AN INCLUSIVE VOCATIONAL AND TECHNICAL SCHOOL AT SOKWAI, ASHANTI REGION

By

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APPENDIX C

BL0CK PLAN

A – Staff Accommodation

B – Male Hostel

C – Female Hostel

D – Dining Hall

E – Administration/Library

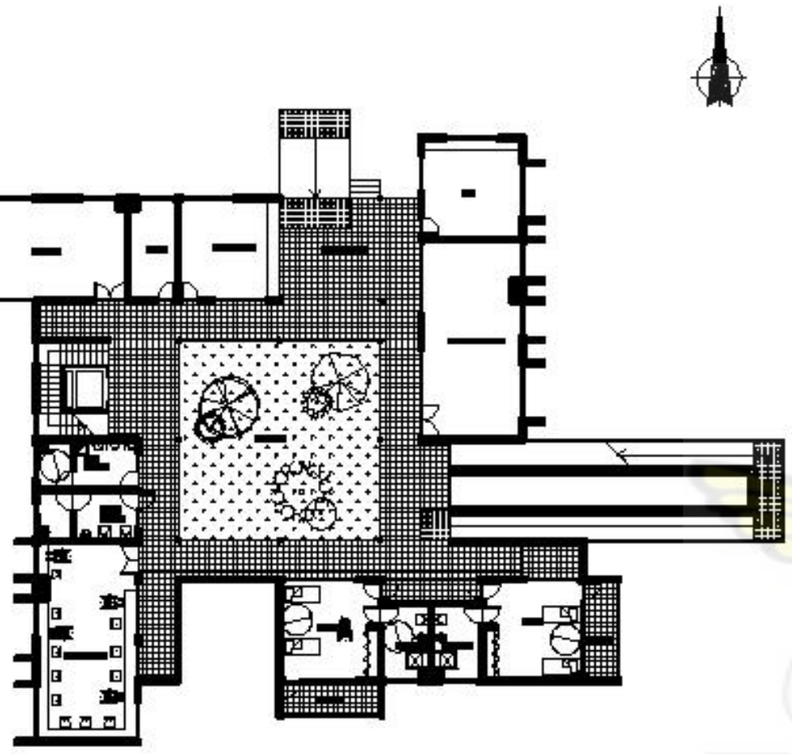
F – Multipurpose Hall

G – Classrooms

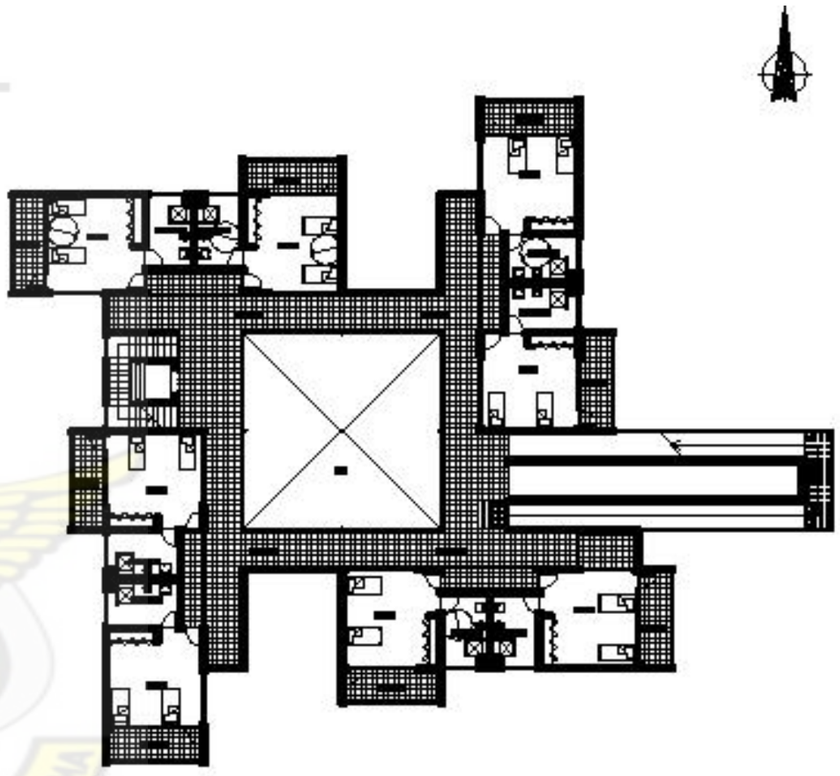
H – Sanitary

I – Workshop

HOSTEL (PLANS)



ground floor plan



first/second floor plan

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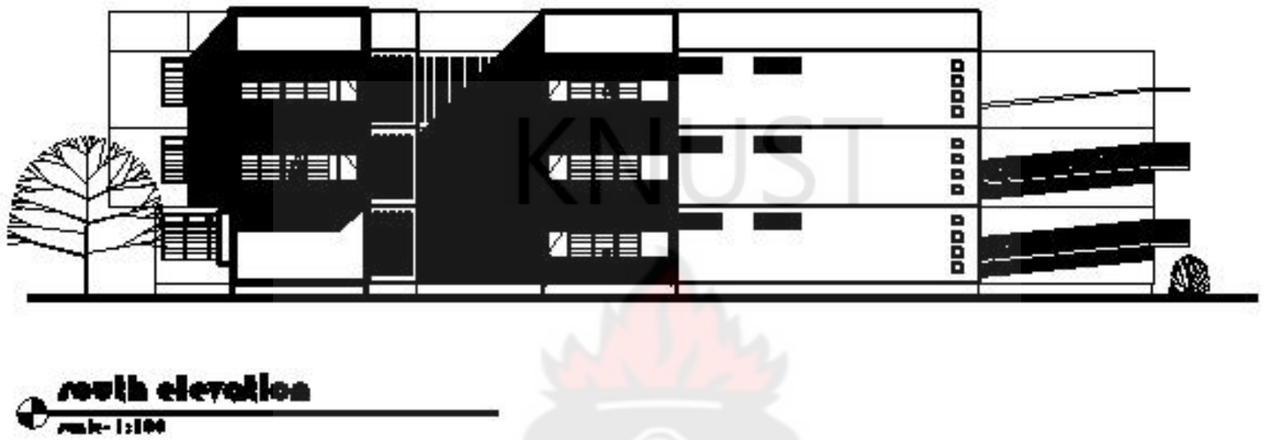
NYANSAPO WO SANE NO BADWENIMMA

HOSTEL (ELEVATIONS)



south elevation

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north elevation

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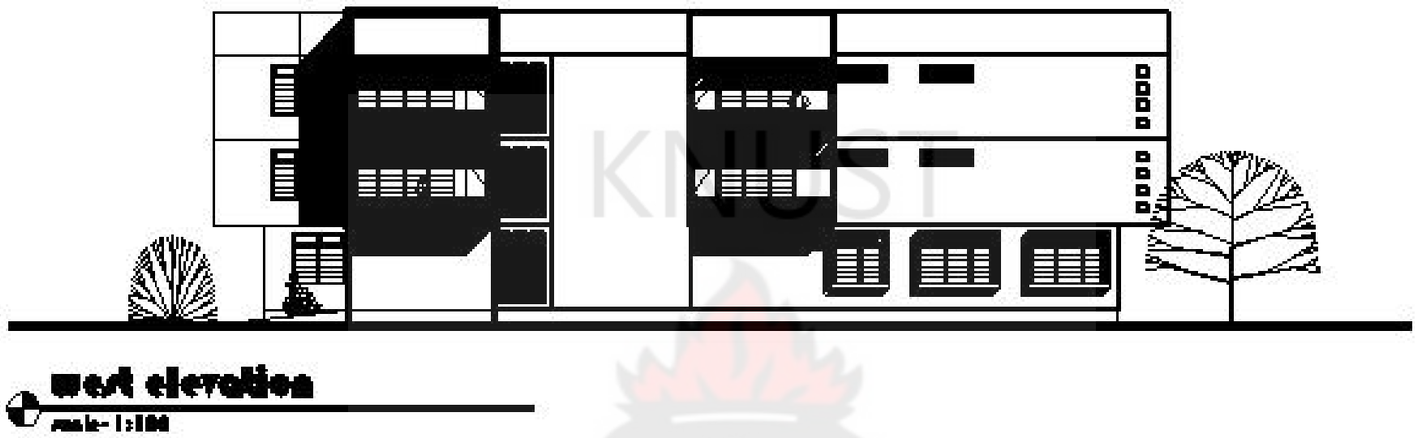
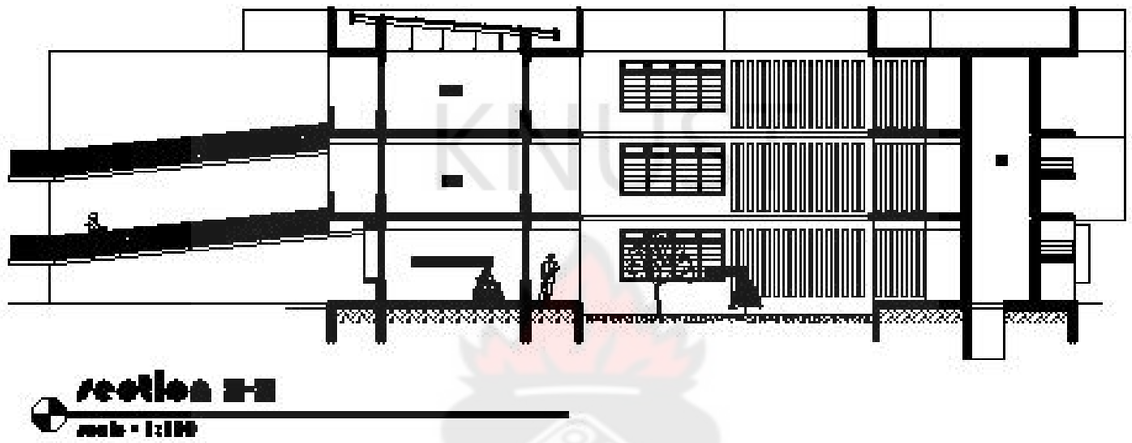
HOSTEL (ELEVATIONS)



west elevation

east elevation

HOSTEL (SECTIONS)



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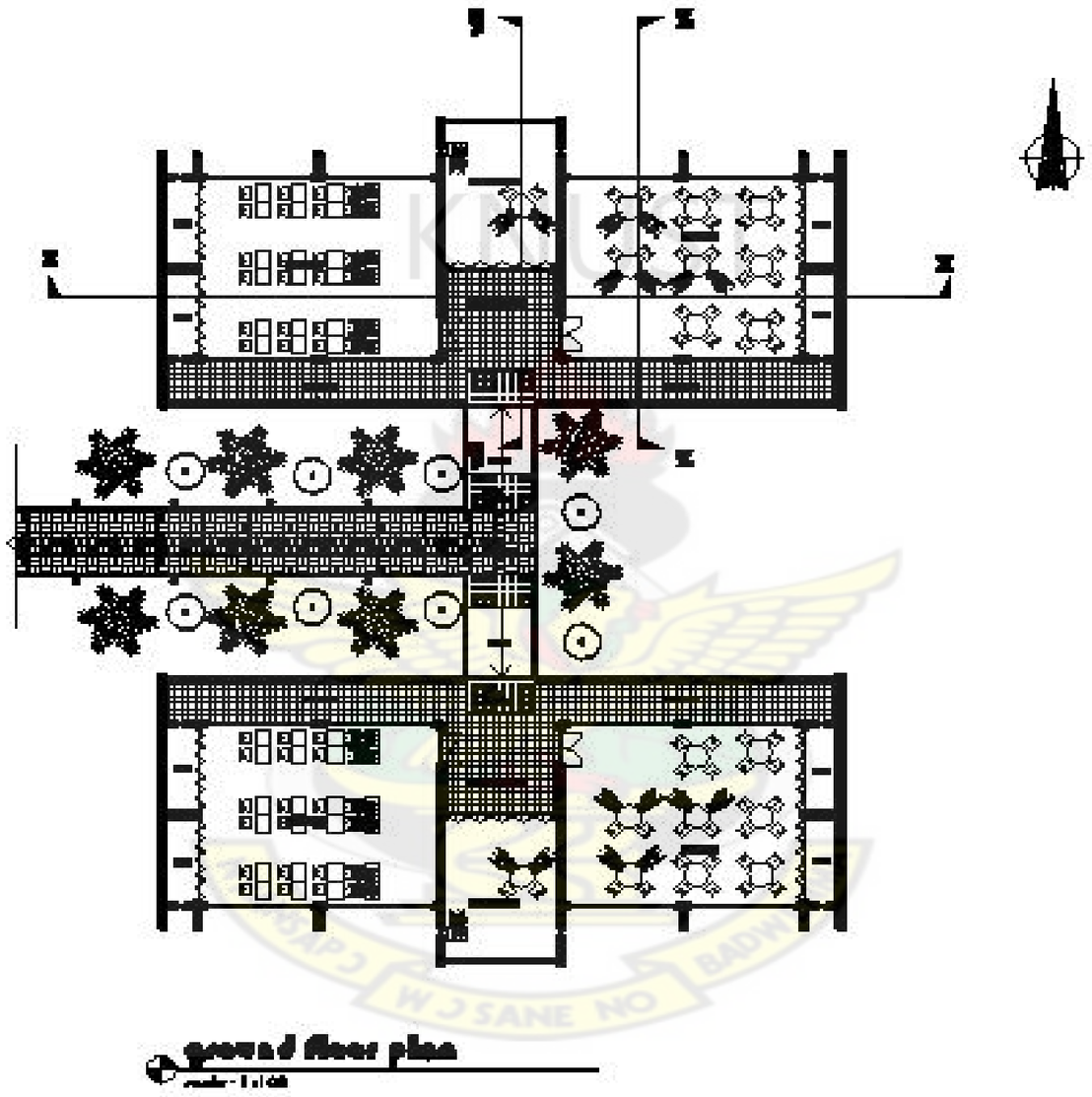

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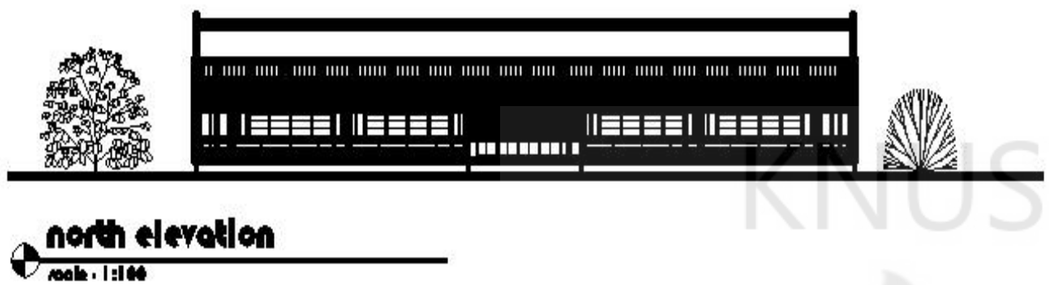

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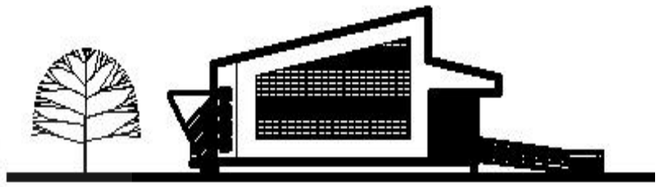

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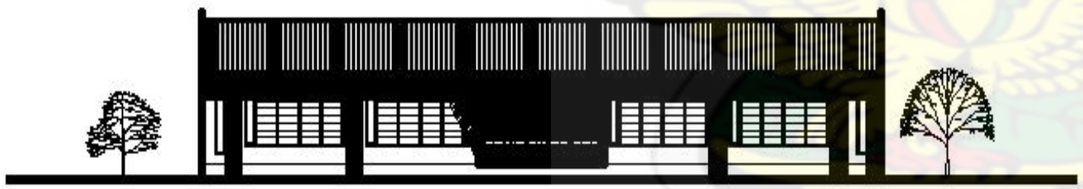

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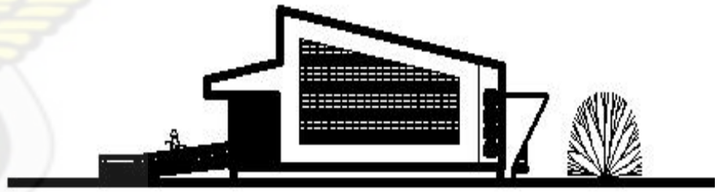

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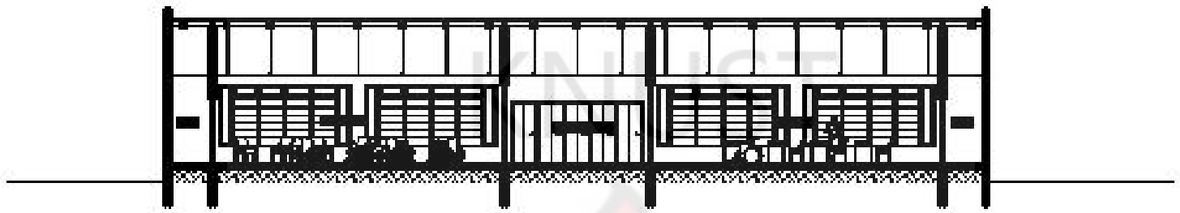

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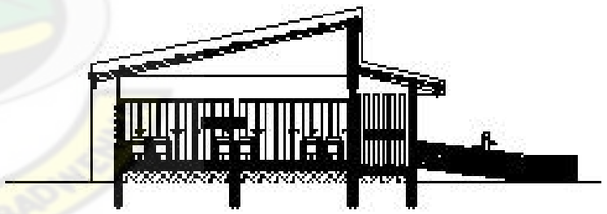

