AN EVALUATION OF ARCHITECTURAL FEATURES AS MEANS TO ENHANCE WELL BEING IN AUTISM CENTRES.

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A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA.
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DEPARTMENT OF ARCHITECTURE,
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AHMADU BELLO UNIVERSITY,
ZARIA, NIGERIA.

DECEMBER, 2014.

DECLARATION

I declare that the work in this thesis entitled '**AN EVALUATION OF ARCHITECTURAL FEATURES AS MEANS TO ENHANCE WELL BEING IN AUTISM CENTRES'** has been carried out by me in the Department of Architecture under the supervision of Dr. M.L. Sagada and Dr.S.N. Oluigbo.

The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at any other Institution.

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FUNMILOLA MORADEYO AWOTUNDE **DATE**

CERTIFICATION

This thesis entitled **'AN EVALUATION OF ARCHITECTURAL FEATURES AS MEANS TO ENHANCE WELL BEING IN AUTISM CENTRES'** by **FUNMILOLA MORADEYO AWOTUNDE** meets the regulations governing the award of the degree of Master of Science of Ahmadu Bello University, Zaria, and is approved for its contribution to knowledge and literary presentation.

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ABSTRACT

Care of autistic individuals has become a global challenge in recent times. The environment of care for autistic individuals should be conceived and designed with certain architectural features in mind. Studies has shown that the built environment has been used as a means to enhance healing for autism, which includes the use of the shape, color, orientation, height, location, materials and how building components relate to one another. The external environment is also important as this affect their perception of the environment created. Presently there are about six centres that handle autism in Nigeria but none of them adequately meets the requirement for the care of autism. This research sought to evaluate the various architectural features that could have positive impact on well being of autistic children and to examine the individual safety needs of autistic children within a typical treatment environment. The methodology employed includes the study of selected cases in Nigeria using structured interview to collect data from two centres as well as Visual survey and observation of activities. The research findings were analyzed based on the variable highlighted from literature as factors to determine the autism appropriateness of an environment. The result of the analysis discussion revealed that both centres had not been originally designed for the care of autism but efforts had been made to make them suitable though not adequate and required improvements. In conclusion, a design proposal was made for an autism centre incorporating the use of transitional spaces, sensory zoning of activities, use of materials for noise and echo treatment and safety considerations amongst other things identified for the effective care of autism. After due consideration a site was selected at Abuja to demonstrate the features identified in the research.

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ABBREVIATIONS AND DEFINITION OF TERMS

ASD: Autism spectrum disorder

PDD: Pervasive Developmental Disorder

PDD-NOS: Pervasive Developmental Disorder not otherwise specified

SIB: Self Injurious behavior

SID: Sensory Integration Dysfunction

DEFINITION OF TERMS

Autism Autism is a brain development childhood disorder characterized by impairments in social interaction, communication, restricted and repetitive behaviour, all manifesting before the age of three and continuing throughout life.

Well being The total physical, social, intellectual and emotional health of the individual.

Sensory Relating to sensation or the physical senses, it could also mean how input is transmitted or perceived by the senses.

Proxemics Deals with the amount of space that people feel necessary to set between themselves and others.

1.0 INTRODUCTION

1.1 Background of Study

The built environment provides the setting and backdrop by which humans live and impacts senses, emotions, participation in physical activity and general wellbeing (Buttersworth 2000). Every Child has the right to a full and productive life. It is the duty of society to ensure children can grow up in environments that build confidence, friendship, security and happiness, irrespective of a person's family circumstances or background.

The use of the built environment as a place for healing can be traced back to early Asian, Greek, and Roman cultures (Larson 2010). It follows that the built environment performs a crucial function to some extent in health and mental wellbeing. Physical structure has a significant effect on human behavior, designing structures that are appropriate for each user type has become crucial to inducing positive mental state among its user. Research supports the idea that architectural design has strong but modifiable effects on social behavior, users' countenance and productivity and to some extent design features such as structure of space, number and spacing of windows and lighting effects also affects health and wellbeing (Ayers, 2007).

Architecture, as a profession, is responsible for creating environments that accommodate the needs of all types of users, and it has evolved over the last few decades to incorporate designing for individuals with different types and degrees of physical and mental challenges mainly people in wheelchairs. However there are many other challenged individuals that are ignored in the task of making the environment conducive such as the Autistic (Sánchez, .Vázquez & Serrano 2011). The environment in which autistic children

live can have great impact on their health and wellbeing. Providing the right setting can help enhance confidence, self esteem and motivate them.

Autism is a brain development childhood disorder characterized by impairments in social interaction, communication, restricted and repetitive behaviors which manifests before the age of three and may continue for life. The effort to recognize Autism as a disability in its own class and to address its many challenges started in the United States in early 1940's through 1960's till date and there is still a low level of awareness among parents in Nigeria (Audu & Egbochukwu, 2010)

According to the Centre for Disease Controls (CDC) prevalence for autism has risen to 1 in 150 births as against the previously estimated prevalence of 1 in 166 births. The statistics for prevalence in Nigeria is scarce but based on the CDC report; current research has stated that 1.2 million Nigerians are affected by this disorder (Adewakun, 2012).

Okey- Martins (2007) opined that lack of awareness of this disorder has resulted in most sufferers of autism ending up in the streets as insane people in rural areas. Children are at risk if they are not diagnosed early, they are rejected by regular schools and those accepted are labeled as slow in learning and not given opportunity to develop at their pace.

This research will examine the way people with autism confront the built environment in an attempt to create an environment that is safe and where they can achieve a sense of well being as well as provide social considerations to meet their needs and alleviate the difficulties they face in their daily lives.

1.2 Problem Statement

Despite this high prevalence of Autism, architectural design guidelines are yet to be developed catering specifically to the scope of autistic needs (Mostafa, 2008). In Nigeria,

many children are either not diagnosed or misdiagnosed and the few that are diagnosed have few facilities that have been provided to cater to the need of the autistic and little or no consideration has to be given to the environment of their care to make it inclusive and make it easy for them to be integrated into the society. Autistic children have the potential and the capability to live productive lives and this is largely a function of the support system made available to them. Hence, the need to provide such a facility in Nigeria to cater to recent findings in taking care of these group of children.

As such this study will evaluate architectural design features that can enhance the environment of care for autistic individuals as well as their care givers.

1.3 Justification of Study

The current prevalence rate for autism worldwide is 1 in every 150 children with over a million people in Nigeria being autistic hence the need to provide a centre where autism can be diagnosed, treated, educational opportunity given to autistic children so they can be integrated into society as well as providing support for their parents. Therefore this study focuses on architectural features as a means by which the care and management of autistic children can be enhanced. It is also known that there is ability in disability especially for autistic people who have very good memory and the ability to focus on tasks for a long period of time hence given the right care these children could in turn give back to society.

1.4 Aim and Objectives of Study

This aim of the study is to evaluate architectural design features that support specific needs of autistic children and their care givers.

The objectives of this study are

1. To identify architectural features and their impact on meeting specific needs of autistic individuals.
2. To examine individual safety needs of autistic children with respect to their environment and how it can be used to enhance their care.
3. To assess existing facilities and identify the deficits in meeting specific needs of autistic individuals.
4. To design a centre that incorporates architectural design features in creating an inclusive environment for the safety and wellbeing of autistic children.

1.5 Research Question

1. What architectural features can be applied in autism centres to meet the specific needs of the children?

2. How have these architectural features been applied in existing autism centres?

1.6 Scope of Study

This research will include a review of Architectural design features that meet specific needs in autism centres. Thus an examination of existing autism centres in Nigeria will be made along with studies of such facilities from abroad to identify the useful components with emphasis on the relationship between architectural features and specific needs in these centres for both the children and their caregivers.

2.0 LITERATURE REVIEW

2.1 History and Prevalence of Autism

The word autism is from the two Greek words "autos" which means "self" and "ismos" which means action or state of being and this translates to a state of being absorbed by one's self. This makes sense today because people with autism often seem to be lost in themselves. They are clearly removed and isolated from social interaction. According to the American Psychological Association (APA) the term was first coined by Swiss psychiatrist Paul Eugen Bleuler in 1908, who also coined the term schizophrenia (APA 2000).

In 1943 American child psychiatrist Leo Kanner studied 11 children. The children had features of difficulties in social interactions, difficulty in adapting to changes in routines, good memory, sensitivity to stimuli (especially sound), resistance and allergies to food, good intellectual potential, echolalia or propensity to repeat words of the speaker and difficulties in spontaneous activity (Mandal 2014). A separate studied was carried out by Hans Asperger in 1944 on another group of children; these children had characteristics similar to those previously described by Kanner. In present times, a high-functioning form of autism is often diagnosed as Asperger's Syndrome.

Autism came to be better known in the 1970's. Many parents and individuals still confused autism with mental retardation and psychosis and it is believed that parenting has no role in the causation of autism.

The prevalence and other facts about autism all over the world is disheartening. Current projections indicate a risk that the prevalence may be moving towards 1 in 50 in 10 years (Okey-Martins, 2007). The number of reported cases of autism increased dramatically in

the 1990s and early 2000s prompting researches on autism. This increase is largely attributable to changes in diagnostic practices, referral patterns, availability of services, age at diagnosis and public awareness. Autism was once a rare disorder but is now becoming so common that it is reputed by the World Health Organization (WHO) as the fastest growing childhood developmental disability in the world (Uba & Halim 2013)

2.2 Nature of Autism

Autism is a brain development childhood disorder characterized by impairments in social interaction, communication, restricted and repetitive behaviour, all manifesting before the age of three and continuing throughout life (Egbochukwu & Imoitseme, 2012). Boys are four times more likely than girls to have Autism (National Autism Association 2014). It affects the way a person perceives and interacts with other people and the world around them. According to the World Health Organization, Autism is part of a group of developmental disabilities known as autism spectrum disorders (ASDs) and has been identified as one of the five Pervasive Developmental Disorders (PDD), (National Autistic society,2014). The other types include Asperger syndrome, Rett syndrome, childhood disintegrative disorder and pervasive developmental disorder not otherwise specified (PDD-NOS)

It is a spectrum condition, which manifests in many different ways though people with autism share certain difficulties; they will be affected by them in different ways. Some people with autism have certain learning disabilities, while others possess a high level of intellectual ability, some may lead relatively independent lives while others require dedicated support every day. However, people living with this condition exhibits difficulties in three main areas as shown in Figure 2.1:

Figure 2.1: Areas in which autistic individuals experience difficulty–
Source: Parentinghealthybabies.com

1. **Social interaction**

This includes difficulty with social relationships; appearing uninterested in other people but showing more interest in objects, with little desire to live with others, trouble in understanding and adhering to social rules and giving priority to their own needs over those of other people (Brand 2010). Therefore, it is necessary to provide spaces which allows and even encourage social interaction, and also taking into account that people with ASD may show particular proxemics, needing wide, open spaces, in which interaction may take place without getting too close.

2. **Communication**

People with autism experience language and communication difficulty, they have difficulty interpreting verbal and non-verbal communication, such as understanding the meaning of common gestures, facial expressions or tone of voice (Brand, 2010). In some cases, they might have limited or no ability to talk. Hence the need to remove anything that can constitute a barrier and provide an environment that is specific and easily understandable, simple containing few elements and permanent in nature. The use of visual support for communicating is usually effective for people with ASD and the built

environment should be designed to accommodate these forms of communication. Color coding, for example, of different elements may also help to improve communication.

3. Restricted repetitive behaviours

Autistic people experience difficulty in managing transitions between spaces and dealing with changes in routine. Repetitive behaviours, such as pacing, head banging, hand flapping or rocking and persistent preoccupation with certain objects are typical (Brand, 2010). Other behaviours include fascination with movement, such as the spinning of a fan or turning wheels on toys, insistence on sameness and resistance to change.

4. Sensory integration

Autism is also characterized by some form of Sensory Integration Dysfunction (SID), a condition that affects many other children with special needs. It includes a hypo- or hyper-sensitivity to sensory stimuli such as sound, sight, smells, tastes, and textures. This means that some children with autism may be hypersensitive (over-sensitive) to certain things that make of their environment. While on the other hand some other children may be hypo-sensitive (under-sensitive) which makes them more prone to physical injury (Sachs & Vincenta 2010).

