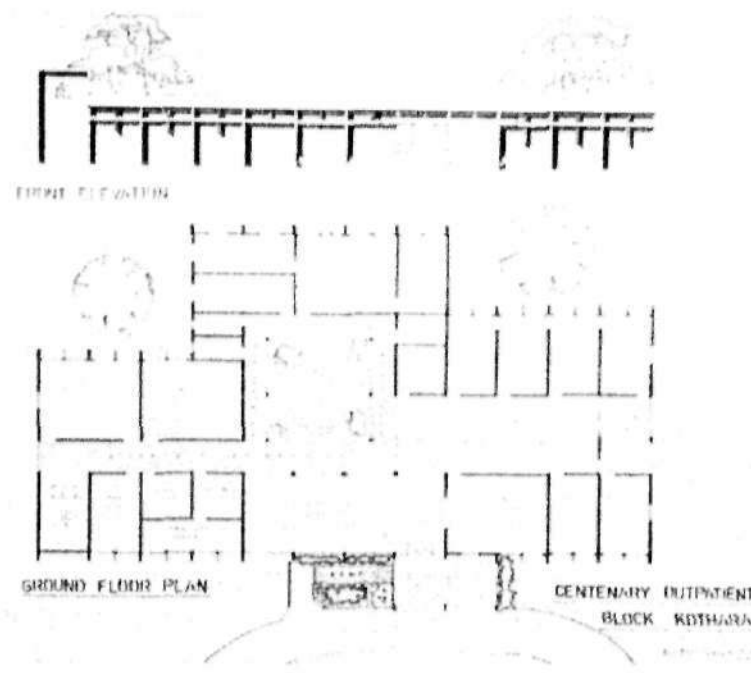


Plate 533
Plan; Kothara, India

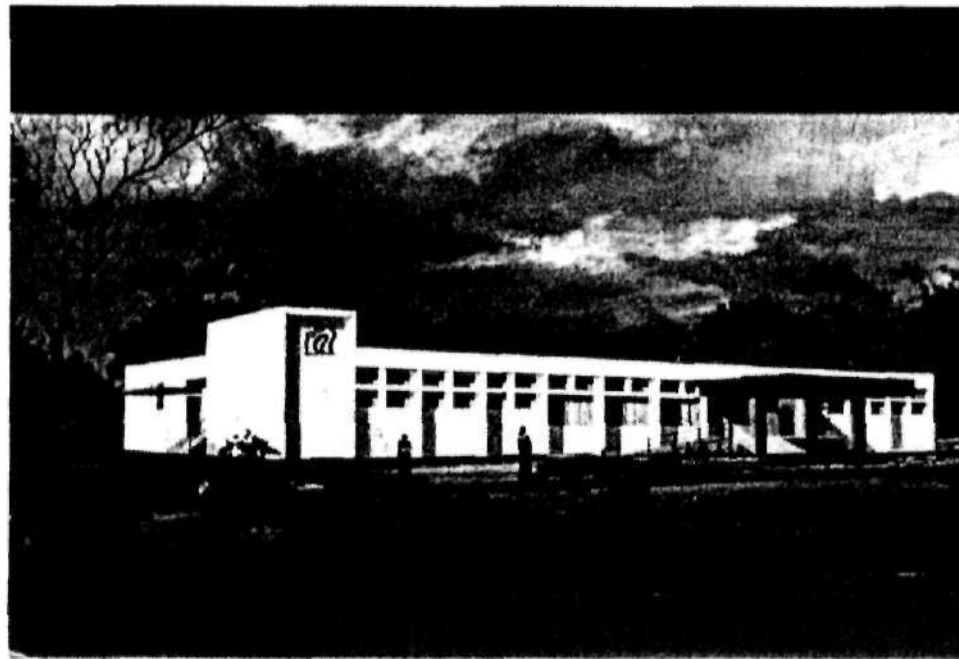


Plate 534
Perspective; Kothara, India.

SOURCE : The Leprosy Mission International, Brentford, Middlesex.

SUMMARY OF FINDINGS FROM CASE STUDIES

The Leprosy and Tuberculosis Hospitals appraised exhibits the evident transition in Leprosy and Tuberculosis Hospitals; due to the gradual integration of other health services into the system.

Another notable factor, is the rehabilitation programmes being run to enable the cured Leprosy and Tuberculosis patients learn a craft that is financially viable.

All facilities are run by Church Missionaries with a few exceptions that have the Federal Ministry of Health and Non - Governmental Organizations as additional donors to the general running of the hospital.

Among all the hospitals visited, Mangu Hospital Jos, Sacred Heart Hospital Abeokuta and the Centenary Outpatient Clinic Kothara; exhibit a well defined vehicular and pedestrian circulation pattern.

The general architectural layout observed is "Scattered planning of bungalow type buildings" taking into advantage the orientation of the buildings. However, the Centenary Outpatient Clinic Kothara, being only for out-patients has no need for wards therefore a more organized pattern of space units can be seen in a confined space.

Courtyard planning is notable in all the hospitals with the exception of Bayara Hospital Bauchi. Daylighting and ventilation have been achieved by the horizontal planning of the building; with well linked wards in the Sacred Heart Hospital and the Mangu

Hospital, Jos.

A general lack of Hygiene, poor maintenance of conveniencies and old nature of buildings can be seen in most of the hospitals I visited with key departments being far from each other.

In discussing space integration in the five hospitals visited, it is evident that most of them were disorganized due to the additional units that needed to be added as the need arose.

Mangu Hospital, Jos and the Sacred Heart Hospital, Abeokuta could be said to be hospitals that partially acheived space integration, although no definate pattern can be defined. This could be because the major units of importance were constructed before the need for integration of other spaces arose; therefore key departments are well related.

Section 7.1.3 of this thesis suggests various concepts that can be adapted in the consideration of integration of space in any hospital design, and the peculiar problem of The National Tuberculosis and Leprosy Training Centre, Saye Village, Zaria.



Fig. 14
Zaria Township



Fig. 26
The hot arid climate

CHAPTER SIX - THE SITE

6.0 THE SITE THE NATIONAL TUBERCULOSIS AND LEPROSY TRAINING CENTRE, SAYE, ZARIA (EXISTING SITUATION)

6.1 HISTORICAL BACKGROUND OF ZARIA

The early history of Zaria is not clearly defined but it is known that during the ninth and tenth centuries, immigrants from the eastern part of Nigeria came into this area.

Based on adventurer written by travellers in the fourteenth and fifteenth centuries; namely Albakri, Iba Battuta and Leo Africanus, the history of Zaria could be divided into four parts. The Habe Kingdom, the Fulani Empire, the Colonial period and the period of Nigeria's independence (1960).

6.1.1 The Rise of the Habe Kingdom

The introduction of Islam and the fall of the Habe Dynasties was in the nineteenth century.

Zazzau or Zaria, was one of the seven states. Its early history speaks of Amina, Daughter of well-remembered pagan ruler Bakwa Turunku, who ruled Zaria from 1492 to 1522; and defeated the Jukun thus making Zaria independent.

It is further reported that Bakwa; mother of Amina and Zaria, was the last Queen who ruled Turunku, and Zaria built the

last of the capital, and named it after herself.

6.1.2 Fulani Empire

The last Habe King of Zaria, Mallam Musa was appointed to rule Zaria by his leader Uthman Danfodio after after his victory over Makaa in C. 1807.

6.1.3 The Colonial and Independence Period

Zaria came under British rule in February 1901, and after the conquest of Sokoto by the British; the Zaria Emirate was reduced and its former states Keffi, Nassarawa and Jama'a, were removed as independent Chiefdoms.

Zaria at present is divided into three parts:

Tudun Wada, Sabon Gari and the Walled City.

Tudun Wada, is a nineteenth century settlement in which stands just outside the wall near the Doka gate (Fig 14) of the old town. Hausa traders, mainly from other parts of the north as well as other northern minority groups such as the Kanuri and Tiv, being unable to build their houses in the walled city, settled outside it.

Sabon Gari (New Town) is located in the north of the River Kubani. Traders and Craftsmen from southern Nigeria have settled in the new town which developed as a prosperous trading centre

exchanging European and Southern Nigerian goods e.g Kolanuts, Palm Oil, Cotton, Groundnut, beans, guinea corn, cattle and hides from the north.

The walled city, has majority of its compounds clustering around two important institutions common to all traditional hausa towns, namely the palace and central mosque which together form the political - religious centre and the market, the socio-economic centre.

The buying and selling of land has been observed in the last thirty years ; quite different from the previous years where land was given to families of settlers.

6.2 SITE LOCATION

Zaria, is located between latitude $10^{\circ}5'$ N and longitude $7^{\circ}.5'E$ to $8^{\circ}.0'E$.

It is headquarters of one of the thirteen local government areas in Kaduna State; and is situated in the middle of high, rolling savannah plains (The Hot Dry climate) amidst striking inselbergs - exfoliation domes that rise abruptly often several hundred feet above the precambrian base. (Fig 26)

6.3 BRIEF DESCRIPTION OF THE NATIONAL TUBERCULOSIS AND LEPROSY TRAINING CENTRE SAYE VILLAGE, ZARIA.

(N.T.B.L.T.C)

The N.T.B.L.T.C started as a leprosy camp under the Zaria

Native Authority in 1929.

From 1936 to 1965, the camp was run by the Christian Missionary Society with the support of the British Leprosy Relief Association (BELRA).

The Nigerian Government took over the responsibility for the centre in 1965 and developed it into a leprosy training centre.

Following the establishment of the National Tuberculosis and leprosy control programme in 1988, the centre was upgraded to a National Tuberculosis and Leprosy Training Centre in 1991.

The responsible body for the centre is the Federal Ministry of Health. Financial and technical support is given by the Netherlands Leprosy Relief and other Non-Governmental Organisations in Nigeria.

Most students coming to the centre are sponsored by the Non-Governmental Organizations (N.G.O)'s co-operating with the National Programme. These N.G.O's are German Leprosy Relief Association (G.L.R.A); Damien Foundation (DFB); The leprosy Mission International (TLMI) and Netherlands Leprosy relief (NLR).

It comprises of

- (a) In-Patient Facilities
- (b) Out-Patient Facilities
- (c) Diagnostic Facilities
- (d) Administrative Block
- (e) Hostel Block
- (f) Training School
- (G) Rehabilitative Units

The N.T.B.L.T.C was built in stages ; as facilities were needed.

The integration of other health services has facilitated the need to upgrade the centre to meet its increasing demands, thus various additions over the years.

The training centre runs a curriculum for individuals like community Health Officers, Senior Community Health Extension Workers, Nurses, Environmental Health Officers, state control officers, Active TBL (Tuberculoic and Leprossy) supervisors and General Health Workers.

The graduates usually end up in Tuberculosis and Leprosy Control Programmes in other institutions or Local Governmnt Areas.

Practical sessions are usually conducted at the Yadaquinya Hospital in Kano ; and some at N.T.B.L.T.C, Zaria.

The Administration of N.T.B.L.T.C can be clearly defined under the following headings.

- (a) General - Administration of the centre is under the schedule of the principle supported by other medical and paramedical staff
- (b) Logistics and Supplies - centre receives logistic support and supplies from the Federal Ministry of Health, Social Services and Non - Governmental Organizations.

The activities of the centre are:

- (a) Manpower development for National Tuberculosis and Leprosy Control Programme (N.T.B.L.C.P).
- (b) Care of Tuberculosis, Leprosy, dermatological patients and recently the care of other general diseases.
- (c) TBL Operational researches.

6.4 ESTABLISHING THE NEED FOR UPGRADING

From research carried out, it's clear that N.T.B.L.T.C is of significance to Zaria and the Nation at large. It's historic significance and its location are positive factors on which it can be redeveloped.

It's location (Fig 27) being an advantage because of the excess availability of land, approximately 40 hectares and the fact that this is the only National Facility; from which other Leprosy and Tuberculosis hospitals in Nigeria were developed.

A survey of the existing structures show a state of gradual dilapidation due to increasing demands and lack of maintenance

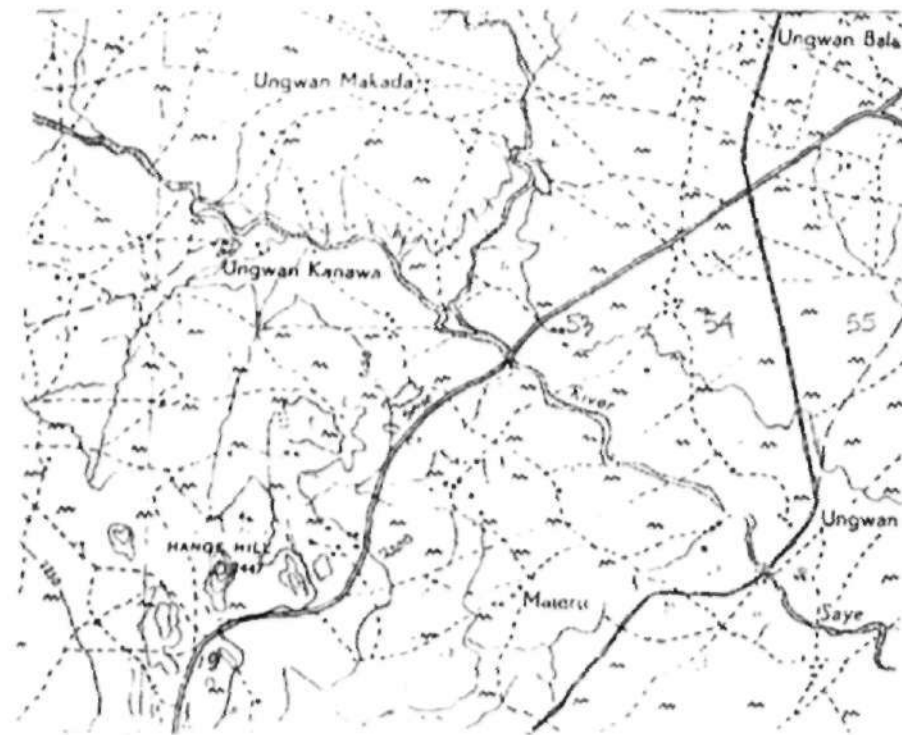


Fig. 27
Site Location and Map



culture.

This therefore necessitates the upgrading to contemporary space & standards for better effectiveness in use by the community.

6.5 SITE SELECTION CRITERIA

The site on which N.T.B.L.T.C is situated is a large expanse of land which belongs to the Federal Government, Its location originally chosen to effect the need to austrocize the leprosy patients, can be seen as a disadvantage because of its distance away from town; but the availability of land, and the fact that the facility already exists leaves no room for a relocation of the centre.

Among the basic criteria used for its selection were:

- (a) Availability of Land - There is enough land for expansion of units
- (b) Good Topography, Vegetation and Landscape
- (c) Location of hospital from commercial areas which could be an irritable source of noise for patients
- (d) Availabiliy of social amenities

Saye, in which the centre is located is connected to the

National Electric Power Authority (N.E.P.A) Grid line, and the Zaria Water Works.

Hence there is enough power and water which is needed for the running of the hospital.

6.6 SITE ANALYSIS

The research study took into cognisance the existing locational factors affecting the site such as road network, public utilities, environmental considerations, etc.

The general characteristics of the site include

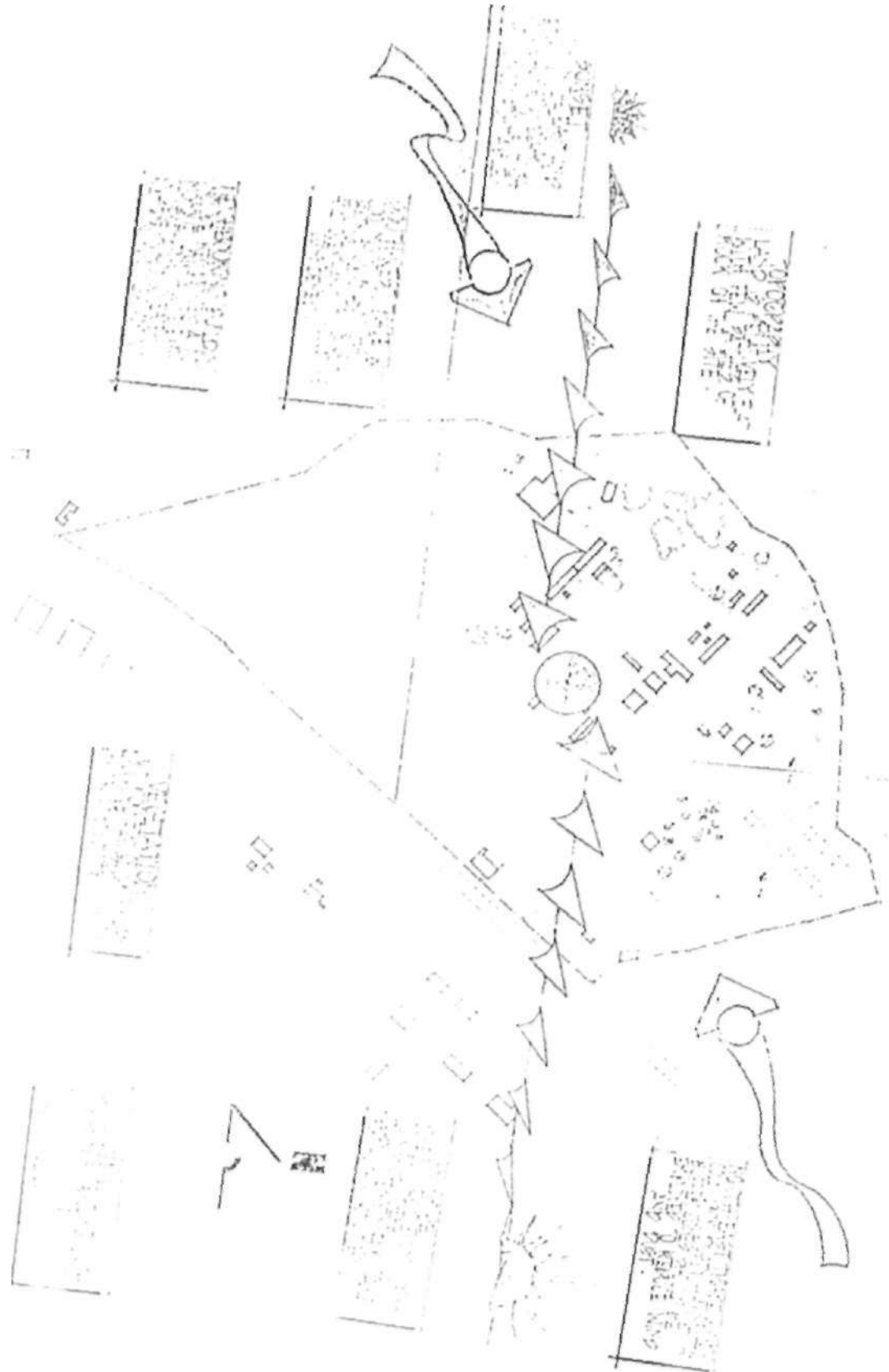
6.6.1 Vegetation:

Zaria is situated within the slightly thicker wood and vegetation of the northern guinea zone. The vegetation is such that when not tampered with by man, consists of orchard bush and well developed trees, some of which are about 10 to 15m.