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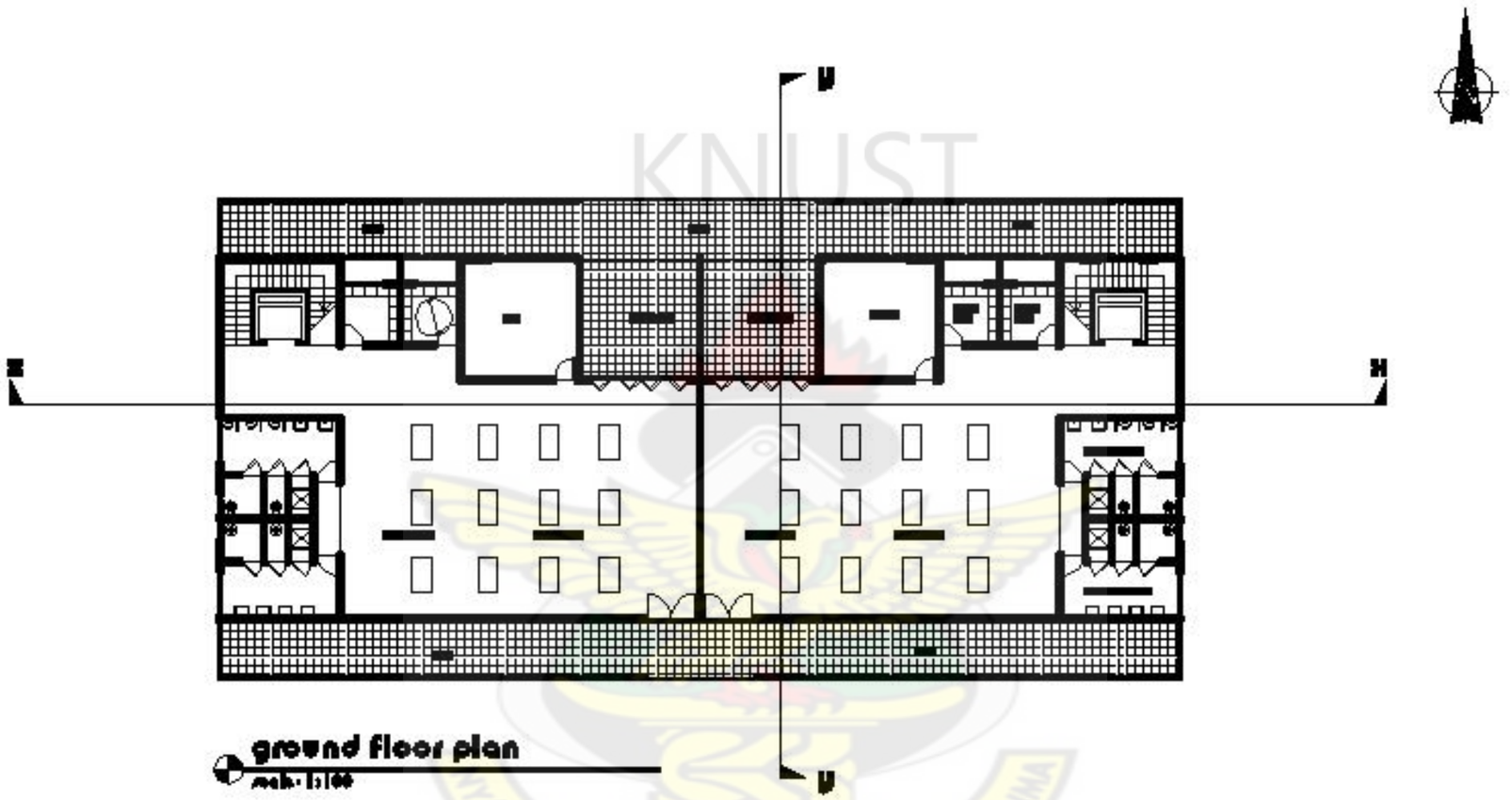
WORKSHOPS (PLANS)



WORKSHOPS (PLANS)

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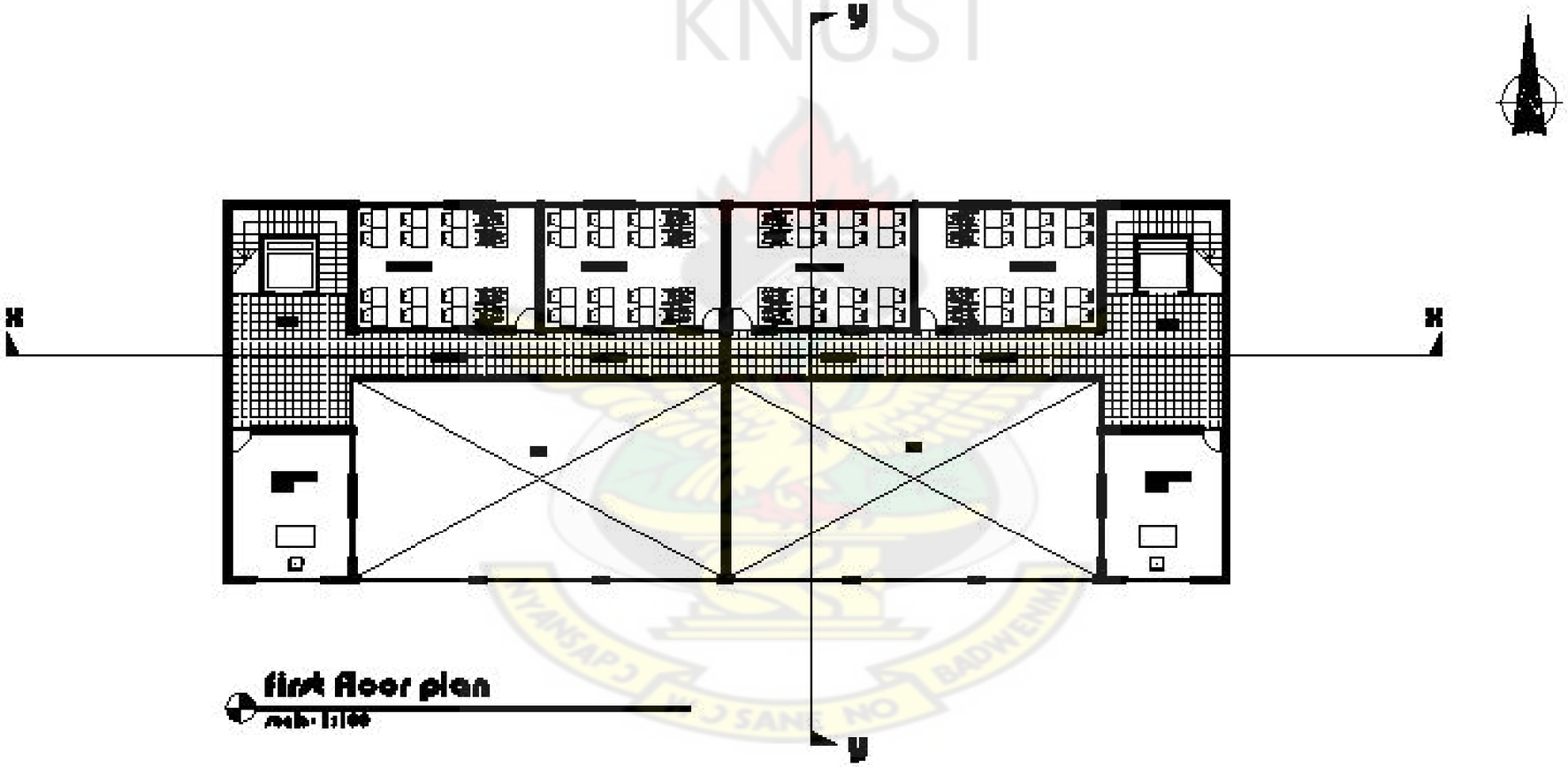

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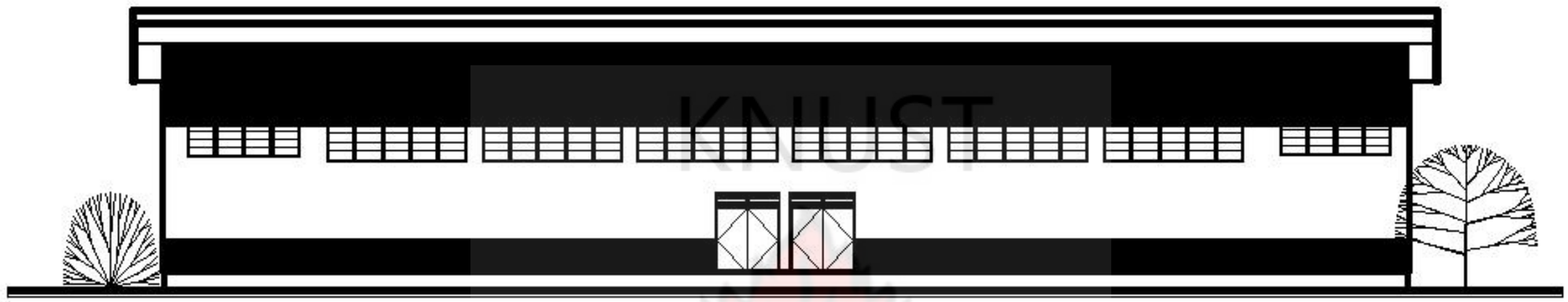

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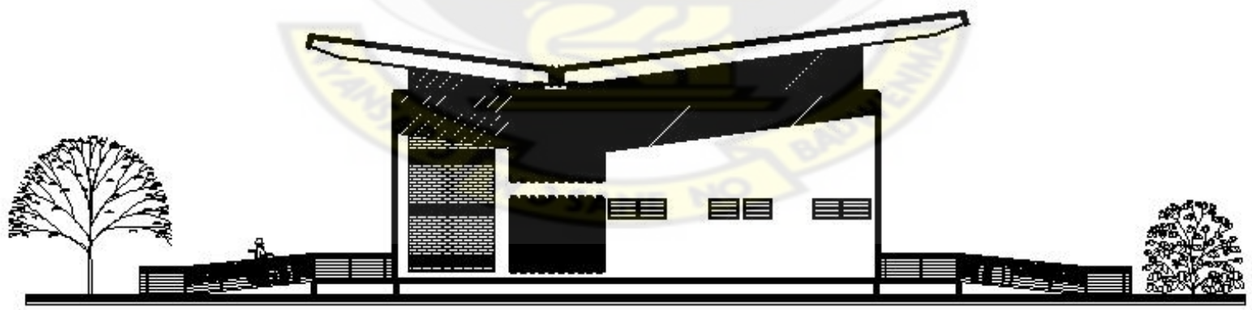

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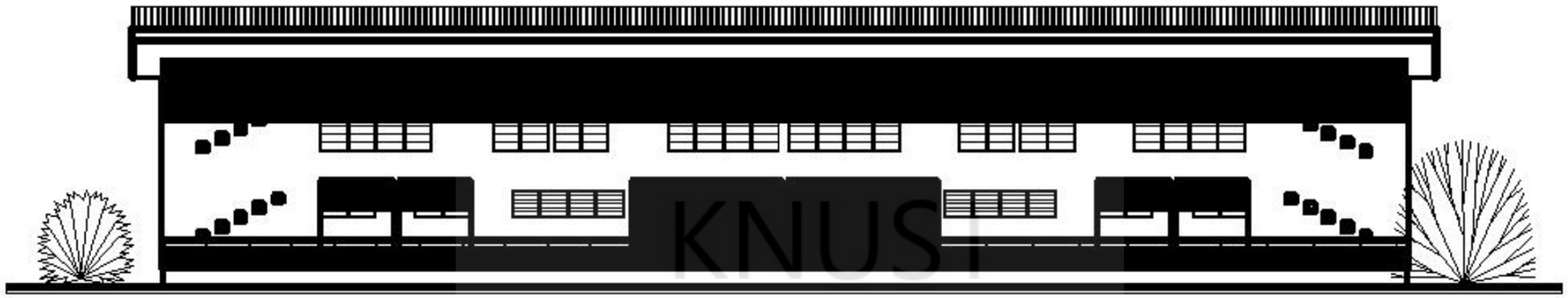

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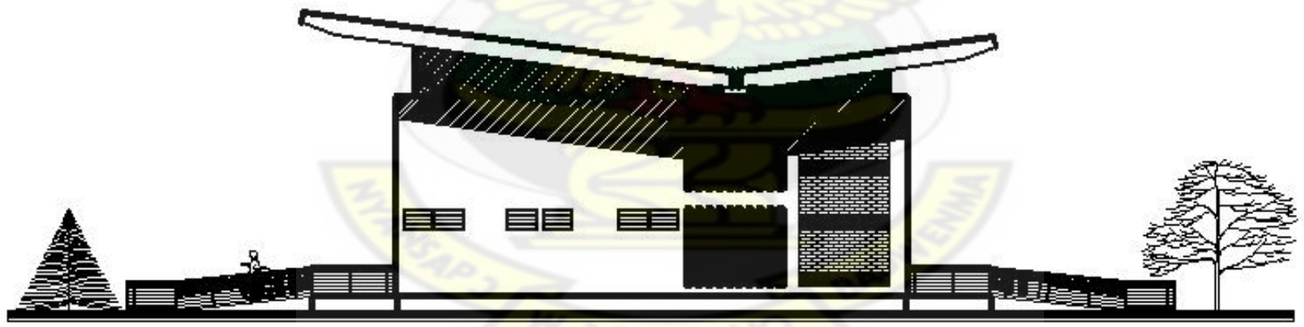

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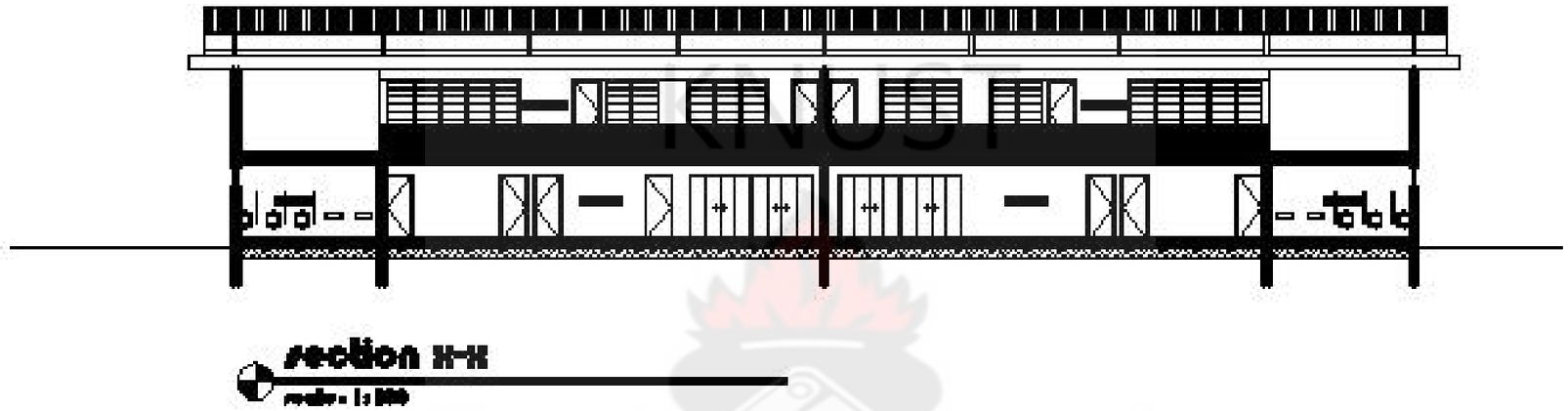

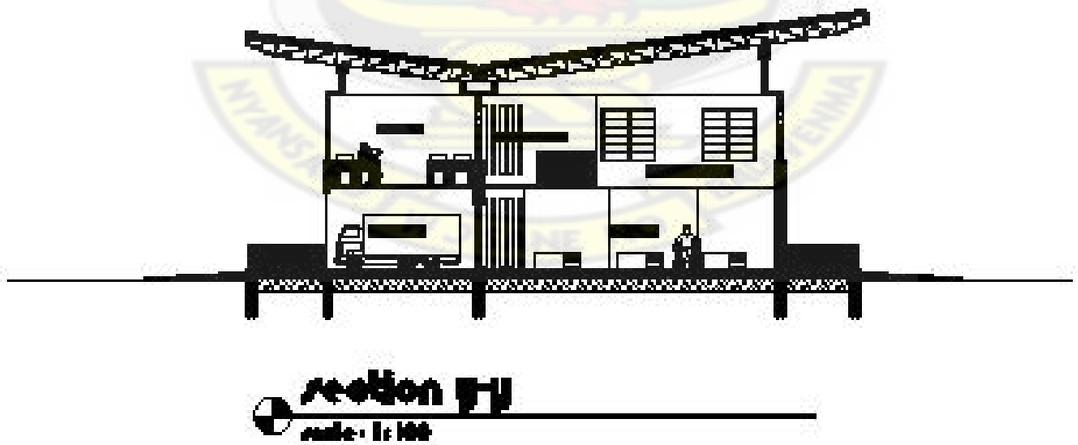

ABSTRACT

Education is said to be an equalizer of society, but sadly this exists only in theory rather than in practice. Vocational and Technical Schools are meant to prepare students for careers that are based on manual or practical activities to equip them for a specific trade, occupation or vocation. The pursuit of this endeavour is however a challenge to persons with disabilities because of the difficulty to access these facilities. Moreover, institutions or schools that are specially designed for persons with disabilities do not incorporate elements that address their special needs such as ramps, tactile markings, grab bars in sanitary areas and acoustic panels. These students feel more segregated because they are excluded from the mainstream education and society making their integration difficult. This thesis, therefore, seeks to highlight some of these anomalies and propose specific design parameters that incorporate the needs of students with disabilities in an Inclusive Vocational and Technical School. The goal is to foster integration and inclusion of students with disabilities in education in particular and society in general.