Other sensory difficulties experienced include

1. Inability to filter input from external sources; visual stimuli, sounds, and smells, are all experienced at once which can become overwhelming. This coupled with communication and language challenges, can frequently lead to tantrums.
2. A need for more personal space and dislike of physical contact
3. Poor awareness of danger

4. An inability to generalize concepts, which means skills learnt in one situation may not be transferred and employed in a similar situation
5. Poor coordination and balance.
6. Seizures or periods of loss of consciousness may be experienced
7. Special interests and sometimes high levels of ability in music, mathematics, technology or art
8. Vulnerability to mental health problems such as anxiety and depression (Sachs & Vincenta 2010).

Some or all of the following characteristics are displayed by people with autism, and they can be seen as either challenges or strengths, but all of which have implications for the design of their living and learning environments.

2.2.1 Behavioural excesses and deficits

According to the National Autism Society NAS (2011) children with high functioning autism may deliberately self-harm as a way of coping with anxiety and being different.

Self-injury is a frequent and serious problem peculiar to individuals with autism and developmental disabilities. Self-injurious behaviours (SIB) is characterised by certain behavioural excesses and deficits that are repetitive and rhythmic in nature and can cause physical harm to the individual displaying the behaviour (Fee & Matson, 1992 as cited in Weiss 2010). Prevalence estimates for self-injury range from 4% to 12% in individuals with intellectual disability (ID) and 33% to 71% in autism spectrum disorder (ASD) (Dominick *et al*. as cited in Richard *et al* 2012). It has been found from recent studies that those with autism had a higher tendency to engage in self-injury than those without autism. The more characteristics of autism displayed, the higher the severity of self injury.

Self-injury occurs among autistic individuals without an apparent intent to knowingly harm themselves. It is important to distinguish between behaviours, such as suicide, that are associated with intentional desires to cause self harm, and SIB found in individuals with developmental disabilities, which may occur in association with biological pathologies or are more a result of environmental factors. Intentionally self-harming behaviours are also often referred to as self mutilation, self-destructive, or masochistic behaviours (Fee & Matson, 1992 as cited in Weiss 2010). Self-injury can range from severe, life-threatening injuries to less directly damaging ones. Studies have shown that self-injury is not particular to autism, and has the same prevalence rates and display similarities as individuals with other developmental disabilities and schizophrenia. Below are some of such self injurious behaviours

1. Head rubbing
2. Self-scratching
3. Nail picking
4. Occasional contact with surface when rocking
5. Finger sucking
6. Thigh slapping
7. Violent head banging
8. Orifice poking
9. Eye poking
10. Hair pulling
11. Self-pinching
12. Chronic rumination

13. Frequent arm biting (Weiss 2002)

The frequency and severity of autistic children engaging in self injury varies and depends on the individual circumstances and environmental demands. Therefore, some behaviour that might appear normal among autistic people may also lead to self injury in a different situation. Social self injury in autism occurs more often in a social setting, aggression is directed to self, and is associated behavioural problems. Although it's unpredictable, as the child matures in age certain fixations depending on adaptive behavior skills, settings, symptoms of severity, and ability level, self injurious behaviors may decrease, though studies comparing self injury in individuals with autism across their lifespan are scarce. Given the communication impairments that individuals with autism experience, it has been proposed by another hypothesis that self-injury is a manifestation of an abnormal and impaired need to communicate. However, some researchers and therapists believe that less intensive treatments, particularly those begun early in a child's life, may be more efficient and just as effective.

2.3 Specific Needs to Take Care of Identified Behavioural Excesses and Deficits.

According to Huppert, Baylis & Keverne (2004) wellbeing is a positive and sustainable state that allows individuals, groups or nations to thrive and flourish. This means at the level of an individual, wellbeing refers to psychological, physical and social states that are distinctively positive. Therefore, well-being can be used to describe a state of physical, intellectual and emotional health as well as economic, environmental, cultural and social health. In the former case it is used in relation to the health of individuals and in the latter with the health or otherwise of a community, organization or system (Storey & Pedersen 2006). Well-being has more to do with feelings and comprises the concept of feeling good

and functioning well. The physical, intellectual and emotional aspects of well-being corresponding to body, mind and spirit respectively (Storey & Pedersen 2006). In Western culture a distinction is made between physical health and other aspects of well-being. Research studies suggest that emotional wellbeing directly affects physical wellbeing. For the purpose of this research well-being is taken to mean the total physical, social, intellectual and emotional health of the individual. These three aspects of well being cannot be separated from each other but infact are related and interdependent.

Table 2.1: Well being ideas and concepts - Source: Storey & Pedersen (2006)

	PHYSICAL WELL-BEING (Body, Health, Physiological)	**INTELLECTUAL WELL-BEING** (Mind,Healing, Psychological)	**EMOTIONAL WELL-BEING** (Spirit, Spirituality, Metaphysical)
	Related Architectural Concepts	Related Architectural Concepts	Related Architectural Concepts
1.	**Air Quality:** Indoor air quality, Outdoor air quality, Ventilation, Breathing skin enclosures	**Engaging with nature:** Working with natural cycles, Working with natural ecosystems, Plants Water, Indoor / outdoor flow.	**Collective cultural and individual aspirations and identity:** Symbolism and metaphor, Beliefs/mores, Ritual Narrative
2.	**Light Quality:** Sunlight and daylight, glare, UV	**Holistic sensory design**: Sight, Touch, Hearing, Taste, Feel, Smell.	**Mood creation and modification:** Ambience, Emotional response.
3.	**Temperature and humidity control**	**Personalization**	**Restorative design:** Relationship building, Portable wellbeing, Community spirit, Planetary healing.

4.	**Water Quality**	**Sprit of Place:** High level of craft Particularity and uniqueness, Beauty, delight, joy,, pleasure	
5.	**Safety**: Fire, Earthquake, Natural disasters Extreme weather events Radiation, Noise, Falling Accident reduction Ergonomics Home security	**Design for Variety** Peace and harmony Stimulation and rejuvenation Relaxation and refreshment	
6.	**Pollution Control:** Biological, Chemical, Electromagnetic Non-toxic materials and furnishings		

Certain factors need to be considered in creating an optimal environment to enhance wellbeing they include:

1. Increasing connection to nature
2. Reduction of factors in the environment that can cause stress for example noise, air pollution.
3. Improved sense of control in the environment.
4. Provision of positive diversions. Storey & Pedersen (2006)

The structural design or arrangement of space imposes restrictions on behaviour within that space, doorways determine access to a room and the size of the space in a room restricts the kinds of behaviour that can be exhibited within that space (Ayers, 2007). Taking these considerations in mind the function of a building and its intended users must correspond with its design because the usage pattern and its users can change both functionality and design needs hence the need for a design that is flexible.

2.4 Architectural Design Features Specific to Autism

The built environment provides a majority of sensory input such as light, acoustics, textures, colors, spatial configuration and ventilation which can be manipulated in the design of the environment for autistic users to provide the needed sensory input. These sensory environment can be minimized through muted colors, natural material, good acoustics, simple and intimate shapes, natural lighting to create opportunity for users with autism to be free from the overwhelming sensory input from the environment and clear the way for communication and the acquisition of skills (Mostafa 2008).

Mostafa (2008) who analyzed the impact of architectural design elements on autistic behaviour in a bid to discover which is the highest ranking architectural element concludes that acoustics are the most influential architectural factor on autistic behavior, followed by spatial sequencing. This result was based on the results obtained from questionnaires administered with 64% of teachers and 79.3% of parents ranking acoustics the most influential, followed by spatial sequencing According to the results of the questionnaire 64% of teachers and 79.3% of parents rank acoustics, and 20% of teachers and 13.79% of parents rank spatial sequencing as the most influential architectural factor on autistic behavior. Other factors like lighting, textures, and colors were considered less important by the respondents.

The autism ASPECTSS design index presents 7 design criteria/ issues that have been indicated through interviews, focus groups, surveys and experimental research to be facilitative of positive behavior and skill development in users with autism. These criteria are listed below

1. Acoustics

2. Spatial sequencing
3. Escape spaces
4. Compartmentalization
5. Transition spaces
6. Sensory zoning
7. Safety.

2.4.1. Acoustics

This involves the application of noise and echo treatment to certain areas such as speech rooms. Its application maybe beneficial in almost all spaces used for autistic instruction particularly in those where long attention spans, quick responses and high level of focus are required such spaces could include computer rooms, one on one instruction rooms, sensory integration, neurological rooms as well as circulation areas as seen in Plate I.

Plate I: The use of noise and echo treatment for floor and ceiling –Source: Torky (2013)

2.4.2 Spatial sequencing

A design emphasizing order, sequence and routine is most appropriate for the environment of care for autism. Spatial efficiency is also important so spaces are used appropriately and uses of various areas clearly defined as shown in Plate II and III

Plate II: Arrangement of children seated around play equipment
Source: Torky (2013)

Plate III: Large and clear classroom space for education and social interaction - Source:Torky (2013)

2.4.3 Escape spaces

The sensory make up of the space should be well designed to provide areas of neutral sensory stimulation. Hence the need to create escape spaces in learning spaces where the children can withdraw to reorient themselves when overwhelmed.

2.4.4 Compartmentalization

Within spaces to reduce visual distractions especially for one on one instruction where focus is a priority. Physical and visual compartment provide a positive influence and help to minimize outside distractions as seen in Plate IV.

Plate IV: Plan of compartmentalized study classroom showing simultaneous use of various stations - Source: Mostafa (2008)

2.4.5 Transition spaces

The use of sensory transition zones when moving to or from an area of high sensory stimulus is important to minimize distractions. These transition spaces could be in the form of gardens or sensory circulation areas that helps to prepare the child for such a move with minimal distractions. Visually distinctive landmarks may be used as the hub of

each zone to make it easily recognizable. Plate V shows an outdoor garden that can be used as a transition space.

Plate V: Outdoor garden: Source: www.gardenconservancy.org

2.4.6 Sensory zoning

Sensory zoning as opposed to conventional functional zoning. Spatial groupings of activities following an autistic logic and involve sensorial compatible functions. High stimulus functions like music, arts, crafts and psychomotor therapy require high level of alertness and can be grouped together while low stimulus functions like speech therapy, one on one instruction and general classroom requiring a high level of focus can also be grouped together. Services which are usually high stimulus like bathrooms, kitchens, staff rooms and administrative offices should be separated with only those to be used by the children grouped near the high stimulus zones. The use of sensory zoning could also reduce the problems of distraction and diversion.

2.4.7 Safety

The environment for autistic children must be safe hence the need to provide subtle enclosures even in outdoor play areas and ensure the removal of anything that may

constitute a safety hazard. Floors should be durable and anti slip, avoid the use of sharp edges to avoid them colliding with the walls and most especially consistency in the use of materials is of importance. Circulation within spaces should be accessed through a one way system emphasizing on routine.

These criteria can be used to score the autism appropriateness of a built environment. The Design index proposes to free the Childs sensory network of unnecessary traffic, sensory noise from the surrounding environment and make those fleeting moments where they can communicate, respond, learn and interact a little bit longer. The index can help to gradually generalize their newly acquired skills in a less controlled environment.

Khare & Mullick (2008; 2009 as cited in Sánchez, Vázquez & Serrano 2011) carried out several research aimed at obtaining conclusive evidence on universal design applicable particularly to educational spaces for the autistic. Universal design is not exclusively an architectural concept but is applicable in this discipline and is aimed at designing environments which include building components, interior and exterior urban spaces in a way that it is easily accessible to the largest number of people, irrespective of their particular condition. This study undertaken by Khare & Mullick was carried out in six phases, highlighted below

1. Establishing users' needs
2. Laying down environment considerations for autism
3. Definition of design parameters
4. Assessment of the selected design parameters
5. Preparation of design criteria or recommendations
6. Selection of principles applicable to Universal Design

The following design parameters were objectively highlighted as the most beneficial to children with ASD which can be accomplished with the aid of design; they are (Khare & Mullick, 2008 as cited in Sánchez, Vázquez & Serrano 2011):

1. Physical structure: the environment should be organized to have a clear visual and physical boundary. These will help each activity to be associated with a particular space.
2. Maximize visual structure: the use of visual cues to organize visual environment like color coding, numbers, signs, labels etc
3. Provide visual instructions: the use of written instruction as well as images, pictures and visual schedules to indicate the steps to be followed in carrying out an activity in its designated space.
4. Provide opportunity for social interaction
5. Parents' involvement in school activities so they can be of assistance in educating their wards when away from school setting.
6. Opportunities for inclusion: provide an environment for children with autism that allows them to interact with their peers.
7. Maximize future independence: create an environment in which the child can learn everyday life skills, as well as vocational ones, that allow them to be independent in the future.
8. Consideration should be given to proxemic i.e. the space required around each person to feel comfortable which will help them face social demands since they are rather wary about their personal space.

