

PAEDIATRIC CENTRE – A NEW DESIGN APPROACH

by

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DECLARATION

I hereby declare that this submission is my own towards the M. Arch and that, to the best of my Knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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DEDICATION

I dedicate this piece of work to my parents Mr and Mrs John Kingsley Sawyerr and my siblings (Brenda, Emmanuel, Abigail and Barbara) for their love, support and contributions to my education.

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ACKNOWLEDGEMENT

“How sharper than the serpent’s tooth is the thankless child” (William Shakespeare).

The realisation of this book has long list of ancestry. Many people and experiences have shaped and informed my mental outstanding skill and ability to put this work together. In this respect, it will be honest and accurate to give honour to whom honour is due.

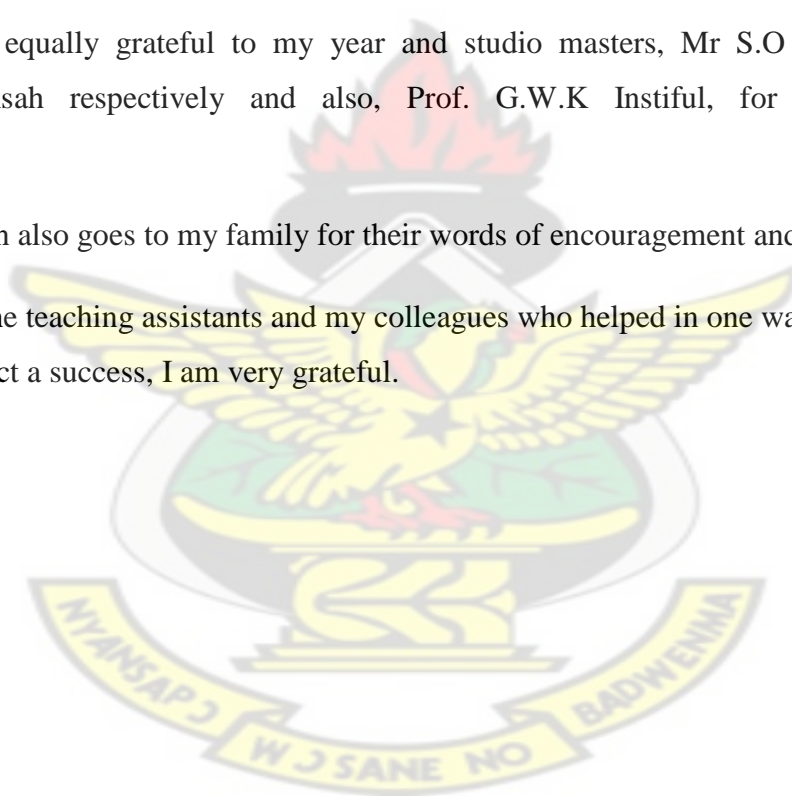
My deepest and foremost thanks go to the Almighty God, who inspired my innermost mind with this idea and ability to do all I have anticipated for.

My next profound gratitude goes to my supervisor, Dr Kuutin-Sawu, for his contributions, guidance and patience.

Besides, I am equally grateful to my year and studio masters, Mr S.O Afram and Mr Amoateng-Mensah respectively and also, Prof. G.W.K Instiful, for their immense contributions.

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ABSTRACT

Architecture is a practice that provides technical and spatial responses to human needs, functions and activities in open and enclosed physical spaces. These needs, functions and activities manifest in a variety of forms according to ages, gender, income and social status among others. They are also expressed in respect of the colours, textures, materials, scale and so on to suite individuals or distinct groups of people. Although technical and spatial responses emerge after the expression of peculiar needs, the corollary also holds true whereby individuals or group of people react in peculiar ways to establish spatial forms.

Children are one group of people who react to spaces with all their five senses; touch, smell, feel, taste and hear. They sense their physical space in a very immediate and detailed way and their response to spaces can be far more direct and energetic than adults¹. Their state of well-being, free from diseases is very important to their parents and the nation as a whole. Part of the process of maintaining well being is occasional or extended visits to hospitals. However the experience of visiting hospitals can be dainty even for adults, partly because of the inflexible space that physically challenge visitors.

For children, visiting hospitals can be particularly tasking emotionally, as they are stressed by ill-health, painful medical procedures and unfriendly demeanour of care givers. Children stress from hospital visits can be further compounded by issues of layout, colours, textures, materials, scale and so on. This is because, many health facilities (spaces) in Ghana, have been designed with little acknowledgement of the differing needs of small children, older children, adolescents, parents and care-givers. Thus, these needs of children in such facilities need to be critically considered. Again, there has also been little research in Ghana that has explored what these needs of the children are and what they think about such spaces and how as patients they experience them.

The recent statistics in Ghana shows that Child Mortality rate has declined as compared to the previous years, but the Ministry of Health is of the view that the rate of decline has been slow especially considering the regional disparities in the country and thus as one of their interventions, proposes more paediatric centres to be put up in all the ten regions of the country. Given the level of investment required to achieve this goal of increased paediatric centres across the country, it is important for the lessons to be learned with children's experiences of hospitals to be highlighted in order to make such investors sustainable and relevant.

For such designs to be sustainable and relevant for the children, Architects and Designers should be able to create spaces within the facility that would be very personal and user-friendly in a welcoming and comfortable environment.

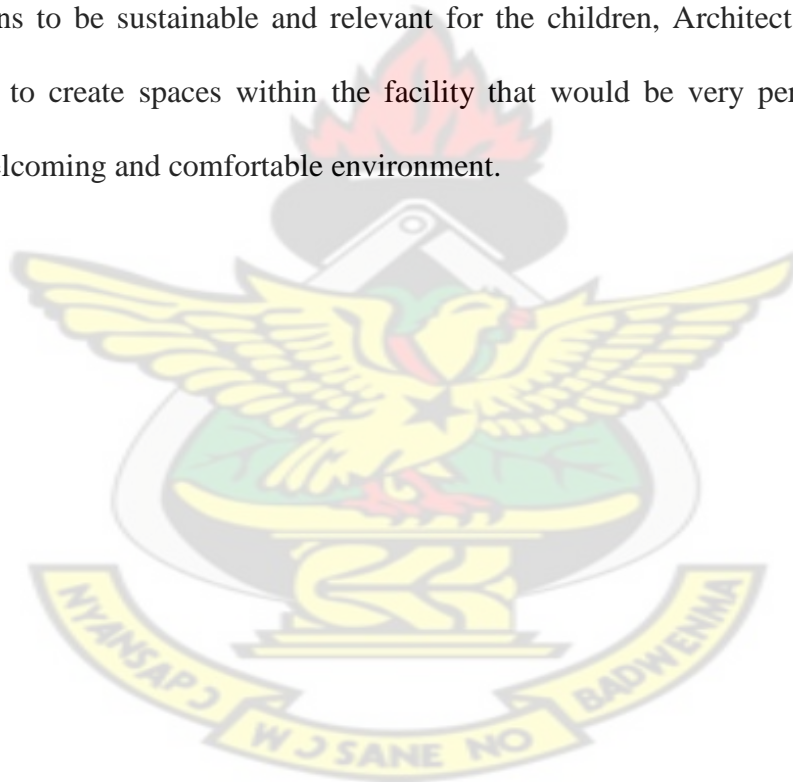


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CHAPTER ONE

1.0 INTRODUCTION

The Infant mortality rate (IMR) and under-five mortality rate (U5MR) have steadily declined in Ghana. For example, the under-5 mortality rate has declined from 157 deaths per 1,000 live births in 1990 to 110 deaths per 1000 live births in 2008². Although improvement has been seen, the Ministry of Health is of the view that, the rates of change have been slow, with the current trends, still far from desirable. This is more evident considering the regional disparities between the northern and southern part of the country, more especially within the districts and communities due to lack of sustainable child health centers as a result of lack of good roads, poor access to services and infrastructure.

As part of their plan of seeing a quick decline of the infant mortality rate and under-five mortality rate, they propose the need to set up more child health-care centres (Paediatric centres) in the districts and rural communities of the country.³

Paediatrics is the branch of medicine that deals with the development and care of infants and children and the treatment of their diseases.⁴ Ensuring child's health is critical not only for reducing child morbidity and mortality, but also for increasing the likelihood of a healthier adult life, as in the popular saying; "Every adult, is a survived child". The primary goal of a child health care, however, is to prevent the major causes of death, difficulties, and disease during childhood: accidental injuries, infections, educational and behavioral problems.

Children are the blessings and joy of society, the pride and strength of their parents and the nation. Their state of well-being, free from diseases is very important to their parents and the nation as a whole.

In Ghana, there has been little research that has explored what children think about hospitals and how, as patients, they experience them. The physical characteristics of the different spaces provided for children within different hospital settings; the kinds of social interactions and health care practices that are facilitated or prohibited in those spaces; children's use of different spaces in hospitals and the meanings and values that they attribute to them; and the extent to which age, gender or medical conditions work to vary children's perceptions and use of different spaces in hospital.

1.1 PROBLEM STATEMENT

The Amansie East district of the Ashanti Region over a period of five years has been noted for its records in increase child mortality rate, particularly, with the major cause being Malaria.⁵

The district has two main government hospitals; Bekwai Hospital (which is the district hospital) and Kokofu hospital (mainly for dermatological cases) and other facilities which include 4 main mission clinics, 4 private maternity homes and 3 community initiated health centers.

Statistics shows that the Bekwai Government hospital, out of all the above- mentioned health facilities, has the highest record in the child mortality.⁵ This is because; the hospital serves as the major referral place for all the health facilities in the district as well as those in the surrounding districts, like the Bosomtwe Atwima Kwawoma, Amansie West and Amansie Central. The hospital has the highest patronage from the communities

and sub-communities, since it is the only government hospital (for all cases) in the district. Some of these communities include Bogyare, Ntinanko, Adankrangya, Aduam, Sanfo, Poano and Asumangya.

Also with the hospital having the highest patronage in the district, (it does not deny the fact that), there is very little provision made in terms of facilities for child health. The hospital has inadequate capacity to manage with the particular problem of dealing with sick children. There are no separate sections for the children, other than the immunization and weighing points for the newly-born babies and the two inadequate wards in the medical and surgical units respectively. Children are presented with illness or injuries that cannot be managed properly in a primary care setting as it pertains in the Bekwai hospital.

A proposal of a paediatric centre, as part of the plans of the Ministry of Health for putting up a new hospital for the above- mentioned area will be beneficial to the children of that area. Not only that, but the proposal will also serve as prototype design for all the districts in the ten(10) regions of Ghana.

Attached is the summary of the child mortality rate of the whole Amansie East District compared with that of the Bekwai Government Hospital from 2003-2007

**MORTALITY RATES OF CHILDREN(%) IN THE AMANSIE EAST DISTRICT (OUT
OF 15 HEALTH FACILIITIES WITH BEKWAI HOSPITAL INCLUSIVE)**

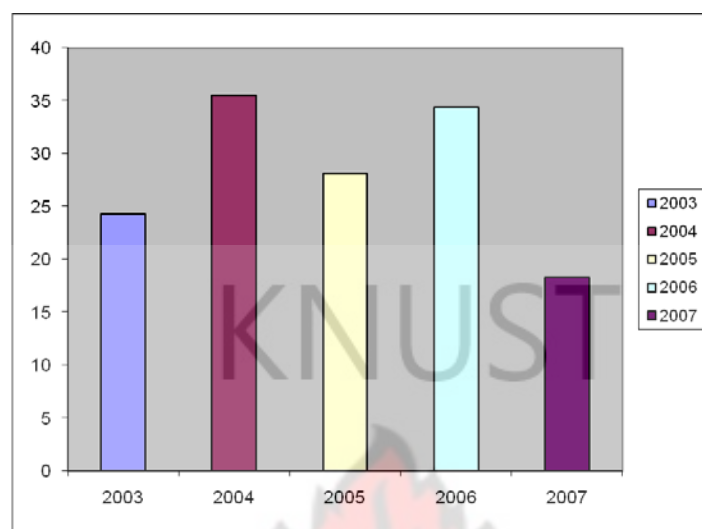


Figure 1. Bar Chart showing the mortality rate of children in Amansie East District.

**MORTALITY RATES OF CHILDREN (%) ONLY IN THE BEKWAI GOVERNMENT
HOSPITAL.**

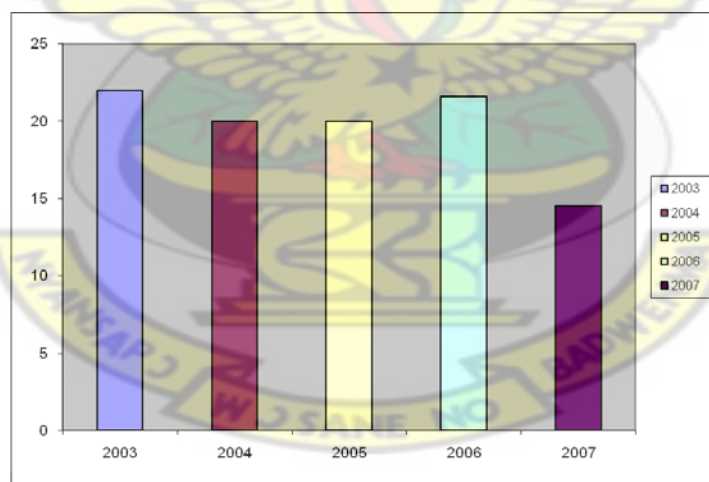


Figure 2. Bar Chart showing the mortality rate of children only in Bekwai Government Hospital.

From the above bar graphs, it can easily be deduced the highest record of child mortality rate in the Amansie East District is from the Bekwai Government Hospital.

1.2 JUSTIFICATION

It is very important to put up such a facility in Bekwai and the other districts of the country due to these imperative reasons:

First and foremost, a provision like that in every district will curb the disparities between the deprived and privileged districts of Ghana. Such that those from the remote places will not have to travel all the way to the major hospitals in the cities, the likes of Komfo Anokye and Korle-Bu Teaching Hospitals.

The New hospital, which will serve as one of the major hospitals on the Kumasi- Cape coast highway, south western part of Ghana, between the Komfo Anokye Teaching Hospital and the Cape coast Regional Hospital, will need such a facility to cater for the health needs of all those children in the communities that fall within the area.

Again, with the Amansie East district having so many adjoining districts like Bosomtwe Atwima Kwawoma, Amansie West and Amansie Central districts at its borders, such a facility in its district capital, will help to save the lives of all the children in the surrounding and sub-communities of these districts.

What is more, a provision like that will now help the child-health specialists in the hospital to cater for the immediate and more complicated cases which in the long run, help to reduce the probability of increment in the child mortality rate in the near future.

There is therefore no doubt that a provision of a Paediatric Centre in Bekwai is benefiting for the children in the district and the surrounding districts as a whole. These children, would then live as healthier adults to become strong and competent leaders in the future.

If a provision like that is not made as soon as possible, then?

1.3 OBJECTIVES

The main objectives of this study are:

- To provide a well equipped facility that will deliver the highest quality of care in the safest setting, and in a child-friendly environment that supports the clinical and caregivers , the families and patients who work, live, and heal respectively in that facility.
- To educate architects, health-care planners, designers and policy makers who have very little acknowledgement of the differing needs of small children, older children and adolescents in a health care facility.
- To set a standard for paediatrics environment that will be a prototype design for the districts and communities in the country.
- To create a very personal, user-friendly and holistic health environment in which children that are sick can feel comfortable.

1.4 SCOPE OF STUDY

The thoughtful study includes the provision of the following spaces and the treatment of such spaces to suite the psychological, physiological, emotional and health needs of the child:

- ❖ Administration and Welcoming centre with an Out-patient unit
- ❖ Special Treatment rooms and Decorated wards
- ❖ Emergency, Theatre and Physiotherapy unit
- ❖ Counseling units with Weighing and Vaccination points

Besides, it will include the provision of the following ancillary spaces to facilitate rapid healing:

- ❖ Indoor Play/ games room and Outdoor landscape play areas
- ❖ Healing and relaxation gardens
- ❖ Family centered areas.
- ❖ Gift shop and snack bars
- ❖ Classrooms and Clinical Research library for the staff (with Internet facilities)

1.5 TARGET GROUP AND LOCATION (SITE)

The target group of the project includes all children from day one to age twelve in Bekwai and its surrounding areas like Bogyare, Ntinanko, Adankrangya, Aduam and Sanfo, as well those in the nearby district like the Amansie west and central and not forgetting the paediatricians and all the other child health specialists.

1.6 RESEARCH METHODOLOGY

The information used to write this research work was acquired through the adoption of a number of tried and tested research methodologies. These are:

- Data Collection
- Sampling of data collected
- Choices of the Data collection instruments to be used
- Analysis of the data gathered

1.7 LIMITATION

The major limitation encountered was the difficulty of getting some vital information from some health workers at the existing areas of study.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 DEFINITION OF PAEDIATRICS

Paediatrics is the branch of medicine that deals with the care and development of infants and children and with the prevention and treatment of their diseases ⁴. A Paediatric centre is therefore a health-care facility for children.