[Fig 81]

Over the years, the ground cover has reduced due to activities like bush burning, grazing, and other human activities. Thus most areas in Zaria show open and park like grassland.

The ever diminishing forest and savanah woodlands outside of the forest reservation are denuded at a continually increasing rate.



N.T.B.L.T.C has vast pockets of green land, thus alot can be achieved in the area of adequate landscaping elements.

6.6.2 Topography

The land is generally flat, with a few patches of rocks.
(Fig 25)

6.6.3 Soil

The site has laterite soil, being of fine texture, which has a high clay content which tends to become water logged in the rainy season and thus cracks in the dry season.

6.6.4 Geology

The basic geological nature is magmatic mixed steady rocks. Granite in parts, with darker softer bonds in some areas.

Zaria is largely underlined by undifferentiated pre-cambrian basement complex formations comprising both igneous and metamorphic rocks.

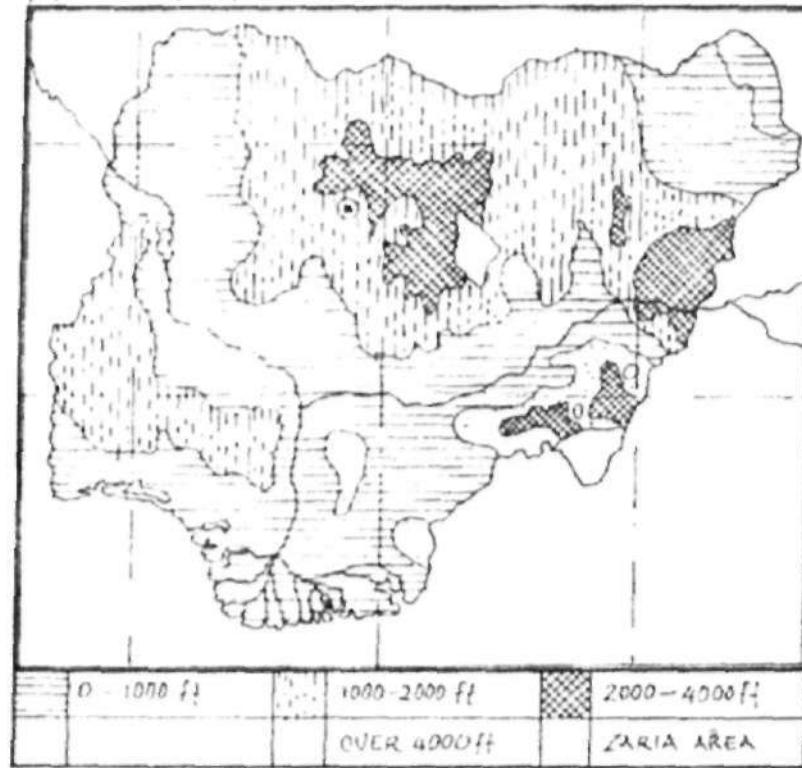
The igneous rocks being mainly biotite gneisses and older granites.

There is no evidence of mineral wealth in Zaria, however, there is laterite and granite on hills and gravel and clay at river bottoms.

(Fig 25)

Based on the characteristics of the site, and the existing

TOPOGRAPHY FIG (8)



GEOLOGY FIG (9)



locational factors affecting the site, the redevelopment proposal will be a great challenge to obtain adequate planning of units.

6.7 CLIMATIC CONDITION OF ZARIA

The climate of Zaria is dominated by the seasonal shifting of pressure belts, the continental air masses blowing outward from the north-east from November to March, which is the harmattan season, while the equatorial maritime air masses blow northwards from the south-west in May to September creating the rainy season.

Below are climatic conditions that affect Zaria.

6.7.1 Temperature

(Fig 15) gives the monthly maximum temperature for Zaria over the years 1994 to 1998.

Maximum air temperature occurs in the February-June period, peaking in April at 35.7°C., in 1994. (Fig 15)

However daily maximum air temperatures in excess of 40°C are regularly recorded in March and April.

A minimum temperature of 28°C was recorded in 1985 (Fig 16)

6.7.2 Winds

Zaria has the following wind types,

- (A) The dry North Easterly - During Nov-February, it carries considerable amounts of dust (harmattan).

(B) The moist South Easterly - This is associated with the rainy season, whose wind preceeds storms and are generally strong but short lived.

6.7.3 Rainfall

Zaria has a rainy period of approximately 210 days (May to October) and a mean annual rainfall of 110 mm. (For the periods of 1994 to 1998), with peak in the year 1994. (Fig 17)

Much of the rainfall occurs as storms for a short period, but with great intensity.

6.7.4 Relative humidity

Zaria showed a maximum relative humidity percentage of 68% in the year 1997. This was maximum during the years 1994-1998. (Fig 18). Figures 19, 20, 21 and 22 show the annual average sunshine hours, the thunderstorm and squall, the annual average climatic conditions, and bio-climatic chart analysis for Zaria respectively.

CLIMATIC ANALYSIS

Maximum and Minimum Temperature for Zaria (°C)

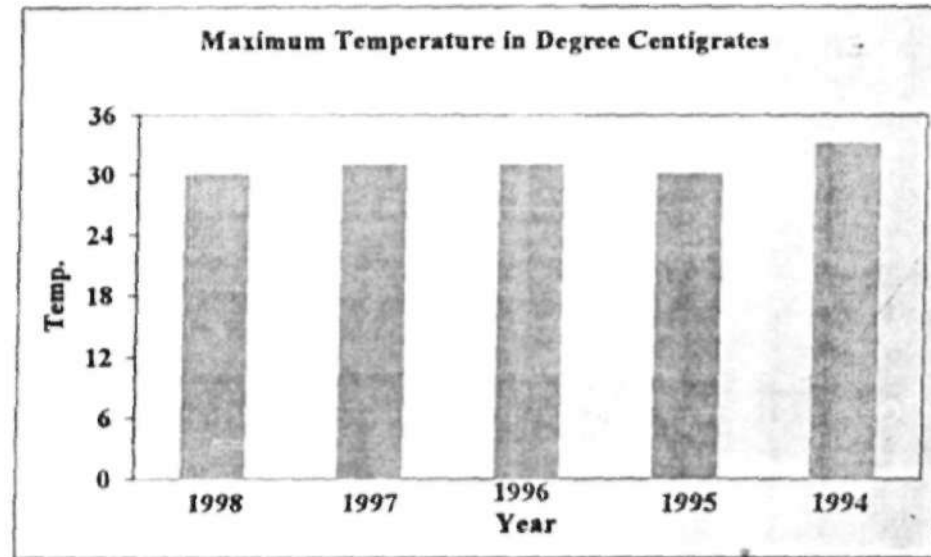


Fig. 15

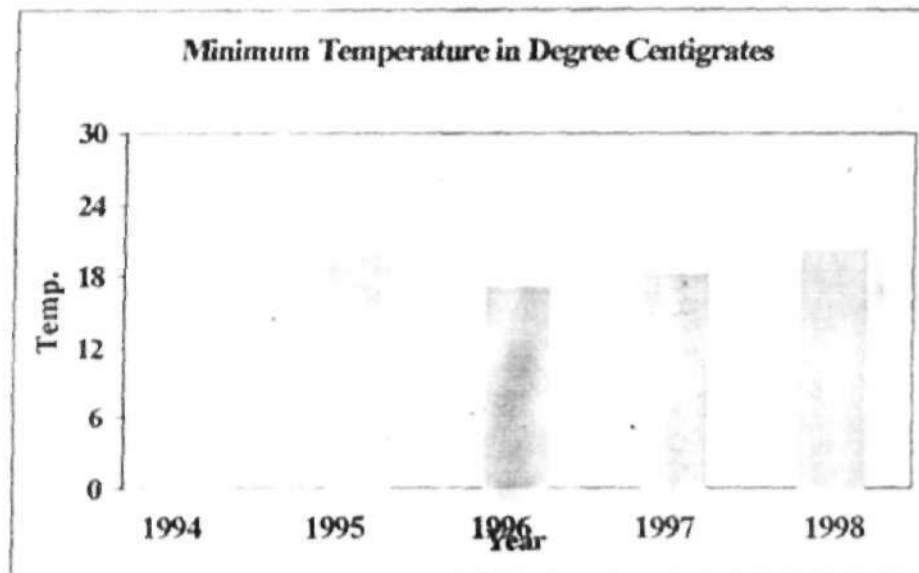


Fig. 16

CLIMATIC ANALYSIS

Average Rainfall and Relative Humidity for Zaria

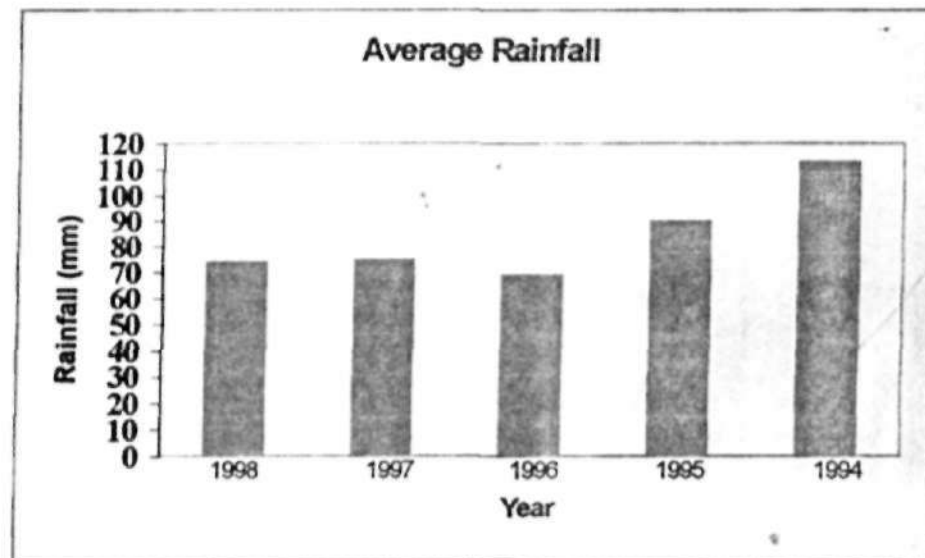


Fig. 17

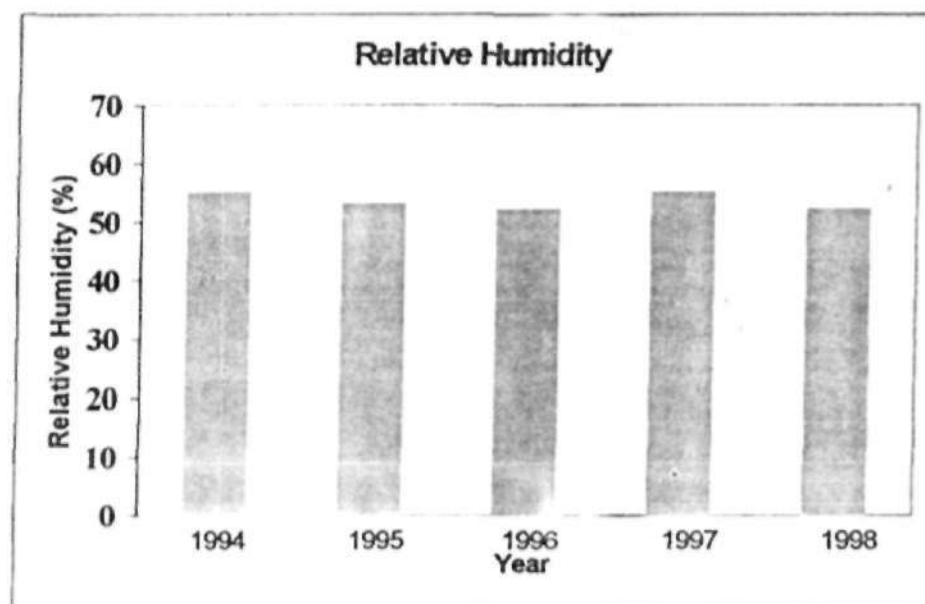


Fig. 18

CLIMATIC ANALYSIS

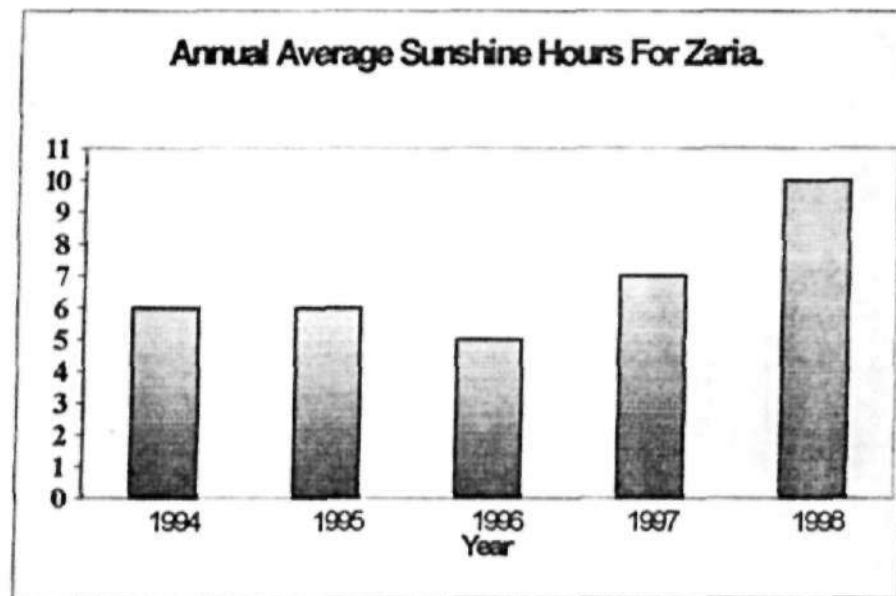
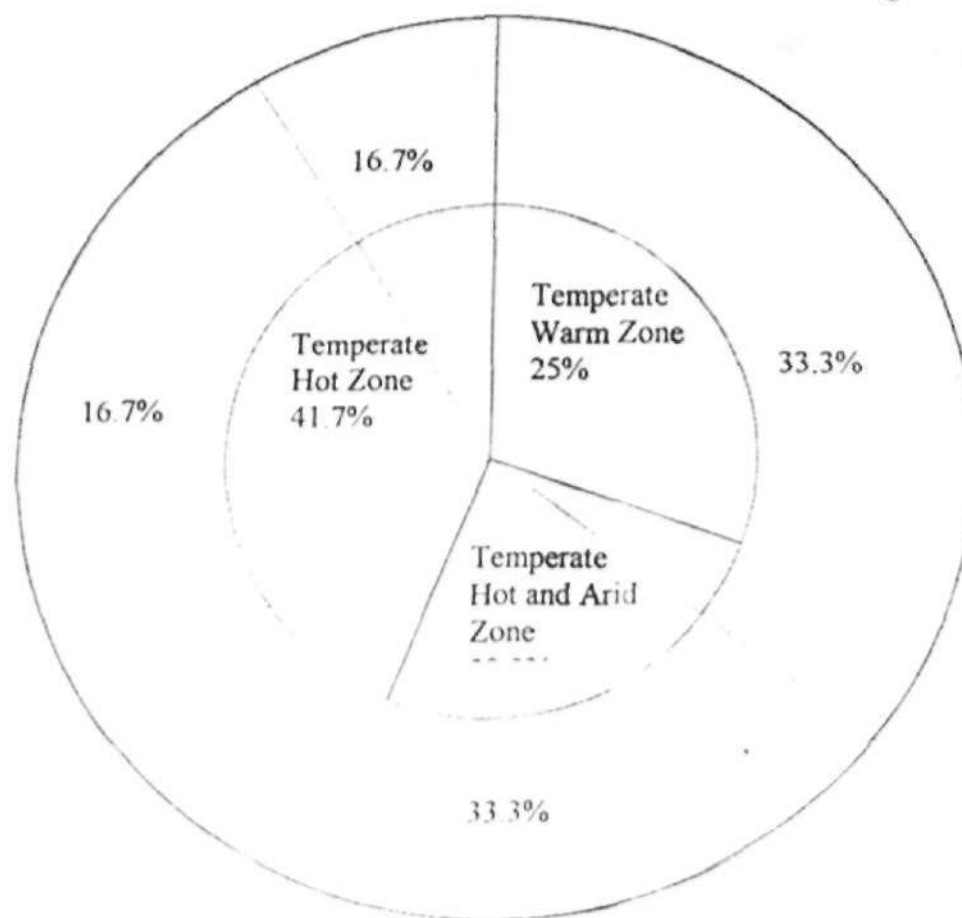
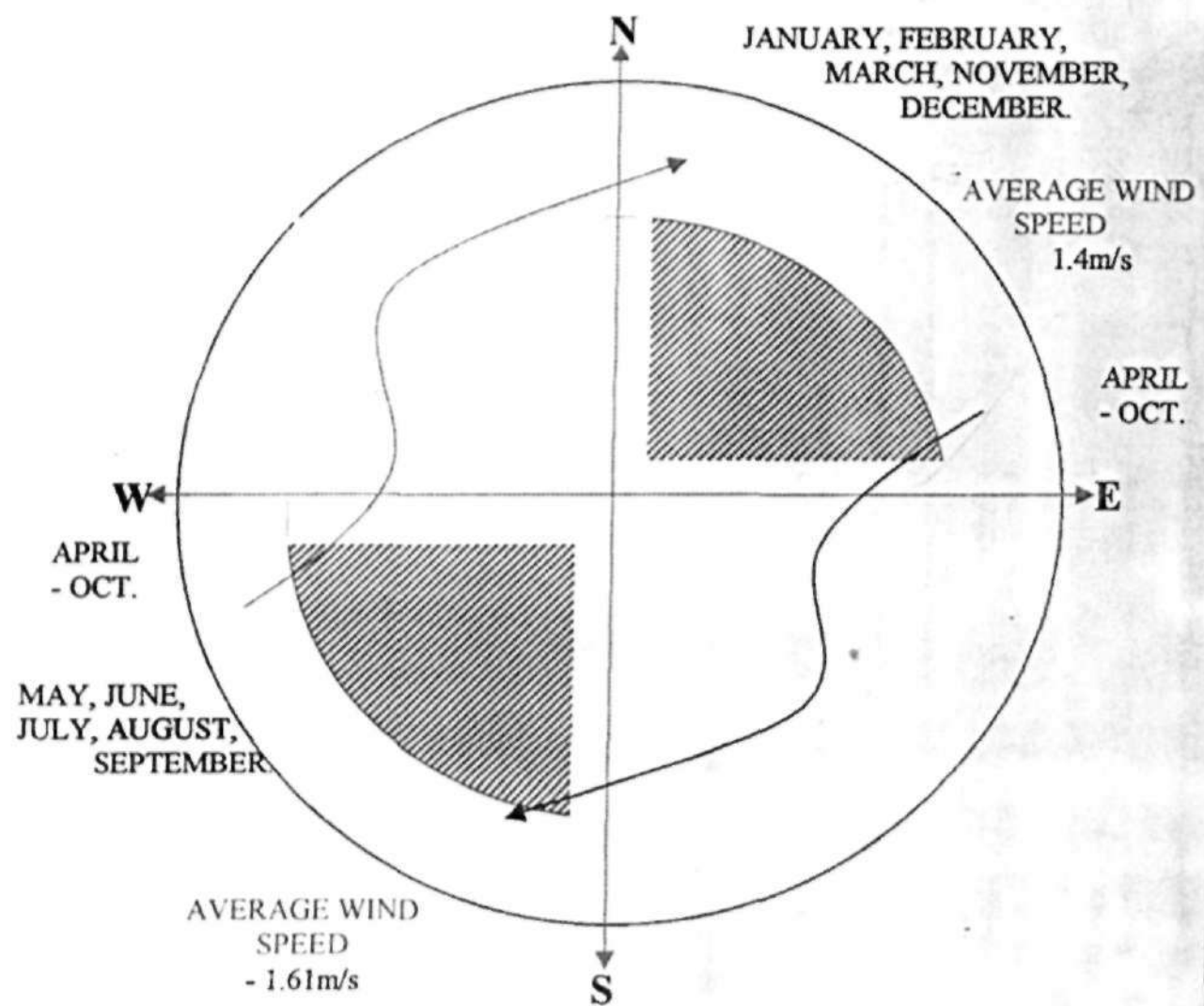