9. Provision of withdrawal spaces: quite areas, a place of respite from the stress caused by certain socially demanding situations.
10. Maximize safety: elements in the environment should not constitute a risk to the autistic child especially due to poor awareness of danger experienced by some of them.
11. The use of simple form, clear and simple arrangement of spaces with direct access between spaces is beneficial to children with autism to understand their environment.
12. Ease of accessibility due to sensory difficulties associated with autism requires the building to be physically accessible.
13. Provide adequate space for assistance to be given to the autistic person in various activities like eating, using the toilet and learning activities.
14. Consideration should be given to the materials used in their environment to ensure they are durable but require little maintenance taking into account aggression and misuse.
15. Minimize sensory distractions: strategic location of facilities to avoid visual, auditory and tactile distraction other than the ones set out for that particular purpose.
16. Provide objects that stimulate sensory integration within the environment, providing opportunities to roll, jump, spin, as well as vibrations, music, visual experiences etc.
17. Ensure environment is flexible enough to accommodate its adaptation to various functional skills and different teaching conditions.

18. Provide an environment that allows monitoring for assessment and planning, this will also help ensure their safety and plan activities based on observation.

The criteria highlighted above may seem like they can be applied generally and not only in an autism specific environment but to a certain extent when applied in an autism specific environment it is adequate and essential hence the need for emphasis.

According to Humphreys (2008) 'the human condition is such that it will respond positively to good quality and with architecture it will respond positively to correct scale and proportion, natural ingredients such as light, air and materials as well as thoughtful construction that will encompass structure and fabric, how a building is put together'. He highlighted some simple architectural concepts that can be applied to designing buildings for people with ASD. They include:

1. Calm, order and simplicity in form:

   People with ASD have difficulty separating noises, shapes and spaces hence the need for an environment that has a calm sense of clarity, is simply organized can be easy to use and reduces discomfort. As an example, Humphreys referred to a school designed by him and located in Newcastle, United Kingdom, in which younger and older pupils are separated each occupying a unit adjacent to a shared common area which holds services, administration, departments, etc. Each unit encloses a courtyard shaped in a golden spiral which becomes a focal point along the circulation spaces in the building as shown in Figure 2.1 . Furthermore, the sense of calm and simplicity can also be achieved by the use of materials i.e. limiting the selection of materials, finishings, textures or colours as seen in Plate VI.

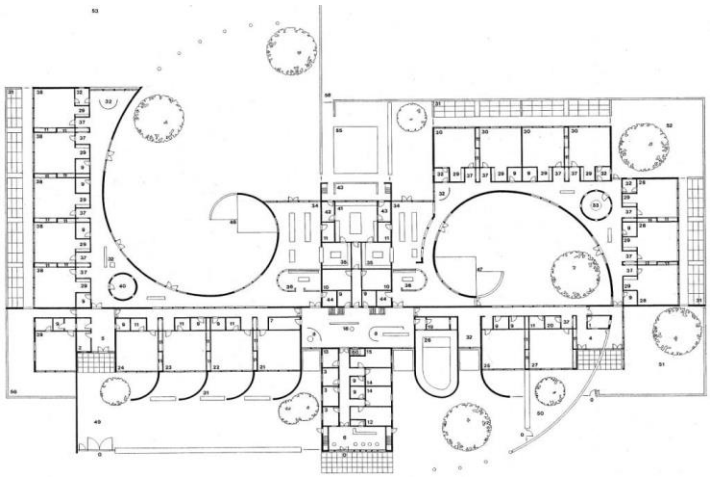


Figure 2.2: Plan of school in Newcastle designed by S. Humphreys
Source: Humphreys (2005)

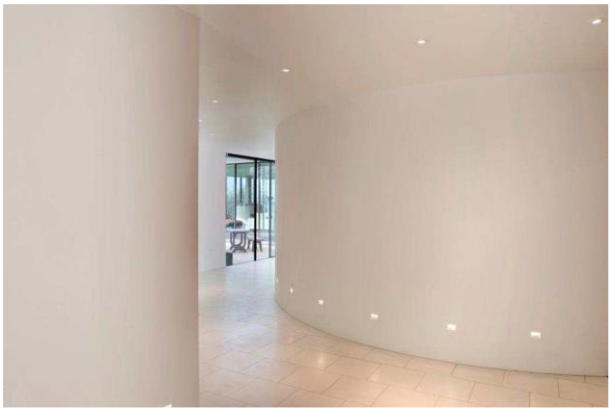


Plate VI: Use of curvilinear form and muted colors in the interior space
Source: Humphreys (2005)

2. Natural light and ventilation:

   Good levels of natural light is uplifting, helps to ease anxiety in people with ASD and assist in visual understanding of space. It also gives access to nature this can be achieved by proper placement of windows and orientation of building but Humphreys warns against certain errors such as entrance of dazzling sunlight, glare, excessive contrasts and deep shadows which can be distracting and cause over stimulation. Natural ventilation is healthier and provides a more balanced environment.

Plate VII: Use of sandblasted glass that diffuses the natural light providing evenness which is less powerful and distracting - Source: Humphreys (2005)

3. Minimal details and materials:

   People with ASD get easily distracted hence the need to minimize the visual distractions that complex detailing brings. Instead Humphreys advocates the use of a broad bold approach using limited palette of material and solutions which is more restful and could reduce stimulation and obsessive behavior.

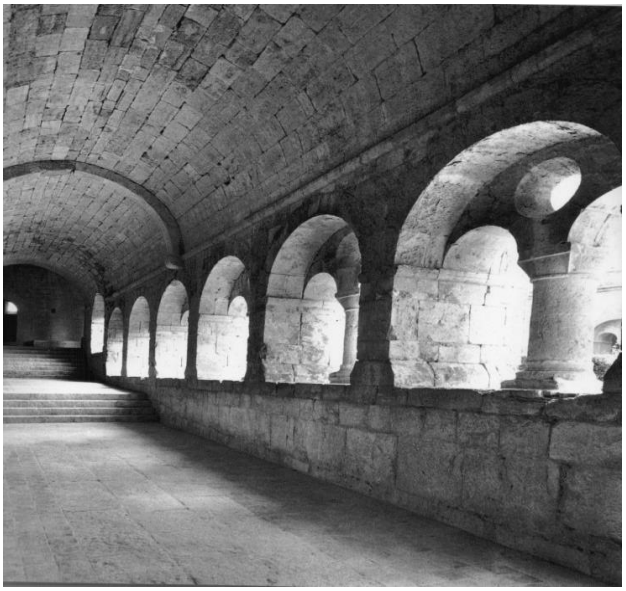


Plate VIII: Minimal use of material, same material use for walls, floors and ceiling – Source: Humphreys (2005)

Plate IX: Elimination of detail around a window providing a calming effect - Source: Humphreys (2005)

4. Proportion:

   The proportioning system known as ‘golden Proportion” was developed by the Greeks and it is found abundantly in nature. These proportions which are harmonious can be introduced into buildings for people with ASD of which they might benefit from the pleasure of proportions and it may manifest in their behavior.

5. Proxemics:

   Proxemics deals with personal space; it is the space that people feel it necessary to set between themselves and others especially for comfort. For a person with ASD it is different from others, they require more space for social relationships therefore

this should be taken into consideration in the design process to reduce any stress on them created by a sense of perceived threat.

6. Containment:

   It is necessary to provide a safe and secure environment for people with ASD by creating boundaries but these boundaries should be subtle, natural but secure such that they can move around freely without harming themselves and ensure ease of monitoring by their care givers as shown in Plate x.

Plate X: Zen enclosed courtyard which does not give the feeling of restriction
Source: Humphreys (2005)

7. Easily managed natural durable materials:

   Material used in an environment to cater for people with autism must be durable because they are extremely demanding on buildings. Material specification though

maybe limited should effectively meet the needs of the user without resorting to an 'institutionalized feel'.

8. Observation:

   It is necessary to constantly observe people on the autism spectrum, as depicted in Plate XI, but this should be done without making them feel under surveillance, therefore the design should be such that they can be observed without being obvious. It will help to improve the well being of the person with ASD as well as their care givers.

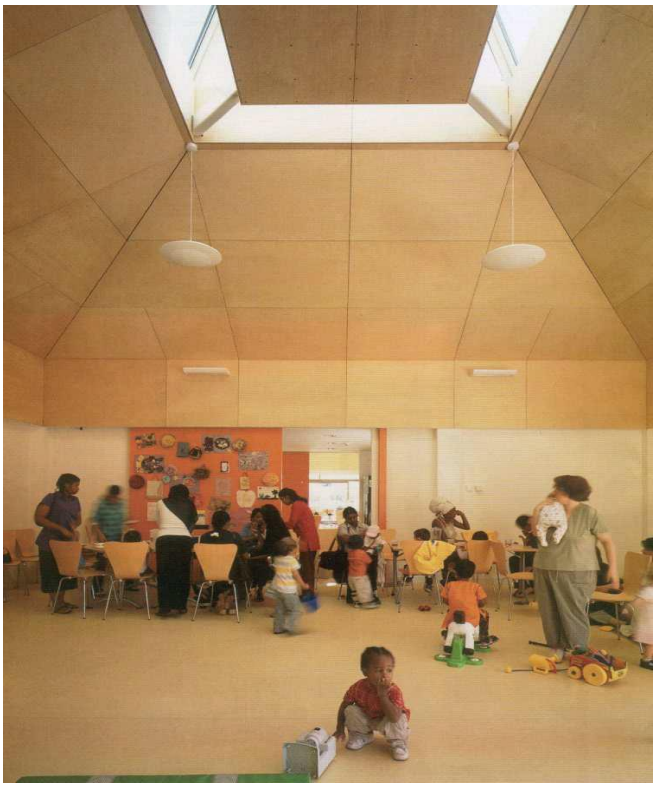


Plate XI: Children under observation by their care givers
Source: Humphreys (2005)

9. Good quality acoustics:

   People with ASD often have to make an enormous effort to differentiate sounds and are extremely sensitive to sound. They require an environment that provides

low stimulation and is stable. It is necessary to design a space, which has good sound quality by taking into consideration the acoustic properties of material used and proper application in areas where noise is effectively reduced as seen in Plate XII.

Plate XII: Grass roof used to reduce the impact noise from the elements such as rain as well as being sustainable - Source: Humphreys (2005)

Another interesting article is that written by Whitehurst (2006) research and development officer at the Sunfield school in which she described the main feature of a new building created as a residential living space for 12 children on the autism spectrum. Through consultation with the Sunfield staff that had a wealth of experience living with children with ASD, the architect incorporated the following design elements in the new building as shown in Figure 2.2. They are:

1. Single storey construction for ease of movement and safety.
2. Single occupants in each bedroom to respect need for privacy and personal space.
3. Circulation space that provided usable space for other functions like storage, play and sitting areas.

4. Provision of communal spaces that are easily accessible from the circulation spaces.
5. Outdoor spaces: by the use of courtyard that is covered and enclosed providing a safe area for play where the children can be easily observed and storage of outdoor play equipment.
6. Curved walls that reduced corners that based on observation by care givers constitute a safety hazard to the children. It helped the children move easily through various area and aids in their visuo-spatial processing.
7. High level window which provide additional day lighting and ventilation this help to prevent the children from climbing out the window and reduce stress.
8. The use of soft non-flickering light for artificial lighting because some people on the autism spectrum are affected by bright fluorescent lights.
9. The use of under floor heating to create a warm environment and regulate interior temperature separately.
10. Use of floor coverings that are durable, reduce noise and are easy to clean is advised.
11. Materials used for ceilings and walls should be such that absorb sound.
12. Color schemes should be such that does not cause discomfort. Research has shown that certain colors can alter the mood of children while others have a calming effect.