2.2 HISTORICAL DEVELOPMENT OF PAEDIATRIC CARE.

In Western Europe, there was a gradual move to found separate institutions specifically for ill- children, partly to avoid exposing them to adults in adult's hospitals.

The first generally accepted paediatric centre is the Hopital des Enfants malades (Hospital for sick children) which was opened in Paris in June 1802. ⁷

The rise of paediatrics itself was intimately related to the establishment of children's hospitals in the 19th century ⁸. This need for specialization has been keenly debated by historians over the past 150 years and the perceived benefits of such a division of labour within medicine were often greeted by suspicion or frank hostility by many influential members of the profession.

With the field now becoming increasingly global and with more interaction among practitioners and care givers worldwide, it is therefore important to begin by placing more importance on its development over the years and come up with new ways of improving the designs.

2.3 NEW APPROACHES IN THE DEVELOPMENT OF PAEDIATRIC CARE – SOME CONCERNS RAISED BY CHILD HEALTH SPECIALISTS.

As health-care specialists and psychologists in various centres began to observe the child health-care settings systematically, they found new different approaches in the development of paediatric care⁹. These included the correlation between the quality of space, the health condition of the child and the behavior. Another important new approach they stressed on is the introduction of family centered care in paediatric care development.

2.3.1 Family-centered care in Paediatric care

Family-centered care is an approach to health care that shapes health care policies, facility design, and day-to-day interactions among patients, families, physicians, and other health care professionals.⁹ Health care professionals who practice family-centered care recognize the vital role that family play in ensuring the health and well-being of children and family members of all ages. These health practitioners acknowledge that emotional, social and development support are integral components of health care.

Family-centered care emerged as an important concept in child health care at a time of increasing awareness of the importance of meeting the psychosocial and developmental needs of children and the role of families in promoting the health and well being of their children.

Family-centered care in Paediatrics is based on the understanding that the family is the child's primary source of strength and support and the child's and family perspectives and information are important in clinical decision making. The practitioners of this approach are keenly aware that health care experiences can enhance parents' confidence in their roles and overtime, increase the competence of children and young adults to take

responsibility for their own health care, particularly in the transition of adult service systems.

2.3.2 Importance of Family centered care in Paediatric care

- Family-centered approaches lead to better health outcomes and wiser allocation of resources as well as greater patient and family satisfaction.
- It brings a stronger alliance with the family in promoting each child's health and development.
- This approach improves clinical decision making on the basis of better information and collaborative processes.
- Family-centered care brings the greater understanding of the family's strength and care giving capacities.
- It also brings greater child and family satisfaction with their health care.

With this new approach, Paediatricians and other child caregivers should convey respect for parents or guardians' unique insight into and understanding of their child's behavior and needs. Parents and guardians should be offered the option to be present with their child during medical procedures and offered support before, during, and after the procedures ⁹.

In view of the above, Health care institutions should design their facilities to promote the philosophy of family-centered care. Paediatricians should advocate for opportunities for children and families to participate in design planning for renovation or construction of hospitals, clinics, and office-based practices.

2.3.3 Quality of a space

According to Carolyn E. Francis, “Well designed and organized spaces, were found to support cooperation and production as opposed to disruptive behaviours and to reduce health discipline problems. Such places were observed to become vital, sophisticated and more effective in improving the health conditions of the child. The children could call those spaces their own and felt more comfortable whenever they were in such environment”¹⁰. This means that Architects should design the functional spaces to facilitate child care and quality of space.

For children to experience outdoor and indoor spaces in a health care facility as their own and forget about the painful medical procedures they go through, designers (architects) should consider these parameters whenever designing such spaces.

(i) Indoor space

The higher the quality of indoor space in a health centre, the more likely specialists are sensitive and friendly in their manner towards the sick children to encourage them in their critical conditions and also to make them feel they could easily recover soon.

What is more, the higher the quality, the higher the social living among the various peer groupings. Where spatial quality is low, parents are likely to be seriously or always involved in the procedures and specialists more likely to be neutral or insensitive in their manner to use larger amounts of restrictions and less guidance on their health conditions¹⁰.

A high quality indoor space needs to be clean, tidy, bright, colourful and spacious. Maximum day lighting and not much artificial lighting are of importance. Such an indoor

space makes the children feel happy, takes their minds off the trauma they go through in there and facilitates quick healing.

(ii) Outdoor space

Some other researchers also pointed out that designers should take the same approach to plan and prepare the outdoor space as they do for the indoor space¹¹. Planning for outdoor space includes the provision of play and well elaborated landscape areas.

(iii) Play space

Preparing materials and activities designed to promote specific types of play and avoid potential health risks, it is very important to provide a variety of play materials that are changed on a regular basis-outdoors as well as indoors-to create interest and greater participation by children¹¹.

According to them, Play grounds are very essential components in the healing and educational process of children. They contribute to rapid healing and children's development. Play provides the sick child with an outlet for the release of tensions due to the restrictions the hospital environment places on their behaviour. Needs and desires that cannot be satisfactorily met in other ways can often be met in play. Outdoor play, therapeutic play, developmentally appropriate activities and creative art therapies helps the child to cope with the healthcare experience¹².

2.4 THE IMPACT OF HOSPITALIZATION ON CHILDREN

Hospitalization is a disorganising experience that may create crisis for children. Sick children, who are hospitalized, are usually taken away, often unexpectedly and unwillingly from their home, family, school and friends; from a comforting familiarity and play, to a new place, filled with constant activity, medical procedures [which may be invasive and painful], nurses and physicians [which may not all be

empathic and pleasant], and-at times-separation from their parents. In addition to being invaded physically and emotionally, hospitalized children commonly witness their parents, who are their source of strength and safety, relinquishing their control to unknown strangers. It was observed that “children have special health-care needs as they are in a state of constant development, both physically and psychologically.”¹³ They are amongst the most vulnerable members of our society and hospitalization only increases their vulnerability. There is extensive evidence that the whole family may be adversely affected when a child is hospitalized, especially when it is for a lengthy period and/or for a serious or life threatening illness. The parents of sick children need not only face their child’s illness and its consequent ramifications, but also the child’s emotional reactions and loneliness, and their own reactions to the situation.

With this knowledge from the impact of hospitalisation on children, architects should be well informed to create spaces that would not be boring and uncomfortable for those children who may be on admission for a number of days. Bringing variety in their choices of finishes in both outdoor and indoor spaces is of much importance.

2.5 CURRENT TRENDS IN PAEDIATRIC HOSPITAL DESIGNS.

The building boom among children’s hospitals is evident and has no end in sight. The strides made in treating common and uncommon childhood diseases, the related technological advances, the attention to patient safety, patient satisfaction, and family-centered care all are playing a role in the pressure to upgrade, expand, or replace paediatric healthcare facilities. Every hospital wants to deliver the highest quality of care in the safest setting, and in an environment that supports the patients, the families,

clinicians, and caregivers who work, live, and heal in that facility. Some hospitals go further with these goals and aspire to be “the employer of choice,” “the safest hospital,” or “the most wired hospital.” Hospitals are no longer competing for patients alone, but also must remain focused on recruitment and retention of frontline staff, allied health professionals, and the hardest-to-recruit nursing and medical professionals. Traditionally, the most common questions that facility designers (planners, architects, interior designers) received from healthcare clients were focused on options for creating a more pleasing environment for the child as a patient and the families. Most of these questions related to the patient room, family and play spaces, grand entrances, and welcoming lobbies. Today, those questions remain, but more commonly, clients not only are asking for, but are demanding, information related to the safest and most comfortable patient room options, the most productive nursing support configurations, the best technology integration plans, the latest communication options, and evidence-based options for creating the optimal healing environment for their patients and the healthiest, most rejuvenating environment for their employees.

2.5.1 Separating Fads from Trends

Design teams today are bombarded with endless options related to configuration and aesthetics of patient rooms, nursing units, diagnostic and treatment areas, and public and outdoor spaces. The important thing is that you are able to decipher between what you need, what you want, and what you feel pressured to adopt. Not every design solution will be right for your hospital, your staff, or your patients.

The overarching trends in today's children's hospital replacement or renovation projects are:

- Flexibility
- Patient Safety with Technology integrations
- Optimal Healing Environment
- Security and Disaster Preparedness

(i) **Designing for flexibility**

The space within a hospital that has seen the greatest changes over the past decade is without question, the patient room. With patients staying days instead of weeks, nursing ratios forcing less face time between the caregiver and the patient, and most parents opting to remain beside the child 24 hours per day, the patient room is facing new demands. Increasing the flexibility of these rooms is of paramount importance, and for many hospitals is a key to maintaining occupancy rate goals and ensuring efficient patient throughput. Private rooms enable a more efficient and more comfortable arrangement through the creation of three distinct zones – the caregiver zone, the patient zone, and the family zone. Allowing for three distinct zones provides opportunities to focus on and enhance the experience for each zone's occupants by creating design elements that respond to the likely needs of each group.

The patient zone may provide views of nature, room temperature and lighting controls that the patient can control, and direct and real-time access to media choices. The bed should be located in close proximity to the bathroom (proven to reduce falls) and at an angle that provides privacy from the public corridor. The caregiver zone must have a hand washing sink, a small area on which to set something or write, access to the

workstation (if wired), and bedside supplies. The family zone usually includes sitting and sleeping spaces, internet access or laptop ports, and in some cases, a separate television in addition to the patient's television.

(ii) Designing for Patient's Safety with technology Integrations

A great deal of innovation has taken place in the patient room and hospital-wide related to the integration of technology for the purpose of reducing medical errors. A recent Hospitals & Health Networks / American Hospital Association survey of the 100 "most wired" hospitals in the United States showed that the overall patient mortality rate at "wired" hospitals is 7.2% lower than the rate at those hospitals that did not make the list¹⁵. Now, patients and visitors expect a wireless environment when they enter a hospital, where they can check their email, receive instant messages on their handheld devices, and post pictures of their just-born infants. It is therefore important to realize that every facility project, big or small, presents opportunities for technological integration and upgrades.

(iii) Healing environments

It was shown that healing environments are no longer found only at the finest spas and luxury or VIP hospital suites¹⁶. The relationship between the healing environment and patient outcomes, staff productivity, and everyone's satisfaction is very critical. Patient care environments should be operationally and aesthetically balanced, family-centered, and provide positive distractions such as water features, soothing music, pleasant smells, and access to art and to indoor and outdoor healing gardens. All of these are linked to shorter lengths of stay, elevated mood, higher patient satisfaction, and increased quality

of life for hospital patients. Natural light is also key to creating an optimal healing environment, as bringing natural light into a building has been shown to result in higher productivity, better overall health, lower absenteeism, and increased job satisfaction for hospital staff¹⁶.

(iv) Security and disaster preparedness

The level of disaster preparedness and mass-casualty readiness a hospital must achieve is very dependent upon the risks faced within the immediate hospital, surrounding community, and region as a whole. Children's hospitals in urban areas especially, must invest heavily in creating a culture of readiness and a response plan for any disaster, natural or otherwise, that they may encounter. The most important security to be provided in children hospital is the theft of babies and workplace violence rather than the likelihood of a terrorist attack directed at the buildings. Thus, most children's hospital's are electing to invest in basic mass casualty equipment (hazmat suits, decontamination areas, isolated showers) and develop sophisticated everyday security processes using a combination of staffing solutions, technological security enhancements, and educational outreach to patients, visitors, and staff regarding personal, hospital campus, and community safety.¹⁷

2.6 CONCLUSIONS OF THE LITERATURE REVIEW

From the above review of the information gathered, architects and designers need to be well informed and be clear about this new approach in the development of Paediatric care which includes the Introduction of family-centered care by way of providing well elaborated family areas, the Quality of both outdoor and indoor spaces by way of providing finishes in its varieties that best suit the children, the Provision of play areas to

help the children release stress from the painful medical procedures they go through, the Impact of hospitalization on the children due to poorly designed spaces, the flexibility in their designs and the therapeutic benefits of gardens in child health centres. All these are linked to shorter length of stay, elevated mood, higher patient, family and staff satisfaction, and increased quality of life for children as patients in a hospital.

KNUST



CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 STUDY DESIGN

The research was carried out in January and March 2007 as a cross sectional descriptive study that primarily accessed the knowledge, practice and perceptions of the caregivers, the parents and children within three (3) selected health facilities across the country.

There were two methods (Primary and Secondary) with which the data on knowledge and perceptions were collected. Focused discussions with the health specialists and key Informant Interviews were conducted to know more about paediatric care and the perception of the children in such a facility.

3.2 VARIABLES

The variables used in the survey included:

- i. Age and Sex
- ii. Years of Experience
- iii. Health Condition
- iv. Education levels

3.2.1 Indicators

The indicators used were grouped into the general knowledge, practice and perception of the child health specialists, the children themselves and the parents or guardian as follows:

a. Child Indicators

- Age
- Sex

- Health condition
- Type of family
- Comfortability and Conduciveness of spaces
- Expectations

b. Health specialist Indicators

- Years of experience
- Expectation of a child health centre
- Comfortability
- Conditions within space

c. Parents/ guardians Indicators

- Conditions of child
- Expectations of a child health centre
- Comfortability
- Variety of spaces

3.3 DATA COLLECTION TECHNIQUES AND INSTRUMENTS

The research was carried using two main techniques and instruments; namely, Primary and Secondary. The Primary included the use of interviews, measured drawings, photographic recordings and site analysis whilst the Secondary included the use of the search engines, books and CD Roms.

To enrich the interventions of this research and also to know the trends of Paediatric care in the other parts of the world, from the internet research, the case, Children Hospital of Philadelphia was as well studied.

For the recent interest in complementary and alternative therapies, which emphasizes healing the whole person - mind, body, and spirit - rather than simply alleviating symptoms, a special study of a Healing garden(with the focus on children) was also carried out. The standards for the creation, types and treatment of spaces in terms of colour, texture, anthropometrics and so on in a Paediatric centre was obtained from these examples from the different parts of the world and this formed the basis of determining the sort of spaces to be created for the intended design of this research.

3.3.1 Key Informant Interviews and Discussions

At the Children's Department of the Komfo Anokye Teaching Hospital and Korle Teaching Hospitals, child health specialists and some experts on Paediatric health who have been working there for over fifteen(15) years as well as some of children between the ages of seven and fifteen years in the hospital were interviewed to ascertain their response.

At the area of study (proposed location), the head of the children's department together with six of the staffs were interviewed. Some other people apart from the health workers, the likes of nursing mothers, other mothers and fathers (families) both outside and within the hospital and the children on admission were interviewed to obtain information on how their perceptions of hospitals are. The interview was done face to face with the people.

The interview guide included some of the following questions. (Results have been attached- appendix 1)

- a. How many years have you been working with this hospital?.....
- b. As a caregiver, what are your expectations in this Children's department of the hospital?
- c. What are the provisions made for the mothers, fathers and guardians (family) of these children in this hospital?.....
- d. Do you like visiting the hospital whenever you are sick?
- e. Are you scared when you are in a hospital?.....
- f. What makes you scared?.....
- g. Would you like to play when you are in the hospital?
- h. Which types of play?.....
- i. Do you like the colour of the paint on the walls?.....
- j. As a child, are you comfortable in this room?
- k. Is the place welcoming enough?.....
- l. Do you get bored being in this room all day?.....
- m. What do you want to see when you come to the hospital?.....
- n. Do you have a place to sleep or relax when your child is admitted in this hospital?.....
- o. As a mother or guardian, what are your expectations in this hospital?.....

3.3.2 Measured drawings

A measured drawing of the Children's department of the Bekwai government hospital, Komfo Anokye and Korle Bu Teaching hospitals were conducted to aid the analysis of the relationship between floor areas and the anthropometrics of a child. Measured drawings of the various fixtures, furniture, medical machinery, corridor spacing, door

types and different room heights depending on the use of the spaces were also conducted. This was a necessary basis for deriving a schedule of accommodation

3.3.3 Site analysis

A thorough site analysis and inventory was made to discover the strength and weakness of the site intended for the design through a detailed analysis. Two sites were considered in Bekwai of the Amansie East District of the Ashanti region, off the Kumasi-Cape Coast Road. These sites were analyzed on issues necessary for site selection of a health facility which included easy access and easy location to site, availability of land for future development, the absence of vigorous human activities on the site and the site being large enough to support such a facility.

3.3.4 Photographic Recordings

Photographs of critical and important facilities and activities that will aid the completion of this work at hand were taken during the case study and site analysis. At critical areas where photographs were not allowed, some information used came about through careful personal observations made by author.