Fig. 19



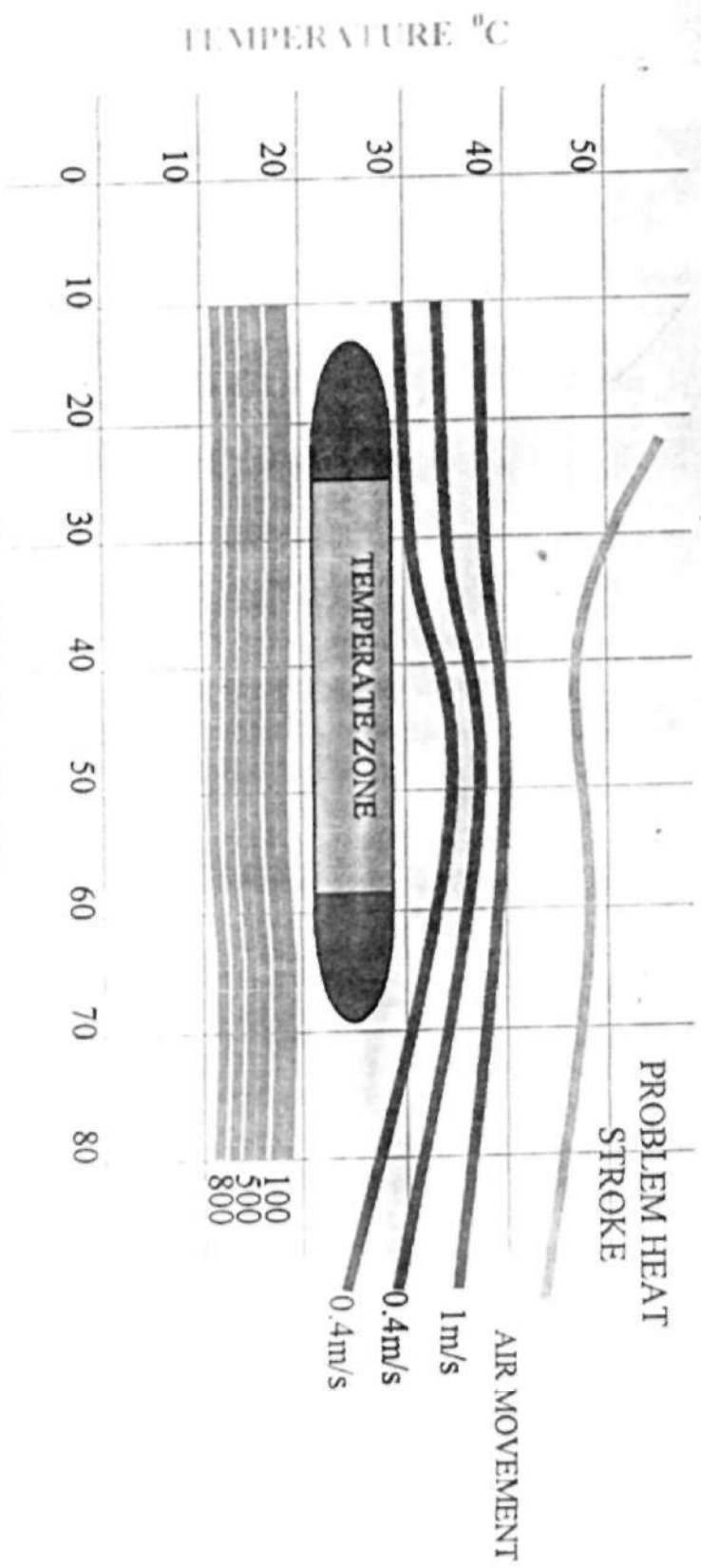
Thunder Storm and Squall Fig. 20



ANNUAL AVERAGE CLIMATIC CONDITIONS AND
CORRESPONDING SEASONS AT ZARIA

COOL	TEMPERATE	WARM	HOT
BELOW 11.1 ⁰ C	11.1 - 20 ⁰ C	20 - 29.4 ⁰ C	ABOVE 29.4 ⁰ C

Fig. 21



BIOCLIMATIC CHART ANALYSIS

Fig. 22

6.8 ANALYSIS OF EXISTING SITUATION

The site being already existing needs a brief description of the units organized on it.

The following are the existing units:

6.8.1 Patients Facilities

(a) In-Patient Facilities - These are the wards that house the various categories of patients, which are mainly tuberculosis and leprosy patients. Though there is an integration of health services into the hospital. They are restructured for now to the out-patient department.

There are four wards, three in use and one out of use due to the dilapidation of the structure.

Two of the wards are male one for leprosy and the other for tuberculosis, there are 16 and 40 beds respectively.

The only female ward has both leprosy and tuberculosis patients. Each of the wards has a balcony where patients tend to use as a sit-out during the day, but there is no definite link between the wards and operating theatre. Conveniences and shower units are directly connected to the male leprosy ward, while the other wards have an extended toilet facility behind the female tuberculosis and leprosy ward.

The male tuberculosis ward has a toilet and shower unit attached to it, but is presently out of use due to dilapidation.

All the four wards are located adjacent to each other, and have the same planning concept. They are bungalow type with a strip of windows and doors on either side to enhance the effect of cross-ventilation thereby reducing cross-infection.

(b) Out-Patient Department (O.P.D)

This is situated directly at the entrance, and it handles cases of referral patients and out-going or discharged patients.

It has four medical consulting offices, a pharmacy, a records office, and a waiting area.

It's proximity to the entrance is ideal, although the make shift Administrative block, the bacteriological laboratory and X-Ray Department (situated in the male Tuberculosis Ward are a distance (about 200 metres) from the O.P.D.

The building is L-Shaped with a covered outdoor waiting area supported by columns underneath the roofing system. Its location is prominent and is identified on entry.

6.8.2 Diagnostic Facilities

These include the:

- (a) Operational Theatre
- (b) Bacteriological Laboratory
- (c) The X-Ray Department

filtering into the room.

It's proximity from the O.P.D is a problem since patients have to travel a distance when x-rays are to be taken.

Apart from that the x-ray room can be converted into other functions that could enhance the male tuberculosis ward.

6.8.3 The Rehabilitation Department

This is about 250 metres from the entrance and is at the North Western position on the site. It includes an audio visual unit, where the leprosy patients undergoing "care after cure" are taught a craft.

In this hospital, the cured leprosy patients are taught to make patterned cloth, which are packaged and sold to earn an income for the patients.

The unit is of bungalow-horizontal type ; with windows on either side of the longer walls; for adequate lighting and ventilation.

6.8.4 SERVICE DEPARTMENTS

This includes the kitchen, the laundry, store, water tank, generator house and boreholes.

They are all located in different areas; and scattered around the site.

The individual positioning of the departments are :

- (a) Kitchen - situated in the north-east section of the site next to the car park, and the old mud leprosy huts. A water tank is close by in case of an emergency of lack of water.
- (b) Laundry - This is obliquely behind the female leprosy and tuberculosis ward, and also next to the male tuberculosis ward.
- (c) Water tank - This is found at the entrance of the site and is large enough to serve the whole hospital.
- (d) Generator House - This houses the generating power system for the hospital, and is situated at the main entrance.
- (e) Boreholes - there are quite a few scattered around the site. One between the male tuberculosis and female ward; another near the student hostel.
- (f) Store - This is situated next to the "Make-shift" Administrative unit. It houses various amenities used in the hospital, including drugs. There is vehicular access to the store.

6.8.5 RELIGIOUS FACILITIES

These include a church; a make-shift mosque near the car park and kitchen facility for the general use of the hospital; and a newly constructed modern mosque with a Koranic school next to it. The entrance to the new modern hospital is about 700 meters from the main entrance to the hospital, and it is off the old Zaria Kaduna road.

6.8.6 RESIDENTIAL BUILDINGS

These are opposite the hospital complex; that is directly on the other side of the dividing road (Old Zaria-Kaduna Road). It's orientation is north-east, and there are various types. There are some for the senior staff of the hospital, and some for the junior staff. There are about a total of 6 senior staff houses and about 8 junior staff houses.

Each plan varies depending on the number of rooms, and status of the individual.

6.8.7 ADMINISTRATIVE UNIT

This is an old laboratory that was converted to an administrative unit this can still be observed due to the planning of the design and the presence of sinks and shower systems.

Its location is inadequate because it is about 180 metres from the entrance, and it is right next to the male leprosy ward. People usually have to ask to locate the administrative unit on the site.

6.8.8 TRAINING SCHOOL

This includes an old classroom block and two new ones that have secretly been constructed; although they are not in use yet.

These classrooms are for the private or sponsored students that are undergoing training in leprosy and tuberculosis services so as to enroll afterward in control programmes or institutions.

Other facilities attached to the training school are the library, the cafeteria and the student hostel. These are all in considerable proximity to each other.

6.8.9 MULTIPURPOSE COMPLEX WITH PHYSIOTHERAPY UNIT

This is situated directly opposite the female leprosy and tuberculosis ward. It is also next to the mortuary. It has stores, and a shoe workshop where various types of shoes are made and finally sold off. This is another form of rehabilitation for the cured leprosy patients.

Two other rooms are situated in this unit, but are not in use at the moment.

6.8.10 MORTUARY

This is a recently constructed mortuary with an area of about 34.6cm². It is a small structure that will be used to keep dead bodies only for a short period until the relatives of the deceased come to take the bodies away.

It's plan is small but adequate with slabs that the bodies will be laid on and airconditioners to keep the atmosphere inside

cool.

The old mortuary behind the dilapidated female tuberculosis ward is presently out of use, due to inadequacy of space and lack of standard ventilation and cooling requirements.

6.8.11 STUDENT HOSTEL

This is located further out to the North-West of the centre. It could be accessed through the secondary road that is connected to the Primary Road (The Old Zaria-Kaduna Road). It is of courtyard type, with two major sections, one being newer than the other.

The conveniences are located in the most recently constructed section B and are of a very good hygienic condition.

Section A, has a total of four rooms in a horizontal plan, with a double shower room at the end of the corridor.

The presence of the open courtyard system and the use of screen walls creates a very cool micro-climate at different periods of the day.

6.9 SCHEDULE OF ACCOMODATION

	Existing		Area (m ²)
(A)	Out - Patient <u>Function</u>		
(1)	Pharmacy	4.11 x 2.62	10.77
(2)	Record Office	4.11 x 2.65	10.89
(3)	Medical Office (1)	4.11 x 4.29	17.63
(4)	Medical Office (2)	4.18 x 3.18	13.29
(5)	Medical Office (Chief)	4.18 x 4.00	16.72
(6)	Secretary (Chief Medical Officer)	4.18 x 2.56	10.70
(7)	Waiting Area	12.84 x 12.78	164.09
(8)	W/C'S (x4) + lobby	4.18 x (2.14+1.83) 4.18 x 3.97	16.59
			Total 260.68

(B)	Main Store <u>Function</u>		
(1)	Main lobby	2.36 x 2.63	6.21
(2)	Store	7.42 x 5.79	42.96
(3)	Extension (curved) [Area of Circle) $l = Q/360 \times 2 \times 3.147 \times r$ $\text{Area} = Q/360 \times 3.147 \times r^2$	$l = 9.67\text{m}$ $d = 5.79\text{m}$	5039.03
(4)	Back store	2.55 x 1.90	4.84
			Total= 5093.04
C.	Audiovisual Room	23.09 x 5.15	118.60
D.	Cafeteria	23.09 x 5.15	118.60
E.	Mortuary	5.54 x 4.25	23.55
			Area (m ²)

	Existing		Area (m ²)
F.	Female Leprosy Ward	22.80 x 5.77	131.56
G.	Male Tuberculosis Ward <u>Function</u>		
(1)	Laboratory	5.42 x 3.88	21.01
(2)	x-Ray Unit	5.42 x 3.88	21.01
(3)	Nurses Office + Corridor Space	3.88 x 2.78	9.41
(4)	Office	+ 1.80 x 2.3	
(5)	Actual Ward	(10.45 x 7.58) x 2	158.42
(6)	Conveniences	7.58 x 3.37	25.34 Total=24 4.9
H.	Male Leprosy Ward <u>Function</u>		
(1)	Ward	9.32 x 6.9	64.31
(2)	Conveniences	2.61 x 1.84 x 2	9.60
			Total=73 .91

I.	Make Shift "Administrative Unit" <u>Function</u>		
(1)	Principle's Office	6.96 x 5.61	39.05
(2)	Deputy Principle's Office	2.92 x 4.04 +(47 x 3.63)	13.50
(3)	Shower & toilet	1.32 x 4.04	5.33
(4)	Secretary	3.34 x 4.04	13.45
(5)	Office	2.12 x 2.65	5.62
(6)	Administrative Department	4.59 x 4.76	21.85
(7)	Toilet	2.12 x 2.11	4.47
(8)	Accounts office	4.76 x 4.0	19.04
(9)	Accountant	4.76 x 4.0	19.04
(10)	Corridor	8.13 x 1.87	15.20
			Total=156.59
J.	Classroom Block <u>Function</u>		
(1)	Classroom (old)	30.31 x 5.23	158.52
(2)	Classroom (New) 1	23.23 x 6.39	148.44
(3)	Classroom (New) 2	22. 63 x 6.31	142.80
			Total=444.76

K.	Operation Theatre <u>Function</u>		
(1)	Scrubbing Unit	9.11 x 3.175	28.92
(2)	Operation Theatre	9.11 x 5.29	48.24
(3)	Autoclave Unit	5.29 x 4.14	Total= 99.06
L.	Laundry <u>Function</u>		
(1)	Laundry (main)	4.97 x 4.81	23.91
(2)	Store	4.84 x 4.79	23.18 Total= 47.09
(3)	Autoclave Unit	5.29 x 4.14	Total=99.06

M.	Multipurpose Complex <u>Function</u>		
(1)	Office	4.57 x 3.06	13.98
(2)	Medical Office	5.15 x 2.07	10.66
(3)	Internal store	4.92 x 4.13	20.32
(4)	Store	4.92 x 3.93	19.36
(5)	Shoe Workshop	6.1 x 4.92	30.01
(6)	Un-used space (1)	4.92 x 5.21	25.63
(7)	Un-used space (2)	5.21 x 1.83	9.5
			Total=129.46

7.0 CHAPTER SEVEN - THE DESIGN REPORT

7.1 INTRODUCTION

The design approach which was carried out by the author, was done in three stages; namely:

- Stage 1: Involved conducting a preliminary survey on the centre whereby the existing facilities were accessed, to see if they were physically and functionally in shape.
- Stage 2: This involved the collection of relevant data from the centre. This included
- (i) Existing Dimensions of structures and site area
 - (ii) Pictures
 - (iii) Relevant Bio-Statistics
- Stage 3: Was the evolution of the design proposal whereby inferences were made from the hospital appraisal, so as to determine what was necessary for the design, and finally come up with a design proposal.