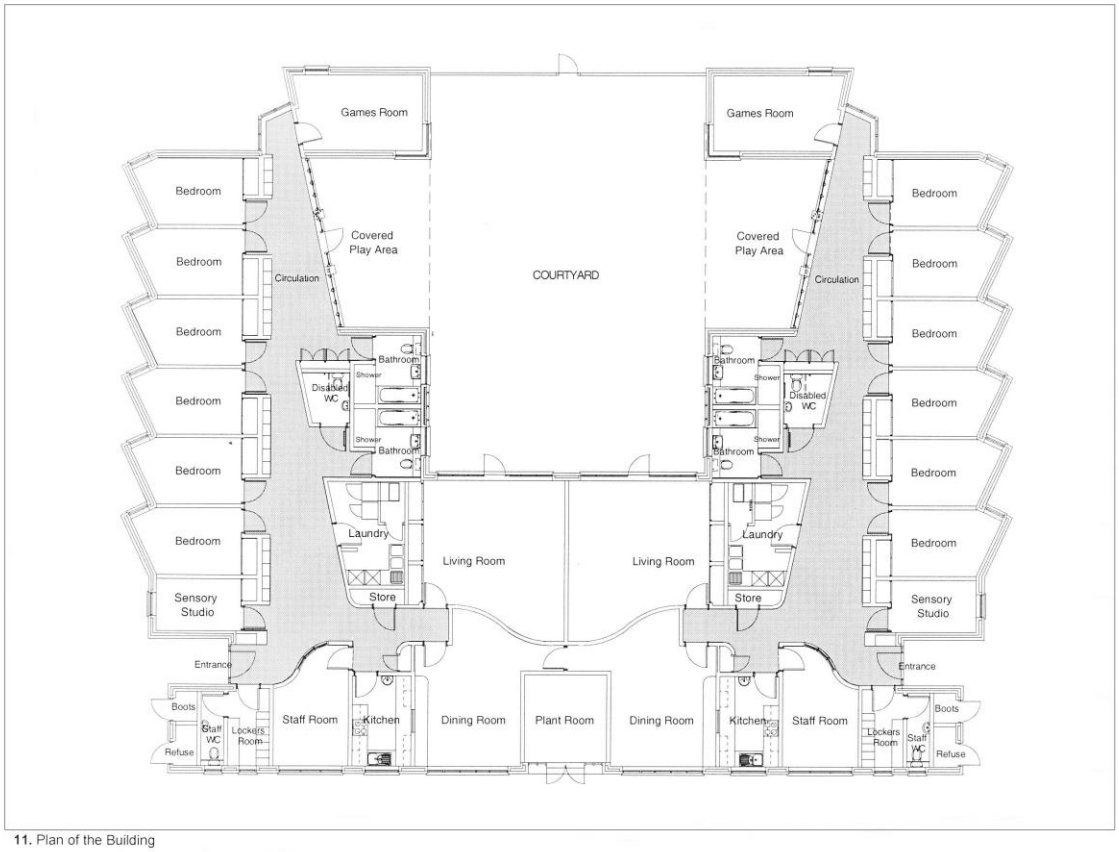
These features matched well with the concepts suggested by Humphreys (2008). The research also considered the impact of the new building on the staff with the following outcome:

A. Calmness: attributed to proper maximization of space and ability to observe children without infringing on their personal space.

B. Wellbeing: happier staff since they did not have to intensely observe the children at all times.

C. Children's independence: due to the layout of the building, care givers had visual access to the children this enabled them maximize the use of outdoor spaces without the direct intrusive supervision. (Whitehurst 2007)

Whitehurst demonstrates that the environment when suitable designed benefits both the staff and children by enhancing their wellbeing.



11. Plan of the Building

Figure 2.3: Plan of Sunfield school - Source: Whitehurst (2007)

2.5 Literature Review on Existing Autism Centre

2.5.1 New Struan centre for autism Alloa, Scotland

The centre was opened in 2005 and is the most advanced centre in the world for the education of children with autism. It provides an independent residential and day autism school for children with ASD. The building is purpose built to enable children with ASD to achieve their maximum potential. The building also includes a research centre, autism advisory centre, training facilities and administrative facilities.

The centre provides the following services

- Diagnostic assessment
- Educational intervention

2.5.1.1 Diagnostic Assessment

This involves a detailed assessment of the child to understand the nature of their autism and to determine whether the school is the right setting for them after which an education and care plan which directly supports the child's needs is determined.

2.5.1.2 Educational Intervention

Based on the assessment an individual educational plan (IEP) is developed along with various therapies which include speech and language therapies, occupational therapies, sensory therapies and music therapy is developed for the children.

2.5.2 Design details

The centre is a single storey building having a central spine called "the street". It is glazed and runs the length of the building providing a clear orientation to the whole project. This central space is airy with simple and elegant clean lines and allows entry of natural light.

The plan of the building is T- shaped with a clear distinction made between public and private areas. Since children on the autism spectrum are sensory sensitive and feel uncomfortable in fluorescent lit rooms, bringing natural light into the environment was therefore important to encourage development in a safe and stimulating environment. The centralized street is cover with a gull wing roof to encourage as much natural light as possible into the building of which the pointed centre of the roof forms a glazed atrium that runs the length of the building as shown in Plate XIII and XIV. The classrooms are located on either side of the atrium as shown in Figure 2.3. Floor to ceiling windows are incorporated in the classrooms with glass that diffuses direct sunlight.

1. Colour schemes: Colour coded doors lead to an external play area and allows pupils to easily remember which classroom to return to. Colours considered to have a positive impact on the mood of people with ASD are used throughout this colour scheme helps to promote a sense of calm throughout the building.
2. Glass panels: every door has glass panels to enable pupils have a view of their class room before entering and the street before leaving the class. See Plate XIV
3. Curved walls the curved walls help to lead the children naturally from one area to the next and reduce the number of sharp angles, obstructive corners and hidden doorways throughout the building. See Plate XIV.
4. In the classrooms angled ceilings were used to maximize natural daylight
5. The use of low perimeter fence in outdoor areas that is aesthetically pleasing and provides a clear boundary without appearing restrictive

Plate XIII: Approach view New Struan School, Alloa, Scotland - Source: www.archdaily.com

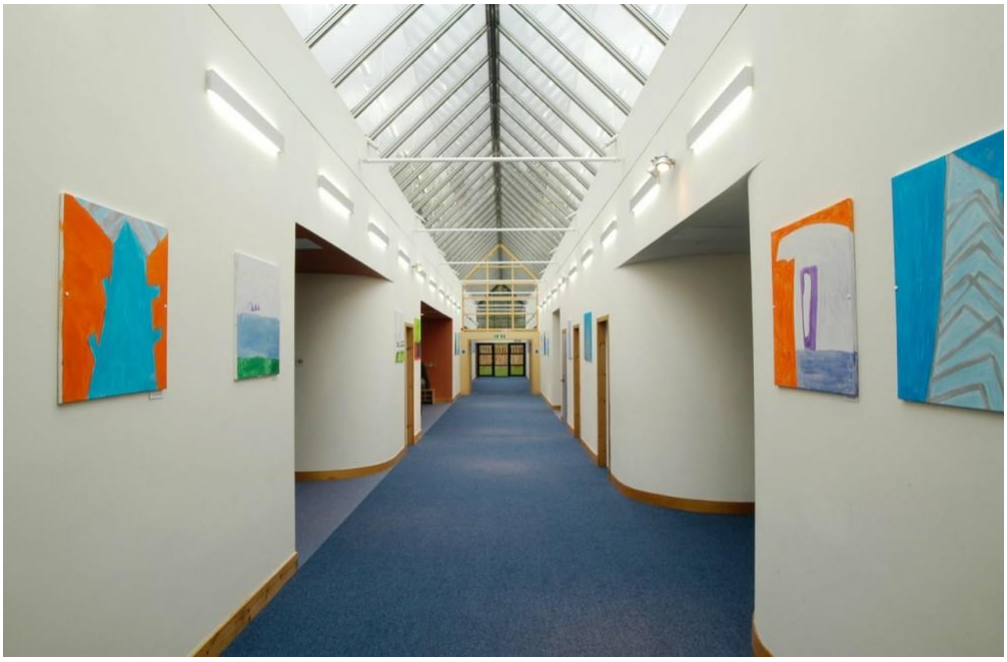


Plate XIV: Interior view of centralized circulation area New Struan School, Alloa, Scotland - Source: www.archdaily.com

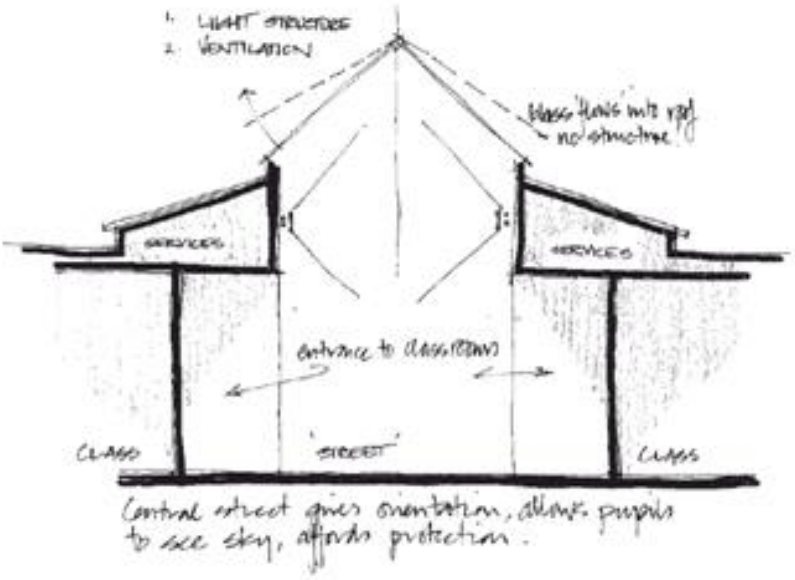


Figure 2.4: Section of centralized circulation area. New Struan School, Alloa, Scotland - Source: www.archdaily.com

2.5.3 Dubai autism centre (DAC)

The Dubai autism centre was founded in 2001 and is the largest, most innovative and comprehensive non profiting organization in the United Arab Emirates, dedicated to serving children with Autism spectrum disorder (ASD) to improve their quality of life. The centre provides specialist care to people with autism and those who care for them.

The centre provides the following services

1. Diagnostic evaluation
2. Intervention
3. Research
4. Training programmes
5. Family support

Plate XV: Approach view Dubai Autism centre. Dubai. Source :
Source: http//dubai-autism-centre.org

2.5.3.1 Diagnostic Evaluation

An assessment of children, adolescents and adult that have ASD but have not received diagnostic evaluation is carried out. Early diagnosis is associated with dramatically better outcomes for autistic individual. The centre has a multidisciplinary team specialized in this aspect, the team consists of

1. Family programme coordinator
2. Clinical psychologist
3. Speech and communication therapist
4. Occupational therapist
5. Pediatrician
6. Behaviour modification therapist
7. Child psychiatrist
8. Neurologist

2.5.3.2 Intervention

This involves the development of an individualized educational plan (IEP) for each child depending on the level of autism experienced and it also involves a combination of

intervention methods to best help the child. Furthermore, intervention involves working with families and school staff to increase a child's ability to successfully function and adapt in the home, community and at school through counseling and individual skill teaching. Intervention is divided into several service units which are

1. Educational unit

   It comprises the early intervention unit which provides important studies and research to prove the progress that occurs with early intervention educational program and classroom program. which provides services to older children with autism based on an IEP and it involves various therapies.

2. Community service unit

   Creates awareness and education in the community regarding autism by holding lectures, seminars and workshops.

3. Speech and communication unit

   Provides a speech and language therapy since communication impairment is one of the challenges experienced by the autistic.