3.3.5 Relevant Web sites and Search Engines on the Internet

Giving all credits to technology, access to information all over the world has become possible by the powerful tool, the Internet. Series of internet research formed major source of literature review. It was used to supplement and compliment the obtained information from the library and other literature source. This was the initial method used as a means of getting to know what Paediatric care was all about, the impact of hospitalization on children and the current trends in the design of paediatric centres. It

was a means of defining architecture which was so welcoming and comfortable for children in the healthcare (delivery) setting.

3.3.6 Books

Books (Magazines, journals, encyclopaedia and dictionaries) from the library were of great help in writing the literature review. Some of the useful information obtained from these books included some knowledge about child psychology, the general brief of designing outdoor landscape spaces for children, basic requirements for the selection of materials to finish both indoor and outdoor child- friendly spaces, requirements for circulation, door spacing and arrangement and positioning of beds in a hospital.

3.3.7 CD-ROMS and Electronic Source of Data

The latest version of the Microsoft Encarta Encyclopaedia, the 2007 updated version was also used which provided information particularly on the definition of Paediatrics and the therapeutic benefits of gardens in a health care setting.

3.4 SAMPLING

A sample size of about 200 calculated from $n = z^2 pq/d^2$ (Source: Biostatistics lecture notes 2004) was used for the three target groups in collecting the data. The sample size was calculated using 95% confidence interval ($z = 1.96$) and a margin of error 6.5% with a maximum proportion (p) of 0.5 (where $p = 1 - q$).

3.4.1 Study Population

The study targeted mainly children from day one (1) to age fifteen (15), parents of these children and the health specialists in and around the area of study. Parents included fathers, mothers and guardians. The health specialists included paediatricians, nurses, child psychologists and caregivers.

3.4.2 Sample Size

The total sample size was estimated statistically based on the resources available which was mainly time based with a level of precision that gives an accurate representative of the target group. A total of 180 persons made up of the children, parents and health specialists were interviewed. The sample size of each target group was predetermined on the basis of the percentage of the total estimated sample size.

3.4.3 Sampling Procedures

Convenience sampling coupled with voluntary participation was used in administering questionnaires to the children, health specialists and parents. Participants who were willing to answer the questionnaires were used.

However, in administering the questionnaire, participation was voluntary the selection of respondents captured the targeted age groups from day one (1) to age fifteen (15).

3.5 DATA COLLECTION

3.5.1 Permission to Proceed

Permission was sought from the three hospitals (Bekwai Government hospital, Korle Bu Teaching hospital and Komfo Anokye Teaching hospital) in administering questionnaires to the children, health specialists and parents.

The district director of health together with the matrons and other authorities of the hospital were consulted and their permission sought before administering the questionnaires voluntarily. Participation of the parents and children were voluntarily.

3.5.2 Pre-testing and review of instruments

The questionnaire developed for the study was pre-tested on the field for its relevance and information gathering capacity through focus group discussion with about twenty children and their parents outside the hospitals. This was conducted to examine the perception of the survey procedures and comprehension of the questions. Following the pretesting of the questionnaires no major reviews were made.

3.5.3 Actual data Collection

Surveys were conducted in the sampled hospitals and health centres. In all a total of three (3) hospitals were selected for the survey. The number of individuals interviewed was randomly picked.

A total of seven (7) Paediatricians, three (3) Child psychologists and ten (10) other health specialists including nurses and ward assistants were interviewed.

A total of 30 children between age two (2) to seven (7) as well as 35 others between age (7) to age ten (10) were interviewed.

Twenty (20) of the older children between age(10) and twelve(12) were also interviewed.

A total of fifty parents (including mothers, fathers and guardians) were as well interviewed.

Apart from the above, (25) nursing mothers were interviewed.

The type of data collected included knowledge from the child health specialists, the perception of the children and the involvement of parents and guardians.

3.6 ANALYSIS OF DATA

A detailed brief of child health care centres was drawn from the general brief obtained from the internet and case studies done. The measured drawings conducted were used as

a basis for spatial requirements of the various spaces. Sizes of furniture, various medical equipments, appropriate corridor and door spacing, arrangement of beds with other allowances for circulation were used to derive an accommodation schedule.

Data collected with the various interviews were also used to derive some practicable brief (which were not part of the general brief from the internet and case studies) that would ensure a conducive environment for the sick children and their families and the welfare of the health specialists (work-force) which would in turn ensure maximum efficiency on their part, in the healing process of the children.

Through the site analysis, it was found out that one of the sites was more appropriate for the health care design. Even though both would have been appropriate, one site would not have allowed for future expansion due to lack of space, which is very necessary for such a facility. This would have been most appropriate since is within the premises of the existing Bekwai General Hospital. Data collected from the case study of the Children Hospital of Philadelphia became a guiding principle to help in the creation of a family centre, outdoor and indoor play spaces of the design thesis.

3.7 LIMITATIONS

There were very few limitations to this study: the implication of power between the respondent and interviewer and restrictions of taking photographs.

The respondents may know what the interviewer is looking for and give the correct answer instead of what they actually know or believe.

The taking of Photographs in some critical areas within the hospital was not allowed. This limited the visual experience of such spaces as a basis to create similar spaces in the proposed design.

CHAPTER FOUR

4.0 RESULTS, FINDINGS AND DISCUSSIONS

4.1 CASE STUDY 1: CHILDREN’S DEPARTMENT OF KORLE-BU TEACHING HOSPITAL, GHANA.

4.1.1 Site Location

The 250-bed capacity child health department of the Korle-Bu Teaching Hospital, one of the largest patronized and best staffed children’s block in the government hospitals is located in the Accra, the capital town of Ghana. In the premises of the hospital, the department is precisely located next to the Accident and Emergency unit. The department is part of a large complex and thus not completely autonomous, but depends on a lot of central facilities that serve the whole hospital.



Figure 3. The Child Health Department, Korle Bu Teaching Hospital

4.1.2 Reasons for study

- It is the largest patronized and best staffed children’s block in the country’s government and teaching hospitals.
- Its spatial organization which is based on standard paediatric centre design is worth studying with the modern facilities, equipment and services used in the hospital is worth studying.

4.1.3 Composition

The Department is made up of the Treatment block, Ward Block, the Kitchen and Laundry.

(i) The treatment block (Ground floor)

This block contains the Out-patient and Emergency departments with a large waiting area which is undefined. This undefined space makes circulation very poor. The other spaces found, include the Record section, a pharmacy, laboratory, X-ray unit, offices, consulting rooms, resuscitation rooms and emergency ward unit.



Figure 4. The Out-patient department.

(ii) The Ward Block

The ward block is three- storey high connected by two main staircases and two elevators.



Figure 5. A view of the ward block

The first floor is the surgical floor with one half for burn cases and the other clean surgical cases. It has 12 beds, 18 cots and 6 treasure cots. The second floor is for medical

cases and it is divided into two. There are 12 beds and 26 cots. The third floor is also divided into two, half of it has 12 beds and 26 cots. The other half was initially designed as an isolation unit but it is used as a nursery for babies up to six weeks old. There are six (6) cubicles and each medical team has one (1), which holds six (6) treasure cots. Another cubicle of six (6) is for skin diseases and each team has its quota of cots, of the two remaining cubicles one is for tetanus and the other for gastro intestinal cases, each of which have to be isolated.

4.1.4 Structure and Building Form

A general column grid dimension of six-metre centres is used for this design. The structure is the post and beam system. The treatment block, kitchen and laundry are single storey whilst the ward block is three-storey high.

4.1.5 Building Orientation and Natural Ventilation

Both blocks are correctly oriented with the longer sides facing the North-South direction whilst the shorter side faces the East-West direction. The longer and wide, correctly placed operable windows allow natural cross ventilation.

This orientation restricts solar exposure of the interior spaces in terms of the sun path but maximizes the prevailing wind for natural ventilation.



Figure 6. The long wide louvered openings

4.1.6 Natural Lighting

The use of long wide louvered windows together with other specially designed openings in the walls allows the penetration of daylight.



Figure 7. Shows the deep penetration of daylight through the windows.

4.1.7 Circulation Systems

(i) Horizontal Circulation System

Lobbies, wide corridors and verandahs are the main horizontal circulation systems used. Main corridors for circulation in the wards are about 3m wide whilst the minor corridors are about 1.8m. The verandahs are about 3.5m wide whilst the lobbies are between 1.2 and 1.5m wide.



Figure 8. The wide corridors used in the wards.

(ii) Vertical Circulation System

Staircases and lifts are the two main types of vertical circulation systems used.



Figure 9. A view of the lifts.



Figure 10. The staircase

4.1.8 Paintings and Wall hangers

Several brightly coloured drawings, wall hangings and paintings on the walls make the spaces more child-friendly.



Figure 11. Shows some of the Wall paintings and Hangings

4.1.9 Services

Well designed service ducts carry service pipes through the various floors of the building.

Fire fighting mechanisms such as fire extinguishers are also used in the building.

4.1.10 Merits and Demerits

Merits

- a. Location at the point of pedestrian access is very good as children would not have to walk a long distance to get to it.

- b. Ventilation and lighting is natural (large and many openings). Building is energy efficient.
- c. In-patient activities have been separated from outpatient activities.
- d. The few paintings and drawings on walls suggest a child-friendly space.

Demerits

- a. Location of the block too close to the Accidents and Emergency unit of the hospital complex. The activities there could frighten or be traumatic to the children.
- b. Location of ward block is too close to the main road. Traffic noise and activities from outside disturbs the children.
- c. Lack of outdoor play and interactive areas for the kids
- d. Green areas (plants) not adequate for effective healing and rejuvenation

4.2 PAEDIATRIC DEPARTMENT- KOMFO ANOKYE TEACHING HOSPITAL

4.2.1 Site Location

The hospital is located in Kumasi, the capital town of the Ashanti region of Ghana, precisely on the hill overlooking Bantama Township, the site where the legendary fetish priest of Ashanti tradition, Komfo Anokye planted a sword which remains stuck in the soil till this day. It is bounded in its Eastern borders by the main Bantama-Kejetia dual carriage road, on the south and west by the Forth Battahim Infantry, Uadarra Barracks and Central Police Barrack respectively, while its northern borders is bounded by Bantama Township.



Figure 12. The exterior view of the KATH.

4.2.2 Composition

The hospital complex has 4 principal blocks which are known as A, B, C, and D with the exception of block C, all the other blocks have five wards. Close to the main entrance, is a polyclinic with the Accident and Emergency Centre. The Paediatric department, a 200-bed department, is made up of the emergency unit, which is in the first floor of block C, the In-patient unit in block B (third and fourth floors), the mother and baby unit in Block A and the Out-patient unit (consulting rooms), also in Block A, precisely on the first floor, the same level with the administration.

(i) Paediatric Emergency Unit

The paediatric emergency unit receives referral and emergency cases. It has emergency treatment areas and two wards.



Figure 13. Views from the Paediatric Emergency Unit, KATH

Spatial disposition: The floor area for each of the two wards in the paediatric emergency unit is 10,000mm x 8,000mm. The height to the ceiling for almost every ward is not less than 3metres.

Fenestration (doors and windows): The use of long and wide louvered windows allows maximum flow of air and good penetration of daylight. 1000mm x 500mm double swing wooden doors are used.

Lighting and Colour Schemes: Luminance levels by natural day light source are supplemented artificially by fluorescent tubes. Walls are in white and cream painting. Ceiling is in emulsion white colour

Floor finish: Floors are finished in tiles of 600mm by 600mm. Tiles are washable and dry faster after cleaning. There is no skirting around wall and floor edges.

(ii) The Wards

The department has two main floors in block B for the wards. The surgical ward (B3) is on the third floor, whilst the medical ward (B4) is on the fourth floor.



Figure 14. View of a typical ward.

Natural lighting and ventilation: There is maximum cross ventilation and daylight penetration through the long, wide, pivoted windows used, thus building (spaces)

conserve much energy. Other specially designed openings in corridor walls also allow some amount of natural ventilation and natural lighting.



Figure 15. Long pivoted windows, KATH

Partition: Specially designed polished wooden board with glass, about 1.8m high is used for partitioning the space according to the medical cases. These partitions facilitate easy supervision in the wards.



Figure 16. Shows the wooden partition with glass

Floor Finish: 400mm by 400mm semi-polished ceramic tiles are used as floor finish. The choice of finish is washable and easy to clean.

4.2.3 Merits and Demerits

Merits

- a. Building conserves much energy due to the use of the long, wide pivoted, and well positioned windows and openings in the walls.

- b. Semi-polished tiles for flooring makes cleaning very easy
- c. Transparent partitions facilitate easy supervision.

Demerits

- a. Identification of the various units in the department is difficult due to their entirely different and distant locations.
- b. Lack of playrooms and play areas in the department.
- c. Overcrowding in the wards.
- d. Spaces are not child-friendly. Very few wall hangings and paintings on walls
- e. No provision made for the family in the wards.

4.3 CHILDREN'S HOSPITAL OF PHILADELPHIA

4.3.1 Site Location

The children's hospital of Philadelphia, the top ranked paediatric hospital in the United States of America lives on a busy campus amid a cluster of healthcare buildings. The hospital is dedicated exclusively to the medical and surgical care of children and adolescents throughout the region and around the world.



Figure 17. The Children's Hospital of Philadelphia.

4.3.2 Composition-Spaces found

All the spaces found in the hospital are child friendly; these spaces include a welcome centre, an atrium, playroom, operating room, patient's room and family resource centre.

Welcome centre: This is the first point of call in the hospital. Families coming to the hospital get direction, pick wheel chairs or gain access to other spaces through the welcome centre.



Figure 18. The Welcome Centre, CHPH

Atrium: The colourful ,brightly lit atrium inside the main building is a vast waiting area filled with health-related, hands-on exhibits and interactive games materials.

Playroom: The Department of Child life, Education and Creative Arts Therapy helps children, teens and family members cope with the healthcare experience through therapeutic play, developmentally appropriate activities and creative arts therapies.



Figure 19. The Play room

Patient's room: The patient rooms are equipped with bathrooms, a bulletin board for cards or artworks, a roomy closet and color television. Other rooms have internet access for patients and families who want to stay connected to loved ones and friends.



Figure 20. A view of the patient's room

Family Resource Centre: The centre is a great place for families to take a quiet break between scheduled appointments or to visit during a child's hospitalization. It offers a kitchen, dryers, washers and telephone; a bulletin board where families can exchange ideas and get more information about the hospital.



Figure 21. Interior view of the Family centre

Learning area: This is a fun place for children to learn. Children learn a lot of things aside what they are taught in the classroom. They are giving books on a broad range of topics.

4.3.3 Merits and Demerits

Merits

- a. Every space in the hospital is child- friendly
- b. Much provision is made for the family
- c. Maximum play areas (both outdoor and indoor) are provided.

- d. Spaces area well lit and brightly-painted.

Demerits

- a. The exterior view of the hospital does not suggest a facility for children (not welcoming enough for children).

4.4 SPECIAL STUDIES

4.4.1 Therapeutic/Healing gardens

Throughout history gardens have been used to aid in the healing process - from the Japanese Zen Garden to the Monastic Cloister garden. However, with the advances in medical technology in the 20th century, the use of gardens as healing elements began to diminish. Fortunately with the recent interest in complementary and alternative therapies, which emphasizes healing the whole person - mind, body, and spirit - rather than simply alleviating symptoms, the interest in garden as healer has been revived.

Research has been done showing the therapeutic benefits of gardens. Roger Ulrich, a professor and director of the Center for Health Systems and Design at Texas A & M University, found that viewing natural scenes or elements fosters stress recovery by evoking positive feelings, reducing negative emotions, effectively holding attention / interest, and blocking or reducing stressful thoughts.

Based on research by Ulrich and others, it could be argued that any garden is a healing garden. However, for the purposes of this article, we refer to Eckerling's definition of a **healing garden**: "a garden in a healing setting designed to make people feel better" (Eckerling, 1996). The goal of a healing garden is to make people feel safe, less stressed, more comfortable and even invigorated.

4.4.2 Designing Healing Gardens

When designing healing gardens, the same considerations are used as in designing any other garden. However, these considerations take on special meaning in healing environment.

Functionality is imperative because the garden need to accommodate the limitations of the users of the space. It is also important that the garden design be maintainable both for physical safety and therapeutic benefits. At institutions such as hospitals, it is especially important that, the garden be easy to maintain because a poorly maintained garden could make patients lose confidence that they are being well taken care of by hospital staff. If the garden isn't environmentally sound, it could be detrimental to the users of the space, especially those who are physically unwell. Often times the funding for healing gardens is raised through donations and other contributions. Therefore is it important that the garden design be effective. Finally, healing gardens are meant to provide pleasant surroundings to produce restorative effects for its users. The garden will not be successful if it is not visually pleasing.