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ACKNOWLEGDEMENT

First of all, my heartfelt gratitude goes to the Lord God Almighty for His profound help over the years from cradle to this moment. Without Him, this project would not have seen the light of day.

I would also like to extend my sincerest thanks to my supervisor, Mr. Benjamin Odame for his direction and guidance throughout the entire thesis period. My unparalleled thanks go to my uncle, Mr. Daniel Kofi Okudzeto and mother, Madame Victoria Awotor Okudzeto for their support over the years and also to my entire family. Finally, I would want to thank all those who consciously or unconsciously strengthened my feeble legs in academia.

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DECLARATION

I hereby declare that this submission is my own work 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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Student	Signature	Date

Certified by:

Mr. Benjamin Odame	…….	…….
Supervisor	Signature	Date

Certified by:

Mr. S.O. Afram	…….	…….
Head of Department	Signature	Date

DEDICATION

I dedicate this project to my mother, Madame Victoria Awotor Okudzeto.

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CHAPTER ONE

RESEARCH DESIGN

1.1 PREAMBLE

Equality, they say exists in the minds of equals. The flip side of the coin tells us everything that has been proved was once imagined. We live in a world where variety or diversity beckons at us in every nook and cranny. A particular school of thought holds sway to the philosophy of duality. (Anonymous) A world divided by night and day, covered by land and water, inhabited by animals and humans alike. And the latter also subdivided into male and female, black and white, haves and have not's, able and disabled. The nomenclature is simply endless. But in man's quest to achieve a union in diversity where equality will be the mantra not only in our minds but also in our deeds, the nagging rhetoric on my mind is: What are we doing about people with disabilities?

1.2 INTRODUCTION

Human beings live in a space of one form or another. Moreover, because of our mobile nature we traverse different spaces aside our own. We access these spaces to perform an activity or a series of activities depending on the task at hand. These activities come in various shades namely social, economic, educational, cultural, and recreational. Contrary to this basic human right of accessing these facilities, it has become more of a privilege to 'able' people rather the people with disabilities.

People with disabilities are persons with physical, sensory or mental impairments that make performing an everyday task more difficult (Encarta 2007). The World Health Organisation (W.H.O 1981and 1992) also defines disability as a condition which makes an individual unable

to function normally in a particular socio-cultural context; it is the inability or limitation to function as expected of any given age and sex.

Statistics from the United Nations (UN) reveals that about 7-10 % of every nation's population is disabled and includes people with disabilities (UN 2006). The 2000 Population and Housing Census posits that Ghana's population stands at 18.7 million but recent statistics as at 2007 gives a postulate of about 22 million (World Fact book 2007). If an average of the nations percentage range for calculating the number of people with disabilities in the country is 8.5 % then by simple arithmetic, 1.9 million of the country's population are disabled.

According to regional data collected by the Community Based Rehabilitation Programme (CBRP) the most common forms of disability are visual impairment, 40 to 60 percent and mobility impairment which are 20 to 40 percent. Hearing impairment stands at 10 percent and mental impairment at 15 to 20 percent (W.H.O 2002).

We live in a society that is profoundly stratified in every imagined and unimagined way. Sadly enough, the disabled could be said to be at the bottom of the food chain for want of a better expression. They have been victims of discrimination and even in some instances ostracized. People with disabilities are the last if not the least considered in terms of social, economic, educational and health issues. To make matters worse, these activities are undertaken in spaces or structures which are barriers in themselves because of their inaccessible nature.

Article 3 of the General Principles on the Conventions of the Rights of Persons with Disabilities states that:

The principles of the present Convention shall be:

(*a*) Respect for inherent dignity, individual autonomy including the freedom to make one's own choices and independence of persons;

(*b*) Non-discrimination;

(*c*) Full and effective participation and inclusion in society;

(*d*) Respect for difference and acceptance of persons with disabilities as part of human diversity and humanity;

(*e*) Equality of opportunity;

(*f*) Accessibility;

(*g*) Equality between men and women;

(*h*) Respect for the evolving capacities of children with disabilities and respect for the right of Children with disabilities to preserve their identities. (UN 2005)

The irony is that Article 38 (1) of the 1992 Constitution of the Republic of Ghana states that: The state shall provide educational facilities at all levels in all Regions of Ghana, and shall, to the greatest extent feasible make those facilities available to all citizens. So do these laws exist only in theory and not in practice?

A walk or drive through towns also reveals some people with disabilities begging for alms on our streets daily. The question therefore is: Will these people still be on the streets if they had a skill and were gainfully employed? Rather than give them money why not equip them with the necessary skills to facilitate the acquisition of money. As part of the 86th Speech and Prize-giving day of Asuansi Technical Institute whose theme was "Technical Education, the bedrock of effective technological development", Dr. A.K Dzisi Rector of Ho Polytechnic who was guest speaker, said "For Ghana to develop, there was the need for a critical mass of well trained and highly competent technical personnel to keep the engine of growth running." (Ghana News Agency, 2008). For this to be achieved both the 'able' and 'disabled' must be educated to help advance the effective technological development of Ghana and the world at large.

The import of the above stated reasons has necessitated the design thesis "An Inclusive Vocational and Technical School." The underlying reason for this thesis is to produce a design that will be disability friendly or facilitate their activities in the school with respect to skill acquisition.

1.3 PROBLEM STATEMENT

Out of the thirty eight special schools spanning across the country only seven are vocational and technical schools (GES, 2006). Findings of studies conducted in India, a developing country like Ghana by the Office of the United Nations Commissioner for Human Rights revealed that, about 80% of students with disability studying in special schools wish they were studying with their 'able or normal' age mates who are in 'normal schools'. (UN, 2006). They contend that separating them and putting them into special schools makes them feel inferior and isolated, almost as if they are unfit to blend with mainstream society. Such a psyche lives with them perpetually and inhibits them from realizing their full potential even after graduation from such schools (UN, 2006).

According to UNESCO on The Right to Education for Persons with Disabilities (Towards Inclusion: An Education for All Flagship) more than 90% of children with disabilities in developing countries do not attend school.

1. Schools do not often give quality education that responds to the diverse needs of their students with disabilities.
2. Persons with disabilities are at high risk of becoming illiterate which often leads to restricted possibilities to higher education, employment and income (UNESCO, 2006).

Disability is not inability. This adage is true in every sense but physical structures pose a great deal of opposition making it true in theory rather than practice. The will and ability of people with disability to engage in activities of human endeavour is hampered due to the barriers or inaccessible nature of the various facilities. Some of these barriers are staircases, small door sizes, small sanitary facilities without grab bars. Most educational and public institutions in the country are not accessible because the designs do not consider persons with impairments. There is also a direct link between disability and poverty. However, not all people with disabilities are poor. Research has shown that about 400 million people with disabilities live in low income countries, often in poverty and isolation and despair (W.H.O 2002).

Economic growth is directly linked with quality of the human resource in every country. This assertion is made evident in most of the advanced countries because they have been able to integrate those with physical impairments into the mainstream of society. The opposite is rather found here.

The person with impairment/disability therefore has to compete with able people and these physical barriers make life more challenging and unbearable. Statistics from the Ghana National Association of People with Disabilities (GNAPD) reveals that for every ten disabled people soliciting for alms on the streets eight of them are willing to vacate the streets if they are assured of an alternative but decent source of livelihood (GNAPD, 2006). The Government of Ghana acting through the Ghana Education Service (GES), Special Education Division, is currently moving towards the concept of integration and inclusion in all special schools; a system where people with different types of disabilities and their 'normal or able' peers all study in the same school (GES, 2006).

1.4 JUSTIFICATION

The Principle of Inclusive Education was adapted at the UNESCO 1994, Salamanca World Conference on Special Needs Education and was restated at the Dakar World Education Forum (2000) as: "…schools should accommodate all children regardless of their physical, intellectual, social, emotional, linguistic or other conditions. This should include disabled and gifted children, street and working children, children from remote or nomadic populations, children from linguistic, ethnic or cultural minorities and children from other disadvantaged or marginalized areas or groups."

Research shows that children who learn together, live together, play together and share resources together and live happily together. This confirms the Salamanca statement and framework for action (1994) which states that: "Regular schools with inclusive orientation are the most effective means of combating discrimination, creating welcoming communities, building an inclusive society and achieving education for all."

In view of these global development since Ghana was a participant at the Salamanca and Dakar Conferences, the Ministry of Education pursued those rights hence the Ghana Education Service in its Education Strategic Plan of 2003 – 2015 adapted Inclusive Education. Strategies

Under Policy Goal 1: Increase access, participants in education and training and the related policy objective EA 7 – provide equitable educational opportunities and has indicative target of integrating all children with non-severe special needs in mainstream by 2015. To achieve this target, the strategies in realizing this goal are to:

1. Provide training for all teachers in Special Education Needs.
2. Re-design school infrastructure to facilitate the accommodation of pupil/students with special needs.

3. Organize sensitization workshop for parents and children with special needs.
4. Incorporate training in Special Education Needs into All Teacher Training College Courses.
5. Establish special education assessment centres in all districts (MOESS/GES 2003 – 2015, Ministry of Education, Science and Sports).

The above mentioned policies make it imperative for the establishment of a vocational and technical school for skill acquisition by persons with disabilities.

1.5 OBJECTIVES

1. To propose a model architectural design that will facilitate an inclusive vocational and technical education for the disabled in Ghana.
2. To establish design criteria for school facilities that will facilitate the inclusion of persons with disability into the mainstream.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

For a design to be classified as inclusive, it must satisfy peculiar design parameters to pass the required litmus test. There are instances where these requirements have been satisfied and implemented but have been consequently met with some degree of rejection or reservations. The range of concerns span from teachers, students, parents and the society at large. This chapter, however, highlights the prerequisites of an inclusive vocational and technical education and the different parameters of design that make a school inclusive.

2.2. INCLUSIVE EDUCATION

Inclusive Education (IE) is a strategy that contributes to the ultimate goal of promoting an inclusive society, one which enables all children/adults, whatever their gender, age, ability, ethnicity, impairment or HIV status, to participate in and contribute to that society. Difference is respected and valued. Discrimination and prejudice will be actively combated in policies, institutions and behaviour (Wikipedia, 2008).

Education is the right of all children, and IE aims to ensure that all children have access to an appropriate, relevant, affordable and effective education within their community. This education starts in the home with the family, and includes formal, non-formal and all types of community-based education initiatives (Wikipedia, 2008).

Within schools IE is an approach which aims to develop a child-focus by acknowledging that all children are individuals with different learning needs and speeds. Teaching and learning can

become more effective, relevant and fun for all. Therefore IE will always be good for all schools, although all schools may not be good for all children (Wikipedia, 2008).

IE is part of development, and development should be inclusive, i.e. responding to the needs of real people who are all different. As with all children, disabled children have a range of basic needs which need to be met in order for them to benefit from education. These include nutrition, acceptance, love and basic health care. Poverty and lack of basic infrastructure (roads, transport) affects children's access to education, including disabled children. Whatever the level of socio/economic development, the education of disabled children should be seen as integral to the development of education for all children. Many of the 'problems' which exclude disabled children from education is a result of exclusive planning therefore planning should be inclusive (Wikipedia, 2008).

IE is the responsibility of both government and community, requiring collaboration between sectors and extensive participation. Supporting and involving families is central to IE, as the family has prime responsibility for the care and education of their children (whether disabled or not). Community Based Rehabilitation (CBR) as a component of community development can help meet basic and specific needs of disabled children, such as access to Braille and sign and mobility aids. CBR may also have a direct role in supporting the education of children with severe and multiple disabilities, both in the context of their own homes and in day care facilities (Wikipedia, 2008).

Issues of disabled identity and discrimination need to be addressed as part of an IE strategy. In order to combat discrimination and to promote positive identity in disabled children, disabled

role models should be accessible to all children, schools should employ disabled teachers, and curriculum materials should reflect the existence of disabled people in society in positive ways.

As a catalyst for change IE provides not only school improvement but an increased awareness of human rights which leads to a reduction of discrimination. By finding local answers to complex problems, it empowers communities and can lead to wider community development. IE addresses a real need, is a readily understandable concept and requires no new major resources. It primarily involves changes of attitudes and behaviour. It has the potential to be a very effective starting point for addressing the Rights of the Child in a range of cultures and contexts **(**Wikipedia, 2008).

2.3 VOCATIONAL AND TECHNICAL EDUCATION

Vocational education (or Vocational Education and Training (VET), also called Career and Technical Education (CTE)) prepares learners for careers that are based in manual or practical activities, traditionally non-academic and totally related to a specific trade, occupation or vocation, hence the term, in which the learner participates. It is sometimes referred to as technical education, as the learner directly develops expertise in a particular group of techniques or technology (Wikipedia, 2008).

Generally, vocation and career are used interchangeably. Vocational education might be contrasted with education in a usually broader scientific field, which might concentrate on theory and abstract conceptual knowledge, characteristic of tertiary education. Vocational education can be at the secondary or post-secondary level and can interact with the apprenticeship system. Increasingly, vocational education can be recognized in terms of recognition of prior learning

and partial academic credit towards tertiary education (e.g., at a university) as credit; however, it is rarely considered in its own form to fall under the traditional definition of a higher education

Up until the end of the twentieth century, vocational education focused on specific trades such as for example, an automobile mechanic or welder, and was therefore associated with the activities of lower social. As a consequence, it attracted a level of stigma. Vocational education is related to the age-old apprenticeship system of learning (Wikipedia, 2008).

However, as the labour market becomes more specialized and economies demand higher levels of skill, governments and businesses are increasingly investing in the future of vocational education through publicly funded training organizations and subsidized apprenticeship or traineeship initiatives for businesses. At the post-secondary level vocational education is typically provided by a local or community technical vocational schools. Vocational education has diversified over the 20th century and now exists in industries such as retail, tourism, information technology, and cosmetics, as well as in the traditional crafts and cottage industries (Wikipedia,2008)

2.4 INCLUSIVE EDUCATION IN GHANA

Ghana's concept of inclusive education, however, is aligned with her Free Compulsory Universal Basic Education, FCUBE policy - increasing access, retention and participation of all students of school going age in education and not the movement and provision of education to children with disabilities in regular schools. The emphasis is on changing school culture and organisation, to providing resources and to building capacity in special and regular schools to offer new opportunities to pupils who may have previously or continue to experience learning difficulties (GES, 2004; and Ocloo et al 2002).

A 10-year Free Compulsory Universal Basic Education Programme in 1996, a policy framework that will increase educational access to all children, emerged from the 1992 Constitution. This policy has three main themes:

1. Improving quality of teaching and learning.
2. Improving management efficiency.
3. Increasing access and participation (GES, 2003).

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Further, architectural barriers, inaccessible curriculum and limited pre-/post-training in special education courses for regular classroom teachers limit access to education for students with disabilities (GES, 2004). The government of Ghana states:

> The challenges facing the government of Ghana for ensuring social and educational inclusion include public prejudiced perception of persons with special needs, architectural barriers, inadequate assessment facilities, inaccessible curriculum, curriculum inflexibility and pre-/post-training in special education needs for regular teachers (GES, 2004, p. 15)

Inclusive schooling offers new hope for school success and social integration for persons with and without disabilities (Bennett et al 1997; Cowne, 2003; Gable & Hendrickson, 1997).

2.4.1 EFFORTS AT EMBRACING THE PHILOSOPHY OF INCLUSION

The government of Ghana have realized the barriers to participation of students with disabilities in society and regular schools, due to the pressure from disability active groups – Ghana Society for the Blind (GSB) and Ghana society for the Physically Disabled (GSPD) - entered into an agreement in September 2003 with Voluntary Services Overseas (VSO), a

British non-governmental organisation. According to the agreement, the VSO would pilot inclusive education in ten districts within three regions, and upon its success, to extend it to other regions. The pilot project incorporated the following objectives:

1. Project officials will collaborate with District Social Welfare and Health officials to sensitise the communities involved by October/November, 2003;
2. Increase public awareness on disabilities by November/ December 2003;
3. Organise training programmes for teachers and selected GES personnel/Stakeholders by February/ March 2004;
4. Move towards inclusive education system by September, 2004;
5. Improve access to physical facilities by September 2004; and
6. Supply appropriate teaching and learning materials by March/April, 2004. (Ghana Education Service, 2003).

2.4.2 RESOURCE ISSUES

Apart from teachers' negative beliefs about inclusion and concern for their professional competency to practice inclusive education, resource issues also drew much concern for both teacher groups. Resource issues addressed physical aspects such as inaccessible classrooms to students in a wheel chair, overcrowded classrooms; materials such as Braille and large prints:

"It is really hard for us to manage with the existing resources…as I speak our schools are not accessible to those students in a wheelchair. Our classrooms are overcrowded with one

teacher teaching 50 to 60 students in one class. It is not possible to give individual attention to all these students, including students with disabilities would worsen the learning situation (PST and NPST, 2004).

Research shows that children, who learn together, live together, play together and share resources together and live happily together. This confirms the Salamanca (1994) statement and framework for action which states that: “Regular schools with inclusive orientation are the most effective means of combating discrimination, creating welcoming communities, building an inclusive society and achieving education for all.”