7.1.1 Theme and Purpose of the Design

This thesis is aimed at evaluating the functions that are imperative to solving the problems associated with the National Tuberculosis and Leprosy Training Centre, namely;

- (a) The best means of space integration and organization while taking cognisance of the available and expected future functional modifications of the site

- (b) Recognizing the difficulties in incorporating additional facilities, with consideration of already existing facilities, while keeping alteration to a minimal.
- (c) Observing structures that are beyond rehabilitation; and those that can be relocated so as to give way for the development proposal.
- (d) Evaluating the circulation pattern of the users (vehicular and pedestrian) and proposing the best method of inter - relating the spaces.

7.1.2 Brief proposal of the Centre

The proposed design will include the provision of spaces that could enhance the efficiency of the centre. In recent times, with the improved knowledge of leprosy and tuberculosis and their treatments; the social awareness of individuals has led to the integration of other health services with leprosy and tuberculosis, making them general health centres.

The statistics obtained of the General cases that visit N.T.B.L.T.C (Fig 7) shows the need for facilities that will meet the need of the obvious demand of more infrastructure for general cases; thus also effectively creating an avenue that will encourage social integration; even if only partially achieved.

The components of the proposal will be divided into two:

- (a) Facilities in need of upgrading, renovations, demolition,

conversion and relocation.

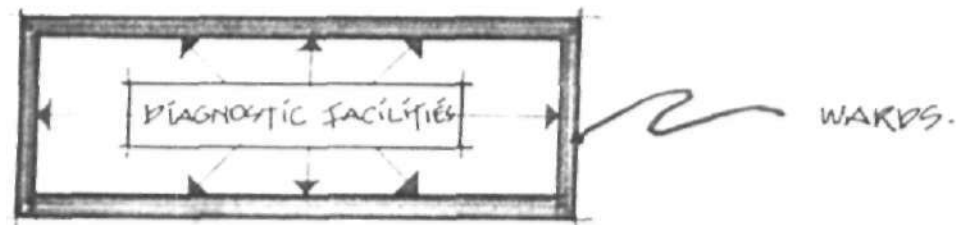
- (i) Present Office Block - Conversion back to Laboratory
- (ii) Audio-visual Unit - Upgrading and Renovation
- (iii) Old Leprosy huts - Demolition and levelling
- (iv) Female Tuberculosis Ward - Upgrading
- (v) Kitchen - Renovation
- (vi) Conveniences - Renovation
- (viii) Multipurpose complex - conversion of space units, and relocation of shoe workshop
- (viii) Conversion of O.P.D - Functions of Spaces were converted to maintenance offices, dangerous/toxic drugs store, mattress store, wheel chair store, and general storage.
- (b) New Facilities
 - (i) New Medical Units
 - (ii) Rehabilitation Workshops
 - (iii) Accommodation wing for relatives and staff
 - (iv) Administrative Unit
 - (v) Research Library
 - (vi) New Kitchen and Cafeteria
 - (vii) New Laundry

7.1.3 Design Concepts

Although this is a redevelopment proposal; the mode of conceptualization still has to be considered in the individual planning of each unit; and the site as a whole.

In hospital design, the following concepts of design exist

(a) Greenwich Pattern



This type of arrangement involves the diagnostic facilities being at the core of hospital, then wards are connected outward.

This arrangement facilitates rapid horizontal movement between departments that have close relationships; but they are not easily expandable.

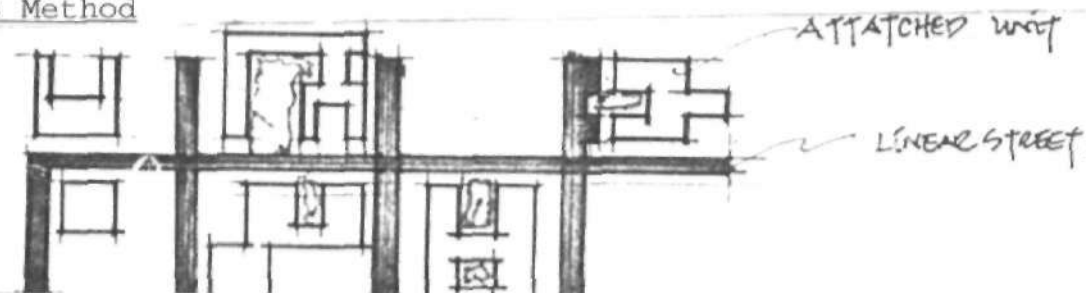
Services can be easily provided.

(b) Best Buy Method



This is similar to the Greenwich pattern, but it is more open, less compact and is lit and ventilated by open internal courtyards.

(c) Harness Method



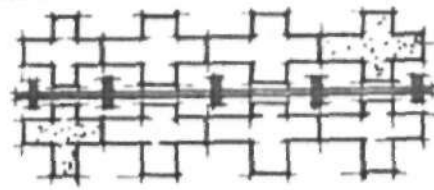
This comprises of attached units to a linear street, to

which different configurations are attached with relative freedom on a grid pattern. It's advantages are

- (i) Greater flexibility
- (ii) Modular structure can be extended and changed without interrupting the whole organization
- (iii) Complex organization responds well to this pattern of arrangement.

The only disadvantage is that when the design gets complex; it can lead to monotony and lack of identity.

(d) Nucleus



CLUSTER CONTAINS WARDS,
DEPARTMENTS, AND/OR A
COMBINATION OF SMALLER
DEPARTMENTS.

This is a neater and geometrically more lucid pattern of arrangement. It encourages designs to be built in stages; and does not demand space. There is a single spine along which all elements are organized and a secondary spine can be added at angles to give the pattern a new row.

Servicing in this case is independent to each cruciform

(e) Ring Concepts



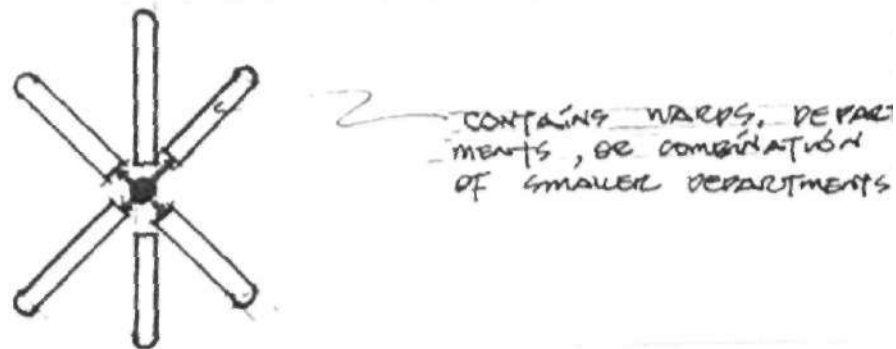
OPENING RING

CLOSED RING.

This promotes interaction in the central core. Expansion can only be in complete repetition of the form.

It could be subject to central congestion, circulation and problems.

(f) Capsule Formation



Here expansion radiates from the centre, and other capsules are formed from the radiating members. The only problem is that congestion is likely to occur during expansion.

In the course of this proposal, it was necessary to extract concepts from the different patterns given in different units of the design. This will be described when discussing the individual units. On the other hand, the site being already an existing facility, can not be conformed to follow one particular concept of planning. Therefore, an attempt was made to choose only applicable patterns in relevant areas, and use land scaping elements as much as possible to try to achieve the integration of space.

Visual, vertical and linear relationships were also criteria in the planning of the design proposal.

Since land mass is abundant, the building masses were arranged along the horizontal plain to give visual elegance of an axis.

Finally, the general site concept adopted in the proposal was based mainly on the following:

- (i) Compact planning with restriction of buildings to bungalow height due to orthopaedic nature of some of the hospital cases.
- (ii) Circulation pattern which should be short and orderly to protect the patient
- (iii) Zoning of the departments into close and key relationships with consideration of
 - (a) Diagnostic and treatment zones
 - (b) Inpatient zones
- (iv) Introduction of covered walkways in areas that need protection from weather factors.
- (v) Viewing the parking outlook and trying to create a pattern to will be effective and visually pleasing in the centre.
- (vi) Organizing the landscapes while taking into consideration the already existing landscaped areas and elements.

7.1.4 Design Criteria

In order to achieve a good design proposal, some design criteria were considered these were:

(a) Fire Precaution

To prevent fire spread in the event of an out break; asbestos ceilings were used in some spaces e.g the rehabilitation workshops and wards; with consideration of minimal distance travel from wards to the outside in event of a fire.

(b) Special considerations (The handicapped)

The bungalow planning makes movement patterns of the handicapped easier. The introduction of ramps at specific intervals in areas of varying heights also aid movement.

The walkways are large enough for a wheelchair and another person walking alongside; approximately 1.5m wide, with special considerations in the bathroom and toilet spaces. Distance from patient to toilets should not exceed 12 metres.

(c) Noise Control

This was achieved by locating the new wards in areas where noise would be reduced; and relocating the shoe workshop from opposite the present leprosy female ward, to a new area on the site where all workshops have been integrated.

(d) Structural Methods

Different methods were employed depending on the area. In the rehabilitation workshops, the linear axial concept was used to enhance the affinity, of human beings to nature; which gives

the users a communal feeling, and increases the interaction between them.

Shading devices and false walls were used in areas where the need for shading against the western sun was necessary and where the direction of the north east dust laden harmattan winds and the moist south west moist laden winds could have been a problem.

Columns were placed at 3 metre intervals for increased structural stability thereby taking advantage of the 3 metre grid system.

(e) Finishes

In areas that are frequently exposed to the public, eg the reception area, waiting area, workshops e.t.c hairweaving paints could be employed.

(f) Circulation

The circulation pattern adopted is predominantly pedestrian this is necessary to aid movement of patients and encourage both visual and physical participation in related activities.

Vehicular circulation is well considered to aid the dropping - off of patients in areas where necessary.

Walkways; both covered and uncovered were used as the main circulation pattern.

Internal circulation in some units are seen in the use of connecting corridors like seen in the new medical unit. So that there is an opportunity to mix with one another.

(g) Orientation

The site is oriented on the North-East and South-West angle to take advantage of the wind patterns. Care was taken not to direct ward openings in the view of the north-east wind direction since leprosy and tuberculosis are air-borne and could be carried into areas where infection should be curtailed.

In cases where buildings are placed in the direction of the N.E trade wind; trees are used as barriers as well as fins.

The use of courtyard planning in the medical unit, gives protection from sandstorm and also cools the micro-climate by lowering the ground temperature.

(h) Ventilation

Openings on either side of the walls and the use of courtyard wards help to facilitate wind movement.

(i) Landscaping

Human beings have an affinity to beauty especially where in a hospital environment; this flowers and trees were used in the design.

It is important to note that some trees already exist on the site namely fig trees and mango trees. There was therefore not much deviation from what already existed.

Flowers like the common wild rose plants, and the hibiscus

plant can be used however in the design for beautification and hedges respectively.

(j) Social Consideration

In the rehabilitation programme of the already treated and cured leprosy patients creates the need for the effectiveness of the workshops in the centre. This helps to encourage the P.A.L.S (persons affected with leprosy) to be of good use after treatment and discharge from the hospital.

Also it could be used by people around the hospital and affected persons in Zaria at large.

7.2 PROPOSED NEW FACILITIES

7.2.1 New Medical Unit

This is a bungalow that will house the diagnostic and treatment facilities of the centre. This has been proposed because of the general cases that are increasing daily at the centre. The present Out-Patients department will still be used; although it is not adequate for the demand .

Facilities that were to far into the site have been brought to this unit for better proximity.

- (a) Reception
- (b) Waiting Room
- (c) Consultation Rooms
- (d) Physiotherapy room

- (e) Toilet facilities
- (f) Drug store and Dispensary
- (g) Minor treatment room
- (h) Emergency bay
- (i) Laboratory
- (j) Operation theater
- (k) Maternity Clinic
- (l) Wards (4 in number)

The maternity Clinic which is separated only by the use of a side entrance; with its maternity ward, delivery ward and cotroom, next to it.

The other wards include children's ward female and male ward. Each ward takes approximately thirteen beds making a capacity of 42 beds.

The shape of this unit was evolved from the use of hand which could mean any of the following:

- (i) Reaching out to those ostracized by social stigma.
- (ii) The patterned concept obtained by combining the closed ring concept and radiating linear capsules radiating from a central point. The harness pattern was also adopted in diagnostic section, with functions placed round a courtyard

The "figure or capsules" contain the wards and the maternal

Clinic, with the "palm" serving the diagnostic and treatment facilities.

There are 2 main entrances into the unit; with other side entrances. The major entrances are:

- (1) The approach entrance
- (2) The accident and emergency entrance while the side entrances are:

- (1) Services entrance
- (2) Entrance from classroom block
- (3) Entrance at maternity Clinic

Support facilities like

- (a) Lavatories
- (b) Clean and dirty utilities
- (c) Kitchen
- (d) Laundry

can be found in this unit and parking spaces for the handicapped and normal people is available; with a capacity of about 40 cars.

7.2.2 The Rehabilitation Workshop

These include optical, orthopaedic, metal, wood and cloth making workshops.

The audiovisual unit is presently being used as a cloth making workshop, although it's store is in the present library

unit.

Some of the spaces have thus been converted to house the workshops.

The library will be converted to the cloth workshop with the store already in place.

The audiovisual unit will be converted to a metal workshop while the cafeteria will be converted to an optical workshop. The cafeteria will thus be relocated next to the kitchen by the new medical unit.

The Orthopaedic and Carpentry workshops will be placed in the spaces already existing between the units. These will be built up and integrated with the other units, thus making one building.

A group of rooms already existing for the National Youth Service Corps Students (N.Y.S.C) at the end of the facility. This be upgraded by partially sealing it off, and providing toilet, and kitchen facilities for the rooms; which don't exist at the moment.

Each workshop, has storage for raw materials and adequate lighting is achieved by the use of plenty windows.

Outdoor workspace is provided to cater for any outdoor crafts when necessary.

Parking for loading and off-loading is provided, but its major axis route is through a inside entrance on the site. This is because trailers or large vehicles may be used to deposit raw materials.

7.2.3 Accommodation Wing For relatives and staff

This wing is proposed for the use of relatives of long-term patients who need to care for their family; or for guests of the administrative or medical staff of the hospital.

It includes 18 rooms, with laundry and cafeteria facilities. There is a central reception, where a minimal charge can be paid to run the upkeep of the wing.

The Cafeteria is connected by a walkway to the present kitchen.

A parking area of 9 spaces at the entrance in cases where users come with vehicles.

7.2.4 The Administrative Unit

An administrative unit has been proposed right at the entrance to the site because the existing office block is right

inside the centre; with the male Leprosy wards right next to it.

Also the office block was originally a biological laboratory therefore it will be converted back to its former use.

This new unit will be used for the administrative functions of the centre.

It will include:

- (a) Office spaces (3)
- (b) Staff lounge
- (c) Principle's Office
- (d) Deputy Principle's Office
- (e) Conference Room
- (f) Toilets
- (g) Reception and Waiting Room

7.2.5 Research Library

The present library is too small for the centre, i.e for the use of the medical staff and the students under training.

Therefore I have proposed a research library next to the classroom block which would be used by the medical staff, Training students and patients in the wards. The allocation of space was determined based on the requirements needed for approximately a 100 hundred bed ward.

600 bed ward = 65 metres square

100 bed ward = $100 \times 65/600$

=10.83 metres squared

Source :Neufert Ernst, (1980). "Architects' Data".

A covered walkway from the research library has been connected to the new medical unit so that patients can use the library as well. Toilet facilities have been provided for disabled and normal/ambient patients.

7.2.6 New Kitchen and Cafeteria

This will be located near the new medical unit so that the wards will be easily serviced. It will take the name outlook as the present kitchen, except that it will be oriented differently.

The cafeteria will be used mainly by the staff of the medical unit and the students in the hostel.

7.2.7 New Laundry

This laundry will be located between the New medical unit and the Existing Out - Patients Department.

This will serve mainly the new unit because the existing laundry is quite far from the entrance next to the Existing Tuberculosis and Leprosy Wards.

7.3 UPGRADED FACILITIES- The following facilities will need neither renovation, demolition, upgrading, conversion or relocation of functions

7.3.1 Present Office Block

This will be converted back to a laboratory, which it was originally. The building will be left as it is, but the functions of the spaces will change.

The office spaces will be converted to:

- (a) Microbiology room
- (b) Clinical Pathology
- (c) Histology
- (d) Laboratory Officer in Charge
- (e) Administrative Officer
- (f) Specimen Collection room

The toilets and store will be maintained

7.3.2 Audiovisual Unit

The unit needs a general face-lift.

Painting, and repair of the ceiling boards are suggested.

The spaces will then be converted to a metal workshop.

7.3.3 Old Leprosy Units

These are mud huts that once housed the leprosy patients

when the centre began. It has reached the state of disrepair and plants are growing out of it. Thus, it should be demolished completely and levelled.

7.3.4 Female Tuberculosis Ward

This structure is already being renovated so that room can be made for more patients. Especially as the rate of tuberculosis in the country has increased tremendously.

7.3.5 Kitchen

This is adequate as far as space is concerned.

Presently there are some obvious cracks in the walls.

Re-plastering and general painting of the facility should be considered.

7.3.6 Conveniences

These are located in various areas of the site. Generally they need re-plastering, painting and remodelling.

Maintenance is another aspect that should be considered by the centre and also by the users of the facility.