4.4.2.1 Children's Gardens

- Make all entrances welcoming and child-friendly. Provide differentiation of spaces for preadolescent and adolescent groups, if appropriate.
- Provide a comfortable social environment with plenty of places for parents and staff to sit and share the space with children.
- Provide as many options as possible for children to interact with nature through their senses and/or hands-on activities.
- Provide opportunities for planting and harvesting.

4.4.3 Play and Learning Areas

Play space is required and so is space for teaching, these are usually shared with other functions so that a home like setting escheated to aid the natural healing process. This becomes one of the concepts of this design thesis. This will evolve the creation of a friendly and a CHILD-FOCUSSED DESIGN.

The play areas will comprise indoor and outdoor areas.

(i) Indoor Play Spaces

The indoor play space will include large open floor spaces with indoor game facilities.

(ii) Outdoor Play Spaces

The outdoor spaces will include well landscape areas with play equipment. These play areas usually have at least one seat or bench suitable for adults.

(iii) Learning /Class Rooms

Classrooms are very necessary in paediatric unit to help children continue their formal education. An inclusion of such a space in the design, makes the hospital a more complete and friendly space for the children.

4.4.4 Children and Colour –Its Effects on them.

Colour schemes for children facilities include the predominant use of the three primary colours of red, blue and green. The careful selection of these colours can be used to paint the wards, the reception, and other areas where necessary. The selection can be made from combination of colours of the colour wheel or chart.

Red: It is known as a sociable and lively colour which best stimulates excitement in children. It could be used in children's play room with a combination of yellow, orange or purple. It should never be used in a baby's bedroom.

Green: This is the colour of concentration and intellect, calming in a neutral, positive sense and the most restful colour to the eye. It promotes feelings of well-being and harmony, nature, security, stability and balance. It is best used for children's learning areas (libraries and classrooms).

Blue: Correct shade of blue is best used for welcoming area of hospitals. It slows the pulse rate, lower body temperature, relieve headaches, migraines and muscle cramps. Due to its soothing and calming nature, it could be used for a child's bedroom and bathroom.

Yellow: This colour heightens energy levels, creativity and stimulates the intellect. It cancels out feelings of heaviness or oppression and brings feelings of warmth and joy. It is one of the most appropriate colours for a child's play area because of its friendly and inviting nature. It promotes socialization among children. It should not be used for bedrooms as it is not a very restful colour.

4.4.5 Other parameters to consider in a child's space

4.4.5.1 Anthropometrics/Scale: Equipment and facilities used in any of the spaces should fit the child's anthropometrics, the likes of furniture, play materials, beds, cabinets and bathroom equipment.

4.4.5.2 Textures: Quite a different approach to interior design and furnishing is needed for children facilities. The setting should promote a "kindergarten environment", however not at the expense of medical efficiency.

4.4.5.3 Finishes: Walls could be finished in claddings of soft materials like chip board finished in bright colours of careful combination of primary colours. Floors could be carpeted and not too slippery.

4.4.5.4 Edge Treatment: Sharp and rough edges usually are to be rounded to reduce injuries for example in the play areas, and classroom.

4.5 TECHNICAL STUDIES

4.5.1 Design of Doors and Corridors spacing in a Hospital

Doors

Doors must meet the same standard of noise insulation as walls surrounding them.

Hygienic Requirements should always be considered when designing doors in hospitals.

The surface coating must withstand the long term action of cleaning agents and disinfectants, and they must be designed to prevent the transmission of sound, odours and draughts.

Corridor

In the hospitals, for the maximum expected circulation flow, corridors must be well designed. Access corridors generally, must be at least 1.5m wide. Corridors in which patients will be transported on trolleys should have a minimum effective width of about 2.25m and a maximum 3.0m and above.

If suspended ceilings are provided, they may be installed about 2.4m high above the ground.

4.5.2 Lifts and Staircase

Lifts transport people, medicine, laundry, meals and beds between floors and for hygiene and aesthetics reasons, separate lifts must be provided for some of these. In buildings in which care, examination or treatment areas are accommodated on upper floors, at least two lifts suitable for transporting beds must be provided. The elevator cars of these lifts must be of a size that allows adequate room for a bed and two accompanying people; the

internal surface must be smooth, washable and easy to disinfect. The lift shaft must be fire-resistant.

Clear dimension of lift car: 0.9 x 1.20 m

Clear dimension of shaft: 1.25 x 1.50 m

Stairs: For safety reasons, stairs must be designed in such a way that, if necessary, they can accommodate all of the vertical circulation. The relevant national safety and building regulations will, of course apply. Stairs must have handrails on both sides without projecting tips. The effective width of the stairs and landings must be a minimum of 1.5m and should not exceed 2.5m. it is better to have a rise/tread ratio of 150:300mm.¹³

4.5.3 Arrangement of the bed spaces

The beds may be placed in an open, closed or combined arrangement. With an open arrangement a large floor area is required. All the beds must be in clear view of a central nurse's duty station and the patients are separated by moveable half-height partitions which should be lightweight and easy to move. With closed arrangement, the patients are accommodated in separate rooms which again must be in sight of a central nurse's workstation. Hygienically and psychologically, the closed arrangement is preferable because the patients are extremely vulnerable.



Figure 22. Shows different arrangement of beds.

4.6 CONCLUSIONS OF CASE, SPECIAL AND TECHNICAL STUDIES

- A paediatric centre should have spaces which follow the normal hospital flow pattern (the functional relationship diagram of a hospital design) and at the same time, should be child friendly to give the child what sickness has denied him or her from.
- Provision of outdoor and indoor play areas, help the child to release tension due to the restriction the hospital spaces place on his or her behavior and also help the child to interact with his or her peers, through which his imagination is nurtured.
- The need for observation or supervision is greater in a paediatric centre than privacy. Thus the use of transparent partitions or glass partitioning is very necessary to facilitate easy supervision.
- Provision of family areas within a paediatric centre promotes good interaction between the child and his family.
- Creation of gardens for visual interest speeds up the healing process.
- Paintings, wall hangers and brightly coloured walls in the spaces make the child comfortable and feel at home.

The case studies were primarily done to know the spaces needed in a paediatric centre. It was also carried out to understand the basic operation of a paediatric centre and the future demands of its users.

The spaces considered include:

The Out-patient Department and its treatment areas

The In-patient department

The operating theatre.

The relationship and positioning of the ancillary facilities like the play areas, family centre and kitchen.

Among these observations was that;

The activities of the out-patient department were different from that of the In-patient department.

There was lack of outdoor play areas.

Very few paintings and hangings on walls.

4.7 DEVELOPED BRIEF AND ACCOMMODATION SCHEDULE

Table 2(Appendix 1) shows the developed brief and accommodation Schedule.

4.8 THE PROPOSED SITE

4.8.1 Site Selection and Location

There were two main options to choose from. Both sites are located in Bekwai in the Amansie East District of the Ashanti Region, off the Kumasi-Cape Coast Road.

The first site is located within the existing Bekwai Government Hospital which is in the heart of the town, precisely next to the Post Office and Ghana Telecom buildings and the other is next to the proposed site for the New Bekwai Government Hospital. It is located along the Bekwai-Kokofu road, approximately about 450metres away from the Methodist School junction and close to the District Headquarters.

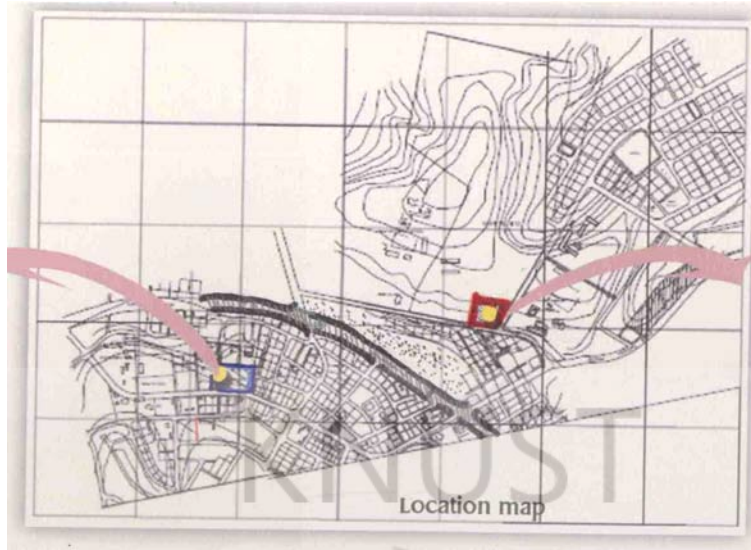


Figure 23. Site plan showing the two locations

Upon a lot of considerations, the second option would be appropriate to site such a facility due to its availability, location these merits listed below:

Merits

- Site will allow for future expansion.
- It is located in the outskirts (serene zone) of Bekwai.
- Site could be easily accessible by the surrounding and adjoining towns.
- It is next to a proposed site for a new general hospital.
- There is easy location and accessibility to the site.

4.8.2 Detailed Analysis of the Site

POTENTIALS

- There is easy accessibility to the site.
- There is the availability of land for future development.
- Large enough to support such a facility.

- The topography is good for drainage.
- There is the absence of vigorous human activities.
- The site has good soil for landscaping (garden designs)
- The site is easy to locate.

DISADVANTAGES

- There is the absence of well laid out service lines.
- The road around the site is untarred.
- The Wesley High street is currently a footpath.
- The site lacks good lighting.

ADVANTAGES

- Soil supports good landscaping.
- The virginity of the site supports innovativeness in design.
- Take advantage of gentle slope to discharge sewage, etc.
- Trees on site could be preserved and used as part of the landscaping.

THREATS

- Noise from the hospital and Wesley high street junction could be a threat.
- Current haphazard development of correctly zoned areas around site.

The site was principally chosen because its strengths, potentials and opportunities far outweigh its threats and weaknesses.

In addition, the threats can be solved and used as an advantage for the site.

4.8.3 Site Conditions / Analysis

An appropriate design responds positively both to its site and climate. The designer therefore has to get an intimate knowledge of both the site and the climate prevalent in

the area for which he is designing. The correct selection of the site for the project or design is paramount and crucial to the optimum performance of any facility. In my case, since the facility is a health facility and one that has a healing dimension, a quiet and remote site void of all the hustles and bustles of the everyday noisy environment was selected.

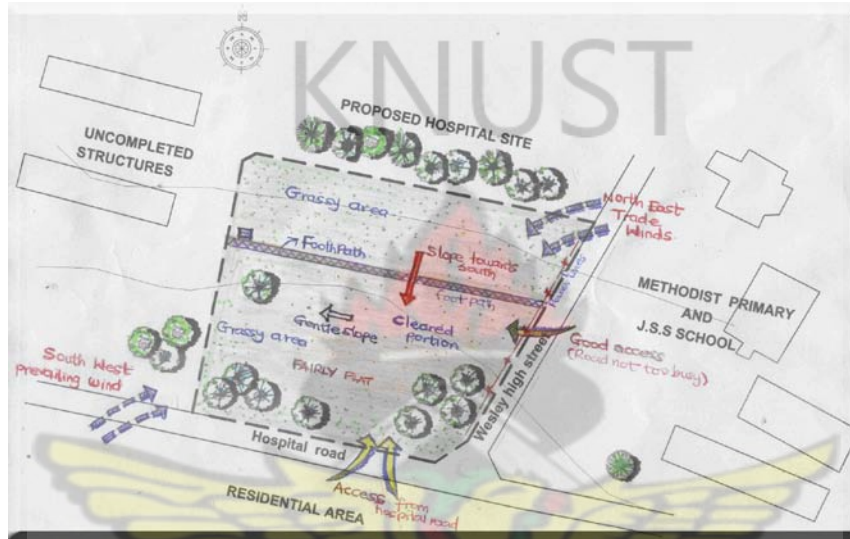


Figure 24. Shows the analysis of the site.

The site is located within the proposed area designated for the construction of the New Bekwai hospital which is close to the Amansie East District headquarters.

The analysis of the site includes documentation and evaluation of the following data:

4.8.3.1 Site Features

The general condition of the site is excellent and good enough to hold up such a project, together with its landscape and vegetation characteristics, topography and slope, soil condition and land type.



Figure 25. Shows the burnt and cleared portion of the site.

The site is fully covered with grass and weeds. Some part of the site has been weeded and burnt. There also lots of different trees on the site.



Figure 26. The different trees on site



Figure 27. Site covered with grass

4.8.3.2 Climate

The climate of the site is the semi-equatorial type. Average temperature is about 32 degrees Celsius and precipitation is moderately high due to the peripheral nature of the site which is covered by trees and greenery. The South Western wind which happens to be the prevalent wind direction blows through the corner of the site which makes it very strategic to place an entrance. The sun path is over the site from the east to the west for the sunrise and sunset respectively. The sunlight over the site is excellent and enough to take advantage of for such a health institution which needs enough natural day lighting and ventilation.

4.8.3.3 Topography

The land slopes towards the south with a difference in height of about two metres, and it is fairly gentle toward the west.

4.8.3.4 Geology

The dominant soil is laterite which is compact enough to support such a facility.

4.8.3.5 Vegetation

The land is very fertile and almost covered with grass. There are a lot of different trees on the site.

4.8.3.6 Other Features

Views, accesses, utilities and services, noise source and direction were also analyzed to ascertain the correct area to position the facility on the site.

4.9 THE DESIGN

4.9.1 Design Philosophy and Concept

The philosophy used for the design, is “MORE THAN CURE BUT CARE”.....

This evolved from the objective which is to create a personal, user friendly and holistic environment for the child as a patient. Care is the cause of showing concern through maximum attention and the provision of things that will make an individual happy.

“A child’s happiness is achieved primarily through play, exploration and interaction with people (peers and family) without being impeded” according to Elizabeth B. Hurlock (1969), a child psychologist.

From the case studies and research done, it was found out that “Play” is the primary vehicle that propels a child on in life, from the early stages of development.

Through play and interaction, the child releases tension due to the restrictions an environment places on his life, his imagination is nurtured and his social and motor skills are developed.

Other ways and means through which care (happiness) of the child could be achieved, is through the maximum attention given to him or her by the health workers, the provision of multi-sensory space (a space in which the child is not restricted and reacts to by using all his five senses such as touch, sight, feel and so on) and the interaction with the family.

THE CONCEPTS

- Using courtyards to create spaces for interaction (play) and also gardens for visual interest and impressions.
- Provision of family areas very close to the wards to facilitate the interaction between patient's and families.
- The use of transparent partitions (glass and carefully designed openings of basic shapes in walls) to facilitate easy supervision from the health workers.
- The use of paintings, drawings and hangings on the walls to suggest a child's owned space.

Thus the planning of the design evolved, based on this philosophy and concept. A big play court is planned to be in the centre (core) of the design, which is easily accessible by all the children from the various units. This court serves as the main court of interaction by both out-patients and in-patients.

4.9.2 Conceptual Site Planning

4.9.2.1 Option 1

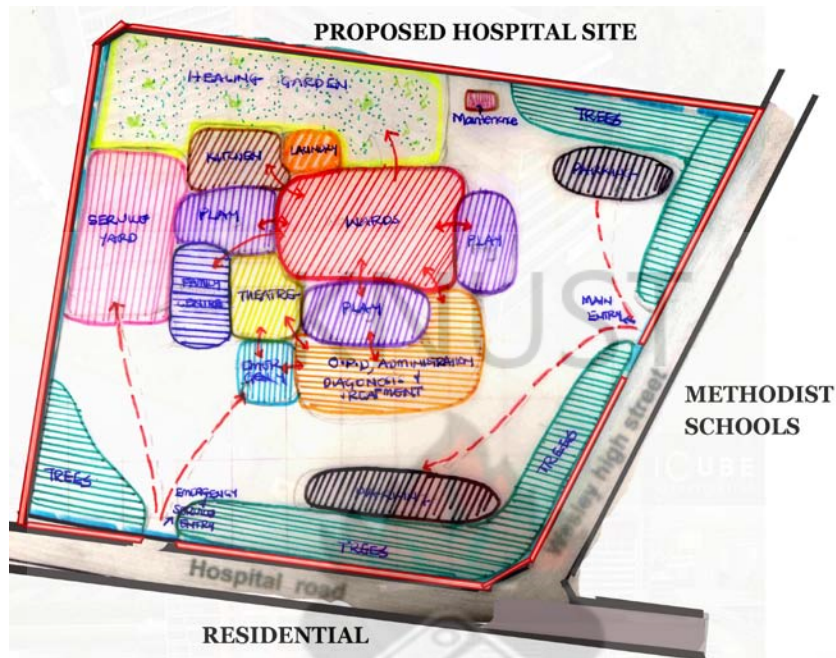


Figure 28. Option 1

The observations made are as follows

Merits:

- There is good and direct access to emergency.
- There is good location of wards.
- There are more play court created.

Demerits:

- The Philosophy could not be achieved with this option.
- There are pockets of play courts, thus Interactions are not centralized.
- The Theatre and Emergency units are far away.