4. Occupational therapy and creative unit

   This unit is further subdivided into other units, they are Occupational therapy, Movement therapy, Art therapy, Computer therapy and Music therapy.

2.5.3.3 Training programme

The centre provides specialized workshops, seminars and lectures to parents, care givers and professionals on issues relating to autism.

2.5.3.4 Family support

This involves workshops for family members to help cope and be more compassionate toward the autistic child; it includes interactive discussions, games and other related activities. Seminars and workshops are also organized to provide families with the most recent information regarding intervention.

3.0 RESEARCH METHODOLOGY

According to Shank (2002) qualitative research is a systematic inquiry that seeks to understand how others make sense of an experience in their natural setting. It involves analysis of data such as words, pictures and objects and usually gives a complete and detailed description of the phenomenon being studied.

Multiple methods of data collection are employed such as in-depth interviews, observation and visual survey in case studies selected in order to provide an in-depth study. This is important to provide appropriate guideline and standards for the design proposal. Case studies provide an insight into the issue being investigated as they are in existing facilities and methods employed to militate against them.

3.1 Case Study Research Method

Architectural research methodology usually makes use of case studies, simulations, investigative architectural projects, analyses and interpretation etc but different methods can be combined for the purpose of illuminating a particular case. According to Yin (2004) case study can be seen as an empirical inquiry that investigates a contemporary phenomenon within its real life context using multiple source of evidence. This method is characterized by a purposeful selection of a case to study using multiple methods to collect evidence some of which are interviews, direct observation, archival records and participant observation (Johansson 2010). Oluigbo (2010) suggests that for a case study to be properly documented, it should be carried out under the following headings: history and background; site planning and landscaping; spatial organization of buildings; structure and materials; and building services. This method suggested by Oluigbo (2010) will be adopted in reporting cases selected for this research.

3.2 Case Study Selection

Oluigbo (2010) stated that for a case to be selected it must have certain characteristics that are representative of the phenomenon under consideration. Hence the following selection criteria have been considered for this research

1. Architectural features employed and its impact on well being of its user.
2. Facilities provided and how it relates to the facility being proposed
3. Its functionality and architectural characteristics such as material, spatial arrangement and safety consideration.

The cases selected that meet with phenomenon under investigation are;

1. Patrick's speech and language centre (PSLC), Lagos
2. The Zamarr Institute (TZI), Abuja.

The case studies approach is illustrative in nature because it is chosen deliberately to increase the likelihood of showing or presenting important variations of several features of the facility. It is information-rich and gives a description of what the situation is like.

3.3 Instruments of Data Collection

The instruments of data collection used in this research are

1. Visual survey: this involves the use of the eye to survey and record existing features and specific characteristics being researched upon. Documentation can be done through pictures, diagrams, drawings and creating a checklist.
2. Observation: involves looking at activities and the pattern in which they are carried out and how it affects the user of a particular space.
3. Interviews: this involves asking questions from specific people who are experienced and knowledgeable in the field being research.

3.4 Procedure of Data Collection

Each case selected will be visited; Visual survey and Observation of the architectural features, materials, finishes, spatial organization and functional flow will be made as well as Interviews of care givers, key staff and where possible the designer. The data collected will be documentation under the following headings;

1. Architectural features adopted in the center and how it improves wellbeing
2. Facilities provided and its functionality and spatial arrangement

Visual survey will be reflected using photographs which were taken of relevant case studies to ascertain the architectural features used, sketches will also be made of some parts of the selected cases. These sketches will show the spatial organization of space and facilities of the cases.

3.5 Variable of Study

Variables are characteristics or attributes specific to a particular research study. Therefore, to give a full assessment of the selected case studies in the research, the variables which meet the requirements of research questions and are to be used to assess the case studies are the architectural features that have been discussed in the literature review, this variables highlight the architecture features applied and how they have been used to meet the need for well being among autistic users. They are;

1. Materials used.
2. Acoustical treatments applied
3. Spatial sequencing
4. Provision of escape spaces
5. Compartmentalization

6. Transition spaces
7. Sensory zoning
8. Safety.

3.6 Data Analysis

Data obtained from visual survey and observation will be analysed using descriptive analysis and will include the uses of plates and figures that clearly depict what is being described, furthermore tables will be used to provide comparative analysis of information obtained from both case studies. Data obtained from interview will be analysed comparatively by description as well as tables.

4.0 FINDINGS AND DISCUSSION

4.1 Findings at The Zamarr Institute (TZI)

4.1.1 Introduction

The Zamarr Institute (TZI) was established in May 2006 to promote educational excellence and training opportunities for children and adults with developmental, behavioural and learning disabilities. It is located at LEA primary school, Patrick O. Bokkor street off Ebitu Ukiwe street, Jabi, Abuja. The centre currently has facilities to provide services such as Behavioural, Occupational Therapy. It is made up of two floors and consists of;

1. 2 group classes
2. Music room
3. Computer room and staff room
4. Partitioned spaces for individual therapy sessions
5. Outdoor play areas
6. An office.

4.1.2 Findings from visual survey

The building currently used by TZI is a converted building. The factors considered in the visual survey are discussed below;

1. Acoustics

There was no particular use of acoustic treatment in areas such as the speech room and computer rooms. Generally the floor finish was terrazzo in most of the classrooms and some areas like the computer room, staff rooms and some parts of the classroom were

rugged this is to further mute noise from people moving around and noise transmission from activities taking place in adjoining classes as shown in Plate XVI and XVII. The walls are made of concrete, with glazing for the windows. The walls are painted in not too bright colors using a color coding pattern for the different spaces.

Plate XVI: Terrazzo floor finish in Group class with limited area rugged.

Plate XVII: Computer room floor fully rugged to minimize noise distractions during sessions.

2. Spatial Sequencing

Rooms used for group classes and individual therapy sessions are centrally located and with even floors. The individual therapy session room is a large room that is partitioned into smaller space and accessed through the group classes. The interior of each of the spaces has access to natural daylight on both sides through the use of large windows so the rooms are well lit but these windows are covered with venetian blinds especially during sessions to reduce the amount of sunlight and scenery so the children are not distracted as shown in Figure 4.1 and Plate XVIII. The arrangement of the group classes and individual therapy session classes was the same throughout the building emphasizing routine and order.

Figure 4.1: Ground floor plan, TZI

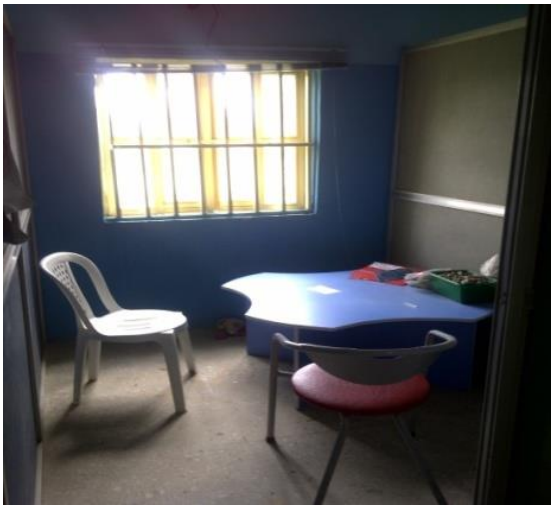


Plate XVIII: Cubicle for individual sessions

3. Escape spaces

There was no provision made for escape spaces that is areas where the children can be allowed to retreat to when overwhelmed by the sensory environment. From the interview with care givers what was done in a situation where by the children became overwhelmed and threw a tantrum was to take them outside to the play area and allow them calm down, with a care giver supervising whatever the child does.

4. Compartmentalization

Activity areas for group classes, individual therapy sessions, sensory classes and computer room was distinctly separated so each activity has a clearly demarcated space so the children are able to easily differentiate these activities. But the group classes and individual therapy session was one large room demarcated with plywood so there was the problem of noise distractions during individual therapy sessions as shown in Plate XIX and XX.

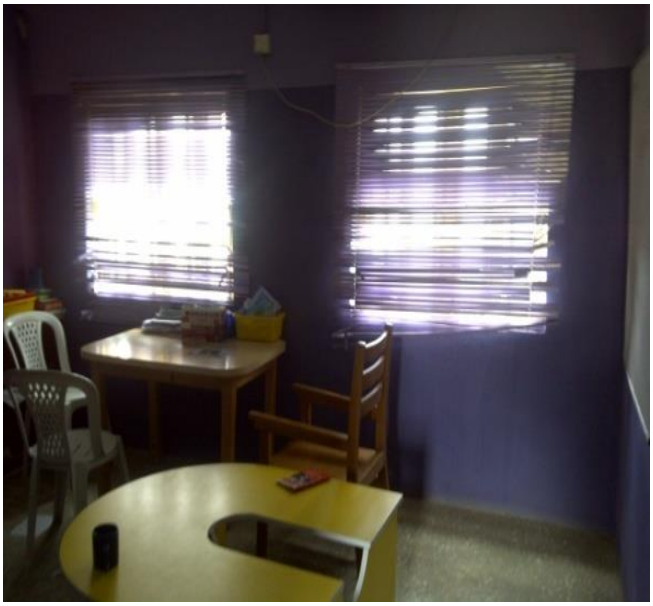


Plate XIX: Smaller group class

Plate XX: Demarcated Cubicles for individual therapy sessions

5. Transition spaces

The outdoor play area serving as a transition space is located directly in front of the building providing a brief respite for the children when they are moving from the classrooms to the sensory room and computer room. See Plate XXI.

Plate XXI: Landscaped outdoor play area

6. Sensory zoning

Since the building was not originally designed as an autism centre, and it was a classroom block donated by the L.E.A. school, the classrooms where just partitioned and allocated for various purposes, there was not sensory zoning done. All classrooms where side by side with administrative activities. The computer room which is a high stimulus activity was grouped with the staff room which should have been separated to reduce the problem of distractions and diversions.

7. Safety

The use of terrazzo floor finish was safe since the children rarely slipped and fell on it but the building made use of a long external corridor which encouraged the children to run as discovered from the interviews and the windows to the classrooms opened onto the corridor so the children bumped into them so these windows where closed most times except when the weather was unbearably hot. Furniture was also arranged close to was edge in the computer room to avoid children bumping into it. Overall the environment had to be made child proof.

4.1.3 Findings from interview

From the interview with the clinical psychologist and care givers of the institute, it was stated that the linear form of the building did not allow much for sensory zoning but this was still achieved by using the landscaped play area in front of the building as a transition area when moving the children from one activity to the other. Walkways and corridors should be clear and free from all obstructions and should not be too complicated so as not to confuse and distract the children.

Further suggested was that spaces having various sizes that is the use of compartments needed to be provided for the children, this is to aid the transition process from large to smaller spaces when needed and also to avoid distractions during individual therapy sessions. Floor surface should provide a firm grip to avoid slipping and falling. Color coding was also used in the centre each functional space having a specific color for easy identification for example, the administrative office was painted yellow, the sensory room painted pale green and the group classes painted purple.

Other suggestions raised where the use of soft landscape elements like grass and sand in outdoor play areas and less of concrete. Proper building orientation to avoid the glare caused by sunlight and incorporation of other facilities for the care of the children like the listening room, library etc.