2.5 UNIVERSAL DESIGN OF HOUSES

A truly universally usable house is a goal for the future. Many features in houses today already are or easily can be made universally usable. The universal design concept increases the supply of usable housing by including universal features in as many houses as possible, and allows people to remain in their homes as long as they like" (Mace, 1989).

2.5.1 DEFINITION OF UNIVERSAL DESIGN

Universal design or inclusive design is an approach to the design of products, services and environments which can be used by a variety of people regardless of their age, size or personal requirements. While accessible design requirements are specified by codes and standards relating to specific group of people (those with mobility limitations) and to some particular buildings, the universal design concept targets people of all ages, sizes and abilities and is applied to all buildings (Mace, 1989).

Universal design concerns itself with the life of a facility or building. The hope is that if a facility is well designed with the universal principles, it will easily be accessible and used by

everybody. Universal design- also called trans-generational design- goes beyond disability. It is intended to meet the needs of people with diverse abilities that change throughout their lives. This means that a young child will be able to access and manoeuvre in the environment as well as a tall, healthy, able-bodied standing adult. At the other end of the spectrum, an elderly frail person who might be restricted to a wheelchair or a scooter will also live comfortably in the same environment (Mace, 1989).

The universal design concept does not introduce complex, out-of-the-ordinary features into a design but it is about carefully selecting a building product or feature, placing it differently or omitting it all together in order to create environments that is accessible and can adapt to a variety of people. For example standard electrical receptacles can be placed higher than usual above the floor, standard but wider doors can be selected, and steps at entrances can be omitted or combined with ramps to make housing more universally usable. (Mace, 1989).

According to Gary E White, President of Whitmark Design, Inc. (dba Kitchen & Bath Design), good universal design is invisible, hidden or blended into the aesthetic of the design. The clever designer can find ways to make the necessary physical elements of universal design contribute to the theme of the design rather than looking like bolted on afterthoughts. An example of a good universal design is the Safe Kids' Bath which was designed by Gary E White. In this design he concocted a nautical theme for two boys who live at the beach in southern California. The tub platform was constructed to resemble a yacht. Ocean going boats usually have a rail running around them to prevent people from falling overboard. Therefore the railing of the yacht becomes the grab bar, but its part of the design. This one is lit with fiber optic lighting, it glows and changes colour, drawing even more attention to the one thing

most people are most reluctant to accept. This is just one example of the many elements that are blended invisibly into this design (Mace, 1989). Figure 2.1 illustrates a safe kid's bath.

Figure 2.1 The Safe Kids Bath (Source: White 1998).

2.5.2 UNIVERSAL DESIGN PRINCIPLES

Toward the goal of creating universal environments and products, the following seven principles were developed under the direction of the Centre for Universal Design, North Carolina State University. They are as follows:

1. Equitability
2. Flexibility in use
3. Simple and intuitive use
4. Perceptible information
5. Tolerance for error
6. Low physical effort

7. Size and space for approach and use (Centre for Universal Design, 1989)

These seven principles are explained in detail as follows:

2.5.2.1 Equitability

This means the design should be useful and marketable to any group of users. The same means of use should be provided for all users; this should be identical whenever possible and equivalent when not. Segregation and stigmatizing of any user should be avoided to ensure equitable use. Last but not the least, provision for privacy, security, and safety should be equally available to all (Centre for Universal Design, 1989).

2.5.2.2 Flexibility

The design accommodates a wide range of individual preferences and abilities. For flexibility in use the design should provide choice in methods of use, left-or right-handed access and use should be accommodated. Facilitation of the user's accuracy and precision and provision of adaptability to user's pace is very important when creating a flexible design (Centre for Universal Design, 1989).

2.5.2.3 Simple and intuitive

The design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level. Therefore unnecessary complexities should be eliminated and the design should be consistent with the user's expectations and intuition. A wide range of literacy and language skills should be provided and information should be arranged according to its importance. Another important point is the provision of effective prompting for sequential actions and also provision of timely feedback during and after completion (Centre for Universal Design, 1989).

2.5.2.4 Perceptible information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities. For a particular information to be perceptible different modes (pictorial, verbal, tactile) should be used for redundant presentation of essential information. Provision of adequate contrast between essential information and its surroundings makes information more perceptible. "Legibility" of essential information in all modalities should be maximized and also elements should be differentiated in ways that can be described. (i.e., make it easy to give instructions or directions).Lastly, the design should be compatibility with a variety of techniques or devices used by people with sensory limitations (Centre for Universal Design, 1989).

2.5.2.5 Tolerance for error

The design minimizes hazards and the adverse consequences of accidental or unintended actions. In this light, elements must be arranged to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated or shielded. Warnings of hazards and errors should be provided as well as fail safe features. The design must discourage unconscious action in tasks that require vigilance (Centre for Universal Design, 1989).

2.5.2.6 Low physical effort

The design can be used efficiently and comfortably with a minimum fatigue. To ensure this, the designer must allow the user to maintain a neutral body position and use reasonable operating forces. Repetitive actions and sustained physical effort should be minimized as much as possible. (Centre for Universal Design, 1989).

2.5.2.7 Size and space for approach and use

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture and mobility. Provision of a clear line of sight to important elements for any seated or standing user is important. All components should be within comfortable reach for any seated or standing user. Variations in hand and grip size must be accommodated and also adequate space must be provided for the use of any assistive device or personal assistance (Centre for Universal Design, 1989).

It must be acknowledged that the principles of universal design in no way comprise all criteria for good design, only universally usable design. Certainly, other factors are important, such as aesthetics, cost, safety, gender and cultural appropriateness, and these aspects should be taken into consideration as well when designing (Centre for Universal Design, 1989).

2.6 ACCESSIBILITY

Accessibility is a general term used to describe the degree to which a product (e.g., device, service, and environment) is accessible by as many people as possible. Accessibility can be viewed as the "ability to access" the functionality, and possible benefit, of some system or entity. Accessibility is often used to focus on people with disabilities and their right of access to entities, often through use of assistive technology. Several definitions of accessibility refer directly to access-based individual rights laws and regulations. Products or services designed to meet these regulations are often termed 'Easy Access or Accessible'. (Fange and Iwarsson 2003)

Accessibility is not to be confused with usability which is used to describe the extent to which a product (e.g., device, service, and environment) can be used by specified users to achieve

specified goals with effectiveness, efficiency and satisfaction in a specified context of use. (Fange and Iwarsson 2003)

Accessibility is strongly related to universal design when the approach involves "direct access." This is about making things accessible to all people (whether they have a disability or not). However, products marketed as having benefited from a Universal Design process are often actually the same devices customized specifically for use by people with disabilities. An alternative is to provide "indirect access" by having the entity support the use of a person's assistive technology to achieve access (e.g., screen reader) (Fange and Iwarsson 2003).

2.6.1 DIMENSIONS OF ACTIVITIES OF DAILY LIVING

Figure 2.2 indicates dimensions of a wheelchair showing its height, width and length. This helped in the design of door widths, height and position of kick plates at the bottom of doors to aid wheelchair users.

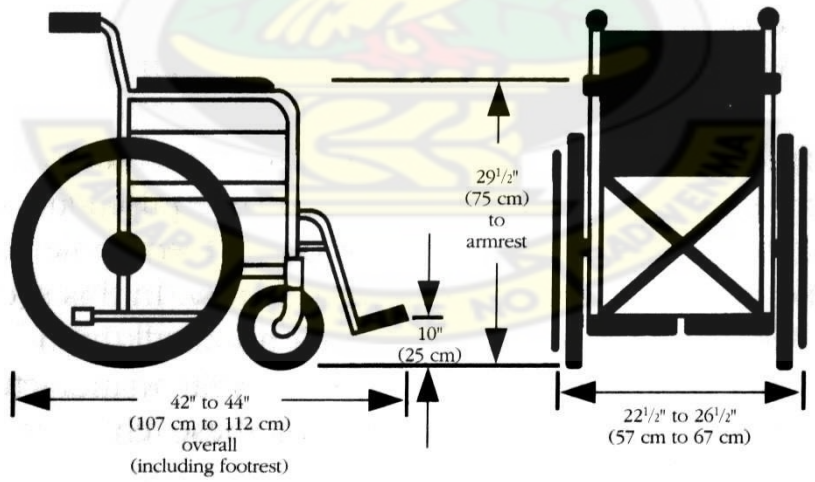

Figure 2.2 Dimensions of a wheelchair (Source: Frechette 1996)

Figure 2.3 illustrates the anthropometrics of a wheelchair user with the required height for armrest, handle, toe, seat, lap and eye level.

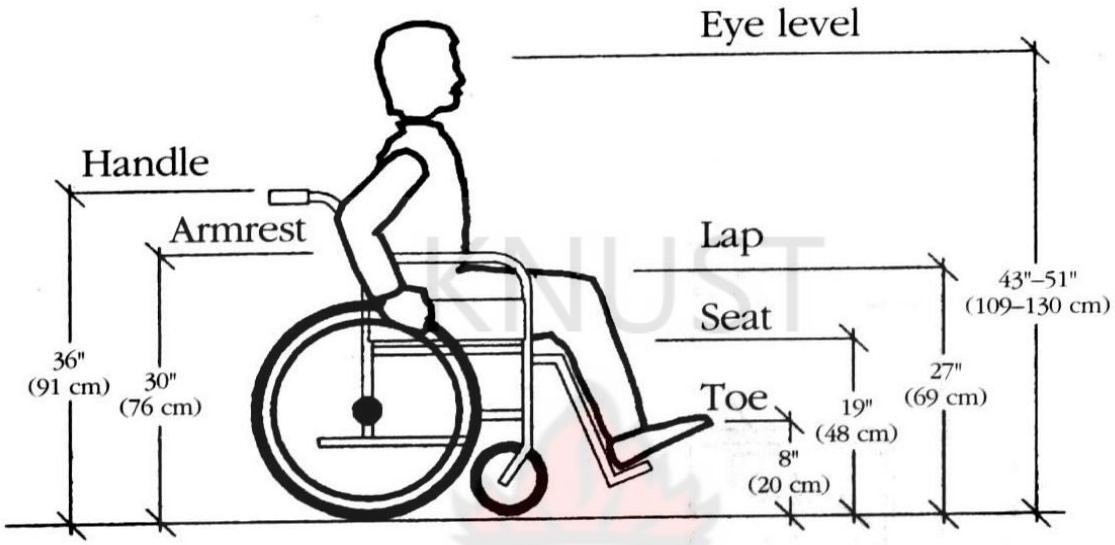

Figure 2.3 Anthropometrics of a wheelchair user (Source: Frechette 1996).

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Figure 2.4 shows diameters of turnaround space for wheelchair represents the required space needed for turning a full circle or negotiating a bend.

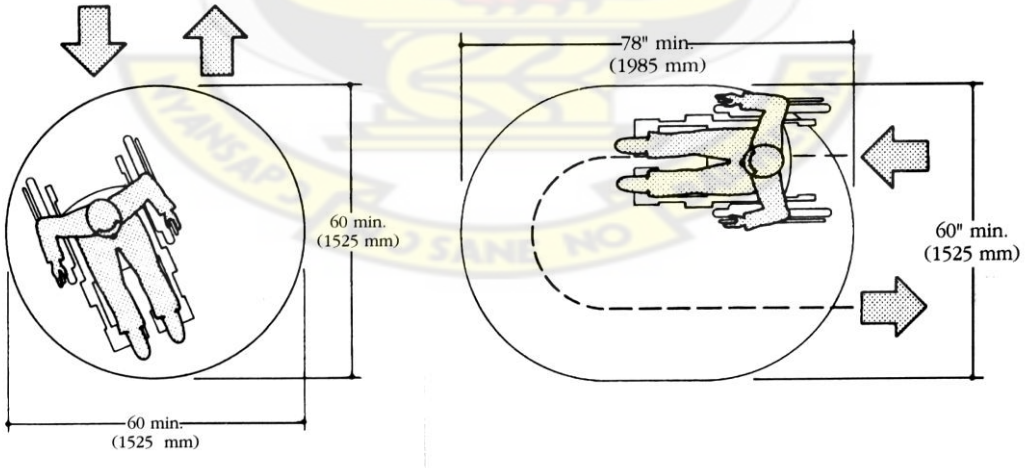

Figure 2.4 Diameter Turnaround space (Source: Frechette 1996).

Figure 2.5 indicates the required dimensions around corners that can be incorporated in design

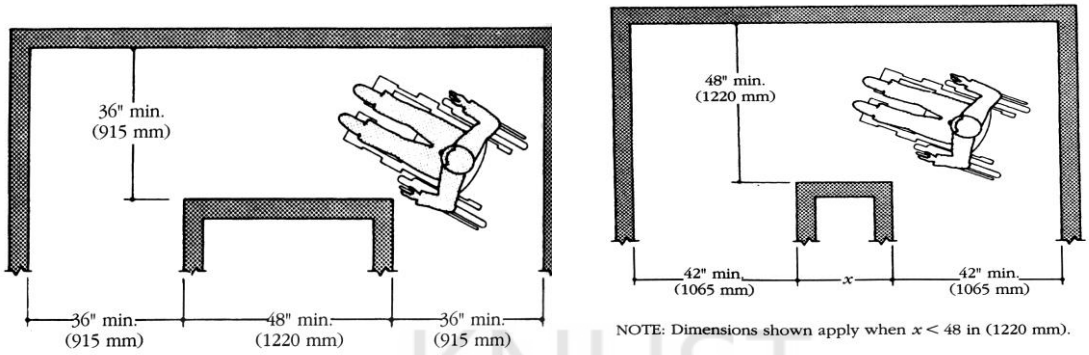

Figure 2.5 Turning within corners (Source: Frechette 1996).

Figure 2.6 and 2.7 Indicate the various heights at which an outstretched arm of a wheelchair user can reach items both on the side and in front.

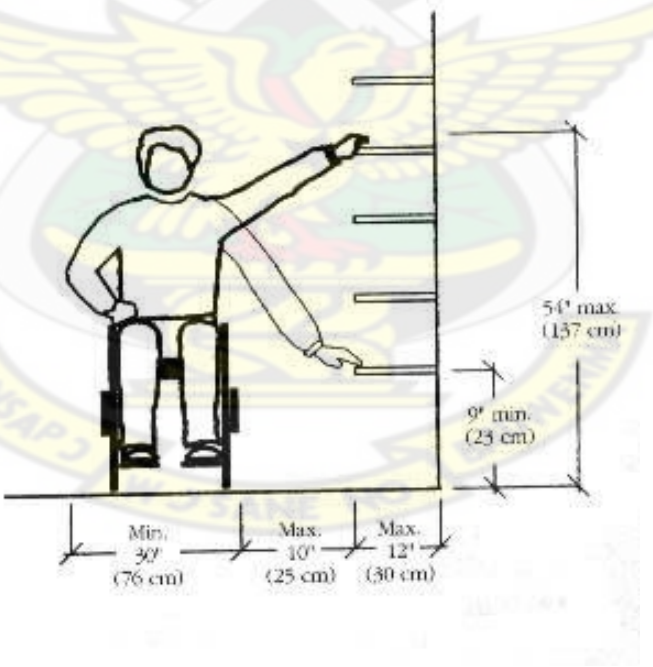

Figure 2.6 Side reach range (Source: Frechette 1996).

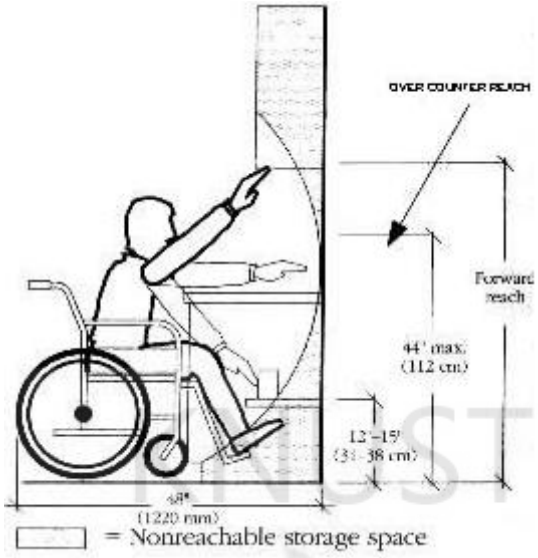

Figure 2.7 Forward reach range (Source: Frechette 1996).

2.6.2 VERTICAL CIRCULATION

Figure 2.8 shows dimensions of length and width of ramps which are required for wheelchair users. Tactile markings on landings helps the visually impaired to know the change in levels.

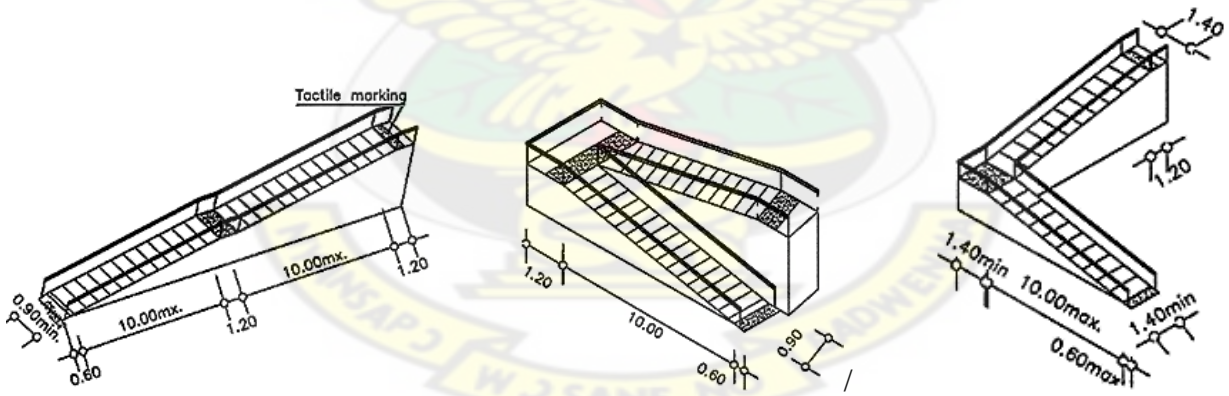

Figure 2.8 Ramp (Source: Neufert 2000).