4.9.2.2 Option 2 - Alternative A

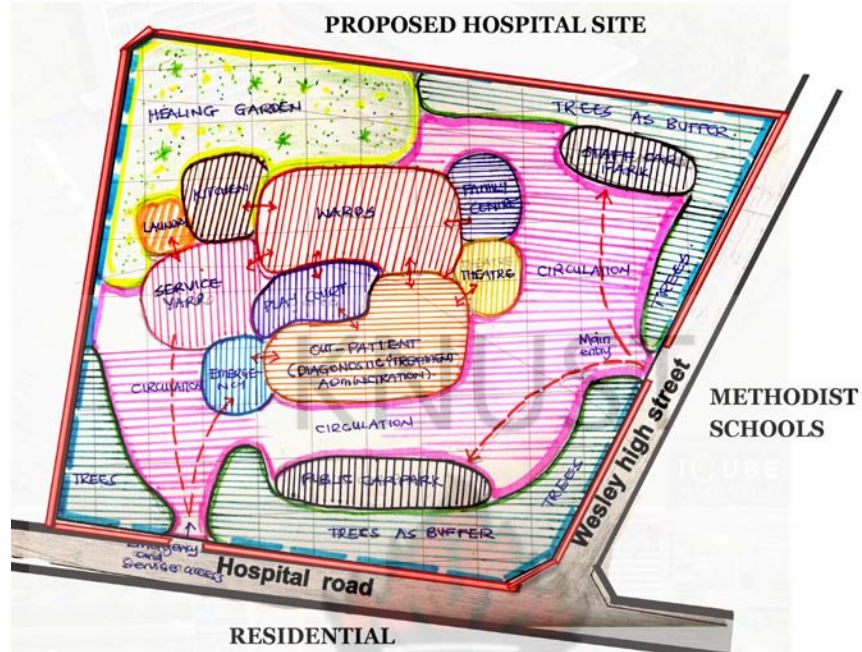


Figure 29. Option 2- Alternative A

Merits:

- There is a good relationship between wards and family centre.
- The service yard is easily accessible
- The centralized play court has been achieved.

Demerits:

- The location of ambulance and service entry are bad.
- The theatre is too close to the main entrance.
- The theatre and Emergency units do not relate.

4.9.2.3 Option 2 - Alternative B (Selected option)

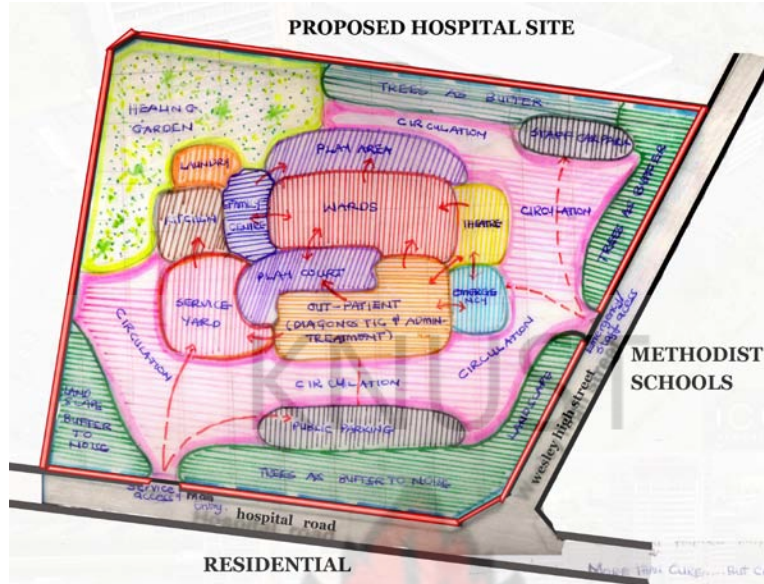


Figure 30. Option 2 Alternative B.

This option was selected because, it blends the two options above and it resolves most of the basic problems and issues of designing such a health facility. The main merits for this option are as follows:

- Good functional relationship between units
- Good link between family centre and wards.
- Centralized play court achieved.
- Good link between theatre and emergency
- Good location of service areas.
- Direct access to emergency.

4.9.3 General Description -What The Actual Design Entails?

The design tries to portray as much as possible, a hospital environment as the patient feels comfortable and focused. Children's preference of a place is dependent on their personal needs on one hand, and the properties of the place associated with these needs

on the other. They experience an environment in a deep and direct manner, not as a background for events, but rather as a factor and stimulator.

Thus an environment (being it outdoor or indoor), can affect the child either positively or negatively. Therefore, when designing spaces for children, designers have to be careful about where and how they place what, in their design in order to communicate so positively to the children.

4.9.3.1 Coverage on site - Block plan

The facility sits on about 40% of the site with the remaining used for landscape. The soft landscaped part of the site provides the play ground for interaction (interactive court), the healing garden and the other courts for visual impressions to give the children what sickness has denied them off. The size of site used for the facility is 125m x 140m.



Figure 31. The Block Plan

4.9.3.2 Orientation

The facility being a health institution which is in use almost the twenty four hours of the day due to its peculiar way of running its medical, surgical and emergency cases has been aligned and orientated to minimise the solar ingress and maximise views and allow the best of prevalent wind to create the desired comfort levels indoors.

4.9.3.2 Ventilation

Adequate ventilation has been provided by the usage of large openable windows. The velocity of air flow and its directions which determine the cooling effect of natural ventilation has been exploited very well by the structure and form employed.

4.9.3.3 The Design of the spaces (Outdoor and Indoor)

Being a paediatrics center though a health facility, the environment possesses such a character that is welcoming and comfortable with lots of aesthetics that will stimulate all the five senses of the child to give him or her, what sickness has deprived him or her from. As psychologists have proven, hospitals that encourage a lot of aesthetics and material pleasure aid child's recovery rate.



Figure 32. The soothing and aesthetically pleasing outdoor environment of the Proposed Bekwai Paediatric centre.

Based on the functional relationship diagram of a hospital design, the philosophy and concept, the design process involved the arrangement and positioning of the desired spaces within an envelope in close proximity or remote from other related and unrelated spaces. As part of the design concepts applied, consideration was also given to the circulation, accesses and general views to and from the site (both wanted and unwanted).

At the frontage of the facility, precisely at the main entrance is a fountain. This water feature at the frontage would psychologically work on the mind sets of the users. Stone finished walkways at different levels help users to move round the fountain. On the right side of the entrance is a well landscape area with a gift shop. In front of the gift shop are shady trees under which concrete seats have been placed for users to relax and enjoy outside breeze.

Inside the Out-patient Department (OPD), precisely close to the main waiting area and along the circulation spine towards the wards and other units are two courts for visual impressions.



Figure 33. Shows the court within the proposed OPD for visual impression.

On the left is a rockery garden and on the right is a garden with varieties of flowers, shrubs and sculpture pieces. As the children react to these spaces with their sight, their

psychological and emotional needs are taken care of. Creation of the gardens within takes nature into the building.

The play court(the court of interaction), which is the biggest court sits in the core of the design, as the design concept was to centralize the play court .This court pulls all the children from the different units in the facility together. Maximum care is shown to the children by allowing them to play and interact with each other without any restrictions.



Figure 34. The Proposed Play court

Just behind the wards, close to the mother's hostel is the garden for meditation and relaxation (healing garden).The location of this garden close to the wards and family centre is to help the resident users (mothers, patients and staff) release stress and tensions from the hospital setting and also to feel safe. Its provision is also to bring variety in the use of gardens in a health facility.



Figure 35.The Proposed Healing Garden behind the Wards and Mothers Hostel

A family centre is also planned so close to the wards to facilitate interaction and supervision between the children and the family.

The happiness of children is achieved as they interact with their peers and families. A happy child is 90% healed.



Figure 36. The interior view of the family lounge. Figure.37 The mother's room

4.9.3.5 Plans, Elevations, Roof Plans and Sections (Architectural Drawings)

These have been graphically shown and well-explained in the Appendix 2.

The elevations show a simple interplay of parapets and planar bands which run parallel to the ground (earth) were used. To suggest a child friendly facility, recesses and colors (both primary and warm ones), wall openings of the three basic shapes (triangle, circle and square) were much used. The use of low pitched roofs to suggest a homey face, especially for the wards was also employed.

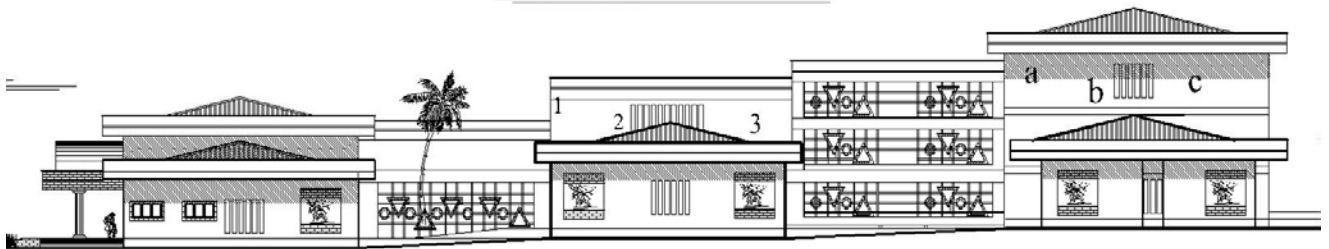


Figure 38. One of the façades showing the interplay of parapets and planar bands

4.9.4 Structure and Form

The size of site could not support the needed space to be provided all on the ground floor and therefore other levels are introduced. Due to this and together with the nature and safety of children, the whole design of the structure is not more than two floors. The Out-patient unit (which is the first block), together with the emergency, theatre and the ancillary facilities (kitchen, gift shop and family centre) is just on the natural ground level with the exception of the welcoming zone in the OPD which is double volume. This was intentionally done to create a change in the feel of the space since that particular space would accommodate more than seventy people at a time.



Fig.39 Interior view of the double-volume welcoming zone

The inpatient unit and its circulation systems (lifts and staircases) are two floors high.

The structural system employed here is the load bearing post and beam system. The amount of sun ingress received by the surface of the structure has been minimized by the thoughtful manipulation of these:

- Shape and orientation of the building plan with respect to the sun and its path
- The height of the building exposed to the sun
- Shape and pitch of the roof.

- Due to the intense solar condition, majority of the spaces, have been oriented to face the north and south to reduce the heat build-up and unwanted sun ingress. The western and eastern facades have been intentionally and carefully planned and used for the non-habitable spaces such as the sanitary, storage and vertical circulation (staircase) spaces.



Figure 40. Three-dimensional view of the proposed Bekwai Paediatric facility

4.9.5 Materials (Wall, Ceiling, Cabinetry and floor finishes)

In hospital designs and construction, interior finishes and treatment are among the important considerations. This is because both interior and exterior, add to the whole environment.

4.9.5.1 Walls (Interior and Exterior)

Exterior: Most of the exterior walls are finished in soothing coloured- paints such as the white emulsion paint. This is to welcome the sick child and psychologically ease him or her from pain. As a measure to generally make the space and environment lively, some of the walls have been rendered with brick and fur-faced finishes.

Interior: The choice of finish for interior walls was dependent on the location and use of the space. Most of the interior walls especially those in the Out-patient Department have been rendered as information walls. This will help stimulate and sensitize users especially mothers about some of the health issues pertaining to the child.

Brightly coloured paintings and wall hangings have also been placed on the walls to make the spaces, more children friendly.



Figure 41. Brightly coloured Indoor play room.



Figure 42. Brightly coloured wards

Interior walls in the play court are finished in semi-polished tiles. This is to make such walls cleanable and easy to maintain.

Internal walls of the theatre, resuscitation and treatment rooms, and the lavatory are finished in white and blue ceramic tiles. The wards are finished in colorful wall paintings, drawings and wall papers.

Walls of the X-ray room are finished in lead plaster finish with two layers of emulsion paint over a layer base coat.

4.9.5.2 Floors

The most critical choice of finishes in a health facility is the choice of floor finish. They are subject to constant abuse and maintenance due to the sort of activities required in the spaces for instance spillages of all sorts, the likes of flems, vomits, blood and chemicals.

Most of the floors are finished in semi-polished ceramic tiles because of its durability (easy to clean and maintain).



Figure 43. The Semi- polished Ceramic tiles flooring for most of the spaces

Spaces that are in constant use such as the foyer and the lobbies as well as walkways, have been treated with terrazzo which is resistant to wear and tear. The children indoor play area will be finished in wood parquet (decorative wooden flooring) whilst the outdoor play court will be finished partly in grass and well treated and compact sawdust.

4.9.5.3 Ceiling

Brightly coloured ceilings in a hospital also add to the luminance of the spaces. Mineral fibre tiles used for the spaces are available in a large variety of styles to suit any decor and perform well in both stopping sound transmission and being sound absorbent. Their biggest disadvantages are moisture absorption and brittleness.



Figure 44. Shows the Brightly coloured Mineral Fibred ceiling

4.9.5.4 Cabinetry

Worktops in the laboratories are also finished with vitreous tiles.

Guidelines:

Plastic laminate or wood (good quality) pre-manufactured with wide selection of styles.

Plastic laminate (better) pre-manufactured with exceptional accessories.

4.9.5.5 Odour

The best way to reduce odours is to keep the sanitarities clean. Adobe walls, which reduce smell, could be used for sanitary areas. Use a high-pressure sprayer with a disinfectant to wash away waste and bacteria that cause odours, and use a floor-drain system.

4.9.6 Acoustics

Noise control is very essential in any health facility because while some patients are in pain and making so much noise, others would then be sleeping or relaxing. Acoustic tiles have been recommended for use in the hospital where necessary.

Keep noise from bouncing off walls by installing products with high noise-reduction coefficient ratings. These include Mylar -faced acoustic ceiling tiles, Mylar-faced sound baffles, and sound-absorbing, fabric-wrapped wall panels.

4.9.7 Services

Services provided for the facility include water supply, electricity, lighting, ventilation, security controls, telecommunication facilities, gas supply, refuse disposal, storm water drainage, waste soil drainage and fire fighting. See Appendix 4 for the Service drawings.

4.9.7.1 Water supply

Water to the facility would be from the mains along the hospital road. Hot water would be provided.

4.9.7.2 Electricity

Power will be tapped from the mains along the hospital road and stepped down by a 500KW transformer before being sent to a switchboard and then distributed to the panel boards. A standby generator set with automatic switches will be provided and would be part of the distribution cable which will be loaded.

4.9.7.3 Lighting and Ventilation

As much as possible natural lighting have been used and complemented by artificial lighting where necessary. A lot of large openings have been designed to improve on the admittance of light from the natural source. Because of the size of the buildings voids and pockets of openings have been made part of the design to help with the situation of lighting. Also the courtyards are designed to provide natural lighting and ventilation. The central courtyard provides adequate natural lighting within the various facilities.

4.9.7.4 Air Conditioning

Due to the peculiar nature of the hospital and its facilities, like the theatre, artificial ventilation is utilized. It is also needed in certain areas of the hospital for the proper and efficient functioning or performance of the activities. Among the spaces to be air conditioned are the theatres, corridors, X-ray, Laboratory and the administrative areas. These spaces will be served by the split air condition system.

4.9.7.5 Telecommunication

Hospital guides use radio phones to communicate. Spaces such as the pharmacy area and theatres all have restricted codes of access.

Telephone: The private branch exchange (PBX) telephone system is been used to facilitate communication at the centre. The PBX actually handles the processing of all calls within it. It also has all the built in features such as, Forwarding, Conferencing, Call Pick up Groups, Intercoms, and Transferring just to name a few.

4.9.7.6 Fire Fighting Mechanisms and Control

Emergency exits have been provided for escape routes. Fire alarm call points and firefighting equipment have also been used.

Fire detection: The fire alarm system shall be an automatic 1-24 zone single loop addressable fire detection and alarm system, utilizing conventional detection and alarm sounders. Detection shall be by means of optical and heat detectors located throughout the hospital building with break glass units on the corridors.

Fire Fighting Installation: Fire fighting is to be effected by the use portable fire extinguishers located at fire-prone areas. Automatic fire suppression system shall be proposed for the labs. The suppression agent shall be safe, effective and environmentally friendly.

Fire Hydrants: This shall be of the sluice valve type to BS 750 comprising a cast iron key operated sluice valve complete with a socket adapter, a duck foot bend and an outlet adaptor or approved equal. The adaptor shall have a standard Belfast Pattern Outlet with the female thread protected by a brass cap and chain. The hydrant fitting shall be tee off from the mains. Each hydrant shall be provided with a heavy duty cast iron hinged

hydrant box to BS 750 with the words fire hydrant cast on the cover. The top of the hydrant box shall be painted red.