Table 4.1: Assessment of variable in TZI - Source: Authors field work

VARIABLES	**Adequate**	**Moderately adequate**	**Not adequate**	**Remark**
ACOUSTICS				Terrazzo floor finish was used throughout the building, the walls were block wall and suspended ceilings
Materials and finishes used		✓		
Consistency of materials used	✓			
SPATIAL SEQUENCING				Spaces for group activities and one on one therapy sessions are clearly separated with a corridor in between as a visual barrier
Emphasis on order, sequence and routine with a clear demarcation of activities		✓		
ESCAPE SPACES				No provision was made for an escape area instead children were taken outside the classroom to calm them down
Provision of areas of neutral sensory stimulation			✓	
COMPARTMENTALIZATI				

ON				
Provision of physical and visual compartments to reduce distractions	✓			Separate rooms were provided for group classes, individual therapy sessions, sensory room and music room. The Individual therapy area is partitioned into smaller cubicles to minimize distractions
TRANSITION SPACES				A landscaped area that also serves as a play area is provided at the front of the building.
Provision of sensory transition zones to minimize distractions		✓		
SENSORY ZONING				Administrative office and computer room which are high stimulus functions was separated from the classrooms.
Spatial grouping of activities following and autistic logic		✓		
SAFETY				Play area is located in front of the building for easy observation of the children with a barb wire fence used as a subtle enclosure.
Use of subtle enclosures and absence of hazardous materials in the environment	✓			

4.2 Findings at Patricks Speech and Language Centre (PSLC)

4.2.1 Introduction

The Patricks Speech and language centre (PSLC) is a unique centre for children with Autism Spectrum Disorders, Asperger Syndrome and other related developmental disabilities. The centre was established in 2006 by Mrs. Dotun Akande and is located at 13B Remi Fani- Kayode Street, Ikeja GRA, Lagos. The building was remodeled to meet current needs as it was previously a residential building. The centre currently has facilities to provide services such as Behavioral, Occupational and Speech Therapy. It is made up of two floors and consists of;

1. A reception/ waiting room.
2. Three educational group classes accommodating children of in different age groups.
3. One large sensory room.
4. One room partitioned into cubicles for individual Sensory sessions.
5. Music and movement room
6. Vocational unit
7. Two rooms partitioned for individual speech therapy sessions
8. Timeout room.
9. Outdoor play areas
10. Parents' room.
11. One large office
12. Kitchenette for staff
13. Parking spaces.

4.2.2 Findings from visual survey

The PSLC building was remodeled as earlier mentioned. The factors considered in the visual survey are discussed below;

1. Acoustics

The materials used in the building consisted of sandcrete block walls with plaster finish, glazing for the windows in public areas especially on the ground floor and clear plastic in the windows for the therapy rooms, terrazzo floor finish in certain areas like the reception, office and corridors and Poly Vinyl tiles in the classroom and rugged floors for the sensory room as shown in Plate XXI and XXIII, the use of rugs in the sensory room was use to minimize sound, no particular provision was made for acoustic materials in the centre. The ceilings where made of white patterned suspended ceiling and POP ceiling in some spaces as shown in Plate XXII. A mix of paint and wall paper is used for the walls. Where wall paper is used, the patterns are even and vertical. Rooms that are painted have a specific color up to a height of 1.5m and the top half is painted cream this helps the children easily identify the rooms. The colors used are not too bright.

Plate XXII: Terrazzo floor finish and POP ceiling in Group class

Plate XXIII: Floor covered with carpet in Sensory room

2. Spatial sequencing

The building has most of its public areas located on the ground floor towards the front of the building with the more private areas on the upper floor. The ground floor consist of the reception, two group classes, parents room, toilets, kitchenette for staff and an office. Towards the rear of the building is the vocational unit and music room as well as another group class as shown in Figure 4.2 and 4.3.

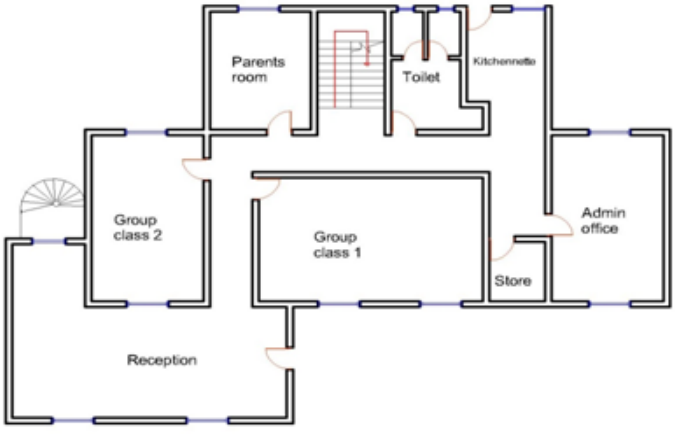


Figure 4.2: Ground floor plan PSLC

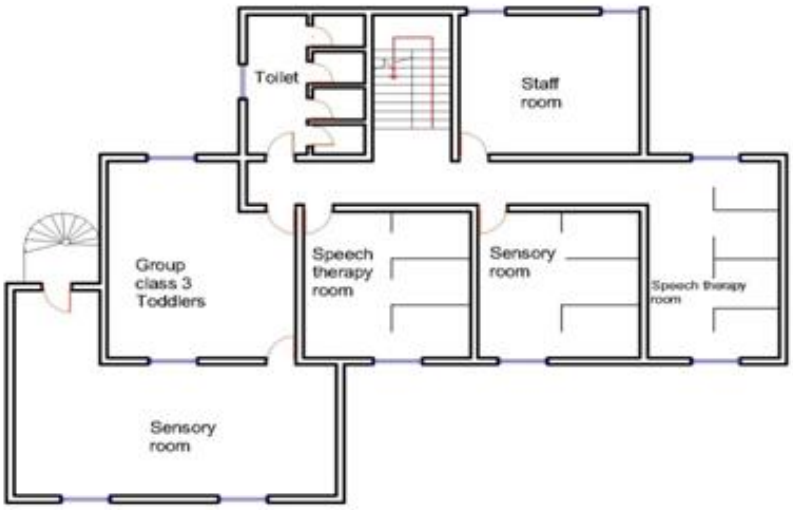


Figure 4.3: First floor plan PSLC.

The classrooms are grouped according to age with the pattern of arrangement similar throughout creating a sense of routine and order. See Plate XXIV and XXV. The individual therapy session rooms are completely separated from the group classes and are located together on one side of the building on the upper floor.

Plate XXIV: Group class for older children with clear central area

Plate XXV: Group class for younger children with clear centre area

3. Escape spaces

No provision was made for an area where the children can use as an area to calm down during tantrums within the classrooms, instead the children were taken to another class that is not in use at the time of the incident to calm them down.

4. Compartmentalization

The various activities were separated into distinct parts, separate rooms where provided for group classes, individual therapy sessions, sensory room, music room, with the group classes being grouped according to age. Hence there was minimal distraction during individual therapy session with the cubicles demarcated using partition boards. Plates XXXI and XXXII respectively.

Plate XXVI: Cubicles for speech therapy sessions

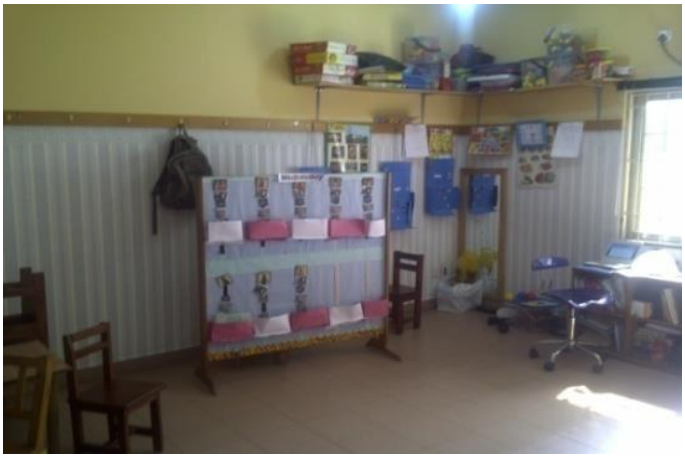


Plate XXVII: Group class for toddlers with partitioned area for individual therapy session

5. Transition spaces

The group classes and the individual therapy rooms are all located within the main building along with the sensory room, but the sensory room is accessed via spiral stair case close to the outdoor play area, further more the music and vocational room is located towards the rear of the main building providing a view of the outdoor play area and a well landscaped area that helps to prepare the children for the move from one activity to the other with minimal distraction as shown in Figure 4.4

Plate XXVIII: Outdoor play area

6. Sensory zoning

Though the centre was not originally designed as an autism centre, a form of sensory zoning was applied in the centre High stimulus functions like music, arts and crafts are grouped together, while low stimulus functions like classroom and individual therapy sessions are also grouped separately. With most administrative activities located on the ground floor of the main building to reduce distractions to the children. The classrooms located on the ground floor were used for older children.

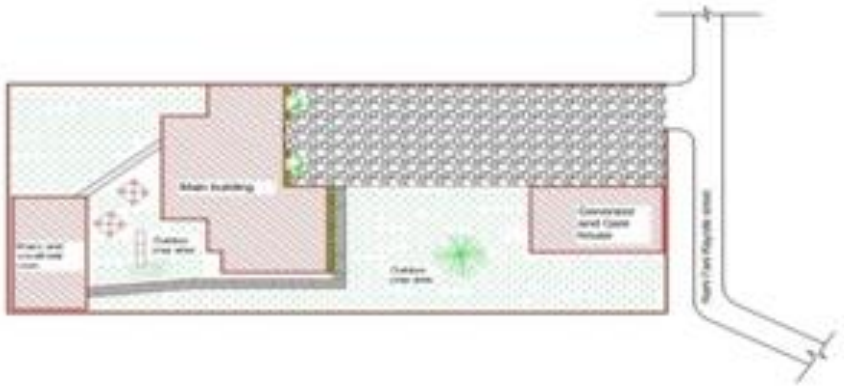


Figure 4.4: Site plan of PSLC

Plate XXIX: Music and vocational room

7. Safety

The use of terrazzo flooring is good to avoid the children slipping and the outdoor play area is enclosed with a white picket fence so that the children can still have a sense of freedom in the outdoor areas while being closely observed by their carers. From the interview with care givers most times the children have to be guided especially where there are wall edges so they do not collide with the oncoming pedestrians.

4.2.3 Findings from the interview

From the Interview at PSLC, it was stated that certain considerations had to be made to the building to make it suitable for use since it was not originally designed for the purpose of being an autism centre. These considerations include the use of pattern walkways through the building to the classrooms. The external walkway leading from the vocational unit and music room to the main building has a walking beam that helps to guide the children along as they walk. Reduction of sizes of some rooms by partitioning them to enable therapists

work individually with the children. Changing the floor finish to terrazzo and PVC tile to reduce noise, and ensuring the floors are even, no sudden change in levels to avoid the children tripping. She further said colors used on the walls were not too bright so the children do not get distracted.

Natural lighting was also considered for most of the room with most windows covered with venetian blinds to avoid direct sunlight and prevent distractions during sessions. The windows in the therapy rooms on the upper floor were covered in clear plastic instead of glass to avoid breakage. It was also mentioned that the most common injuries where self injury like head butting, biting and scratching, others include falling and seizures hence the need to provide a gated door especially to the staircase.

Further stated was that the use of forms was important in feeding the sensory needs of the children since certain patterns of movement was also incorporated into the sensory sessions with the children and this helps in coordinating their bodily movements. Outdoor play and the right combination of soft and hard landscape features which also helps to build mental capacity and meet sensory needs. The music and vocational unit was purposely separated from the main building where classroom and individual sessions took place this was because a higher level of noise was generated and the distraction had to be minimized.

Table 4.2: Assessment of variable in PSLC

VARIABLES	Adequate	Moderately adequate	Not adequate	Remark
ACOUSTICS				A combination of Terrazzo and pvc floor finish was used throughout the building, the walls were block wall and suspended ceilings
Materials and finishes used	✓			
Consistency of materials used	✓			
SPATIAL SEQUENCING				Classrooms where arranged in a manner as to emphasize group activities with an open area in the middle for group play. One on one sessions where totally separated in another room. No provision for low and neutral activity zones in most classrooms.
Emphasis on order, sequence and routine with a clear demarcation of activities		✓		
ESCAPE SPACES				No provision was made for an escape area instead children were taken to an empty classroom to calm them.
Provision of areas of neutral sensory stimulation			✓	
COMPARTMENTALIZATION				
Provision of physical and visual compartments to reduce distractions	✓			Separate rooms were provided for group classes, individual therapy sessions, sensory room and music room. The Individual therapy area is partitioned into smaller cubicles to minimize distractions
TRANSITION SPACES				A well landscaped area serving as a transition space is provided between the
Provision of sensory transition zones to minimize distractions	✓			

				main building and the vocational and music building.
SENSORY ZONING				The vocational and music rooms are separated from most of the classrooms though the reception and administrative office is located within the same building as the classrooms on the lower floor.
Spatial grouping of activities following and autistic logic		✓		
SAFETY				Soft landscape is used in the play area is located in behind the main building and it is enclosed with a wooden picket fence.
Use of subtle enclosures and absence of hazardous materials in the environment	✓			

4.3 Discussions

Research has shown that the form an architectural design takes, affects the functionality of the building. There are certain properties to be considered in analyzing an architecture form which includes, size, shape, texture, light, rhythm, and orientation amongst others. According to Ayers (2007) architectural design has strong but modifiable effects on social behavior, users' countenance and productivity and to some extent design features such as structure of space, number and spacing of windows and lighting effects also affects health and wellbeing.