Figure 2.9 indicate different gradients of ramps showing required and hazardous limits.

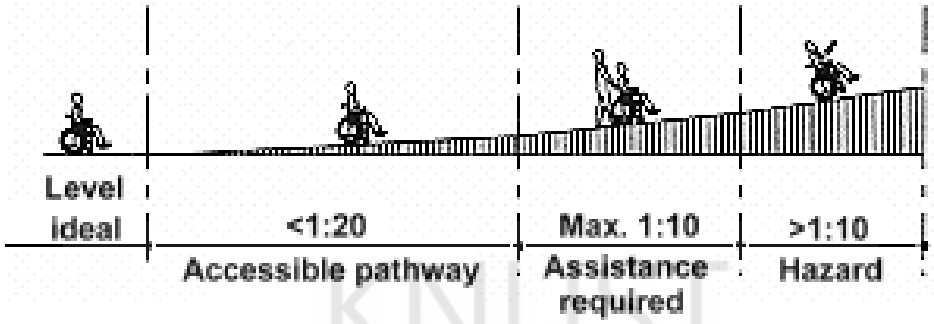

Figure 2.9 Gradient Ramps (Source: Neufert 2000).

Figure 2.10 shows continuous railing and tactile markings also helps visually impaired differences between the stairs and landing.

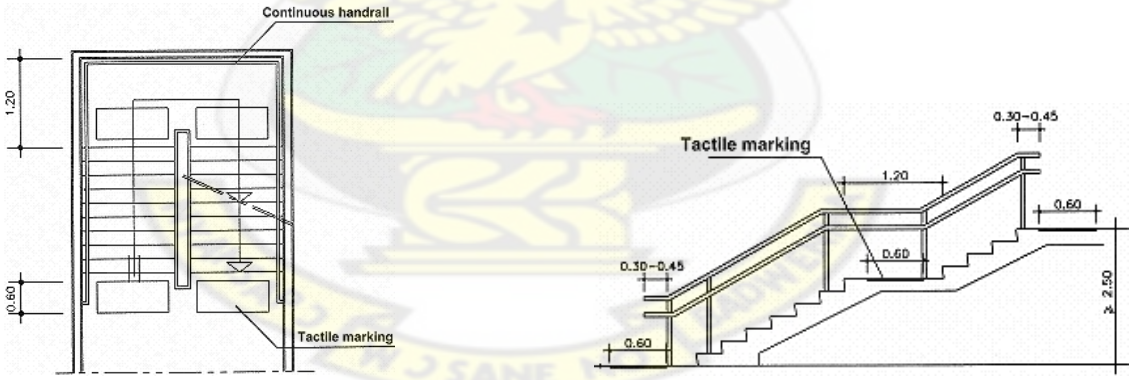

Figure 2.10 Staircases (Source: Neufert 2000).

Figure 2.11 shows stairs with lifts that accommodate wheelchair users.

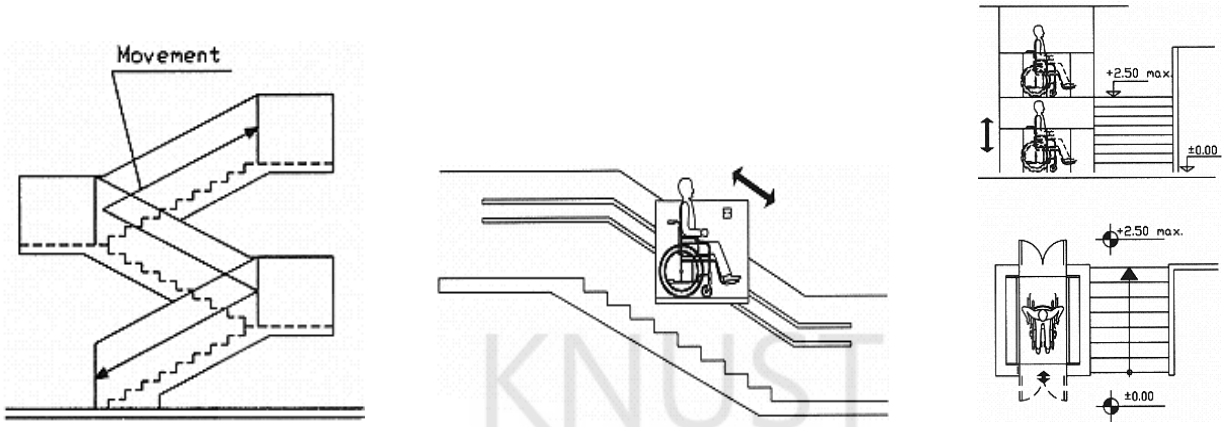

Figure 2.11 Lift stairs (Source: Neufert 2000).

Figure 2.12 shows dimensions of lifts indicating the required width for easy access of a wheelchair user.

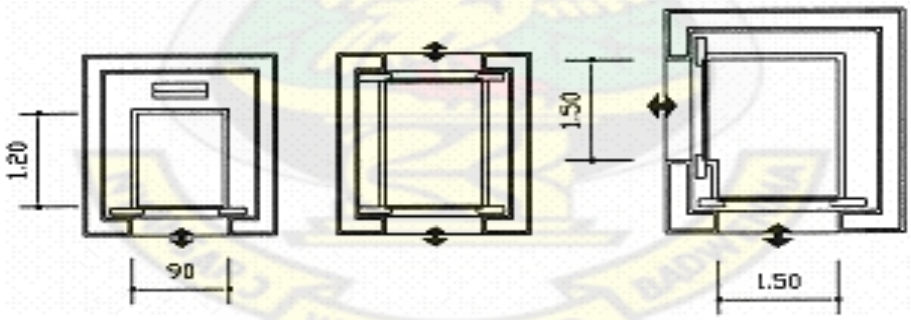

Figure 2.12 Lifts (Source: Neufert 2000).

2.7 ACADEMIC ACCOMMODATIONS FOR STUDENTS WITH DISABILITY

Students who have disabilities, particularly learning disabilities, are a rapidly growing in population on college campuses. Though it is difficult to obtain accurate figures, between 3 and 10 percent of college students report having physical or learning disabilities that require compensatory classroom teaching accommodations (City University of New York Committee for the Disabled, 1988; Project EASI, 1991; Smith, 1989). Such accommodations are neither difficult to provide nor distracting to the rest of the class.

2.7.1 GENERAL STRATEGIES FOR ACCOMMODATION

These are strategies that are mapped out in conjunction with students to address the basic need of accommodation especially with students with special needs.

2.7.1.1 Identification of Special Needs.

At the beginning of each semester, you might make a general announcement: "Any student who feels that he or she may need accommodations for any sort of physical or learning disability, please speak to me after class, make an appointment to see me, or see me during my office hours." When you meet with a student, explain the course requirements and ask what classroom modifications would aid the student. Students are usually their own best advocates, and they know the techniques and adaptations that best suit their needs. (City University of New York Committee for the Disabled, 1988).

2.7.1.2 Equality of Students.

It is natural for able-bodied people to feel hesitant or uneasy when first meeting people who are disabled. But disabled people are neither more nor less emotionally fragile than able-bodied people. Thus you needn't worry about hurting the feelings of a student who is blind by mentioning the word see. Students who are blind "see" ideas or concepts, just as students who are deaf "hear" what someone means and wheelchair users "walk" to class. Offer physical assistance only if a student requests help or if the need is immediately obviously (City University of New York Committee for the Disabled, 1988).

2.7.1.3 Flexibility of Attendance and Promptness.

Students who use wheelchairs may encounter physical barriers in getting to class on time (broken elevators, late van transportation). Other students may sometimes feel fatigued or have difficulty concentrating as a result of their disability or their medication. Try to distinguish students' physical problems from apathetic behavior (City University of New York Committee for the Disabled, 1988).

2.7.1.4 Sensitivity to "non visible" or "hidden" Disabilities.

Three principal types of disabilities may not be immediately visible:

1. Learning disabilities hinder students of average or above-average intelligence from easily and dependably processing various types of information. Dyslexic students, for example, have a perceptual deficit that prevents them from unerringly interpreting sequences of letters or numbers. It is important to realize that learning disabilities are not a reflection

of a student's intelligence, physical or emotional health, or cultural or socioeconomic background. In general, using a variety of instructional modes enhances learning for such students, as it does for all students, by allowing them to master material that may be inaccessible in one particular mode. Most college students will know which forms or modalities of learning work best for them. (City University of New York Committee for the Disabled, 1988; Smith, 1989).

2. Mild to moderate sensory deficits (low-level vision, slight hearing impairment) should be accommodated by appropriate seating and room lighting.
3. Chronic disabilities (diabetes, seizure disorders, cardiac or respiratory conditions, lupus, cancer, AIDS) may interfere with stamina, attention span, and alertness. The attendance and performance of affected students may be erratic, and they may need flexibility in the scheduling of assignments (City University of New York Committee for the Disabled, 1988; Smith, 1989).

2.7.1.5 Students Program for Advice and Guidance.

Staff members can answer questions and provide helpful information about disabilities and academic accommodations.

2.7.2 PHYSICAL ACCESS TO FACILITIES IN AND OUTSIDE OF SCHOOL

This comprises access to facilities in the school, seating needs of students and their aides and access to facilities outside of school by special needs students.

2.7.2.1 Classroom Access.

Most buildings on your campus should have entrances that are accessible to students who use mobility aids (wheelchairs, canes, crutches, and walkers). Individual classrooms and laboratories may differ in their accessibility. Contact your room scheduling office for assistance in obtaining an accessible classroom (City University of New York Committee for the Disabled, 1988).

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2.7.2.2 Seating Needs.

Students who use canes, crutches, or walkers appreciate having a chair or desk that is close to the door. Access to these seats should be flat: no steps, no uneven surfaces. Wheelchair users need flat or ramped access, and classroom tables or desks must have enough clearance for them to get their legs underneath. Lab tables and computer consoles should be set up so that wheelchair users can comfortably reach the equipment (City University of New York Committee for the Disabled, 1988).

2.7.2.3 Availability of Seating for Students' In-Class Aides.

Students who are disabled usually locate and hire their own aides (note takers, lab assistants, readers), often through referrals from the campus disabled students program. You can help, at times, by announcing to your class that a note taker is needed or by referring qualified tutors and lab assistants to students who are disabled. The student and aide will reach their own arrangements about the type of help needed (City University of New York Committee for the Disabled, 1988).

2.7.2.4 Access to Out-Of-Class Activities.

Be sensitive to questions of access when planning field trips, assigning lab and computer work and recommending visits to museums, attendance at off-campus lectures and dramatic presentations, and the like (City University of New York Committee for the Disabled, 1988).

2.7.3 STRATEGIES TO HELP DISABLE STUDENT TO PARTICIPATE IN CLASS

The under listed are some of the strategies to be employed to help disabled students to participate in class.

2.7.3.1 Classroom Participation or an Alternative Activity.

Students who cannot raise their hand to answer or ask questions may feel isolated or ignored in class. During your first private meeting with such a student, ask how he or she wishes to be recognized in the classroom. Some students will want to be called on; others may prefer to meet periodically with you before or after class to ask questions about course content (Smith, 1989).

2.7.3.2 Address the Student, not the Student's Aide or Interpreter.

In talking to deaf or hearing-disabled students, acknowledge the interpreter's presence but look at and address the student. When talking to a student in a wheelchair for more than a minute or two, it is best to sit down so that you can talk at eye level (Smith, 1989).

2.7.3.3 Repetition of Comments or Questions from Participants.

When a student is speaking out of the range of vision of a deaf or hearing-disabled student, repeat the question or comment and indicate who is speaking (by motioning) so the student can

follow the discussion. To accommodate students with visual disabilities, identify by name the student who is speaking or identify the person to whom you are speaking (Smith, 1989).

2.7.3.4 Attentive Listening to Students with a Speech Disability.

Do not finish a student's sentences or interrupt. Never pretend to understand if you are having difficulty doing so. Instead, repeat what you have understood and allow the student to respond (National Center for Access Unlimited, 1992).

2.7.3.5 Options for Oral Presentations.

Oral presentations may pose difficulties for students who have speech disabilities. Students who wish to give their presentation without assistance should be encouraged to do so. But some students will want to give the presentation with the help of an interpreter, and others may want to write out their presentation and ask an interpreter or another student to read it to the class. (National Center for Access Unlimited, 1992).

2.7.4 WRITTEN MATERIALS AND EXAMINATIONS

The primary source of learning materials for students are in written form and this is not easily appreciated by especially visually impaired students. The following are alternative means of providing learning and examinations materials for students who cannot read written materials.

2.7.4.1 Adequate Academic Help for Students to Succeed in Class.

Although a student may have an in-class aide (a note taker, sign- language interpreter, amanuensis), these aides are not academic tutors. Students with learning disabilities can often benefit from ongoing tutorial assistance.

2.7.4.2 Availability of Computer Disks to Students.

If you prepare your syllabus, assignments, or handouts on a computer, give copies of the disk to students who might need them. Students who are blind or partially sighted can take the disk to an adaptive computer that will prepare copy in Braille. If your campus is networked, you may be able to send the material through electronic mail, eliminating the need for disks. Use a computer or photocopying enlarger to prepare large-type hard copy versions of your reading lists and other handouts for students who are partially sighted.

2.7.4.3 Computer Literacy

Students with learning disabilities and students with reduced manual dexterity can benefit from drafting and revising their papers on a computer. Students with dyslexia and similar information-processing disabilities should be encouraged to use computers that have spell-checking features or to work with a proofreader or editor during the preparation of their final copy. Students who are partially sighted can use large point sizes on their computer screen and then reformat the text when they print out their papers.

2.7.4.4 Appropriate Test-Taking Conditions.

Federal law mandates academic accommodations. Some students with physical or learning disabilities may need one or more of the following kinds of accommodations to complete their examinations:

1. An in-class aide to read the test orally or to take down the student's dictated answers to examination questions.

2. A separate room that provides better lighting or fewer distractions or that houses special equipment (computer console, video magnifier, text-to-speech converter).
3. An extended examination period to accommodate a student's slower writing speed or need to dictate answers to an aide or to equalize a student's reduced information-processing speed.
4. Option of substituting an oral examination for a written examination, or a written examination for an oral examination, or a multiple-choice examination for an essay examination.
5. Option of having examination questions presented in written or oral form.

You and the student should agree early on how the student's progress in the course will be evaluated.

2.7.5 ASSISTIVE INSTRUCTIONAL TECHNOLOGY

The under listed are some of the assistive instructional technology measures that can be explored and implemented to aid in learning of students with various forms of impairments.

2.7.5.1 Availability of Technological Aids in the Institution

For example, some campuses have talking calculators, speech-activated computers, Braille workstations, and reading machines for use by students who are blind or visually disabled. One university has experimented with "stenocaptioning," a stenography machine hooked up to a computer for helping students with hearing disabilities read from the computer as the lecturer speaks ("New Technology Boosts Hearing- lmpaired Students, 1992).

2.7.5.2 Availability of Adaptive Computer Equipment.

Check with your disabled students program or your computer center for information and advice. Adaptive technologies for people with mobility disabilities include modifications of keyboards, mouth sticks and head wands for striking keys, and floppy disk guides that make it easier to handle disks. For students with visual disabilities, equipment includes speech synthesizers, Braille or large-print output devices, and screen-reading programs. Students with learning disabilities can benefit from special software. (Berliss, 1991) offers advice and information for making computer laboratories and equipment accessible.

2.7.5.3 Close Captioned Films or Videos

Check with your media center about the Captioned Films Program, which distributes captioned theatrical, short subject, documentary, and educational films (Smith, 1989).

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CHAPTER THREE

METHODOLOGY

3.1. INTRODUCTION

In order to gather authentic data for documentation, analysis, discussions and recommendations for the write up and design the author used the methodology below to facilitate the completion of the research.

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3.2. PRIMARY SOURCES OF DATA

This source of data collection enabled the author to get a first-hand experience of situations on the ground by conducting interviews, taking measured drawings, personal observations and photographs.

3.2.1 Interviews

As part of three different case studies conducted, I interviewed the heads of the various institutions to ascertain the challenges they as well as some of the able and disabled students' encounted. I further interviewed some able and disabled students to know how easy or challenging it was to access the facilities in their respective institutions. This ,however, brought to light what they were lacking and how certain facilities provided were either meeting their intended use or otherwise.

3.2.2 Measured Drawings

Measured drawings were made of the following schools: Edwenase Rehabilition Centre, Akropong School for the Blind and Accra Technical Training Centre to enable the author assess the spaces in terms of accessibility requirements.

3.2.3 Personal Observations

Sketches were made of peculiar details that the author could not capture in the measured drawings. Some were also written down by merely observing and cross referencing with the standard requirements.

3.2.4 Photographs

Photographs were taken to get a vivid representation of distinct features of the physical structures being used by both the able and disabled students and the activities undertaken in the various institutions.

3.3 SECONDARY SOURCES OF DATA

Books, journals and the internet served as secondary sources of data to complement the information gathered from the primary sources because they were inadequate.