A 300 by 200 indicator plate of aluminum construction shall be provided with an inscription of “fire hydrant”. The plate shall be supported at 600mm high above ground level by channel steel support. Both plate and support shall be painted in red colour and installed about 1,000m from the hydrant.

4.9.7.7 Security

To ensure safety and security in and around the hospital premises day and night, security type of lighting have been provided at some vantage points. Lights are not arranged at regular intervals. This is because patients been wheeled under lights arranged at regular intervals experience the stroboscopic effect which causes dizziness and nauseous effect.

4.9.7.8 Waste Management and Disposal

Drainage: For the purposes of drainage, the natural terrain was taken advantage of. The open system of drainage requiring covered drains will carry all surface water to the lowest section of the south slope where it joins the water in the storm drain.

Waste Disposal: Dry waste generally non-contaminated and wet food remnants can be disposed of in public landfills.

Human excrement is washed down water closets, urinals and flushing sinks. Sewerage from various facilities takes their outlets at manholes provided at maximum at 9metres apart and at every change in direction. From the manholes the sewerage and waste water will be channeled into water tight septic tanks. Surgical waste which includes bodily organs will be disposed off in the hospital incinerator.

Waste management: Solid waste would be treated in an incinerator on site, at an area quite further away from the active part of the hospital. Refuse and litterbins would be placed at vantage points to suit the landscape furniture introduced and suitable for the children.

Storm management: Storm water on the roofs would be directed to the underground tanks through drain pipes attached to columns. Surface runoff water would be directed to the tanks through surface drains to be used later to water the lawns and flower gardens.

4.9.8 Landscaping

Extensive landscapes such as greenery, rockeries, fountains, sculpture pieces, and pavers have been used. This is due to the fact that a serene and environmentally interactive space is needed in such a facility to promote and enhance holistic healing. At the frontage of the facility, precisely at the main entrance is a welcoming fountain. This water feature at the frontage would psychologically work on the mind sets of the children. Stone finished walkways at different levels help users to move round the fountain.

On the right side of the entrance is a well landscaped area with a gift shop. In front of the gift shop are shady trees under which concrete seats have been placed for users to relax and enjoy outside breeze.



Figure 45. Perspective views of the well elaborated landscape areas of the facility

Inside the Out-patient Departments, precisely close to the main waiting area and along the circulation spine to the wards and other units are two courts for visual impressions. On the left is a rockery garden and on the right is a garden with varieties of flowers, shrubs and sculpture pieces. As the children react to these spaces with their sight, their psychological and emotional needs are taken care of. Creation of the gardens within takes nature into the building.

The play court (the court of interaction), which is the biggest court sits in the core of the design, as the design concept, was to centralize the play court to facilitate interaction. This court pulls all the children from the different units in the facility together. Maximum care is shown to the children by allowing them to play and interact with each other without any restrictions.



Figure 46. Paspolon grass and shady trees in the play court.

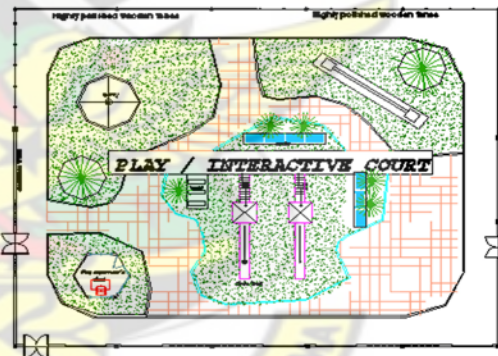


Figure 47. The Plan .

Shady trees have been provided in the court, under which story telling could be done. This brings the traditional type of play into the facility (part of culture).Paspolon grass and well treated sea sand are the two main floor finishes used. This choice of floor finish is to prevent the children from hurting themselves when they fall whiles playing. As part of care through supervision, a play coordinator's shed have been strategically positioned in the court.

Just behind the wards, close to the mother's hostel is the garden for meditation and relaxation (healing garden). The location of this garden close to the wards and family centre) is to help the resident users (mothers, patients and staff) release stress and tensions from the hospital setting and also to feel safe. Its provision is also to bring variety in the use of gardens in a health facility.



Figure 48. The Healing garden showing the use of varieties of trees, plants and shrubs. Greeneries in terms of grass, shrubbery and trees have been used extensively in the design to:

- Direct circulation
- Create and block views
- Create privacy, serenity and quiet zones
- Modify climate and
- Generally add to the aesthetic appeal of the facility.

Plants that will be used include the following:

Ficus benamina (yellow and green leaves) ornamental and screen

Eucharua (all green tree) ornamental and wind break

Yellow duranta (yellow and green leaves) defining walkways and for aesthetics

Royal palm

ornamental

Plants for visual impact

-Flowers: camellia, magnolia, orchid, peony, forsythia

-Leaves: weeping willow, maple, palm, privet

-Seeds: clematis tangutica, physalis, everlasting pea, eryngium.

The lawns will be planted and covered with paspolon grass; carpet grass and some artificial grass where needed. See Appendix 3 for the Landscape plan

4.9.9 Phasing, Costing and Environment Impact Assessment

4.9.9.1 Phasing

The brief of the design shows that, the project when is undertaken, will require extensive planning and financial management, thus the construction will be put into three phases as follows:

Phase 1: The first phase will comprise the O.P.D, and the Emergency unit to be constructed. Work on the vehicular access, car park and fencing would be done.

Phase 2: During this phase the Theatre would be put up as well as Landscaping and Pedestrian walkways.

Phase 3: The final phase would comprise the construction of the Wards, the Kitchen, Healing garden and Family centre. Appendix 3 shows the Phasing plan

4.9.9.2 Costing

For the sake of affordability and architectural expediency, the whole project has been broken down into four main stages.

The brief of design shows that the project when is undertaken will require extensive planning and financial management, thus the construction will be put into three phases as

follows: The first phase will comprise the O.P.D and the emergency unit to be constructed. Work on the vehicular access, car park and fencing would be done. During this phase the theatre would be put up as well as landscaping and pedestrian walkways.

The final phase would comprise the construction of the wards, the kitchen and family centre and the healing garden.

All the phases put together shall cost a total sum of 150,000 Ghana cedis. This is based upon the cost per unit area calculation of 250-350 Ghana cedis per unit area.

4.9.9.3 Environment Impact Assessment

The impact of the hospital has both positive and negative on the immediate environment and as such measures should be taken to address any imminent situation. Environmental impact assessment is an activity that is designed to identify and predict the impact on the physical environment and on the human's life .A brief summary of such an impact by the design and planning can be outlined as follows:

Impact on Air Quality

Air pollution would be caused by dust during the construction stage through site clearance, excavation works, delivery and use of cement and aggregates.

Impact on flora and fauna

The clearing of vegetation cover and removal of topsoil during site preparation would result in the following:

- i. degradation of plant cover
- ii. Destruction of the natural habitat of fauna on site.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

From the results, findings and discussions unveiled, together with the concerns raised by some paediatricians and other child health specialists, if the Ministry of Health wants to set up more child health care centres to see a quick decline in the child mortality rates recorded in the country, architects and designers should be able to create spaces which are very personal, user-friendly in a welcoming and comfortable environment for the children.

What is more, if the government of Ghana wants to achieve the Middle Income Level by 2020, as it has set for itself, there is the need to have very good paediatric centres in all the districts across the ten regions of the country. This will reduce the morbidity and mortality rate of these future leaders and at the end preserve the healthy human resource for the nation, which in the long run, increase productivity and so will help achieve this income level by the year stipulated.

Again, this Paediatric Centre proposed for Bekwai Government Hospital would help reduce the mortality rate of children in the Amansie East District and its environs. It will also serve as one of the referral places for the adjoining communities.

A well designed and functional Paediatric Centre is a centre which has spaces designed according to the normal hospital flow pattern (functional relationship diagram of hospital designs) and at the same time those spaces are child-friendly to give the child what sickness has denied him or her from.

5.2 RECOMMENDATIONS

The only room that is never full is the room of improvement

(Source unknown)

With the keen observations made in the findings, as well as the knowledge from the references made from the literature review and the interviews from the children themselves, it is required that, designers take the following recommendations into consideration:

5.2.1 Quality of space

The quality of spaces (both outdoor and indoor) in a health-care facility has a direct impact on the recovery of children.

- The higher the quality of space, the more likely the specialists will be sensitive and friendly in their approach towards the patients to encourage them in their critical conditions and to make them feel they could get well soon, vice versa.
- Because Children dislike dull, dirty, disordered and crowded spaces in a hospital but rather like clean, tidy, colourful, bright, comfortable, well maintained spaces, the walls should not just be plain but decorated with different colours and with very colourful wall hangings, pictures, paintings or drawings. Such spaces, take their minds of the clinical procedures and traumas that they go through and also make a visit to the doctor a much more pleasant experience.
- When selecting floor materials, factors like the wearing surface durability, joints (in seams and at wall intersections), slip resistance, urine resistance, stain resistance, scratch resistance, comfort underfoot, repairability, colour selection, and cleanability must be considered. The order in which you rate these qualities is

dependent on the designer. Semi-polished tiles could also be employed for most of the spaces because of its high performance and easy maintenance.

- Brightly coloured ceiling, especially those in light colours (white or cream) is preferable for most of the spaces, since it adds to the luminance of the spaces. The choice of the ceiling material should perform well in both stopping sound transmission and being sound absorbent. The material should not be moisture absorbent and brittle.
- Maximum day lighting, not much artificial lighting and natural ventilation are of importance in most of the spaces. Except special spaces like the theatre and intensive care units.

5.2.2 Play areas

Since social interactions among children contribute massively to their development and rapid healing, a provision of play areas (indoor and outdoor) is of much importance. This will help them to release anxiety due to the restriction the hospital spaces place on their behavior and also help the child to interact with his or her peers, through which his or her imagination could be nurtured.

- In the preparation of play areas, materials and activities which promote specific types of play and avoid potential health risks should be selected.
- Different varieties of play materials should be provided and changed on regular basis to create interest and greater participation by the children.
- These materials should be made of natural elements as much as possible. For example, toys should be made of natural materials with simple forms.

- The type of play activity should not be too vigorous, since this can place stress on the sick child.
- Softer materials like lawns could be used as the floor finish for the outdoor areas whilst foamy, carpeted or wooden floor for the indoor.
- Walls close to the outdoor play areas could be tiled or finished in a material which could be easy to clean (washable).

5.2.3 Learning Areas or Classrooms

- Some children like school work as an alternative form of entertainment and therefore, the provision of learning or classroom spaces should be included in the design and also not to leave out those who may be admitted for sometime from their normal academic curriculum.

5.2.4 Partitions

- Because Observation or Supervision is greater in a paediatric centre than privacy, the use of transparent and light materials, the likes of glass fixed in a wooden board could be used for partitioning.
- Depending on the use of the space especially in the wards, shorter partitions (about 1.5m high from floor level) could also be used.

5.2.5 Child-friendly Gardens/Landscape

For the reason that viewing natural scenes fosters stress recovery by evoking positive feelings in people ,the inclusion of Pockets of Child-friendly Gardens as part of the spaces within and outside a paediatric centre is also significant.

- Some of these gardens could be used for only viewing and others useable by the children.

- Those for viewing only should be fenced in such a way that, it will prevent the children from tampering with the shrubs and flowers in them.
- All entrances to the usable gardens could be irregular or rounded but easy to locate
- Floors of the useable gardens could be finished in paspolon grass, carpet grass or well-treated saw dust.
- Shady trees should be provided so that the children could sit under and interact with themselves and their families. Story telling could be done under such trees.
- Supervisor's shed should be located close to or could be part of the furniture in the useable gardens.

5.2.6 Family Center/ Areas

Since the families of the sick child also contribute so much to the healing process of that child, architects should provide well designed and comfortable (homey) spaces for them. Preferably, it could be a separate facility but close to the wards, which is independent from the other spaces in the paediatric centre. Some of the spaces for the family include:

- Well lit- lounges for those who will stay there for longer periods and those who would visit. The lounges could be finished with items like projectors or TV sets or the internet to show some documentaries on child-health. This could make the parent or guardian more informed about how to take good care of their wards in any conditions they may find themselves.
- Bedrooms with sanitary areas (Mothers hostel), kitchen/laundry and gift shop.
- A healing garden which could be used not only by the kids or the staff but also for the mothers to meditate and relax.

REFERENCES

1. Arthur T. Jersild (1960). *Child Psychology*. Prentice-hall publishing Inc. Englewood Cliffs.
2. [Www.google.com/unicef/child mortality rate 2007.pdf](http://www.google.com/unicef/child%20mortality%20rate%202007.pdf) (accessed February 2008)
United Nations Child Educational Fund Fact Sheet on the Welfare and Survival of the Child,
3. [Www.google.com/mortality rate in children 2006.pdf](http://www.google.com/mortality%20rate%20in%20children%202006.pdf) (accessed February 2008)
Ghana Statistical Service (Macro International) and the World Health Organization's (W.H.O) Mortality Fact Sheet.
4. Houghton Mifflin. The American Heritage ®Stedman Medical Dictionary, Second Edition, accessed August 2007.
5. Bekwai General Hospital. *Annual Report on Child health, 2003-2007*. Ghana Health Service
6. Microsoft ® Encarta ® 2007 © 1993-2005 Microsoft Corporation.
7. Laplane, Robert (1991). *History of Paediatrics* .Nestle Nutrition Workshop Series. New York: Raven press.pp.39
8. Ballbriga, Angel (1991). *One century of Paediatrics in Europe (section development of paediatric hospitals in Europe)*.Health Science Publications, copyright.
9. [Http// aappolicy.aappublications.org/cgi/content/full/paediatrics/112/3/691](http://aappolicy.aappublications.org/cgi/content/full/paediatrics/112/3/691), accessed September 2003.
10. Clare Cooper Marcus and Carolyn Francis (1998). *People Places: Design Guidelines for Urban Open Spaces*, John Wiley and Sons, Inc. (pg 260)

11. Kritchovsky, Sybil, Elizabeth Prescott and Lee Walling (1969). *Planning Environment for Young Children: Physical Space*. Washington, E.C, National Association for the Education of Young Children, (pg.5)
12. Moore, R.C., Goltsman, S.M., and Iacofano, D.S. (1987). *Play for All Guidelines: Planning, Designing, and Management of Outdoor Play Settings for All Children*. Berkeley, CA: MIG Communications.
13. Ami Rokach and Ben Rokach (1995). *Impact of Hospitalisation on Children*, New York University Press, Toronto, Canada, (www.arokach@yorku.ca)
14. Rebecca Eder. Ph.D, Record articles (1995-2003). *New model for Paediatric space Design to help Children cope*. Washington University press in St. Louis
15. <https://www.ahasurvey.org/>(accessed February, 2008)
16. Ulrich, R.S. *View Through a Window May Influence Recovery From Surgery (Visual Landscapes and Psychological Well-Being)*. Landscape Research Journal, Texas A&M University press (17-23)
17. Juliet L. Rogers, MPH. *Karlsberger Knowledge Series*, Volume1, Number 1, © Ann Arbor, 1992-2008, Columbus, New York, Birmingham

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APPENDICES

Appendix 1- Questionnaires and Interviews

CHILDREN

- a) Do you like visiting the hospital whenever you are sick?.....
- b) Are you scared when you are in a hospital?..... What makes you
scared?.....
- c) Who do you visit the hospital with?.....
- d) In case you are admitted, would you like your parents, siblings or friends to be with or
visit u?..... If yes, for how long?.....
- e) Do you like the colour of the paint on the walls?.....
- f) As a child, are you comfortable in this room?..... Is the place welcoming
enough?.....
- g) Do you get bored being in this room all day?.....
- h) Do you like the existing outdoor environment in this hospital?.....
- i) Would you like to play alone or with your other colleagues when you are in the
hospital?..... Which types of play?.....
- j) What do you expect to see to feel so comfortable in the hospital?.....
.....
.....
.....

CHILD HEALTH SPECIALISTS

- a) How many years have you been working with this hospital?.....
- b) Do you feel so comfortable working within this environment?.....
- c) Do you get bored being indoors all day attending to these children?
.....
- d) Do most of the children appear to be scared or afraid of any of the medical procedures
you prescribe?.....
- e) Do they seem to be traumatized?.....
- f) What do you think could be done to these children for them to release tension anytime
such procedures are prescribed?.....
- g) Do you see the need to involve the family (mother, father or guardian) in any of the
medical procedures you offer to the children?.....
Are any provisions made for them?.....
- h) How often do your visitors use the outdoor spaces?
- i) What are the possible features you would want to see in your outdoor
space?.....
- j) In general as a caregiver, what are your expectations in this Children's department of
the hospital?.....
.....
.....