7.3.7 Multipurpose Complex

This structure is presently being used for a shoe workshop, storage space and consultation space. Two of the spaces are not

being used.

I am proposing that these spaces will be used for physiotherapy offices so that the patients close to this facility i.e leprosy and tuberculosis wards, will find it easily accessible.

7.3.8 "Compound" directly behind Existing Cafeteria

Demolish and shift owner to accommodation wing.

7.4 PROPOSED SCHEDULE OF ACCOMMODATION

The proposed schedule of accommodation will include the following groups which will be added to the existing design. The upgraded facilities being already discussed in Section 7.3 of this chapter.

- (A) Medical Unit
- (B) Rehabilitation Workshops
- (C) Accommodation Wing for Relatives and Staff
- (D) Administrative Unit
- (E) The Research Library
- (F) New Kitchen and Cafeteria
- (G) New Laundry

	PROPOSED	QUANTITY		AREA (m2)
(A)	Medical Unit <u>Function</u>			
1.	Reception and Waiting Area.	4	6.0x5.0 8.0x7.0 12.0x6.0 6.0x4.8	30.0 56.0 72.0 28.8
2.	Consultation Rooms	4	6.0x3.8 6.0x4.2 5.0x4.2 6.0x4.0	22.8 25.2 21.0 24.0
3.	Data Processing and Account Room	1	6.0x5.2	31.2
4.	Medical Records	1	6.0x5.2	31.2
5.	Refraction Room	1	6.0x5.5	33.0
6.	Laser Room	1	6.0x4.4	26.4

7.	Minor Treatment Room	1	8.6x6.0	51.6
8.	Dispensory	1	8.4x6.0	50.4
9.	Drug Store	1	8.6x6.0	51.6
10.	Ultra Sound Room	1	6.0x4.4	26.4
11.	Staff Room	1	6.0x4.4	26.4
12.	Blood Bank	1	6.0x6.6	39.6
13.	Accident and Emergency Lobby	1	6.0x5.0	30.0
14.	Dirty Utility Room	1	4.4x4.2	18.5
15	Clean Utility Room	1	4.4x4.2	18.5
16.	Minor Operation Room	1	11.2x6.0	67.2

17.	Delivery Theatre:			
	a) Recovery Room	1	5.0x4.2	21.0
	b) Autoclaving Room	1	3.6x4.2	15.1
	c) Scrub Unit	1	6.0x4.2	25.2
	d) Cot Room	1	5.0x5.5	27.5
	e) Theatre	1	9.0x6.0	54.0
	f) Toilets and showers	4	4 (1.4x0.8)	4.5
18.	Operation Theatre:			
	a) Waiting and Recovery Room	1	5.0x4.4	22.0
	b) Scrub Unit	1	4.4x3.6	15.8
	c) Theatre	1	11.0x6.0	66.0
	d) Toilets and Showers	4	4 (1.4x0.8)	4.5
	e) Autoclaving Unit	1	5.0x4.0	20.0
19.	General Toilets and Changing Rooms	3	3 (2 (1.5x1.9) + 3 (1.9x0.8))	21.7

20.	Laboratory	1	11.0x7.0	77.0
21.	X-Ray Room	1	6.0x5.0	30.0
22.	Physiotherapy Room	1	5.6x6+11.2x 5.2	88.24
23.	Wards:	4	4 (12.4x6.0)	297.6
	a) 13 Bed Bay			
	b) Sisters' Room	4	4 (6.0x3.0)	72.0
	c) Treatment Room	4	4 (6.0x6.0)	96.0
	d) Wheel Chair Store	4	4 (6.0x4.0)	
	e) Toilets and Bathrooms	5	3 (1.2x0.8) + 2 (1.9x1.5)	8.6

24.	Ante/Postnatal Clinic:			
	a) Reception	1	Phi x 4.5x4.5/2	31.8
	b) Changing	4	4(0.6 x 1.0)	2.4
	Rooms and Toilets	2	2(1.2x2.6)	6.2
	c) Examination and Urine Testing Room	1	6.0x6.0	36.0
	d) Antenatal Room	1	6.0x6.0	36.0
	e) Postnatal Room	1	6.0x6.0	36.0
	f) Records and History Taking Room	1	6.0x6.0	36.0
				Total 2186.54m ²
B	Rehabilitation Workshops Function			

1.	Metal Workshop Store	1	11.8x6.6	77.9
2.	Orthopaedic Workshop	1	17.2x4.2	72.2
3.	Cloth Workshop (Added Section to Existing Unit)	1	13.2x4.2	55.4
4.	Toilets and Bathrooms (NYSC)	7	7(1.8x2)	25.2
5.	Kitchen (NYSC)	1	4.2x2	8.4
6.	Screen Wall attached to existing Toilets and Bathrooms	1	12.4x2.4	29.76
C.	Accommodation Wing Function			
1.	Laundry	1	9.0x6.5	58.5
2.	Outdoor Washing	1	9.0x2.6	23.4

3.	Cafeteria	1	9.0x6.5	58.5
4.	Double rooms	10	10 (4.2x2.7)	113.4
	Toilets and showers	4 (2toi.) 4 (1sho.)	4 (2.0x0.9x 2.0x0.9x1.0)	21.6
5.	Single Rooms	8	8 (1.8x2.4+1. 8x4.0)	92.26
	Bathrooms	8	8 (2.0x1.8	28.8
6.	Reception	1	5.6x3.8	21.28
				Total 417.68m2
D.	Administrative Unit Function			
1.	Waiting and Reception	1	10.5x6.0	63.0
2.	Offices	3	2 (6.0x5.4) 1 (4.8x3.4)	64.8 16.3
3.	Toilets	5	5 (1.2x1.0)	6.0
4.	General Store	1	5.5x3.9	21.5

5.	Conference Room	1	7.2x7.0	50.4
6.	Principles Office	1	4.8x3.7	17.8
	+Toi.	1	3.0x1.2	3.6
7.	Secretary	1	4.8x3.8	18.2
8.	Deputy Principle	1	4.8x4.5	21.6
9.	Staff Lounge	1	7.0x3.6	25.2
				Total 420m2
E	Research Library Function			
1.	Patient Library	1	12.5x12.0	150.0
2.	Professional Library	1	9.0x12.0	108.0
3.	Female Toilets	3	2 (1.4x0.8)	2.2
			1 (1.9x1.5)	2.9
	Male Toilets	4	3 (1.4x0.8)	3.7
			1 (1.9x1.5)	2.9

				Total 269.7m2
I	New Kitchen and Cafeteria Function			
1.	Cafeteria	1	11.0x10.0	110.0
2.	Kitchen	1	9.8x4.3	42.14
3.	Out door Cooking Space	1	9.8x3.5	34.30
				Total 186.4m2
J.	Laundry attatched to medical Unit.	1	14.2x5.4	76.7
	Outdoor Cooking.	1	14.2x2.0	28.4
				Total 105.1m2

8.0 CHAPTER EIGHT - REDEVELOPMENT PROGRAMME AND CONCLUSION

8.1 INTRODUCTION

The redevelopment proposal will be administered in various phases.

8.1.1 Phase I

- (a) Construction of New Medical Unit, Kitchen and laundry
- (b) Construction of Accommodation Wing

8.1.2 Phase II

- (a) Relocation of "family from compound" to one of the student hostel rooms temporarily, so that Landscaped sit-out can be constructed. After which the family will be moved to accommodation wing on completion.
- (b) Internal redevelopment and conversion already stated facilities in section 7.3 of this thesis.
- (c) Demolition of old leprosy huts and levelling; and internal redevelopment of existing kitchen; while services are transferred into the new kitchen.

Alternative could be to use the present outdoor kitchen space, while renovation is taking place.

- (d) Construction of Research library and the rehabilitation workshops. Present library will be maintained until Research Library is completed.
- (e) Construction of new Administrative Unit, after which present Office Block will be converted back to bacteriological laboratory.

8.2 SUMMARY AND CONCLUSION

The exercise involved in the redevelopment programme is one that has to be carefully considered and properly planned so as not to be a disturbance to the activities already going on in the centre. This chapter discusses a brief report of the procedures carried out in this proposal and how it is concluded.

8.2.1 SUMMARY

The National Tuberculosis and Leprosy Training Centre, Saye Village, Zaria began as a leprosy camp, and is gradually becoming a general hospital.

The improved knowledge of leprosy and tuberculosis has now made it possible to bring about the awareness in the society and to provide medical care for affected individuals, and other medical ailments. The growing need for new facilities was determined by the in-flux of various categories of patients to the centre.

This thesis work was started out by the author discussing the need to upgrade the centre due to its dilapidated state in some areas; and the probable need for new infrastructure to cater for the patients effectively.

An analysis of similar facilities around Nigeria and around the Globe was carried out so as to arrive at an acceptable guide for the design proposal.

The diseases, their spread and treatment, along with the problems associated with expansion of hospitals was also carried out.

Also the climatic factors of the area were considered so as to effectively achieve adequate orientation of the site.

Finally after the afore-mentioned factors were analyzed and synthesized, the eventual proposal was originated.

8.2.2 CONCLUSION

The challenge of this thesis work has benefitted the author's knowledge about hospital design, its intricacies and complexities, which have to be combined together in equal proportions so as to eventually benefit the patients.

Being a redevelopment proposal, this thesis work can not be said to have solved all the problems within the hospital, as some aspects had to be left as they were, so that the aim of the thesis was not defeated.

An attempt to otherwise solve all the design problems would have led to designing a new hospital all together.

The proposed design has tried to adequately integrate the spaces on the site with the old and new facilities; while

considering landscaping and parking methods.

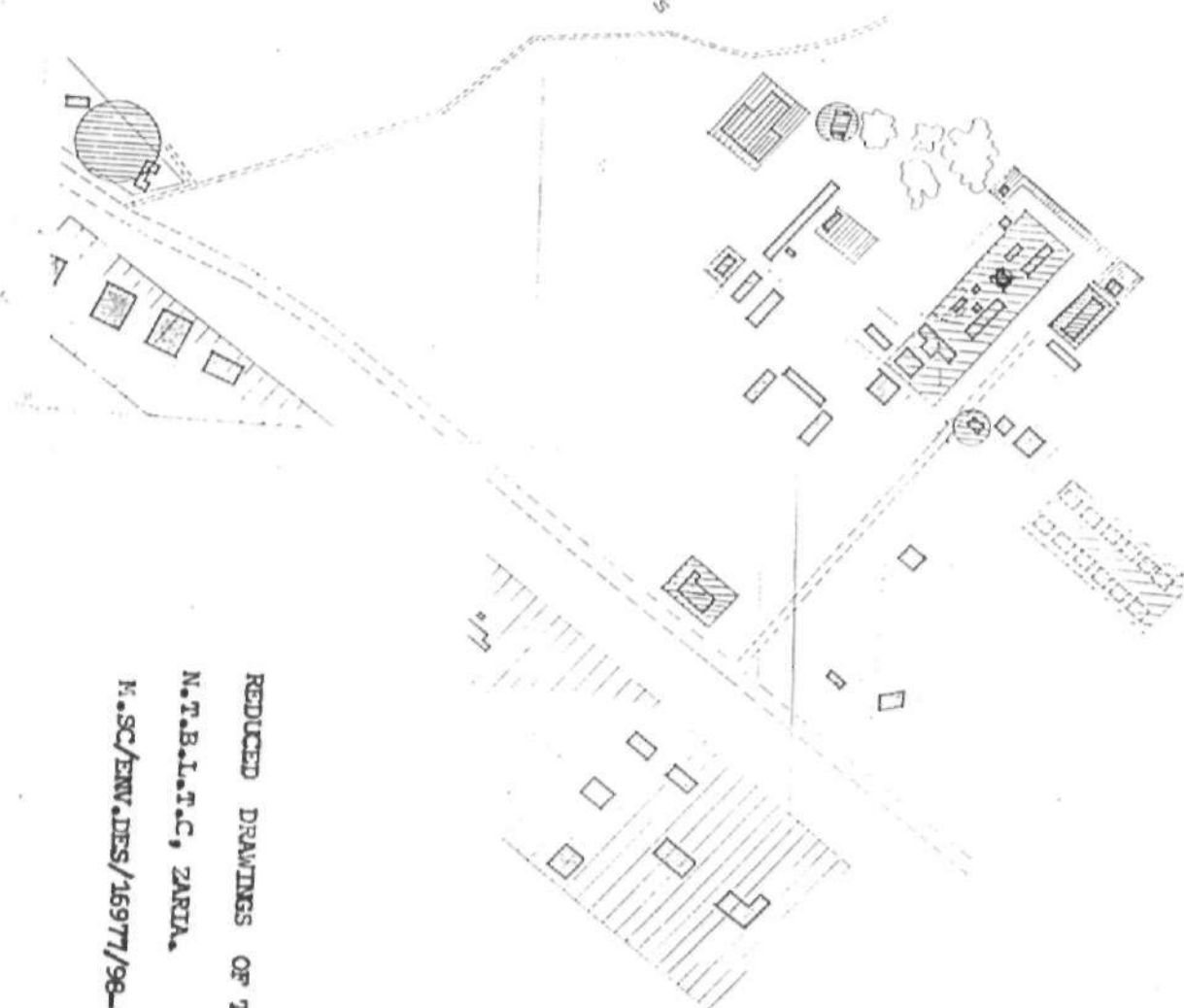
BIBLIOGRAPHY

1. Ajayi Adeyemi Olamide "Redevelopment Proposal for The National Orthopaedic Hospital Igbobi, Lagos' Towards Progressive Patient Care'", Unpublished M.Sc Thesis, A.B.U Zaria, November 1999.
2. "Analysis Report of National Leprosy and Tuberculosis Specialist Hospital" (1988).
3. "Architectural Records" (1987) 'Hospitals for Out-Patients', Vol 5
4. Bralow S. Philip, M.D. "Basic Research and Chemical Medicine
5. Bryceson Anthony and Pfaltzgraff (1979). "Leprosy" Roy E. Pfaltzagraff
6. Cox. Anthony and Groves Philip (1981). Design For Health Care,
Butterworth and Co. Publishers Ltd.
7. Drummond. P. (1980) "On Nucleus in a Nutshell", Health and Social Science Journal, Friday Oct. 10, Pg 1309.
8. Drummond. P. (1980) "On Throwing Bricks at Design", Health and Social Science Journal, Friday Sept. 26, Pg 1256.

9. J.S.Gniadzik, (1984). "Structural Systems in Architecture", A.B.U Press.
10. Neufert Ernst, (1980). "Architects' Data". BSP Professional Books, Oxford.
11. Revised Workers' Manual (1998). "National Tuberculosis and Leprosy Control Programme".
12. Schaffer I., "Archiv Fur dermatologic und Syphillis".
13. Technical Report Series 607, Geneva (1987). "WHO Expert Committee On Leprosy".
14. Wali Usman Muktar. "A Proposed General Hospital for Deba, Gombe State 'Improved Support Services for better Patient Care' ". Unpublished M.Sc Thesis, A.B.U Zaria, November, 1999.
15. Wheeler .E.T (1955), Hospital Modernization and Expansion; Mcgraw Hill Book. Co., pg 26
16. Youmans G.P, (1979). "Tuberculosis"
W.B Saunders Company
WHO Expert Comittee 1979.