3.3.1 Books

A wealth of information was gathered from books on accessibility, barrier free designs and technical data. This served as an eye opener because a lot was discovered that hitherto was relatively unknown to the author.

3.3.2 Journals

Additional information was sourced from statistics and articles on persons with disability in Ghana and around the world.

3.3.3 Internet

The bulk of information I used especially for my literature review was sourced from different websites. Also published articles, journals and other research findings related to my topic proved a worthy source of information.

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CHAPTER FOUR

FINDINGS AND ANALYSIS

4.1. INTRODUCTION

This chapter presents the findings and analysis of three case studies of vocational and technical schools in Ghana. Two of the schools; Edwenase Rehabilitation Centre and Akropong School for the Blind were purposely designed for persons with disability whereas the third, Accra Technical Training Institute was built for 'able' bodied students but with certain provisions made to accommodate the needs of the 'disabled'. Each case study was conducted under four thematic areas namely main spatial features, courses offered, architecture and planning, spatial configuration and circulation.

4.2 EDWENASE REHABILITATION CENTRE (INTEGRATED)

4.2.1 Location of Institute

Figure 4.1 shows the main entrance of the institute with the surrounding vegetation, pedestrian access, driveway and parking.

Figure 4.1 – Exterior view of school

Edwenase Rehabilitation Centre is located in Edwenase a suburb of Kwadaso area council in the Kumasi metropolis. The school is boarded by the main Kwadaso –Agric road, the Kwadaso Agricultural Extension College and the Edwenase and Ohwimase communities. It admits students with varied disabilities such as the mobility impaired, the hearing impaired and the visually impaired.

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4.2.2 Reasons for Study

It is the only rehabilitation school in Kumasi which practices integration. Integration is a system where students with different disabilities study and live together.

4.2.3 Main Spatial Features

The main spatial features in the school are an Administration block, Classroom/workshops, Assembly hall/Dining hall, Master's bungalow, Dormitory, Masters Flats

4.2.4 Programs Offered

The programs offered in the school include rural craft, dressmaking/tailoring, hairdressing, shoemaking, catering, and agriculture (snails, crops).

4.2.5 Site Layout and Forms of Buildings

Figure 4.2 shows the site layout indicating the various structures that make up the institute and how they have been planned.

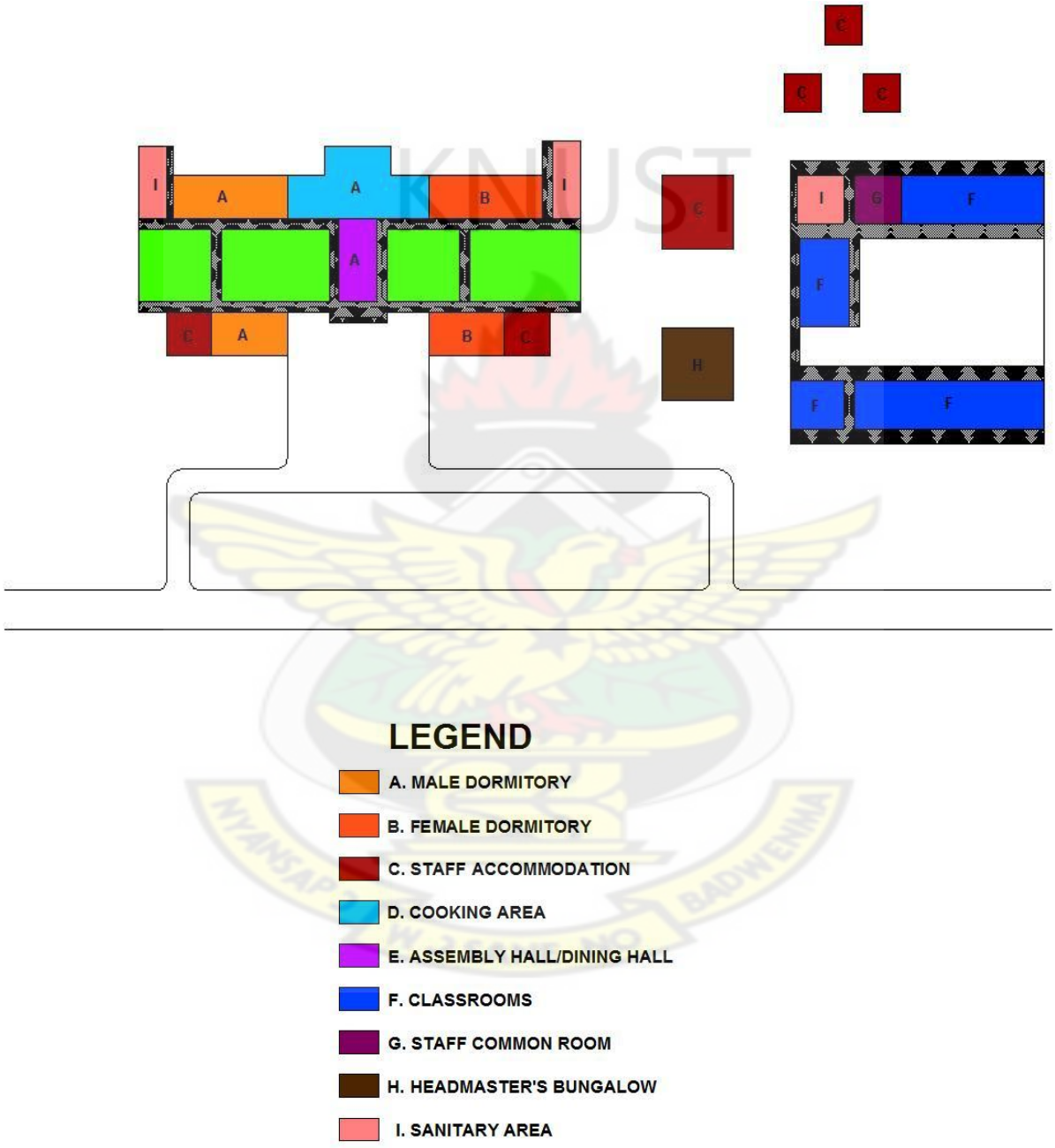

Figure 4.2 – Site layout of Edwenase Rehabilitation Centre.

The buildings are rectilinear forms or rectilinearly shaped and built to create a courtyard. The whole facility is single storey and this avoids the use of flight of stairs which aids in easy access of all the spaces especially by the mobility impaired.

4.2.6 Spatial configuration

The assembly hall doubles as a dining hall and straddles the male and female dormitory forming an enclosed court. By virtue of its position and proximity of about 10m reduces commuting distance of students. An average of 60 students occupies 206sqm of dormitory space. This is adequate considering the ratio of student to floor area.

The proximity of housemasters/mistress accommodation 12m away from students' dormitories helps in the supervision of students. Classroom block about 15m away from dormitories makes commuting distance short especially for mobility impaired students.

Figure 4.3 and 4.4 show the spatial configuration of a typical dormitory and courtyard of classroom respectively.

Figure 4.3 – Interior view of dormitory

Figure 4.4 – Classroom block

4.2.7 Circulation

The covered walkways that link dormitory and assembly/dining hall protect both students and teachers from the vagaries of the weather. The use of ramps connects the walkways and facilities aid in accessibility especially to mobility impaired students.

Figure 4.5 and 4.6 show the covered walkways and ramps that connect walkways respectively.

Figure 4.5 – Covered walkways

Figure 4.6 – Walkways connected by ramp

4.2.8 Merits of school design and layout.

The merits of the school design and layout include the following:

1. The trekking distance is minimal because the dormitory is 15m away from the classroom block. Mobility impaired students are however spared the ordeal of travelling a longer distance to access these facilities on a daily basis.
2. The concept of integrating both ‘able’ and ‘disabled’ students helps students to mix well and eventually enables them fit well into the society after training.
3. The housemasters/housemistresses residence located 12m away from students’ dormitory also reduces trekking distance for both students and housemasters/housemistresses.

4.2.9 Demerits of school design and layout.

The demerits of the school design and layout include the following:

1. There are no clearly defined links or walkways between dormitories and classrooms. The absence of defined links makes access difficult for students.
2. Ramps in the school are rather steep with a ratio of 1:8 hence access becomes a bit challenging especially for mobility impaired students.
3. The absence of guard rails on ramps makes it challenging for mobility impaired students.
4. The lack of grab bars in the sanitary area makes it difficult for visually and mobility impaired students to use them.

4.2.10 Conclusion

Even though the facility was designed for the physically challenged it leaves much to be desired. Ramps and walkways do not conform to the standards hence making their commuting from one space to another much difficult.

4.3 AKROPONG SCHOOL FOR THE BLIND

4.3.1 Location and Background History

The school is located in Akropong-Akwapim in the Eastern Region. It was established in 1945 and presently has a student capacity of three hundred. Students admitted are mild and severe blind. The school trains students for the Presbyterian Training College and Okwapiman Secondary School. It also has a rehabilitation centre for blind adult and a counselling department which teaches mobility orientation. The computer department uses a special software known as voice software. Figure 4.7 shows the main entrance with its long driveway into the school with the surrounding vegetation and pedestrian access.

Figure 4.7 – Main entrance into the school

4.3.2 Reasons for Study

The school was purposely designed for the visually impaired. It offers both vocational and technical training which is in consonance with this design thesis.

4.3.3 Main Spatial Features

The main spatial features comprise an Administration, Male/female dormitory, Dining hall/assembly hall, Classroom block, Vocational department and Masters/mistresses residence.

4.3.4 Programs Offered

The programs offered include Basketry and weaving, Grammar related courses, Woodwork, and Music.

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4.3.5 Site Layout and Forms of Buildings

Figure 4.8 presents the site layout which indicates the various structures that make out the institute and how they are interrelated.

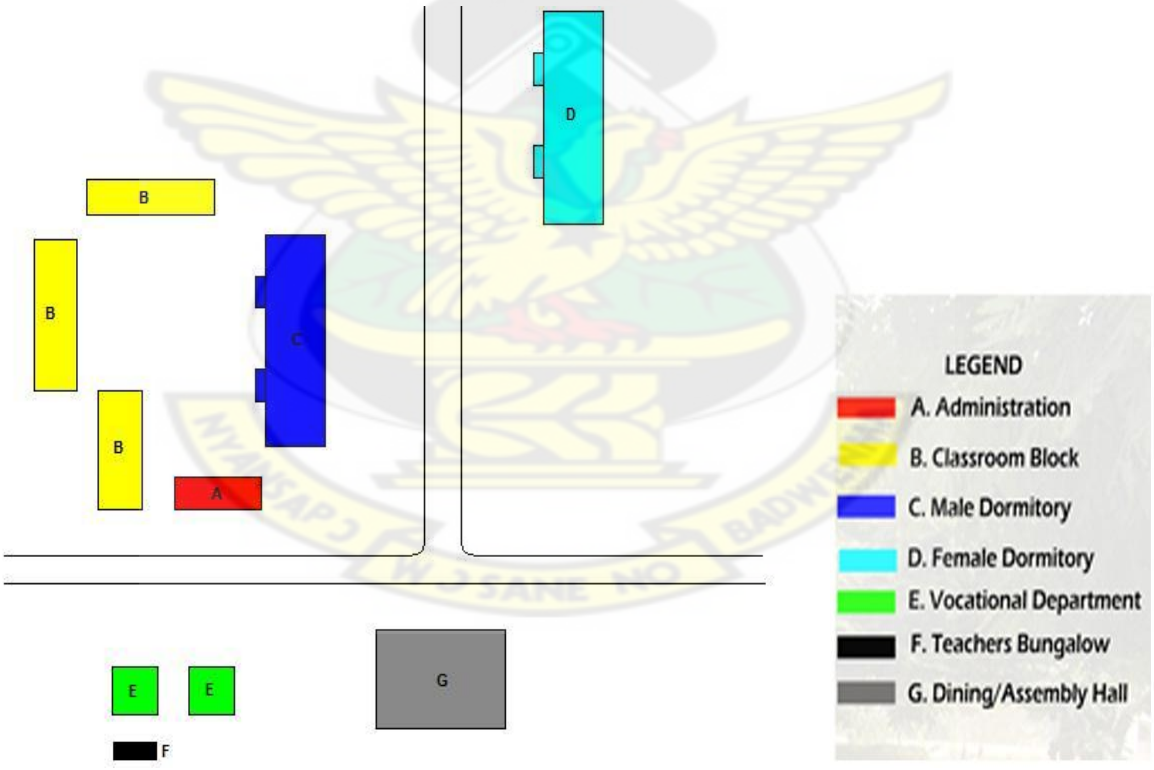

Figure 4.8 – Site layout of Akropong School for the Blind.

The positioning of the classroom block, administration and boys dormitory forms a courtyard which serves as an interactive space because of the lawns and walkways that link the various facilities. Students are accommodated in two storey dormitories.

There is an extensive use of staircases rather than ramps for vertical circulation because they are preferred by the visually impaired. Screed treated walkway makes it easy for commuting of students because of its non-slippery nature. The separation of classrooms and workshops prevents conflicts in activities.

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4.3.6 Spatial Configuration

The use of rectilinear forms is predominant in the school. The basic classroom unit covers an area of 48 sqm. All columns flush with walls to prevent students from bumping into them. Verandas are boarded by balustrades which guide students and also prevent them from falling over. Figure 4.9 and 4.10 shows the predominantly rectilinear forms in the school and metal balustrades which serves as guide and safety element in the school respectively.

Figure 4.9– Rectilinear forms dominant.

Figure 4.10 – Balustrades serve as guide and safety.

4.3.7 Circulation

Walkways made of screed connect the classrooms, dormitory and administration. The rough nature of the screed provides a firm and non-slippery surface for commuting even in instances of rain. The position of dining hall and workshops across the arterial road through the school poses a danger to students when crossing. Ramps have been used to connect walkways in workshops due to their elevated level. Vertical circulation is made possible by the use of stairs in dormitory, administration and classrooms. Figure 4.11 and 4.12 shows walkways that link facilities and ramps that connect walkways in workshop respectively.

Figure 4.11–Walkways connect facilities

Figure 4.12 – Ramps connect walkways in workshop

4.3.8 Merits of school design and layout.

The merits of the school design and layout include the following:

1. Columns and windows are made to flush with the walls to protect students from bumping into them.
2. Balustrades on verandas prevent students from falling over.

4.3.9 Demerits of school design and layout.

The demerits of the school design and layout include the following:

1. Location of dining hall and workshop across the arterial road in the school poses grave danger to the students since they risk been knocked down by vehicles.
2. Open drains in the school also pose a threat to the daily commuting in the school.
3. Location of the borehole is too farther away from dormitory and the absence of clearly demarcated walkway compels students to walk on the street to fetch water. This exposes them to cars driving in and out of the school.
4. There are no tactile markings on the walkways and especially in front of stairs and ramps to alert and guide students on a change in level and orientation.

4.3.10 Conclusion

Though the school was purposely designed for the blind certain basic details like tactile markings and walkways are missing. Wrong positioning of dining hall and workshops puts students in danger rather than protecting them. Open drains should be covered in order to prevent students from falling into them. A borehole should be provided close to the dormitory to reduce trekking.

4.4 ACCRA TECHNICAL TRAINING CENTRE

4.4.1 Location

Accra Technical Training Centre is located in Kokomlemle opposite the Challenge bookshop. It was established by a Canadian firm and is one of the foremost technical institutions in the country. Figure 4.13 shows a panoramic view of the school.

Figure 4.13 – Panoramic view of the school

4.4.2 Reasons for Study

First, to know what goes into a purposely built technical school with respect to layout and spatial requirement. Secondly, to ascertain whether the needs of persons with disability was considered during design stage or post construction of school.

4.4.3 Main Spatial Features

The main spatial features include the Administration, Workshops, Cafeteria, Assembly hall, Classrooms, Assembly hall, Library and the Teacher's bungalow.

4.4.4 Programs offered

The programs offered are Draughtsmanship, Building construction, Welding, Painting, Electricals and Electronics. Others are Refrigeration, Carpentry and Joinery, Auto Body, Auto Mechanics, Industrial Maintenance, Textile and Garment Training.

4.4.5 Site Layout and Forms of Buildings

Figure 4.14 illustrates the site layout indicating the various structures that make up the institute and how they are interrelated.