MOTHERS, GUARDIANS AND FAMILIES

- a) What are the provisions made for you as a mother, father or guardian of your child in this hospital?.....
- b) Do you have a place to sleep or relax when your child is admitted in this hospital?.....
- c) Do you get bored sometimes sitting at one place waiting to see your child healed?.....
- d) Do you like the outdoor space? What are the possible features you would like to see?.....
- e) Would you like to be involved in the medical procedures of your child?.....
- f) As a mother, father or guardian, what are your expectations in this hospital?.....
.....
.....
.....
.....
.....
.....

Appendix 2

Table1: The Detailed brief and Accommodation schedule for the Proposed Paediatric centre as compared with that of the Case Studies.

THE OUT-PATIENT DEPARTMENT

Space	Area (m ²)
Entrance foyer	40
Reception	12
Waiting area	36
Consulting room (4)	96
Records (1)	30
Pharmacy unit	40
Trolley bay	9
Child welfare unit	72
Laboratory unit	90
X-Ray unit	96
Emergency department	300
Counseling	18
Circulation	1000

THE ADMINISTRATION

Space	Area (m ²)
Reception and waiting	12
Offices(4)	72
Staff lounge and pantry	48
Clinical research library	90
Multi-purpose / conference room	96

THE IN-PATIENT DEPARTMENT

Space	Area (m ²)
Waiting Entrance /Reception	30
Treatment room	25
Resuscitation	30
Nurses station	12
Nurses restroom	24
Doctor's rest room	20
Games room	36
Equipment room	18
Drug store	15
Clean utility	12
Dirty utility	12
Pantry	10
Typical ward	36
Isolation ward	36
Patient's suite	24
Assisted bathroom	15
Matron's office	20
Staff overnight stay	24
Classroom	36

THE SURGICAL UNIT

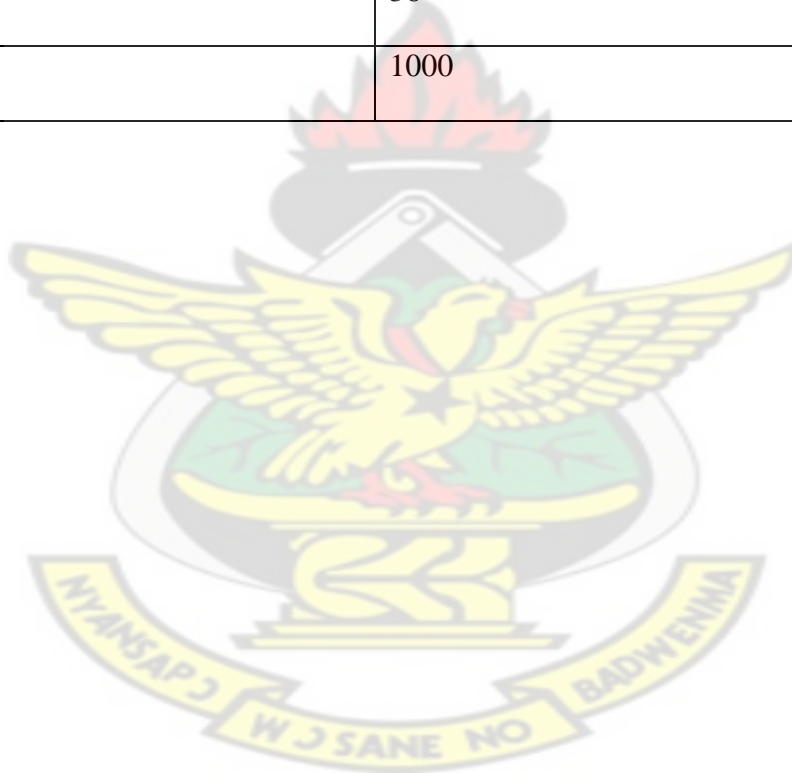
Space	Area (m ²)
Patient's waiting area	24
Changing rooms(2)	36
Nurses room	18
Anaesthetics / preparation	30
Scrub- up room	6
Theatre bay	36
Sterilization	12
Sluice room	8
Recovery ward	36
Intensive care unit	30
Staff lounge	20
Office	18

THE SUPPORTING UNIT

Space	Area (m ²)
Physiotherapy	72
General store	18
Kitchen and laundry	250
Staff parking	500
Customer parking	1450
Circulation	50
Temporal morgue	72

ANCILLIARY FACILITIES

Space	Area (m ²)
Family centre	350
Play or interactive court	750
Visual court(2)	200
Snack bar	12
Eating area	36
Healing garden	1000



Appendix 3- The Graphical Representation of the proposed Paediatric Centre.

(Various Plans, Elevations, Sections and details)

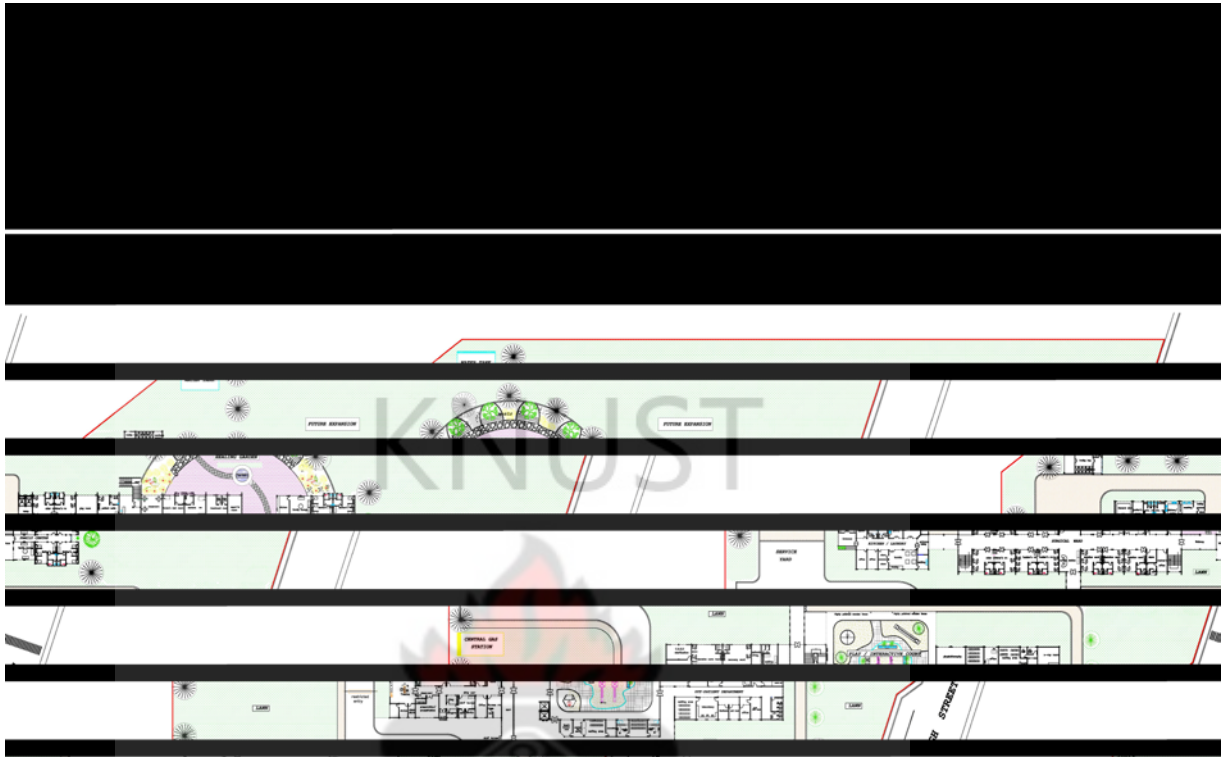
Section 2.1 The Block Plan



LEGEND

- A-** Main entry (vehicular access only)
- B-** Pedestrian access
- C-** Security post
- D-** Public car park
- E-** Staff and ambulance park
- F-** Emergency / casualty
- G-** Out-patient department
- H-** Surgical unit
- I-** In-patient department
- J-** Family centre
- K-** Kitchen and laundry
- L-** Temporal morgue
- M-** power house
- N-** healing garden

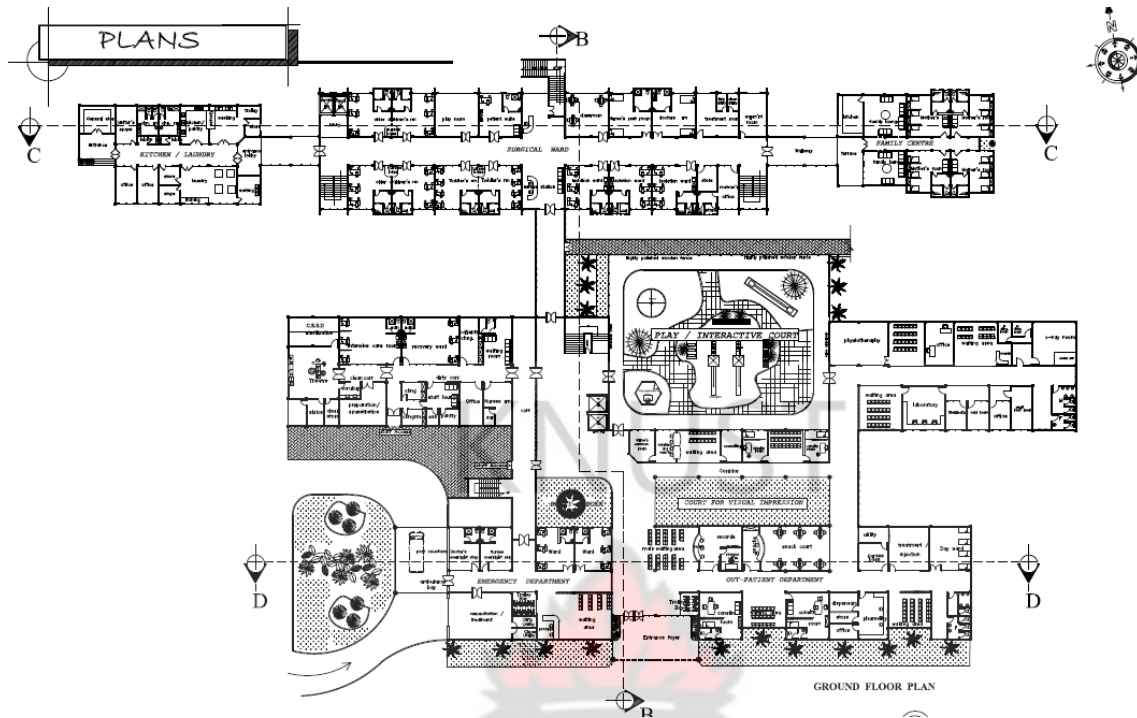
Section 2.2 The Site Plan



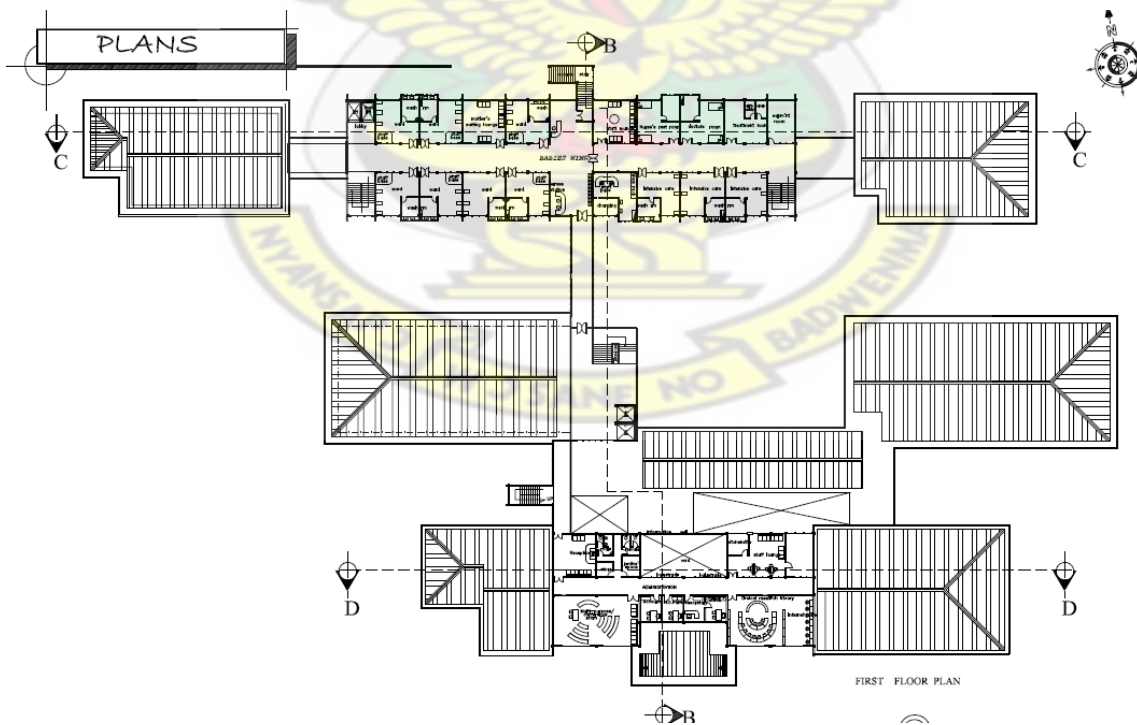
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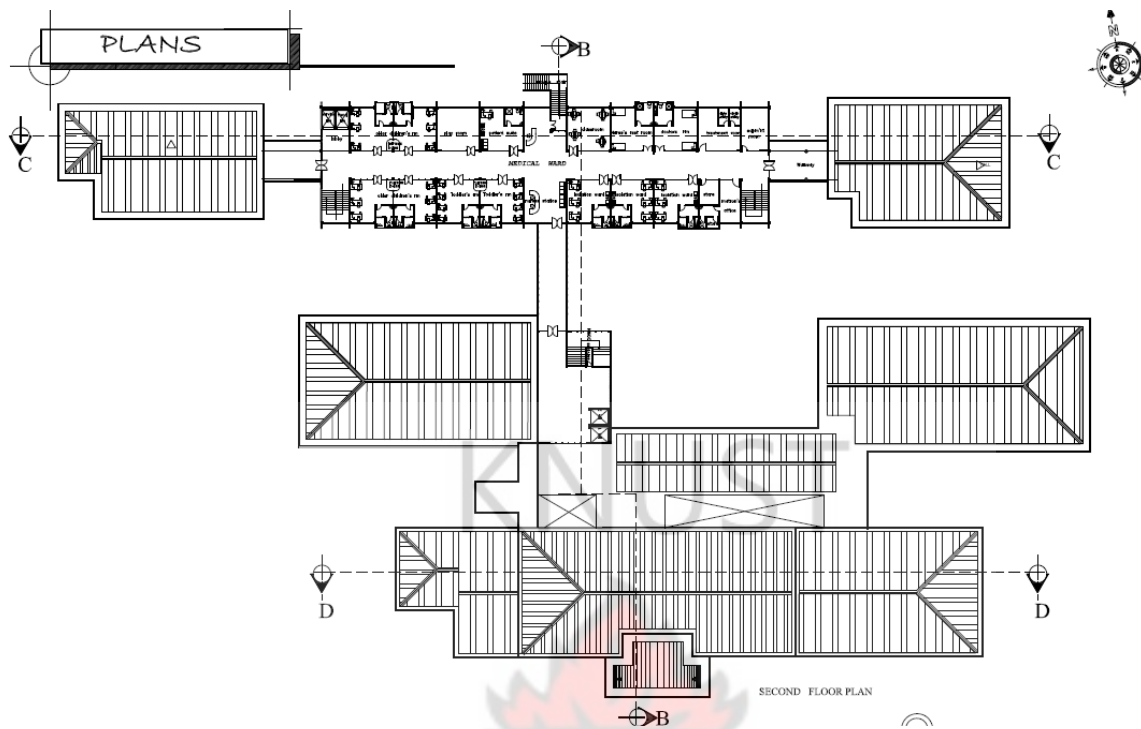
Section 2.2 The Ground floor Plan



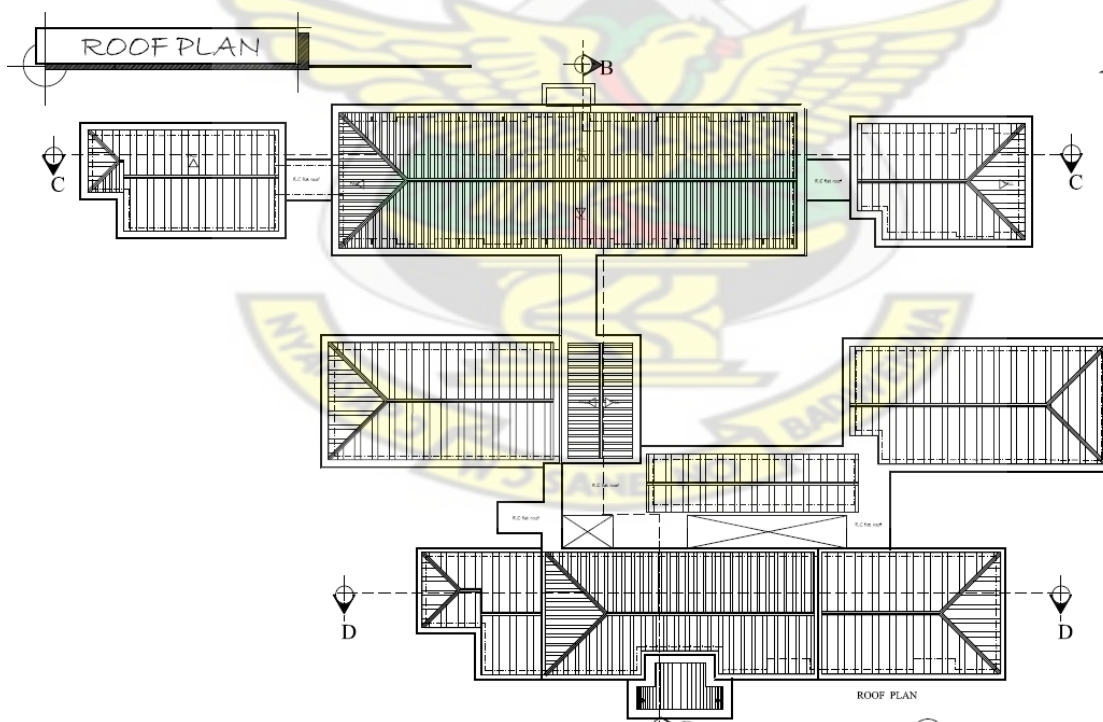
Section 2.3 The First floor Plan



Section 2.4 The Second floor Plan



Section 2.5 The Roof Plan



The drawing shows a two-story building with a central entrance. The entrance is marked by a small archway with the text 'SERAYA SALAMATIK CENTRE' above it. The building has multiple windows, some with shutters, and a balcony on the upper floor. There are palm trees and other landscaping elements in front of the building. The drawing is a black and white line art style.