Some of the properties of architectural forms were considered in the cases studied. Both centres used in the case study are converted structures which were modified to for use hence the lack of adequate facilities. Both centres are located in quite areas away from the noise of the busy city centre to help reduce the distractions around.

The form of buildings are both rectangular with the TZI having a long external corridor off which other functional space are located while PSLC has corridors located within the

building but from the interview, it was stated that these corridors encourage the children to run hence the risk of falling and causing injury to themselves.

From literature review it has been stated that circulation spaces that provide easy access to other spaces and can be used for other functions like storage, play and sitting areas are more beneficial for people with autism. Hence suggestions were made to minimize the use of long corridors and use other simpler forms that encourage sensory stimulation as well as reduce injury.

The colors adopted for the interior spaces of both centers where such as to provide a calming effect on the children, not too bright and also enable easy identification of specific rooms. The external colors were also light and inviting. In the organization of the internal spaces, most rooms where rectangular in shape following the form of the building and in creating social interaction among children in group classes, the furniture where mainly used to create the sense of togetherness when arranged in a circular pattern.

Both centres had their public and private areas clearly demarcated with that of TZI being close on one side of the building away from the therapy rooms. PSLC had all its public areas on the ground floor easily accessible with most of the therapy rooms on the upper floor.

At TZI the group classes and the individual therapy session room were created by partitioning a large room into smaller cubicles but there was still the problem of children being distracted from the voices of the therapist in adjoining cubicle and the sensory room provided was inadequate. The PSLC had separate rooms for group classes and individual therapy sessions of which the group classes were divided according to age group and it also had a dedicated and equipped room for sensory sessions. The separation of group

classes from individual therapy session minimized distractions during individual therapy sessions.

A combination of natural and artificial lighting was used in both centres. Natural lighting was provided with the use of large windows but the windows had to be covered with venetian blinds mostly to reduce glare from the sun and block out the scenery so that distractions are avoided. It is important that proper consideration be given to the positioning of therapy rooms and even their window to avoid distractions so that productivity is maximized. The external spaces provided for outdoor play in both centres where quite small but properly enclosed with mostly the use of soft landscape elements in the play areas but from the interview use both hard and soft landscape was suggested. Both centre currently catered to the needs of less than 40 children each due to lack of adequate space and facilities.

TZI had no staff room, but the PSCL has a staff room and a small kitchenette for staff. Restrooms provided were jointly shared by the children and staff. Facilities lacking for the staff include library and training rooms. Diagnosis was done in the administrators' office only. Other facilities needed as suggested in the interview are sick bay, staff room, dining room for children and staff, indoor exercise room, swimming pool and larger outdoor recreational spaces.

The table below is gotten from deductions made from literature reviewed and analysis of the visual survey and interviews carried out

Table 4.3: Summary of findings.

Variables	**TZI**	**PSLC**
Acoustics	2	3

Spatial sequence	2	3
Escape spaces	1	1
Compartmentalization	3	3
Transition spaces	3	4
Sensory zoning	2	3
Safety	3	3
Total	16	20

LEGEND: Very efficient - 5, Efficient – 4, Moderately efficient - 3, Inefficient -2, Very inefficient – 1.

5.0 DESIGN CRITERIA

5.1 Site Location

The Autism center is to be located in Abuja which is the capital city in Nigeria. Abuja is located in the centre of Nigeria, within the Federal Capital Territory (FCT), it is a planned city and it became Nigeria's capital city in 1991, it is still under development. Its coordinates are 9°4'0"N and 7°29'0"E with a total area of 7315km² and it is situated within the savannah region with moderate climatic conditions. It is bordered to the north by Kaduna state, to the east by Nasarawa state, to the south-west by Kogi state and to the west by Niger state as shown in Figure 5.1

Figure 5.1: Map of Nigeria with Abuja highlighted in red. Source: www.ngex.com

5.2 Climatic Data

Abuja is found within the tropical savannah climate also known as the tropical wet and dry climate which is an extensive area that covers most of western Nigeria to central Nigeria. This climate is characterized by a well marked rainy season and dry season, with an average annual temperature of 25.7°c throughout the year. Annual rainfall is about 1389mm with the rainy season beginning in April and ending in October.

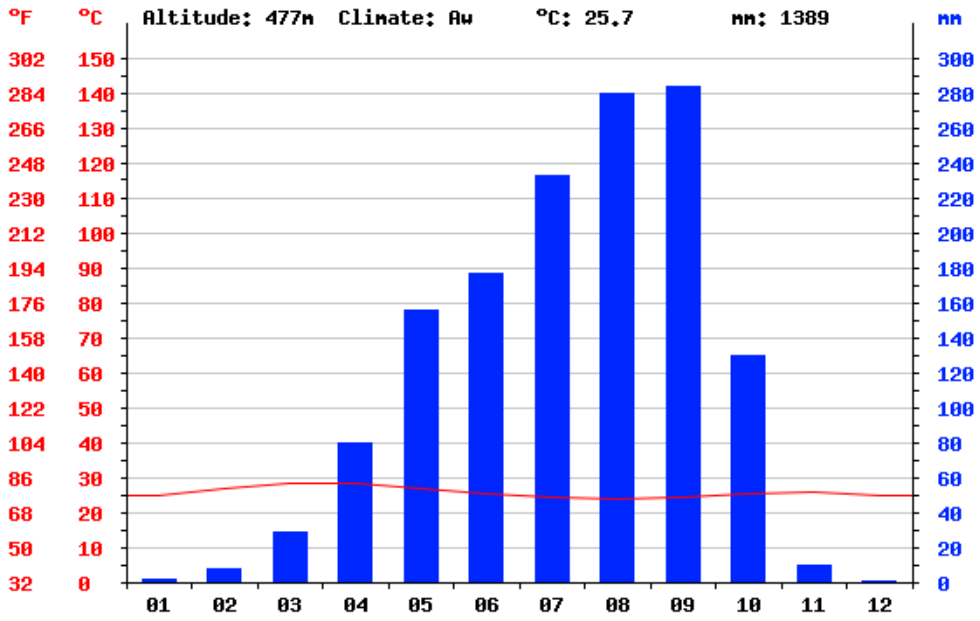


Figure 5.2: Climate graph for Abuja – Source: en.climate-data.org

5.3 Site Selection Criteria

Abuja is a planned city still undergoing development and it is divided into 4 phases of which the master plan has apportion land for various uses within the phases, this include land for government use, ancillary services, residential development, infrastructure, commercial activities and green areas. The criteria considered in the selection of the

suitable site are listed below with the site possessing a majority of these criteria chosen for the proposed design.

1. Provision from the land use map for areas allocated for any of the following purposes which are health, rehabilitation or educational centres.
2. Accessibility
3. Traffic conditions: Most suitable is an area with low traffic to avoid congestion and noise as well good road network for easy access
4. Availability of services such as water, electricity.
5. Topography
6. Noise free environment based on the needs of the users of the proposed facility

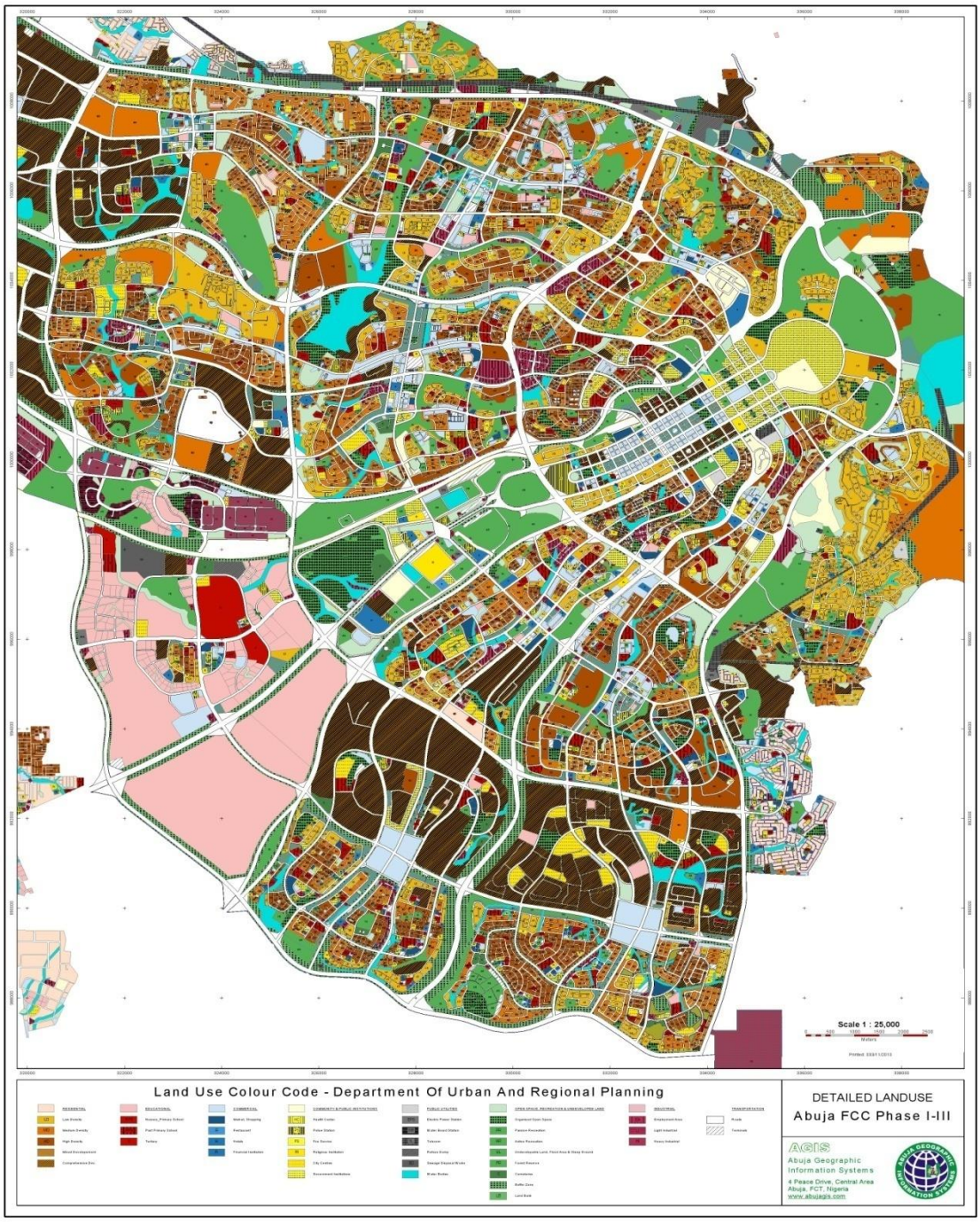


Figure 5.3: Abuja land use map phase 1 to 3 - Source: Abuja geographic information centre (2013)

Three sites were selected within phase 2 of Abuja master plan development which is close to the suburbs and not too far from the city centre as well. These sites are highlighted from the portion of the map as shown below.