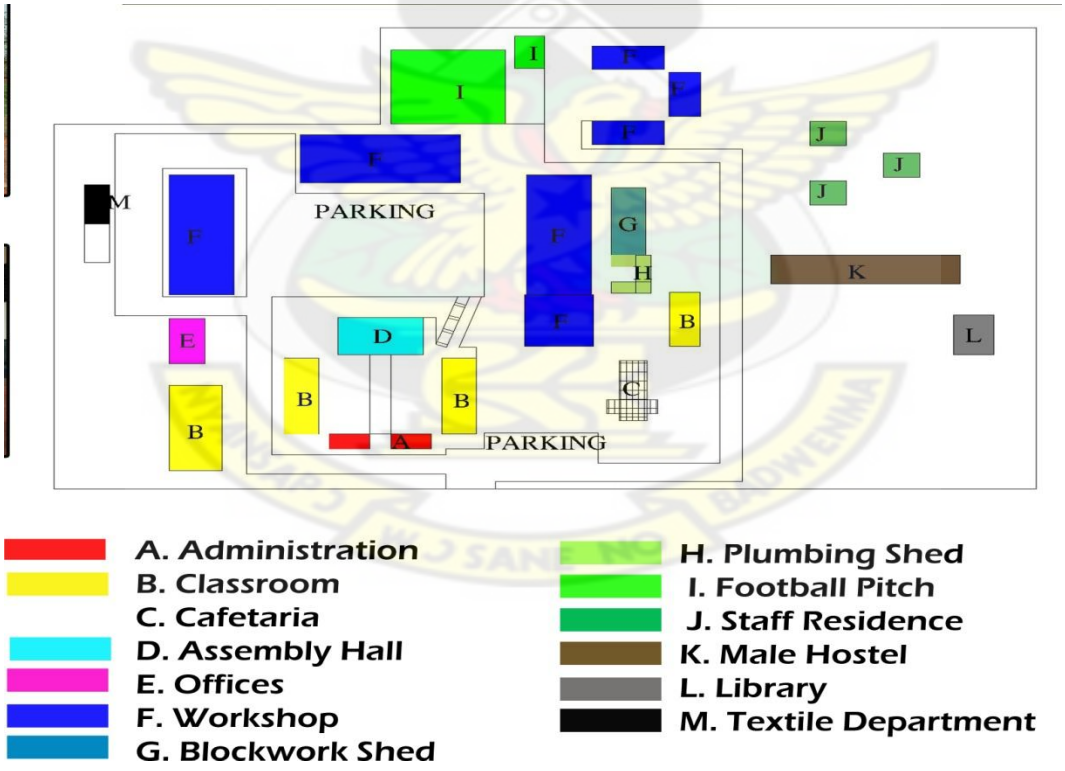

Figure 4.14 – Site layout of Accra Technical Training Institute

There is an extensive use of rectilinear forms in the school. The administration block is flanked by two classroom blocks with assembly hall at the rear forming a courtyard. The workshop buildings also enclose a courtyard behind the assembly hall. The classroom blocks are mainly single storey but with one block as three storeys. The end walls have been clad with stone facing.

4.4.6 Spatial configuration

The basic classroom unit has an area of 48 sqm and accommodates about 25-30 students in each class. Classrooms are punctured by continuous horizontal bands of window and 2m veranda which provides adequate shading for the windows. The workshops have similar spatial configuration but covers a wider area of about 150 sqm. They have classrooms and technician's office on the mezzanine floor. Figure 4.15 and 4.16 shows interior view of a typical classroom and interior of a typical workshop respectively.

Figure 4.15 – Interior view of typical classroom.

Figure 4.16 – interior view of typical – workshops.

4.4.7 Circulation

Facilities in the school are linked by screed walkways and tarred roads. The only covered walkway links the administration block and the assembly hall. Staircases are the main elements

used for vertical circulation in the spaces. Ramps compliment stairs at certain portions of the school but not the main circulation element. Ramps have also been used at entrances to workshops. Figure 4.17 and 4.18 shows ramps used in conjunction with stairs and ramps used at entrance of workshops respectively.

Figure 4.17 – Ramps used in conjunction with stairs. Figure 4.18 – Ramps used at entrance of workshops.

4.4.8 Merits of school design and layout.

The merits of the school design and layout include the following:

1. Clearly defined layout of classrooms, workshops and administration. These are all linked by walkways making movement and orientation fairly easy for students.
2. Large and continuous windows of classrooms and workshops provide adequate light and ventilation in the spaces.
3. Classrooms and workshops are well shaded from the direct ingress of sunlight because of the North-south orientation and use of wide overhangs.

4.4.9 Demerits of school design and layout.

The demerits of the school design and layout include the following:

1. Even though ramps have been provided, they do not conform to the standard of 1:12 but rather 1:8. This makes it difficult and dangerous for persons with mobility impairment especially.
2. The absence of handrails on ramps also makes them difficult to be accessed by persons in wheelchairs.
3. The classrooms and workshops are inaccessible to wheelchair users because of the use of stairs rather than ramps or lifts.
4. The absence of tactile markings on walkways and staircases in the school does not favour the visually impaired in finding their way around.

4.4.10 Conclusion

Though the school was not designed purposely for the physically challenged, attempts have been made to introduce ramps at entrances of classrooms and workshops.

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CHAPTER FIVE

THE PROPOSED INCLUSIVE VOCATIONAL AND TECHNICAL SCHOOL DESIGN

5.1 INTRODUCTION

This chapter details the design response of the proposed Inclusive Vocational and Technical School in Sokwai. It starts with an analysis of the site used for the design and how conditions both on and around it influenced the eventual outcome of the school. It further illustrates the step by step design process of how the design evolved with respect to design parameters of an inclusive school.

5.2 THE DESIGN SITE

This section highlights the location of the site, adjoining sites and settlements, justification of choice of site, site analysis and physical studies. Others include strengths, weaknesses, opportunities and threats of the site.

5.2.1 Location of Site

The site is located in Sokwai 20 km north-east of Kumasi in the Atwima Nwabiagya district of the Ashanti Region. It covers an area of 36,652.2 sqm which is equivalent to 9 acres. The site is located on latitude -6° 75' N and longitude 1° 45' W.

Figure 5.1 shows the exact site location, its extents, adjoining sites and settlements.

Figure 5.1 Base map

(Source: Town and Country Planning Department, Atwima Nwabiagya District Assembly 2002)

5.2.2 Site Selection Justification

Proximity of the site to Kumasi will aid in the transfer of technical know-how from already existing institutions in Kumasi. Also its proximity to Kumasi provides ready market for products generated in the school. The establishment of the school has the potential of facilitating development of rural economy.

5.2.3 Site analysis

Figure 5.2 illustrates the site layout. It indicates the direction of slope, good and bad views, direction of the wind, areas of noise, and position of overhead electric pole.

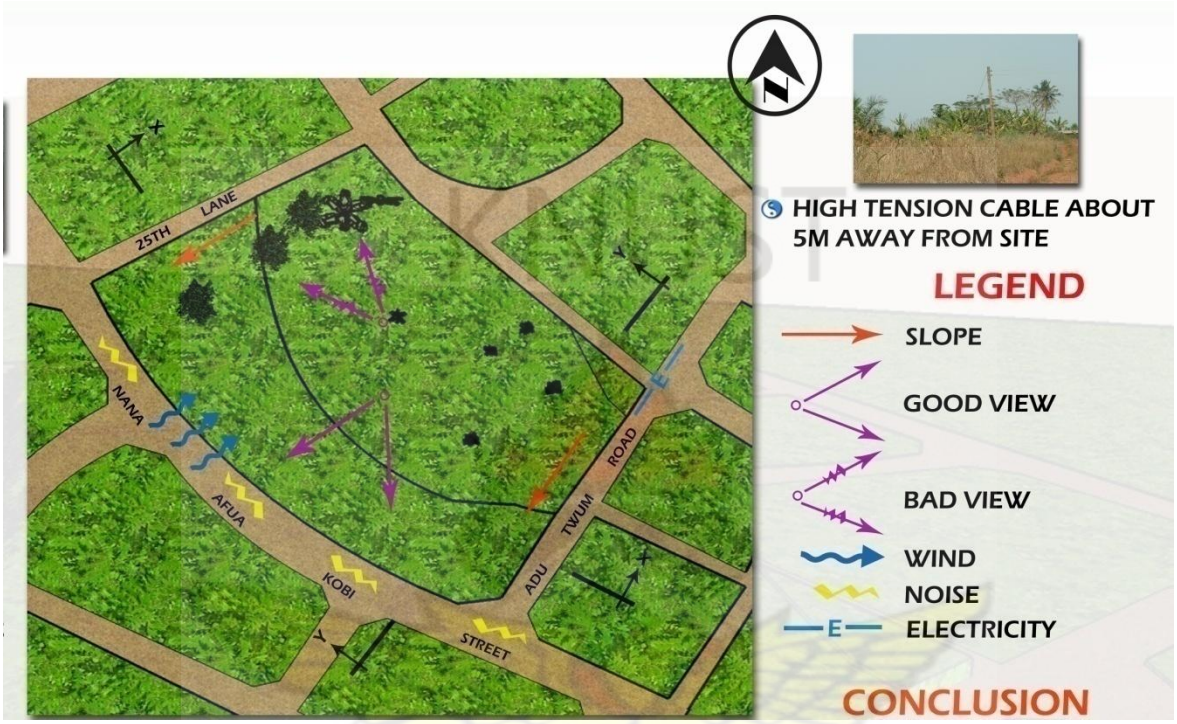

Figure 5.2 Site layout.

5.2.4 Physical Studies

5.2.4.1 Geology of Site

Figure 5.3 shows the soil type which is compact laterite on the site.

Figure 5.3 Compact laterite on site.

The soil is mainly compact laterite but suffers from erosion because of the sloppy nature of the site which has also been left to the vagaries of the weather. Compact laterite serves as good base for foundation relative to other soil types such as sand and clay.

5.2.4.2 Topography of Site

Figure 5.4 shows sections through site to indicate the different directions of slope. The site slopes gently towards the south-eastern and south-western directions. The slope can be taken advantage of by channelling drains into septic tank.

Figure 5.4 Section of site

5.2.4.3 Vegetation of Site

The site is covered by grass, bamboo, plantain and cassava plants and some trees. The presence of vegetation is indication of capacity of soil to support soft landscaping such as lawns and trees if the need arises. Figure 5.5 shows the different kinds of vegetation found on the site.

Figure 5.5 Vegetation on site

5.2.4.4 Climate of Site

The climate is hot and humid with annual amount of rainfall varying from about 1750mm(70in) to more than 2500mm(100in). Wide continuous windows are to be used to ensure proper ventilation of spaces because of the hot and humid climate of the locality. Wide roof overhangs will also be used to prevent out rain and solar ingress because of rainfall pattern and low incidence of the sun.

5.2.5 Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis

5.2.5.1 Strengths

The strengths of the site are as follows:

1. The proximity of the site to Kumasi will aid in the transfer of technical know-how from already existing institutions in Kumasi such as Kumasi Technical Institute.

2. The site is relatively flat.
3. The green vegetation on site is indicative of its ability to support soft landscaping.

5.2.5.2 Weakness

The weaknesses of the site are as follows:

1. The roads bordering the site are untarred hence extra cost to be incurred to construct them.
2. The absence of drainage lines on the site and in the locality would also increase cost of construction.
3. The absence of laid out telephone lines and portable water on the site and in the locality is an indication of low development.

5.2.5.3 Opportunities

The opportunities of the site are as follows:

1. The Sokwai community can accommodate some of the staff residences of the school because of availability of fallow lands.
2. Roads around site could be tarred.
3. The gentle slope of the site could be taken advantage of by laying drainage channels to discharge waste water and sewage.
4. Borehole could be dug on the site due to lack of portable water in the community.
5. Electricity could easily be connected to the site because the main community electricity transformer is about 120m away from site.

5.2.5.4 Threats

The threat of the site is:

1. The site has been badly eroded because of its fallow nature.

5.3 General Design Layout of School

The first step in the design of the layout was to group similar functions together. This called for the zoning of the site into two main areas of academic and domestic. The academic area comprises administration, library, classrooms, workshops, and multipurpose hall whereas that of the domestic are student accommodation, staff accommodation, dining hall and recreational area. This decision was necessitated by the avoidance of conflict of different facilities being at odds rather than in harmony with each other. I further decided to use simple and logical rectilinear forms for the structures rather than irregularly shaped forms to help ease movement on site.

The academic area covers the north-eastern and south eastern part of the site whereas the domestic area covers its opposite direction: the north-western and south-western. The main access to school is from the Nana Afua Kobi Street which is the main access road in front of the site. The administration which is the first point of call straddles the site and has an orientation which is necessitated by the approach into the site. The administration is oriented in the north-east and south-west direction. This is contrary to other facilities which are on site that have a north-south orientation.

At the heart of the site is a pseudo-park with a water feature surrounded by seating, trees and walkways. This particular space is intended to be the hub of the school to serve as an

intermediary between the academic and domestic areas. It is not a clearly defined space for a particular activity but rather different activities. It could serve as a place for group discussions, personal retreat, meetings, performances, snacking, games, and a host of other events. The water feature will help all students in general and the blind in particular by giving them a sense of orientation. It will also enhance the micro climate in the school. Figure 5.6 illustrates the site layout of the buildings and how they are interrelated.

Figure 5.6 Site layout of Inclusive Vocational and Technical School.

5.3.1 Circulation

Simple and logical circulation pattern was adopted for the circulation routes in the school to make it easy for students to commute from one point to the other. In addition to this, different types of tactile markings are used for stairs, ramps and lifts. This is to aid students especially the blind to differentiate between the different types of vertical circulation in the facility. Corridors and walkways are wide enough to aid movement of students especially wheelchair users.

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5.3.2 Ramp

Figure 5.7 illustrates a typical ramp with a wrap-around railing and tactile markings on landings to aid wheelchairs users and blind students.

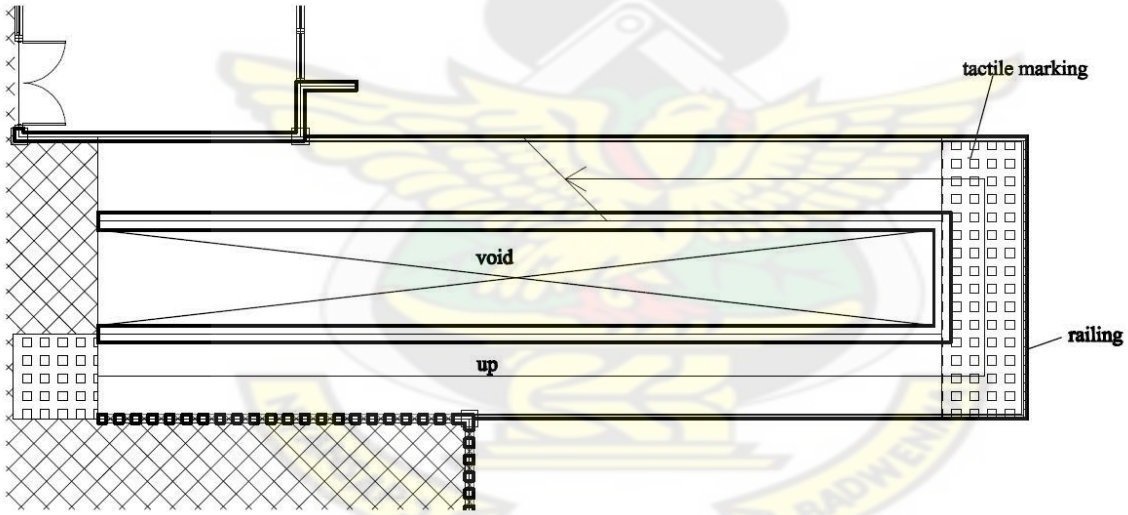

Figure 5.7 Plan of ramp

5.3.3 Staircase and Lift

Figure 5.8 shows a staircase with a lift within its chase and tactile markings on the landings

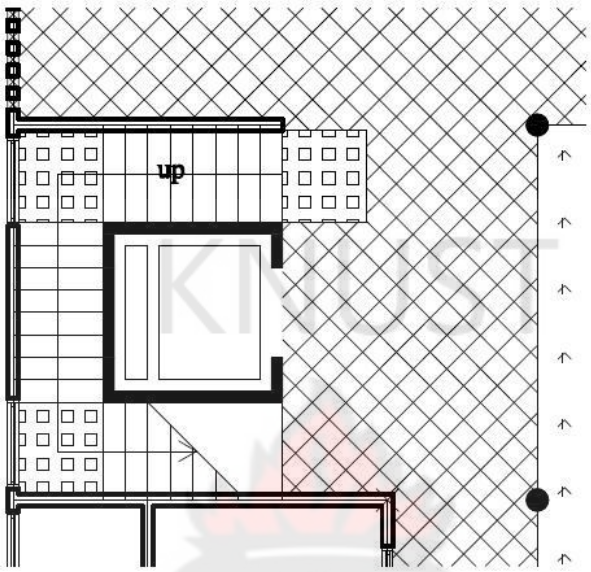

Figure 5.8 Plan of stairs and lift

The use of tactile markings on landings on ramps and stairs aid especially the blind to differentiate between levels.

5.3.4 Dormitory

The clear widths of doors are 1000mm and 2000mm for single and double door respectively.

The door handles are installed at heights within the range of a seated person, that is between 450mm and 900mm. Dormitories are wide enough for easy manoeuvring of a wheelchair user. Window sills are between 450mm-900 to enable wheelchair users to open and close windows and also enjoy the views in the school and around the school. Figure 5.9 illustrates the spatial configuration of a typical dormitory with dimensions of doors and turning angles for a wheelchair user.

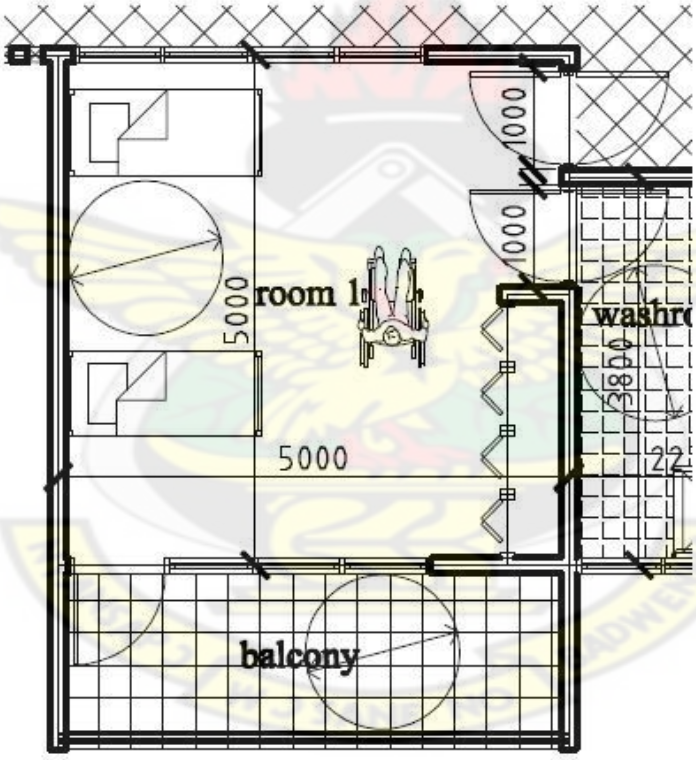

Figure 5.9 Typical room in dormitory

5.3.5 Sanitary

Figure 5.10 and 5.11 show the plan and section respectively of a typical bathroom indicating appropriate height of grab bars, paper holders, kick plates and recommended floor finish.