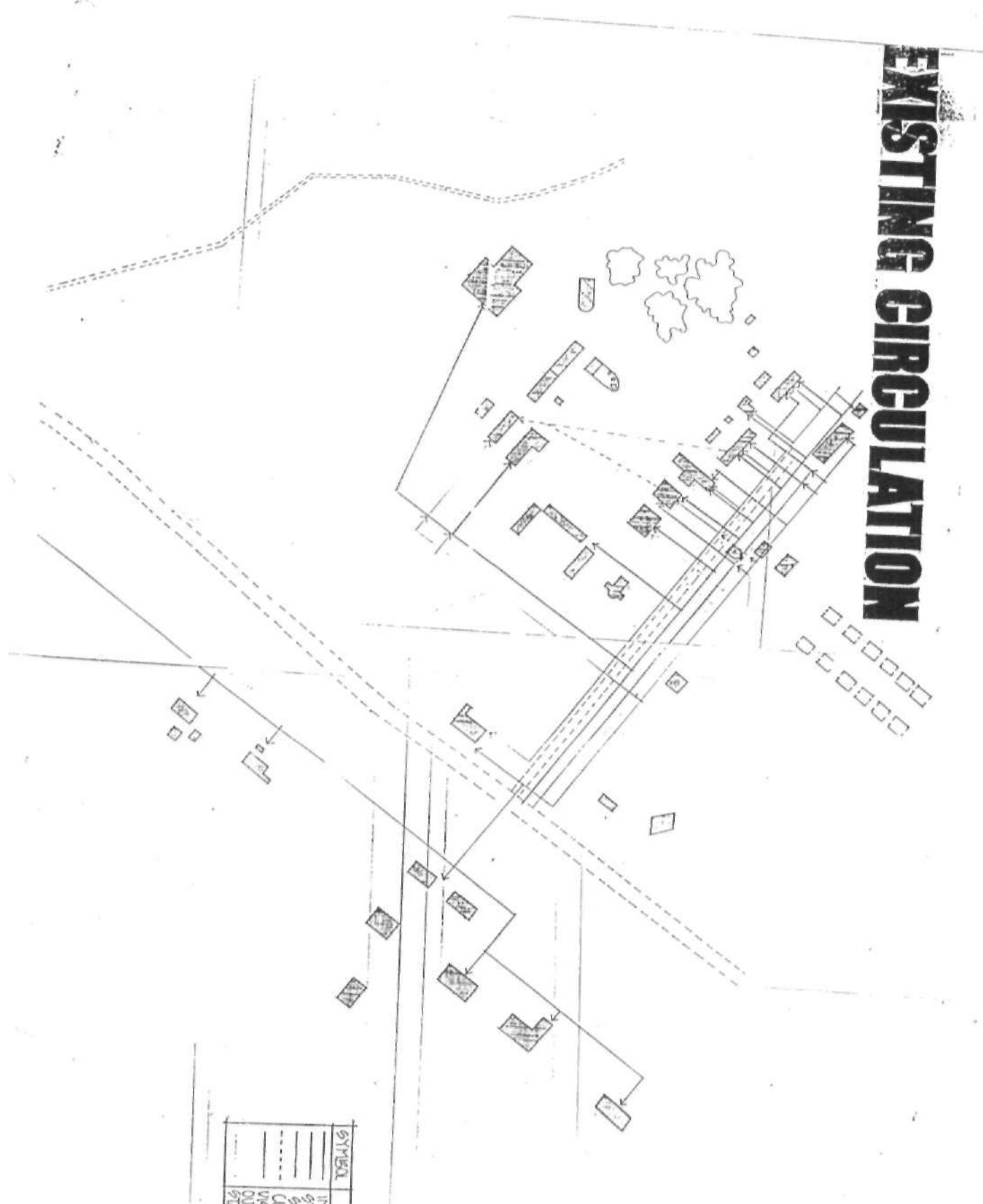
EXISTING ZONING

-  MEDICAL SERVICES
OPR. OPERATION THEATRE,
PHYSIOLOGY/RECE. LAB/RECOVERY
-  GENERAL SUPPORT FACILITIES
ACCOMMODATION (HOMEL AND GUEST)
CORPORATE
-  RELIGIOUS FACILITIES
MOSQUE AND CHURCH
-  GENERAL SUPPORT FACILITIES
ADMINISTRATIVE BLOCK,
CLINICAL BLOCK, STERILE LIAISON,
LABORATORY, X-RAY, CATERING,
RECEPTION, PRIMARY SCHOOL,
SERVICES
LAUNDRY, KITCHEN, MAINTENANCE
OFFICE, POWER ROOM, WATER TOWER
-  IN-PATIENT FACILITIES
WARDEN, OUT-PATIENTS, RECEPTION
WARDEN, CONFERENCES



REDUCED DRAWINGS OF THE
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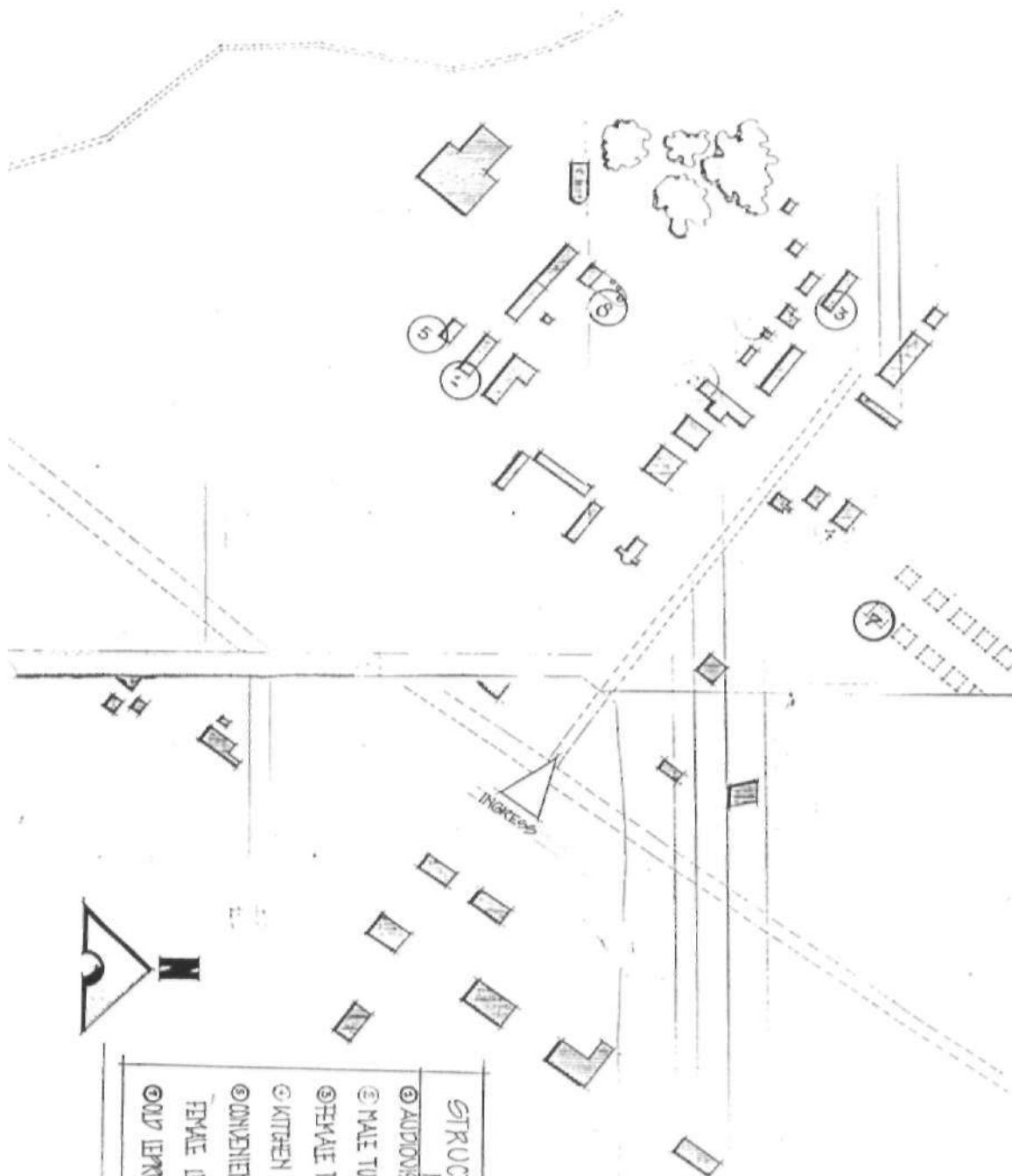
EXISTING CIRCULATION



SYMBOL	CATEGORY
—	IN - PATIENTS
—	STUDENTS
—	STAFF (MEDICAL)
—	UNIDED LEPROS)
—	VISITORS (RELATIVES)
—	OUT - PATIENTS
—	STAFF (ACADEMIC)

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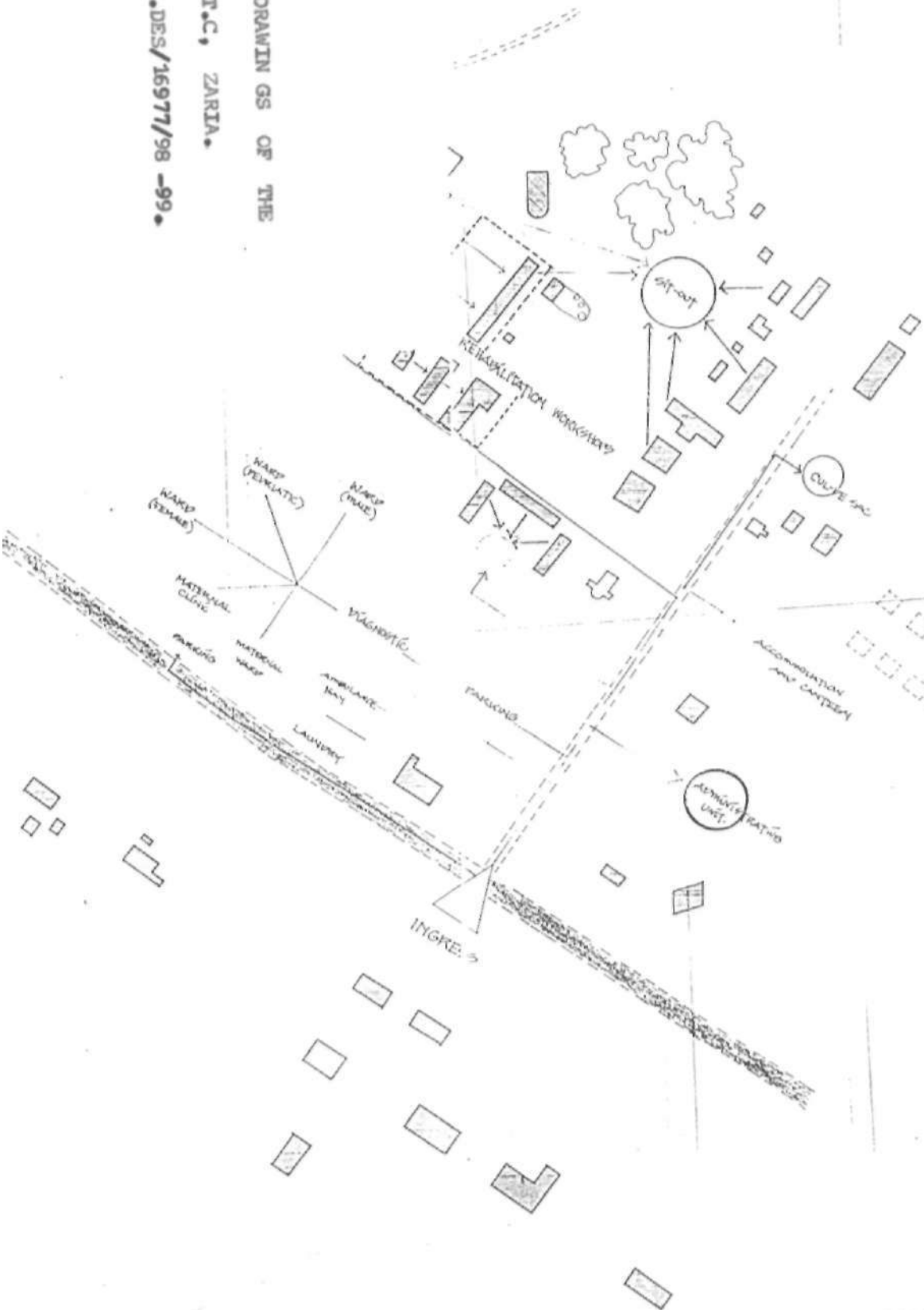
REPORT DETERMINING OF THE ENCLOSED

N.T.B.I.T.C., TABIA.

N.C/ENV.100/16977/98-99.

STRUCTURES REQUIRING REHABILITATION.
③ AUDITORIUM UNIT - RENOVATION
③ MALE TUBERCULOSIS WARD - TOILETS - SHO. - RENOVATE and REBUILD
③ FEMALE TUBERCULOSIS WARD - RENOVATE
③ KITCHEN - REPLASTER AND PAINT
③ CONVENIENCES - RENOVELLING
③ FEMALE LEPROSY WARD - TOILETS - SHO. - RENOVATE
③ OLD LEPROSY HUTS - RENOVATE - LEVEL

PROPOSED CIRCULATION



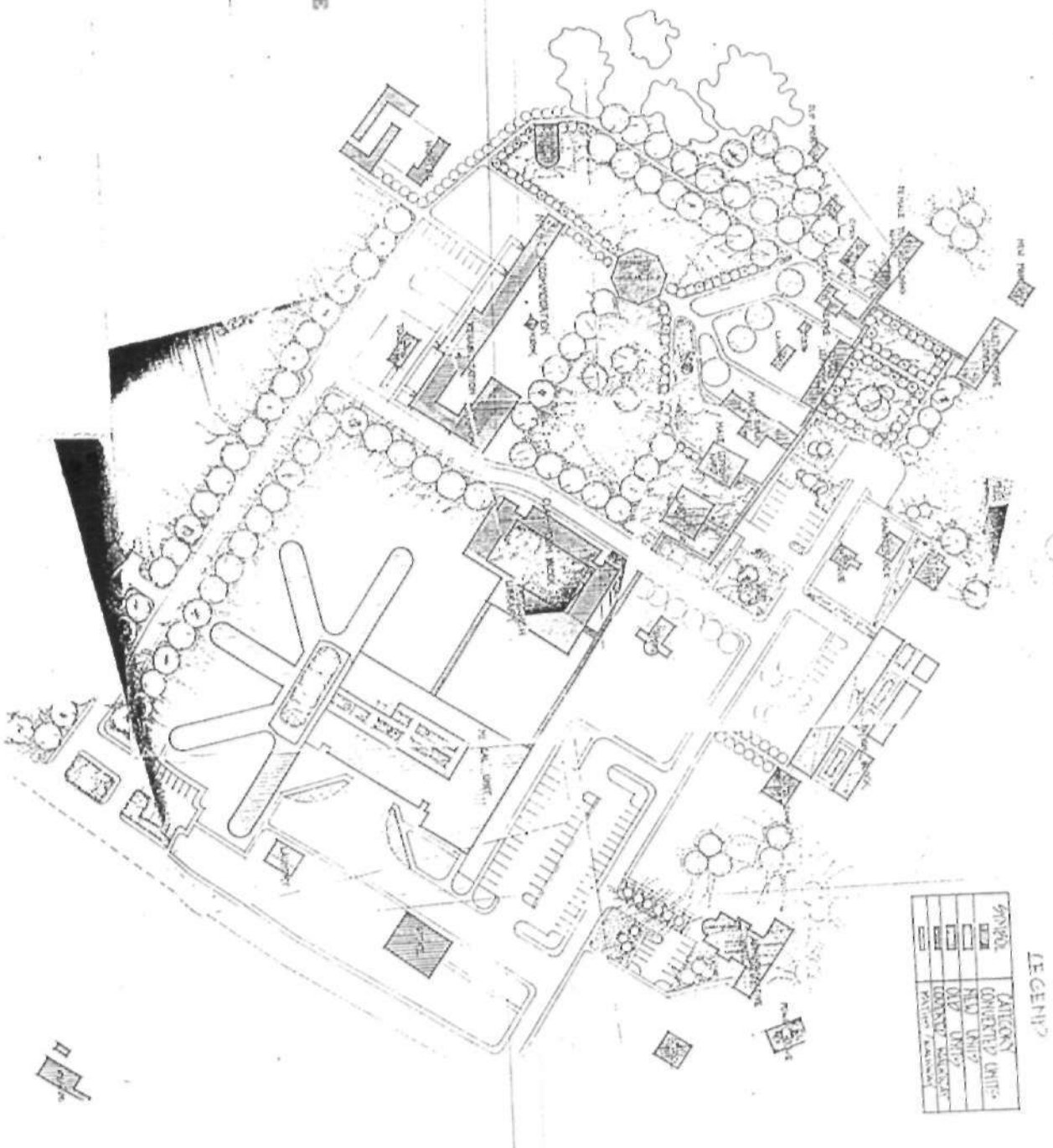
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M.SC/ENV.DES/16977/98 -99.

PROPOSED SITE PLAN

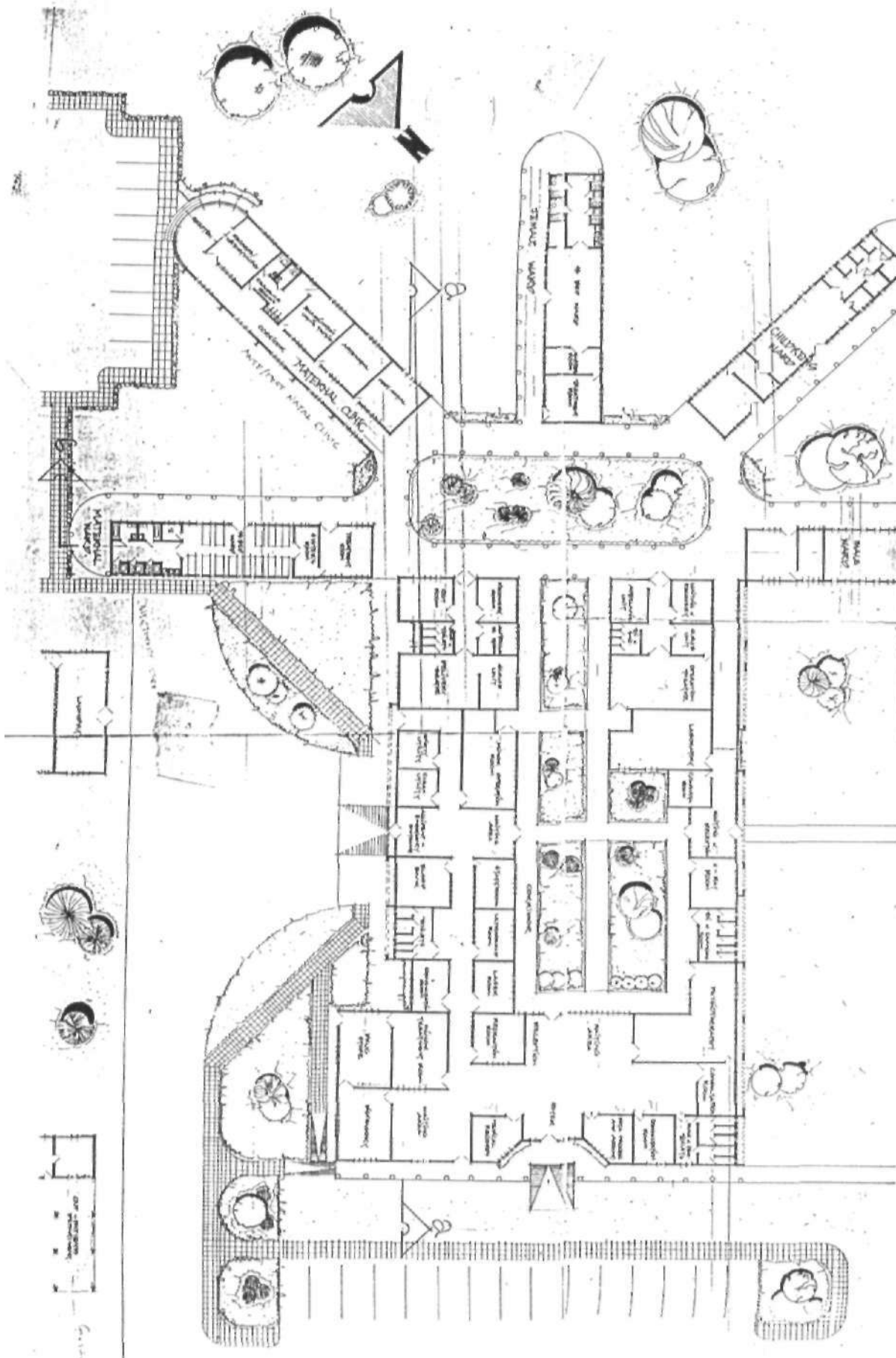
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LEGEND