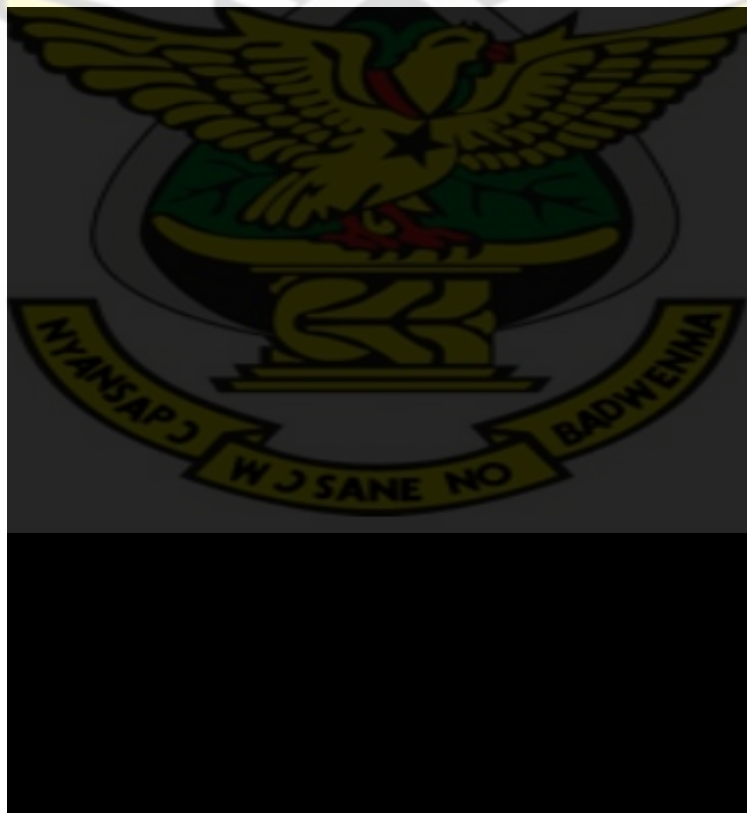
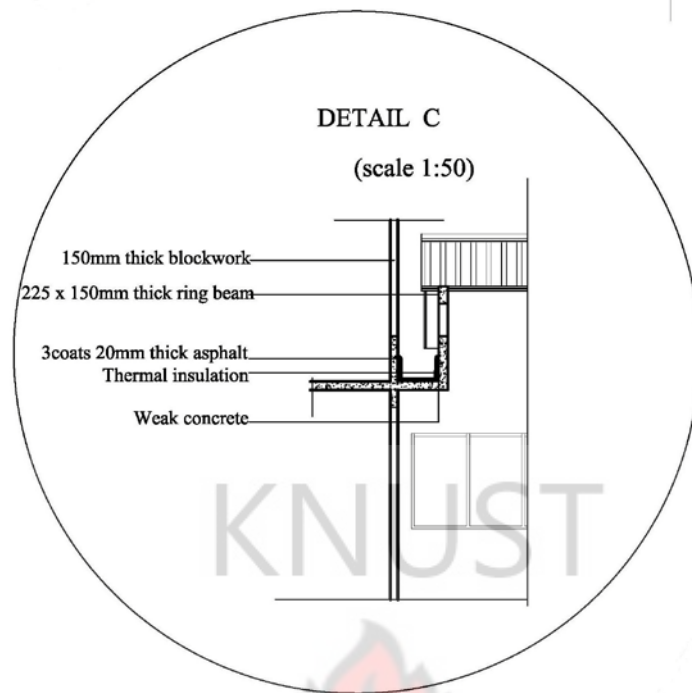
Section 2.7 The Sections



xii

Sections 2.7 Some of the Details



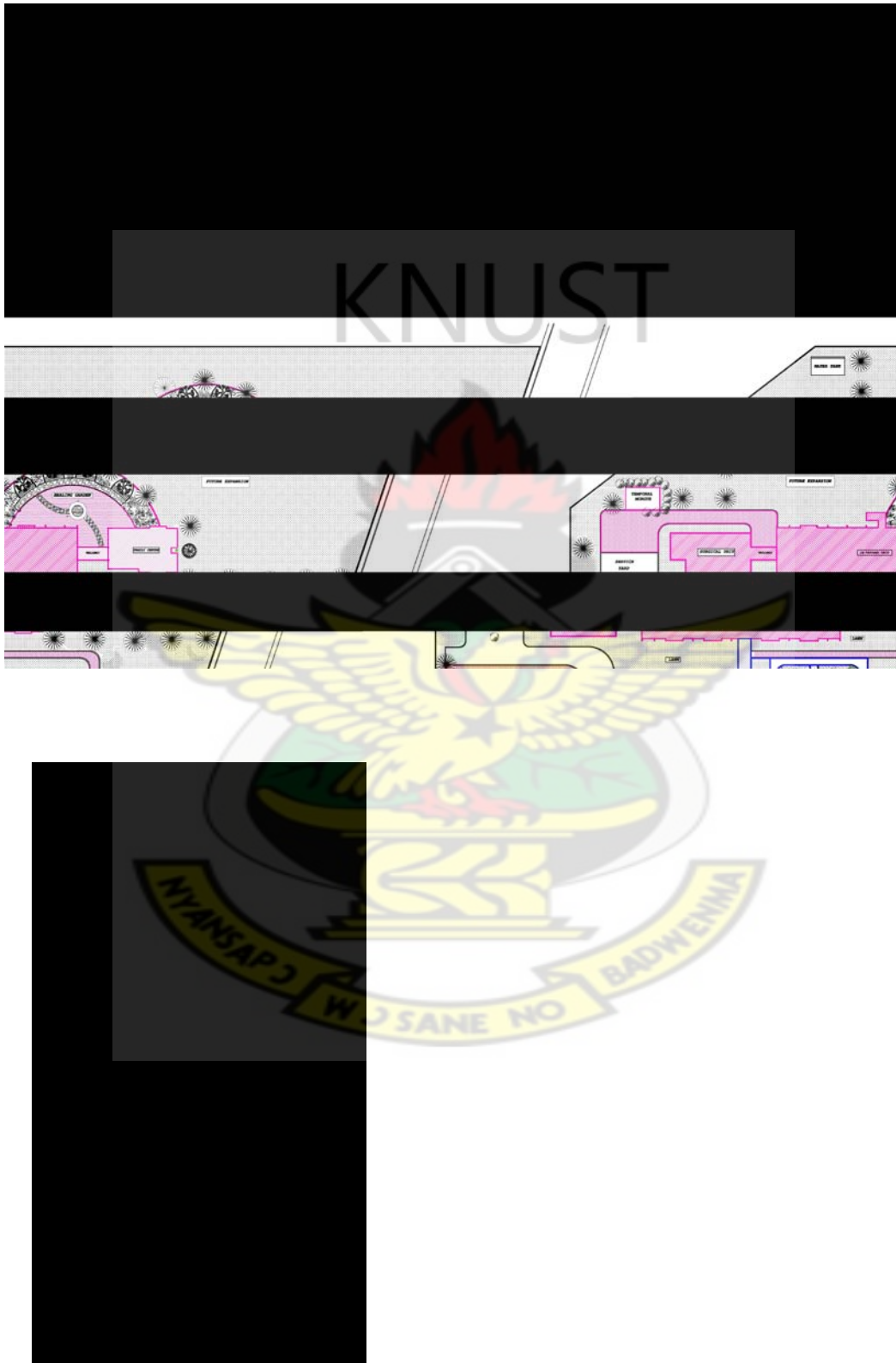


Appendix 4- The Landscape,Phasing and Service Plans(Water,Electricity,Fire and so on)

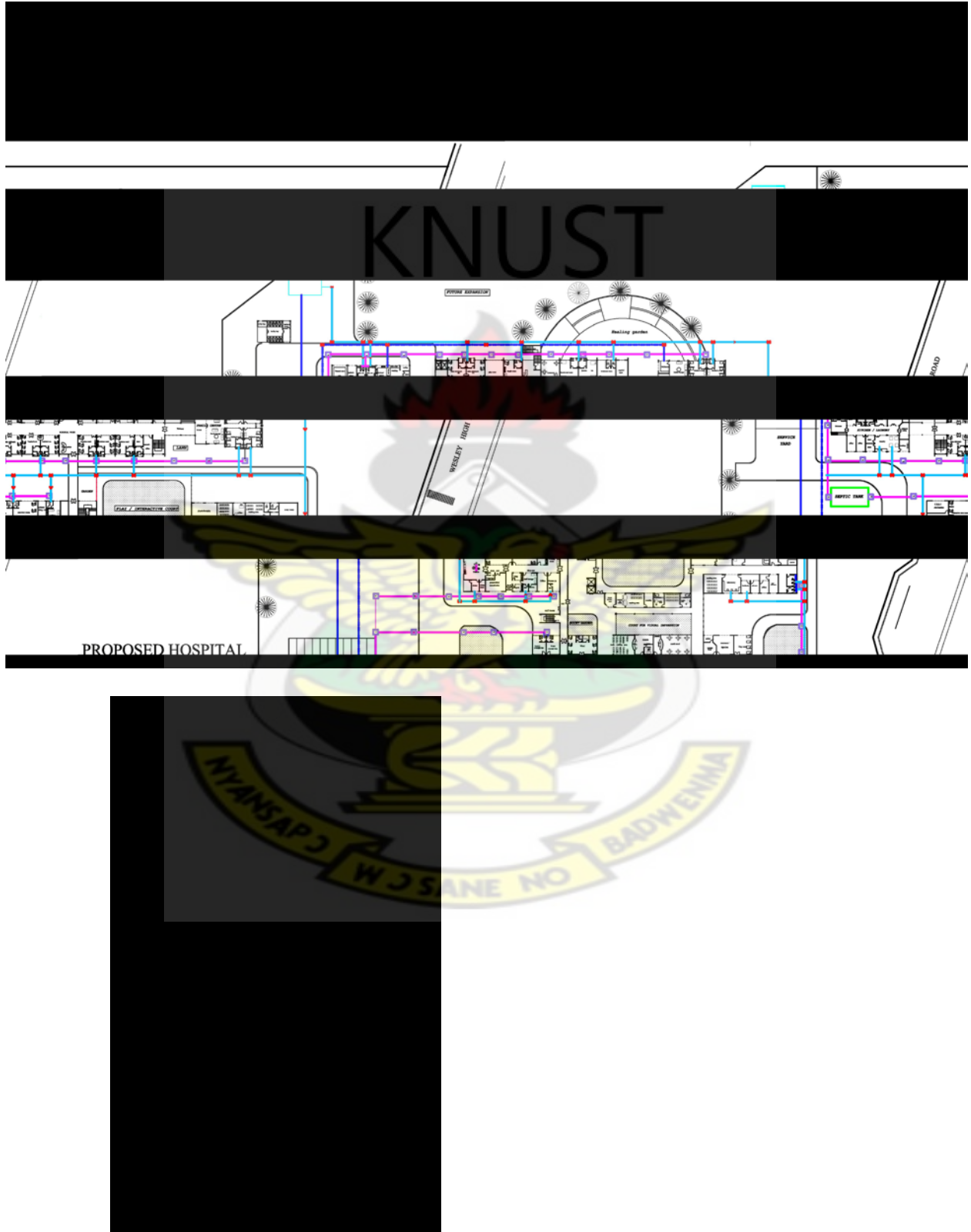
Section 3.1 The Landscape Plan



Section 3.2 The Phasing Plan

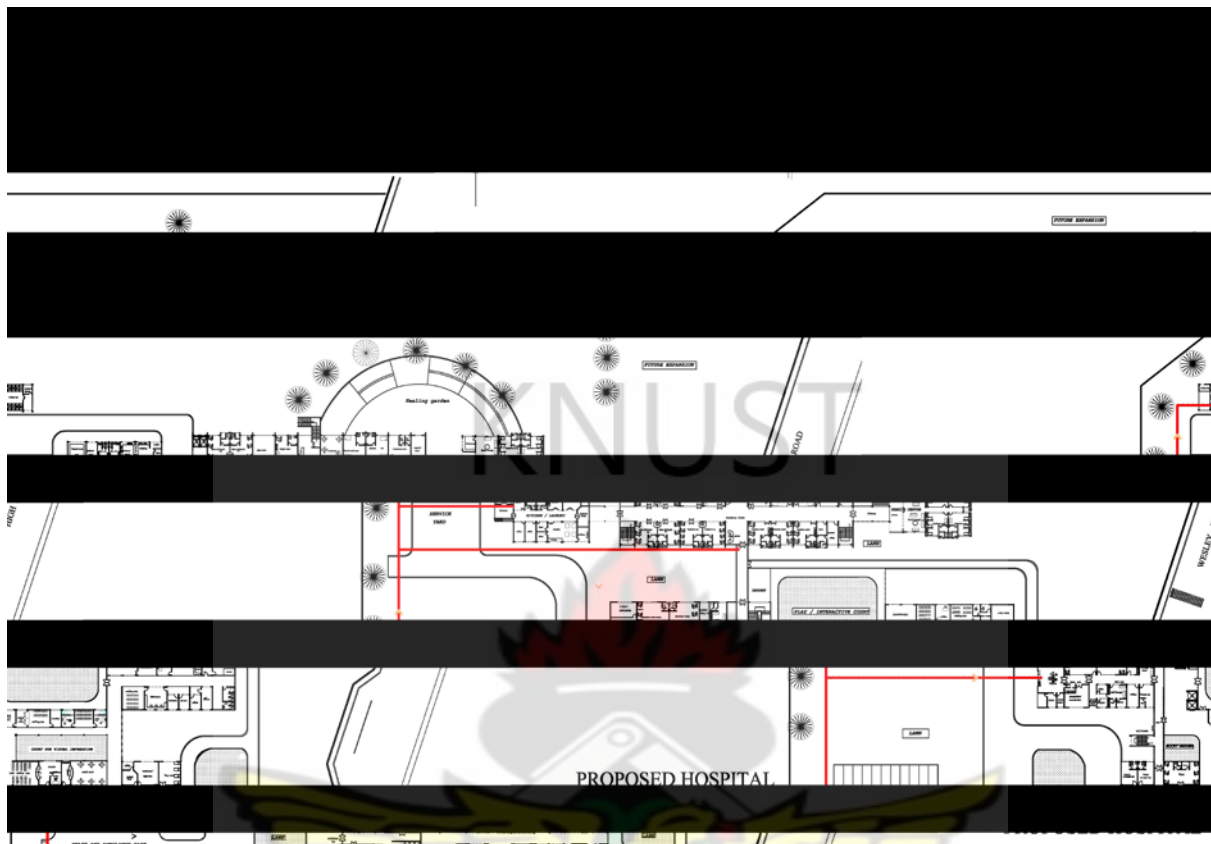


Section 3.3 The Water and Sewage Service Plan





Section 3.5 The Electricity Service Plan



Section 3.6 The Fire Control Service Plan