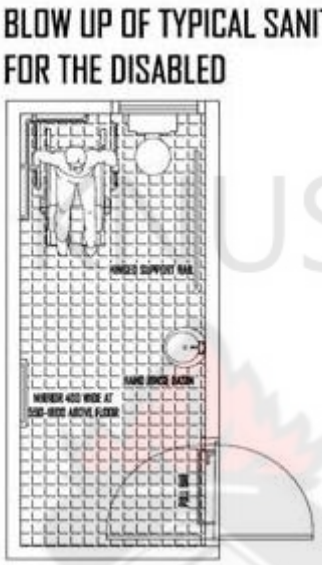

Figure 5.10 Typical sanitary in dormitory

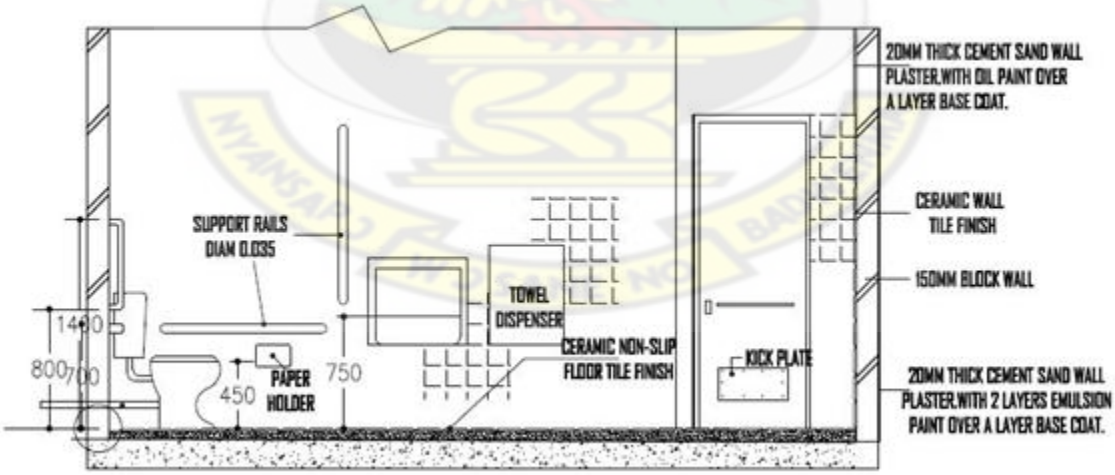

Figure 5.11 Section through sanitary

The grab bars provided in the bathrooms aid transfer of wheelchairs users from and onto the toilet seats. Kick plates are installed at the push sides of the entrance doors to protect them from damage by wheelchair users. Figure 5.12 illustrates a section through a typical bathroom indicating the height of grab bars, adjustable shower heads, recommended wall and floor finish.

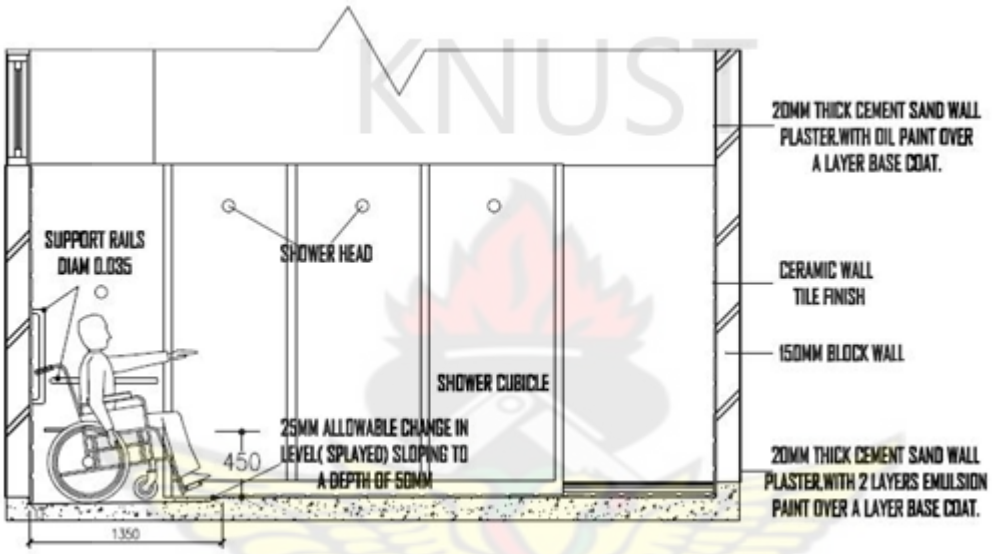

Figure 5.12 Section through bathroom

A clear floor space of about 900mm- 1200mm in bathrooms will aid wheelchair users to park their wheelchairs while they take their bath.

5.3.6 Classrooms

Figure 5.13 shows a plan of a typical classroom indicating the spatial configuration and recommended space between aisle. This is to aid primarily wheelchair users.

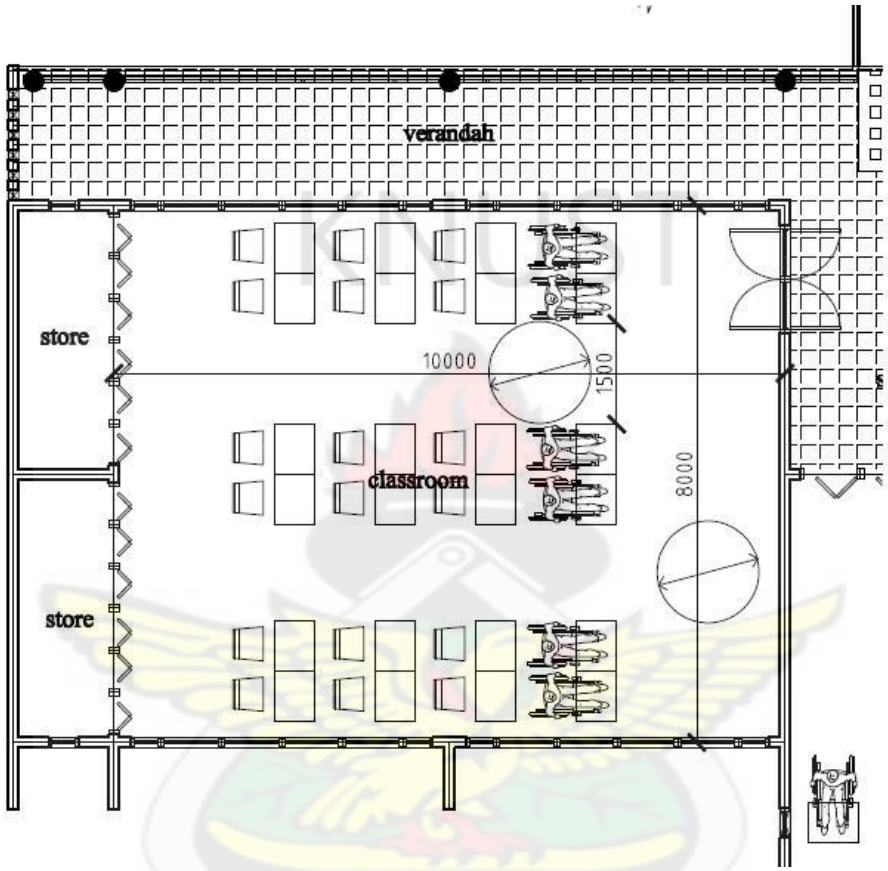

Figure 5.13 Plan of classroom

The aisle in the classroom is wide enough to accommodate easy manoeuvring of students especially wheelchair users. It ranges between 1000mm-1500mm. The window sills are between 450mm-900mm to enable wheelchair users to open and close windows and also easily take in myriad of views around.

5.3.7 Workshop

Figure 5.14 shows a plan of a typical workshop. It illustrates the spatial configuration and recommended spaces between worktops, staircase, lift and washroom.

Figure 5.14 Plan of workshop

Worktops within workshops have spaces between 1000mm-1500mm for easy movement of students especially wheelchair users.

5.4 Landscape

The landscaping used comprises both soft and hard landscaping elements. The hard landscape is the paved walkways with tactile slabs in the middle to guide the visually impaired. Different scented plants, shade trees, flowers, ground covers and lawns make up the soft landscaping elements.

The scented plants such as Balsaminaceae, Melaleuca squarrosa, Guarea cedrata and Pelargonium give a sense of orientation especially to the visually impaired. The shade trees provide a resting spot for students especially the mobility impaired. They also improve the microclimate of the school. Apart from improving the micro-climate and its aesthetic qualities, the lawn in the school serve as grounds for relaxation and learning. A centrally positioned water fountain in the pseudo-park helps especially with the orientation of the visually impaired. This is made possible because of the sound the fountain generates which gives the visually impaired a sense to place and eventually orientation. The water fountain is also surrounded by seating areas that serve as a meeting ground and a hub for relaxation and learning.

5.5 Materials

5.5.1 Ceiling material

The use of acoustic ceilings in classrooms, workshops and assembly halls helps to reduce reverberation and echoes in these spaces. This is to create a good sound or acoustic environment to alleviate the needs of the hearing impaired persons.

5.5.2 Floor material

All circulation areas have been finished with anti-skid floor tiles of different patterns and orientation for different areas of the facility. This is to ensure that students especially the visually and mobility impaired are able to orientate and move freely within the facility.

5.5.3 Handrail

Wooden handrails are used on balustrades attached to stairs and ramps because of its low thermal conductivity. Because the handrail is a major part of the assistive device it is imperative it does not conduct heat.

5.5.4 Walls

The use of different patterned and textured walls for both interior and exterior spaces are important for both hearing and visually impaired persons. It gives a sense of orientation especially for the visually impaired.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSIONS

This research makes evident the fact that Vocational and Technical Schools studied do not incorporate design elements such as ramps to access elevated levels or floors. In instances where they have been used, they do not conform to the standard of 1:12 but rather 1:8 which turns out to be dangerous for especially mobility impaired students. Lack of handrails on some of the ramps also poses another danger to students with mobility and visual impairment.

The absence of tactile markings on pedestrian walkways and on landings of staircases and ramps also makes orientation and movement challenging for visually impaired students. Sanitary facilities do not also have assistive devices like grab bars and rails to aid mobility impaired students. Sanitary facilities are also too small to accommodate wheelchair users hence making them totally inaccessible.

Doors used at the entrance to the facilities are rather too small (<900mm) to be accessed by a wheelchair user. Window sills in some of the institutions are too high (> 900mm) to be operated by a seated person. There is an inadequacy of clear floor space for turning by a wheelchair user in some of the classrooms and dormitories. Notices and information to students are in print and not in Braille to aid the visually impaired students in reading them. Some of the classroom did not have good acoustics and lighting conditions for the hearing and visually impaired students respectively.

6.2 RECOMMENDATIONS

The underlisted are recommendations to arrest these problems to make the design of school inclusive.

6.2.1 Simple and logical design of the school environment.

The layout of the school should be simple enough, that is clearly defined with respect to academic and domestic areas. When there is a mix up of these two basic activities it tends to confuse students especially the visually impaired. The mobility impaired would also not have to move around indiscriminately because of the complex nature of school layout. When this is done students are able to orientate and commute with minimal or no assistance.

6.2.2 Close-to-the entrance parking space.

Parking space for facilities should be close to the entrance where possible in order to reduce the trekking distance of persons with disabilities.

6.2.3 Pedestrian areas with minimum possible slope.

For instance walkways should have slopes which are minimal (0-10º) and not steep as this poses a greater challenge especially to mobility impaired students. Firm and even surfaces should be provided throughout the facility. Walkways especially should be screeded or paved to aid in the smooth and unaided movement of mobility and visually impaired students. On the level access. In cases where possible, that is if slope of site is minimal (0-10º) access to facilities should be on an even level to avoid the use of ramps.

6.2.4 Automatic or easy to operate doors.

These should be fixed to especially the main entrances of facilities in the school. This is to help students apply little or no effort when accessin and traversing various spaces.

6.2.5 Clear width of doors should be at least 900mm.

It should range between 1000mm-2000mm for single and double doors respectively. Height of door handles should be in the range of a seated person which is between 450mm-900mm.

6.2.6 Window sills should be within range.

Window should be within the range of students especially wheel chair users with dimensions 450mm-900mm appropriate for a seated person. Installation of electrical switches and sockets should be reachable for a wheelchair user. The minimum height of any switch used should be 900mm. Reachable switches.

6.2.7 Ramps should be used in conjunction with stairs.

This is to ensure that all students regardless of their disability have the option of using the ramp or stair as they deem expedient. The ratio of the ramps should be 1:12 because this gradient of slope is gentle enough to accommodate persons with mobility impairment.

6.2.8 Installation of lifts to all floors.

Platform lifts or where cost is an issue a stair lift should be provided to aid access to all floors especially for the mobility impaired.

6.2.9 Sanitary areas should be fitted with assistive devices.

Examples of these assistive devices are grab bars and rails to aid the students with mobility impairment. Grab bars should be in the range of 700mm-800mm to make them easily reachable by wheelchair users. Bathrooms should have a clear floor space between 900mm-1200 to accommodate turning radius and also aid parking of wheelchairs when bathing.

6.2.10 Provision of resting places.

Seats or niches should be provided at vantage points about 10m apart along pedestrian walkways for resting. This also will provide reprieve for mobility impaired students after trekking for long distances.

6.2.11 The use of solid anti-skid tiles in certain spaces.

Due to the slippery nature of the bathroom and pedestrian walkways that are exposed to the weather, flooring or surface materials should be anti-skid.

6.2.12 The use of tactile markings or warnings on the landings of stairs and ramps.

This feature actually prompts especially the visually impaired of the change in level because of the change in finish of the surface.

6.2.13 Acoustic panels should be fixed especially in classrooms and workshops.

This is to prevent reverberation and echoes to aid the hearing impaired students. A poor acoustically designed space generates a lot of echoes which irritates person with hearing impairments.

6.2.14 Visually impaired students sense of orientation is boosted by specific scents and sounds.

This need could be realized by the provision of water fountains or particular scented plants which helps identify the peculiar space of activity.

6.2.15 Provision of Braille version of information on notice boards which are in print.

The Braille notice boards will aid visually impaired to easily access information which otherwise will be in print.

6.2.16 Provision of good lighting conditions in spaces.

Lights that are used should be anti-glare in order to aid especially the visually impaired. The visually impaired have a threshold of glare beyond which will cause discomfort.

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APPENDIX A

INTERIOR VIEW OF CLASSROOM

EXTERIOR VIEW OF CLASSROOMS FROM COURTYARD

INTERIOR VIEW OF HOSTEL

INTERIOR VIEW OF WASHROOM

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APPENDIX B:

SAMPLE QUESTIONNAIRE FORM AND RESPONSE TO QUESTIONNAIRE

SAMPLE QUESTIONNAIRE FORM TO THE THREE HEAD TEACHERS

1. Are there ramps in this facility?

   Yes.....

   No.....

2. Are ramps used in conjunction with stairs or not?

   Yes.....

   No.....

3. Are students comfortable with the gradient of the ramps if any?

   Yes.....

   No.....

4. Are there guard rails on ramps?

   Yes.....

   No.....

5. Are there tactile markings on walkways and staircases or not?

   Yes.....

   No.....

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6. Are there assistive devices in washrooms?

   Yes.....

   No.....

7. Are walkways adequate or inadequate?

   Yes.....

   No.....

8. Are notices given out in Braille or print?

   .....

9. What are your impressions about the general layout of the school?

   .....

10. What are your impressions about circulation in the school?

    .....

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Response to Questionnaire

Out of the 3 questionnaires given to the 3 head teachers of the different institutions, the responses are as follows:

1. Are there ramps in use in this facility?

   Yes.....3

   No.....0

2. Are ramps used in conjunction with stairs or not?

   Yes.....3

   No.....0

3. Are students comfortable with the gradient of the ramps if any?

   Yes.....0

   No.....3

4. Are there guard rails on ramps?

   Yes.....1

   No.....2

5. Are there tactile markings on walkways, ramps and staircases or not?

   Yes.....0

No.....3

6. Are there assistive devices in washrooms?

   Yes.....0

   No.....3

7. Are walkways adequate or inadequate?

   Yes.....1

   No.....2

8. Are notices given out in Braille or print?
   Edwenase: Print
   Akropong: Print
   ATTC: Print

9. What are your impressions about the general layout of the school?
   Edwenase: Trekking distance is reduced because of the proximity of facilities to each other.
   Akropong: Location of dining hall and workshop across the arterial road in the school poses grave danger to the students since they risk been knocked down by vehicles.
   ATTC: Clearly defined layout of classrooms, workshops, administration block and ancillary facilities aids in orientation of students.

10. What are your impressions about circulation in the school?
    Edwenase: Extensive use of ramps that connect the walkways and facilities aid in easy accessibility especially to mobility impaired students.

Akropong: There are no tactile markings on the walkways and especially in front of stairs and ramps to alert and guide students on a change in level and orientation.

ATTC: The absence of handrails on ramps makes them difficult to be accessed by persons in wheelchairs.

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