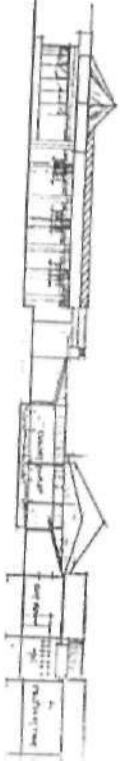
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[Symbol]	EXISTING BUILDING
[Symbol]	NEW BUILDING

FLOOR PLAN MEDICAL UNIT

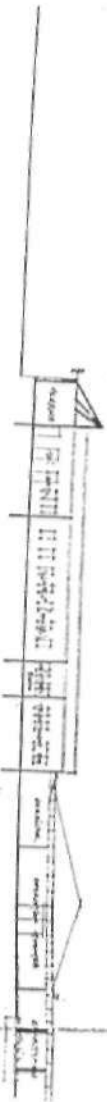


SECTIONS MEDICAL UNIT

SECTION a-a



SECTION b-b



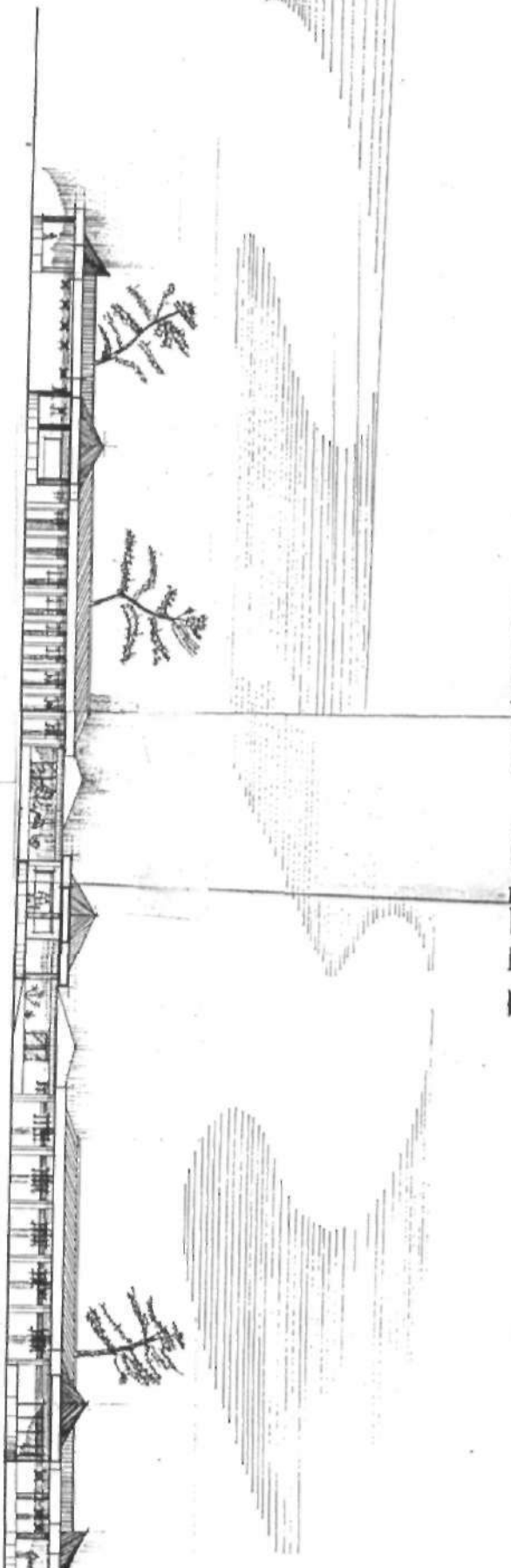
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ELEVATIONS MEDICAL UNIT

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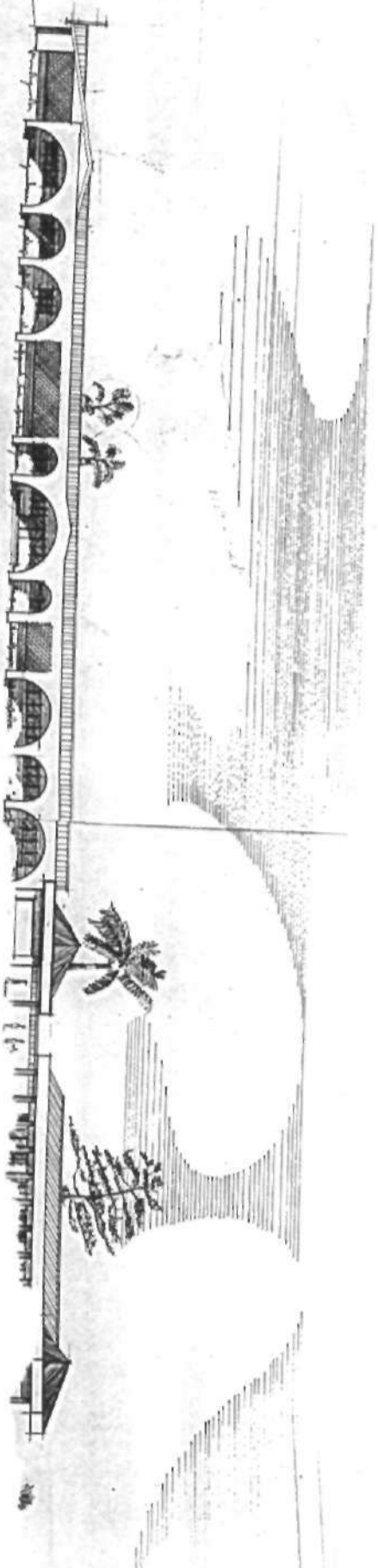


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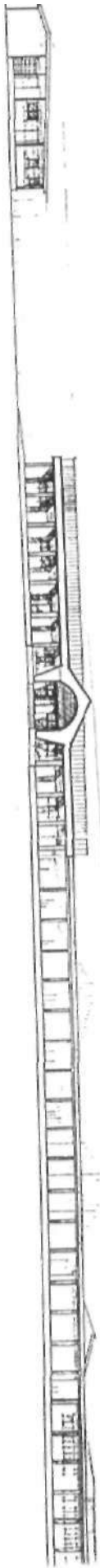
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N-WEST

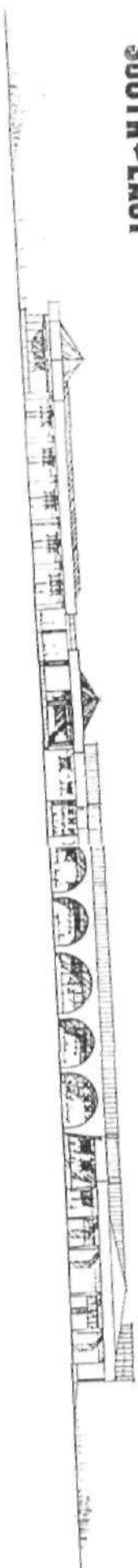


ELEVATIONS MEDICAL UNIT

NORTH~EAST

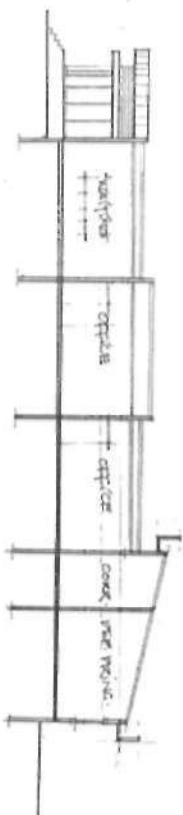
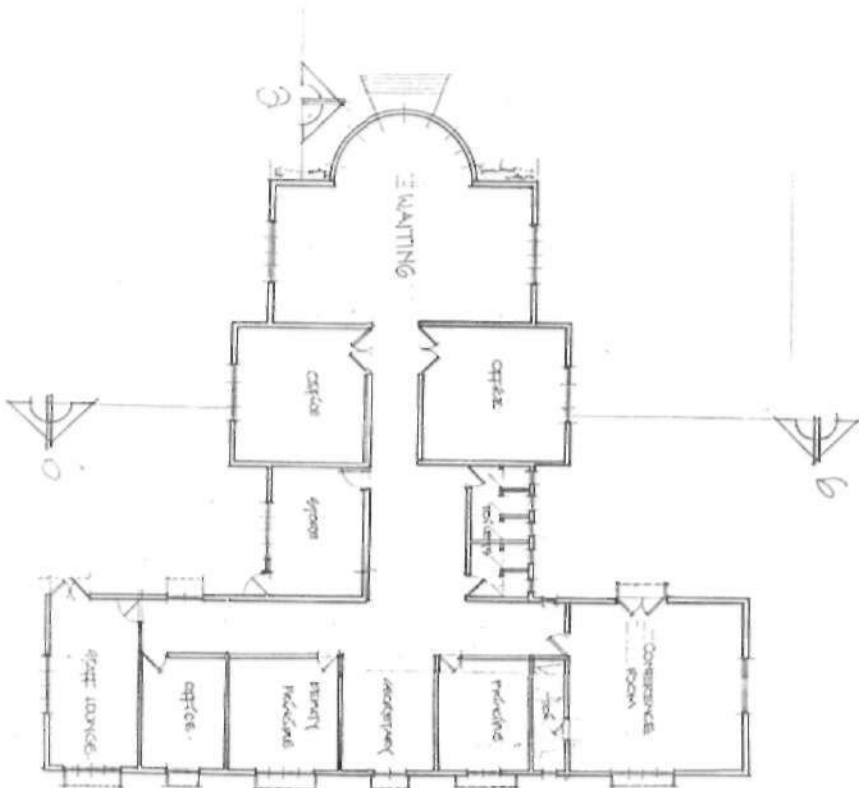


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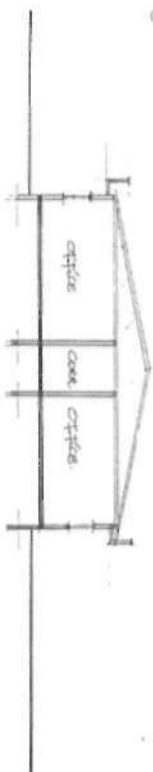


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ADMIN. FLOOR PLAN



SECTION 6-6



SECTION 7-7

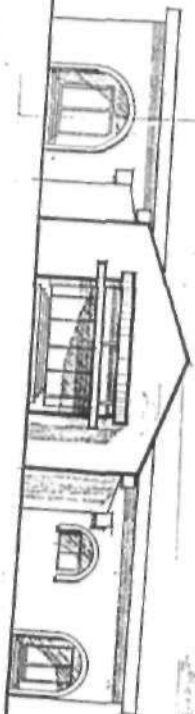
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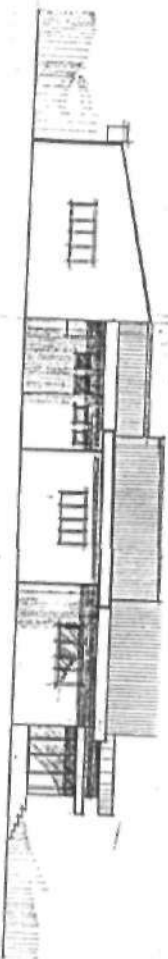
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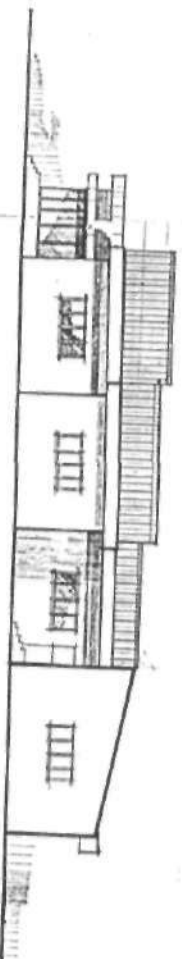
SOUTH - WEST



NORTH - WEST



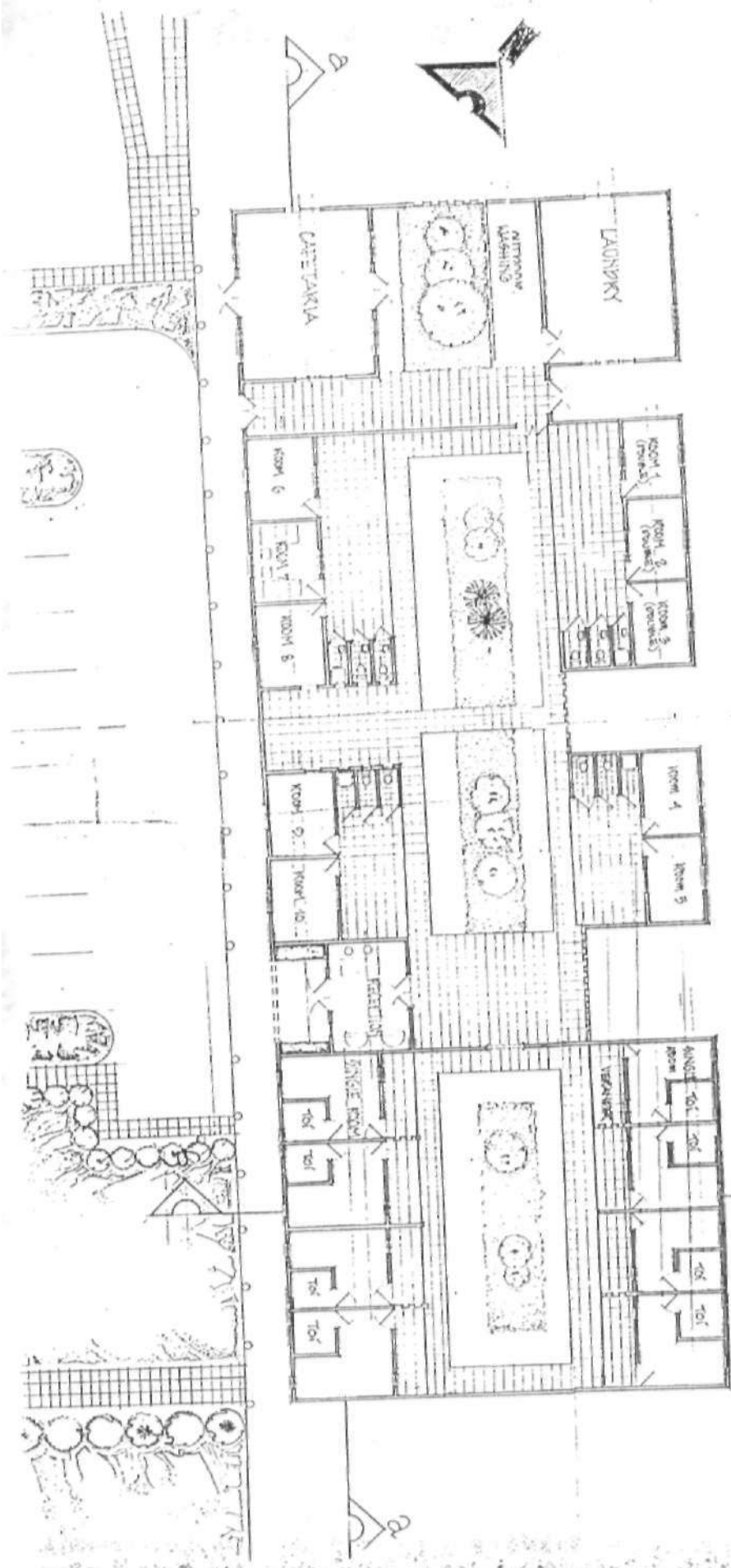
SOUTH - EAST



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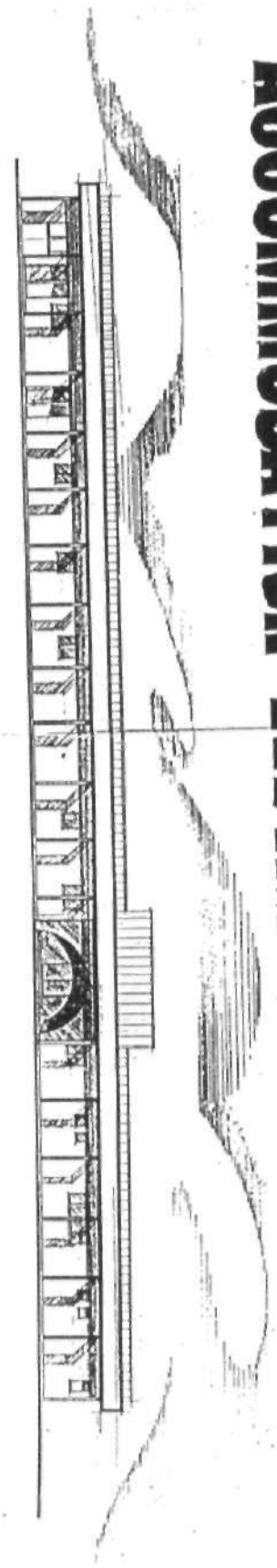
ACCOMMODATION UNIT



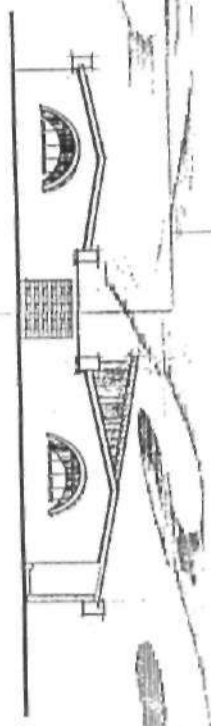
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ACCOMMODATION ELEVATIONS

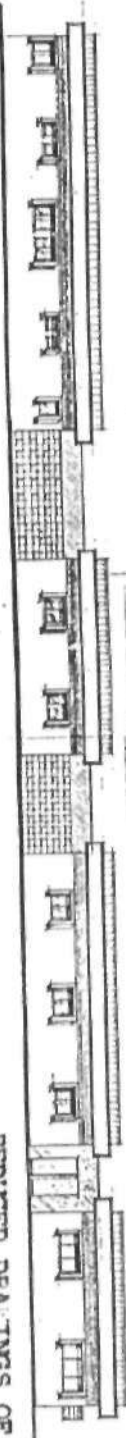
SOUTH WEST



NORTH WEST

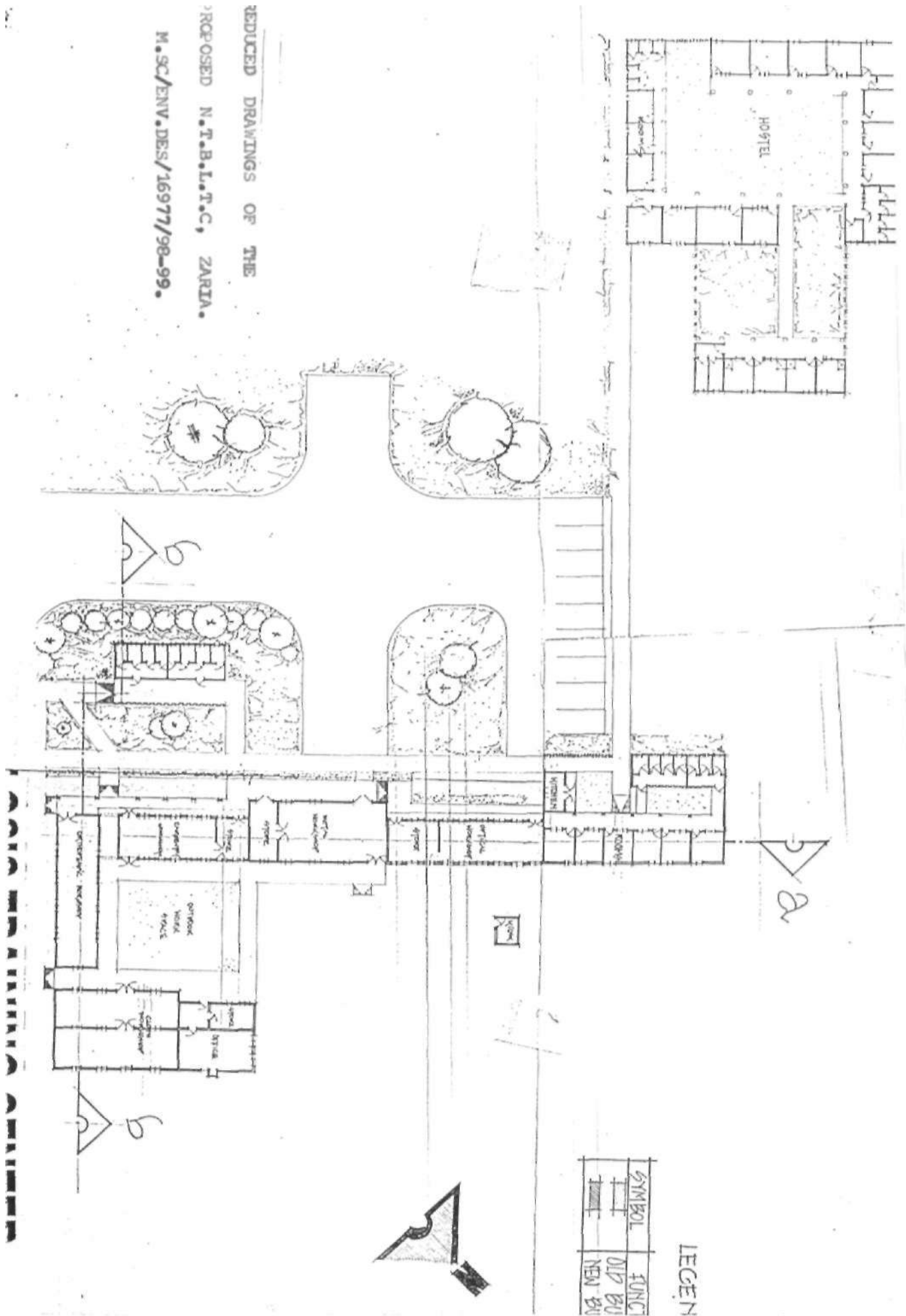


NORTH EAST



REDUCED DRAWINGS OF THE PROPOSED
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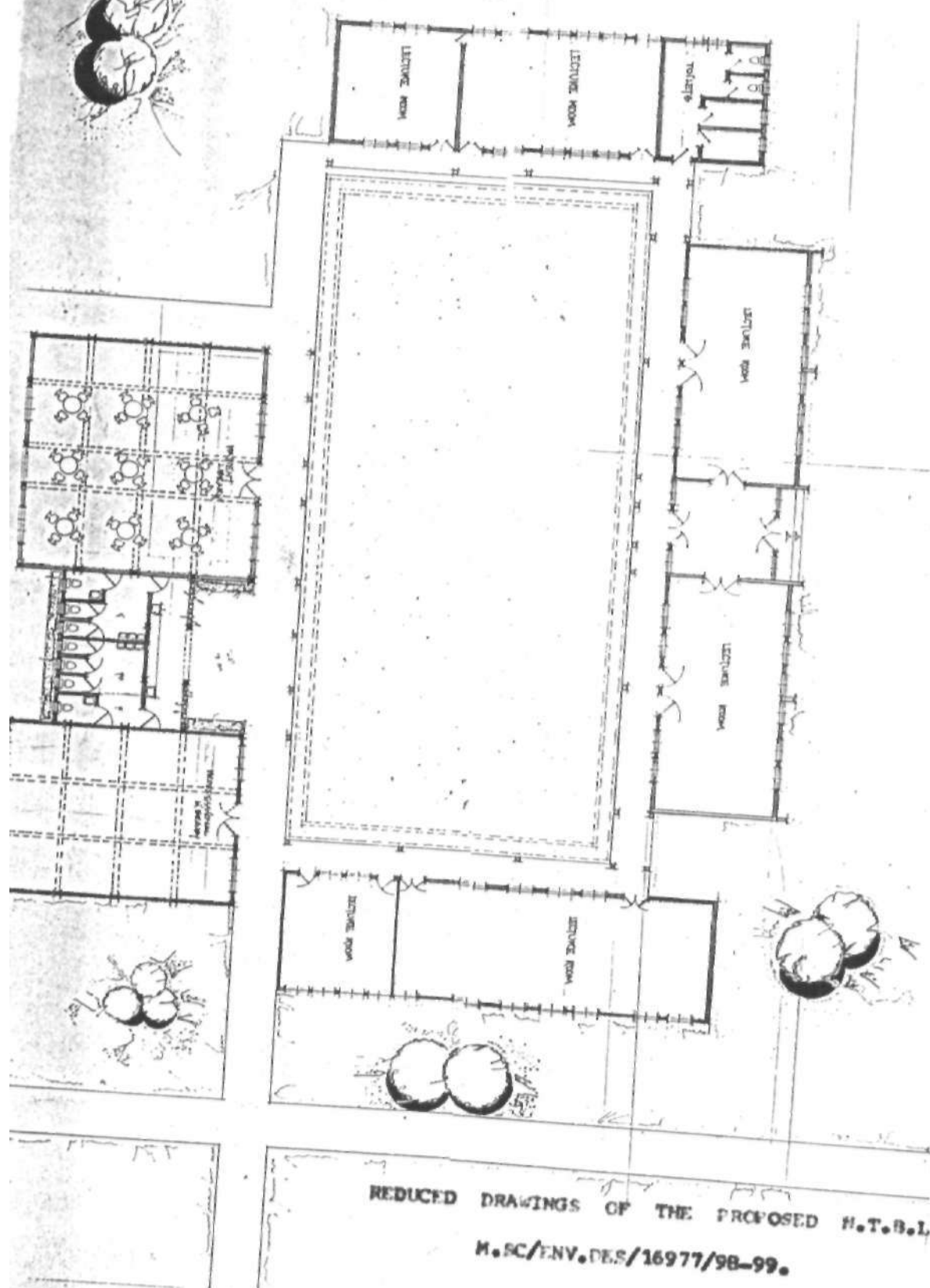
REDUCED DRAWINGS OF THE
 PROPOSED N.T.B.L.T.C, ZARIA.
 M.SC/ENV.DES/16977/98-99.



LEGEND

SYMBOL	FUNC
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[Symbol]	NEW BU

CLASSROOMS/ RESEARCH LIB. PLAN

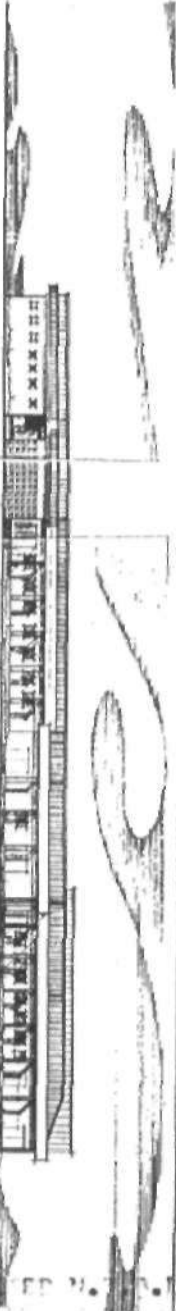


REHAB. ELEV / SECTIONS

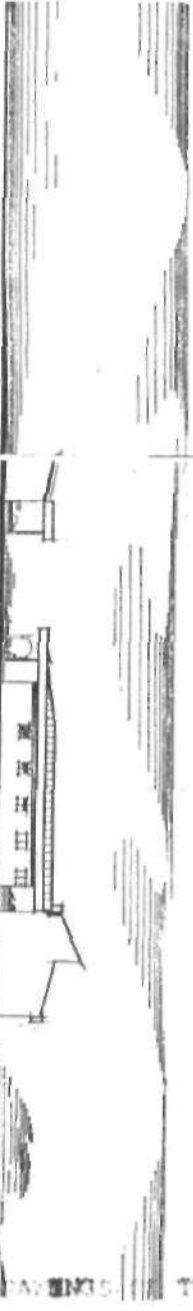
SECTION a-a



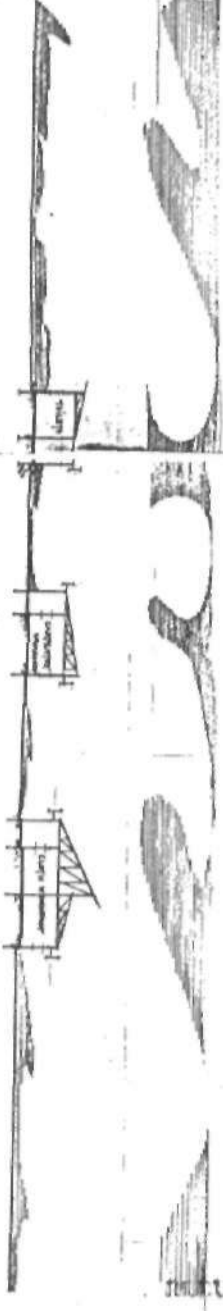
SOUTH-WEST ELEV.



SOUTH-EAST ELEV.



SECTION b-b



REDUCED DRAWINGS OF THE PROJECTED M.T.A. T.C.

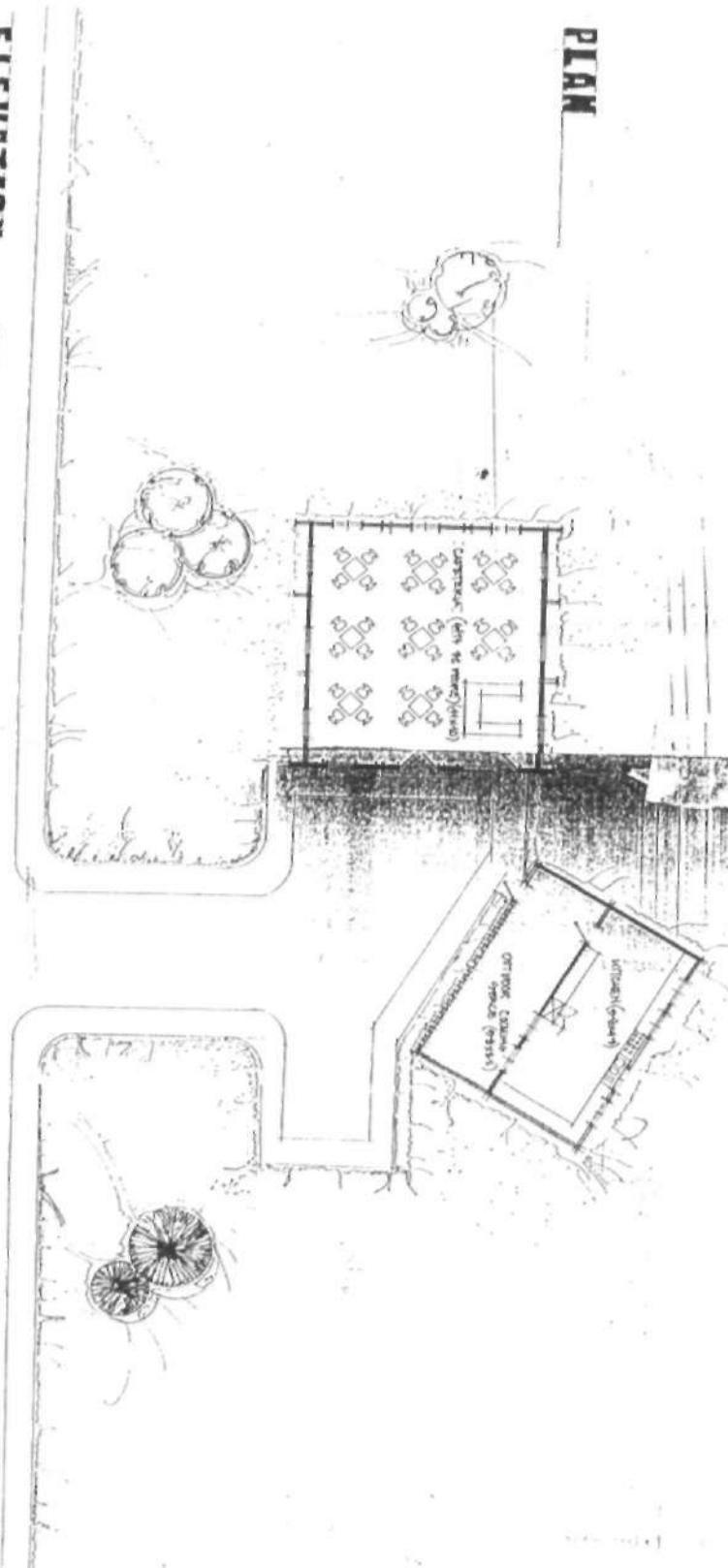
MARIA.

M.SC/ENV.DS /16977/98-99.

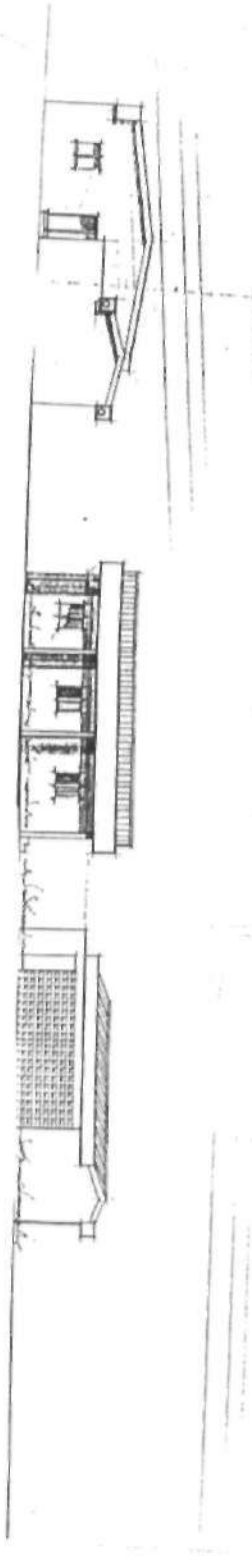
KITCHEN / CANTINE

Little / Jones

PLAN



ELEVATION



RENDERED DRAWINGS OF THE PROPOSED KITCHEN / CANTINE,
MARIA.

M.C/ENV. 11/16977/98-99.

[illegible]

A hand-drawn floor plan of a building, oriented vertically. The plan shows several rooms and corridors. At the top, there are three small rooms labeled 'TOILET', 'TOILET', and 'TOILET'. Below these are three larger rooms labeled 'TOILET', 'TOILET', and 'TOILET'. In the center, there is a large room labeled 'TOILET'. To the right of this central room is a corridor labeled 'CORRIDOR'. At the bottom right, there are three rooms labeled 'TOILET', 'TOILET', and 'TOILET'. The plan also shows several doors and windows, indicated by small rectangles and lines. The drawing is done in black ink on a white background.

Hand-drawn floor plan of a laboratory suite. The plan shows a central corridor with several rooms: 'Microbiology' and 'Laboratory' at the top, 'Culture laboratory' and 'Microscopy' on the left, and 'Wp. and Wp.' and 'Lab. animal' at the bottom. A 'Reception' area is on the right, and a 'Storage' area is at the bottom right. The plan includes doors, windows, and furniture like tables and chairs.

Floor plan of the second floor. The plan shows a central corridor labeled "CORRIDOR" running horizontally. To the left of the corridor are three rooms, each labeled "OFFICE" with dimensions (14' x 14'). To the right of the corridor are three rooms, each labeled "OFFICE" with dimensions (14' x 14'). The entrance is at the bottom center, labeled "ENTRANCE". The overall dimensions of the building are 28' x 42'.

M.SC/ENV.DES/16977/98-99.