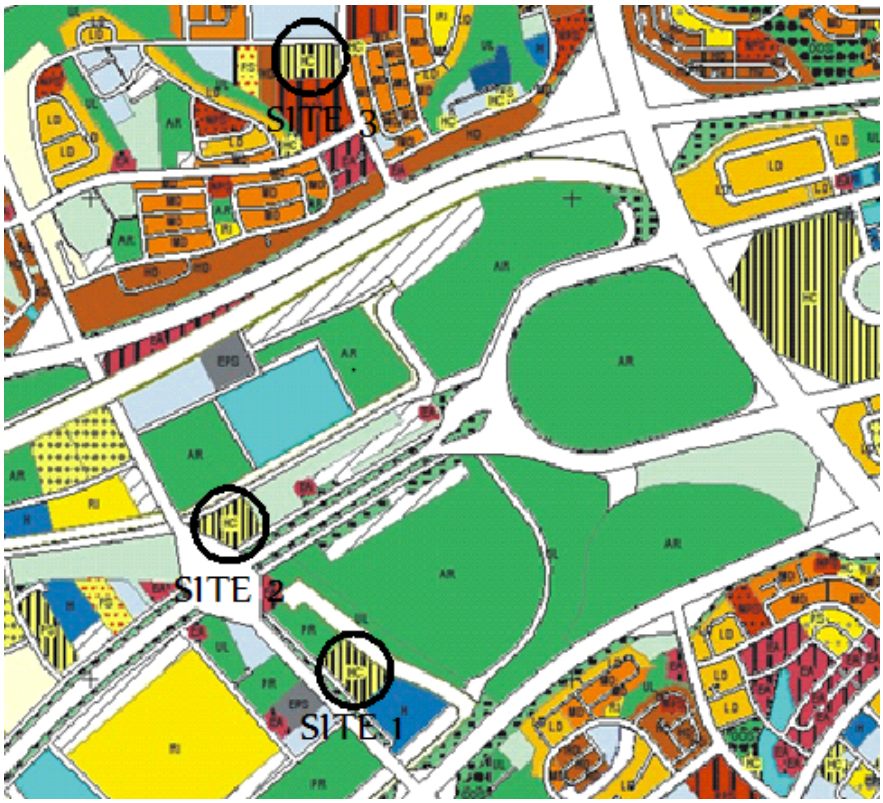


Figure 5.4: Selected sites from land use map - Source: Abuja geographic information centre (2013)

SITE ONE

The area is located along Oladipo Diya Road by Airport Road Abuja. The site is allocated for health care and has a sports complex, a hotel and areas for passive recreational activities close by. It is accessed from Oladipo Diya Road which is tarred as shown in Plate XXX.

Plate XXX: Site One along Oladipo Diya Way - Source: Goggle earth 2014

SITE TWO

The area is located along Oladipo Diya Road off the Airport Road Abuja, it is close to areas for parks and open spaces as well as active recreation spaces. The surrounding area has not been developed and the site is accessed via an untarred road as shown in Plate XXXI.

Plate XXXI: Site Two along Airport Road - Source: Goggle earth (2014)

SITE THREE

This area is located along Idris Gidado Street off Nnamdi Azikwe express way Wuye, Abuja. The area is one of medium density housing and the site is located close to a market and primary school as shown in Plate XXXII.

Plate XXXII: Site Three in Wuye area Abuja - Source: Goggle earth 2014

Based on criteria listed above, the three sites were analyzed and Site One was chosen because it is readily accessible, area is quiet, and it is located close to other ancillary facilities, the site is relatively flat, traffic is light on the access road further reducing noise as well as congestion in the area.

Table 5.1: Analysis of the 3 sites based on site selection criteria

CRITERIA	SITE ONE	SITE TWO	SITE THREE
Land use compliance	The site is allocated for health care	The site is allocated for health care	The site is allocated for health care
Accessibility	The road to site is tarred and easily accessible	The site is not readily accessible as the road is untarrred.	Access road is tarred and is easily accessible
Traffic conditions	Traffic along the access road is light and can be easily access via both ends of the road	Traffic is minimal along the access road.	Traffic along the road is high due to the presence of a market.
Proximity to other ancillary	Area is partly developed with residential area and hotel	Availability of parks and open spaces around	The site is located in a medium

services	nearby and not too far away from the National hospital and the central business district	and areas for active recreation but the area is mostly undeveloped with very few facilities around.	density residential areas with access to a primary school and market close by
Topography	The site slope gently toward the north-eastern end.	The site slope gently toward the rear	The site is relatively flat
Noise	A buffer zone of about 50m is provided from the road and the area is quiet.	Area is quiet only source of noise is from the express road.	Area is noisy due to the presence of the market and other schools closeby.

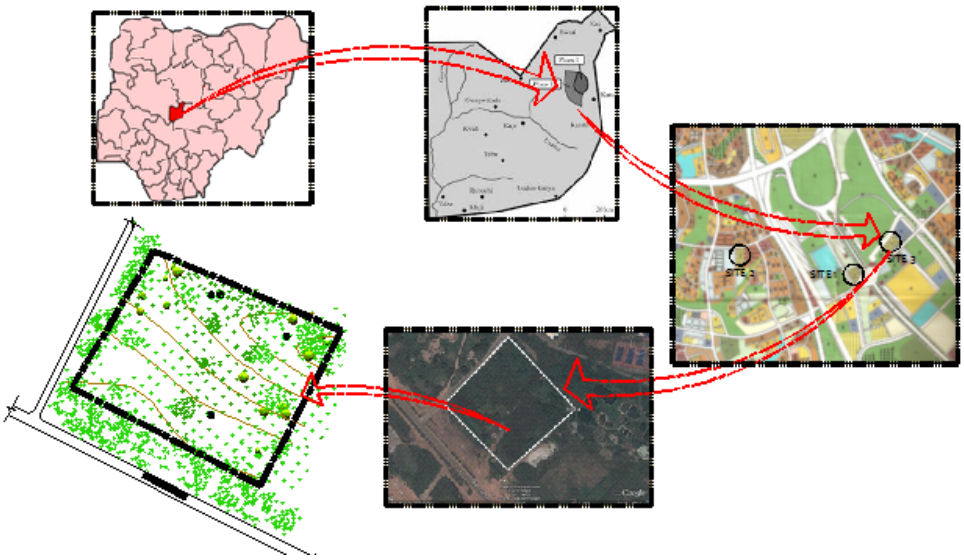


Figure 5.5: Selected site

5.4 Site Analysis

5.4.1 Climate Analysis

The climate of the area where the site is located was analyzed taking into consideration the direction of the rising and setting sun as well as the direction of the trade wind this is to help in proper orientation of buildings and to take proper advantage of the winds as shown in Figure 5.5

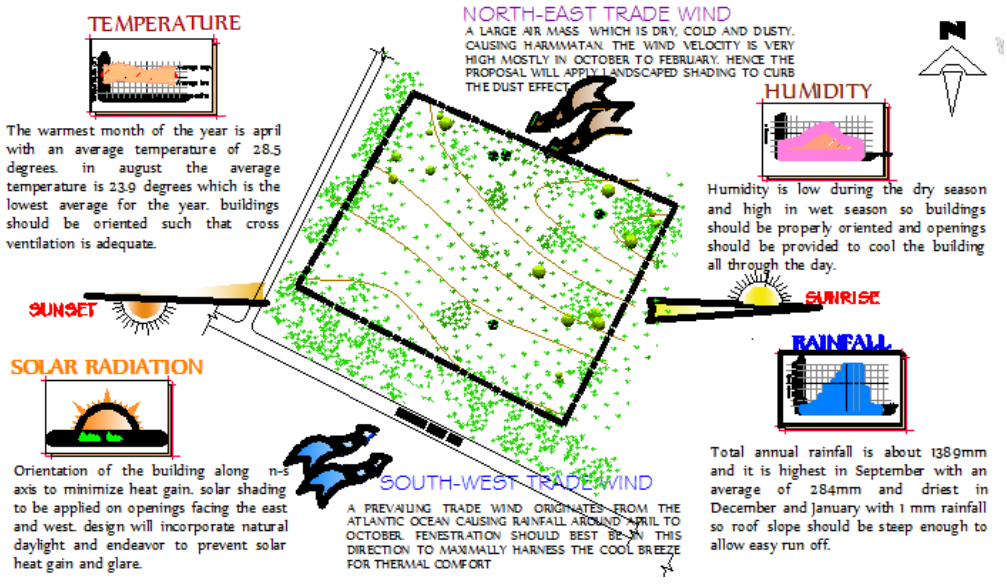


Figure 5.6: Climate analysis

5.4.2 Topography and vegetation

The soil is generally shallow and sandy in nature which is easily eroded but with an underlying strong rock basement, hence the need for low maintenance planting to improve moisture retention. Vegetation is made up of few trees among grasses and the site slopes gently toward the north- eastern end. See Figure 5.6

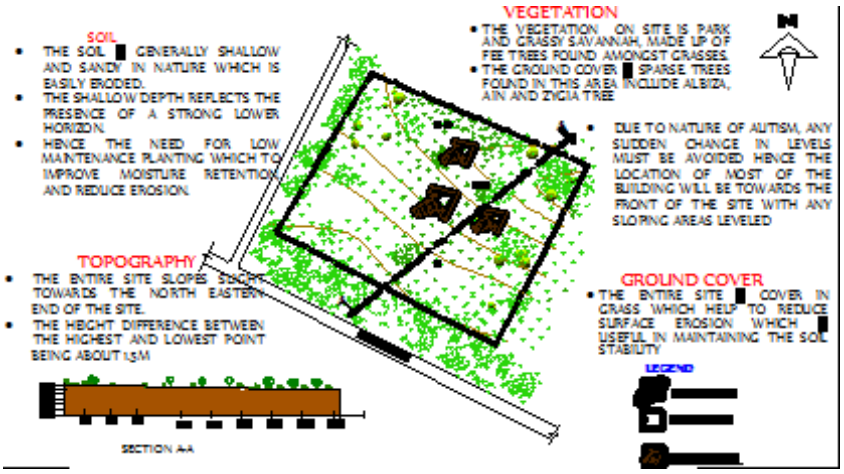


Figure 5.7: Topography and vegetation

5.5 Site Zoning

In other to properly allocate areas for various facilities, analysis was made to check the extent of noise penetration, physical feature like topography and the most suitable scenery as shown in Figure 5.7

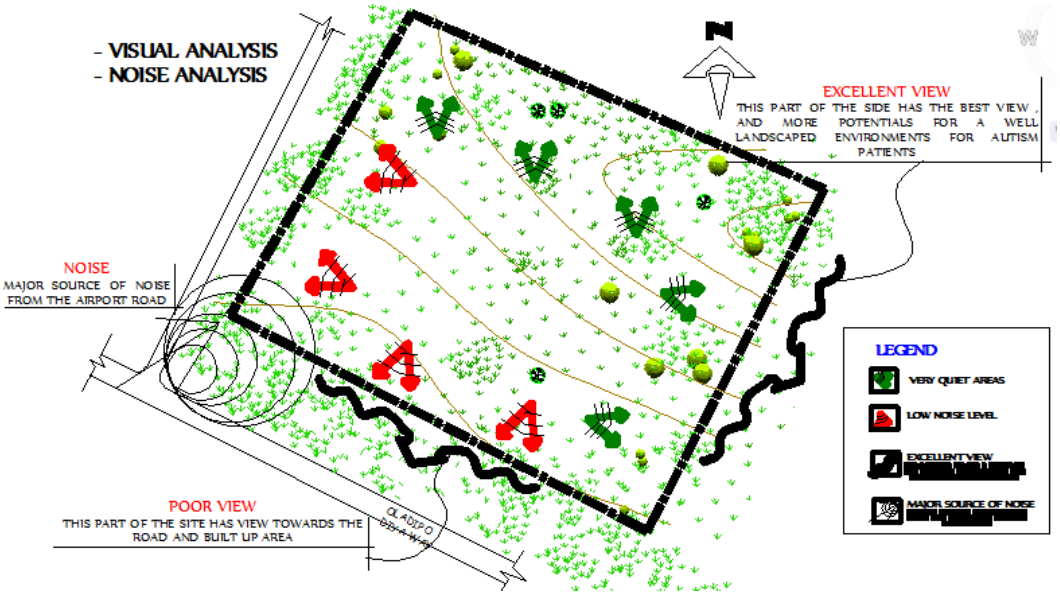


Figure 5.8: Visual and noise analysis

Noise originate from the airport express road hence the red arrows showing the areas nearest to the airport road, while the green arrows show the areas that are most quite toward the north-eastern end of the site.

Based on the information obtained from the above analysis, the site was therefore zoned with the purple area representing areas for administrative functions, the blue zone for classrooms activities well within the site and bounded on the left by a transition area. The red region represents the area for car parking which is towards the front of the site near the noisy zone as shown in the Figure 5.8

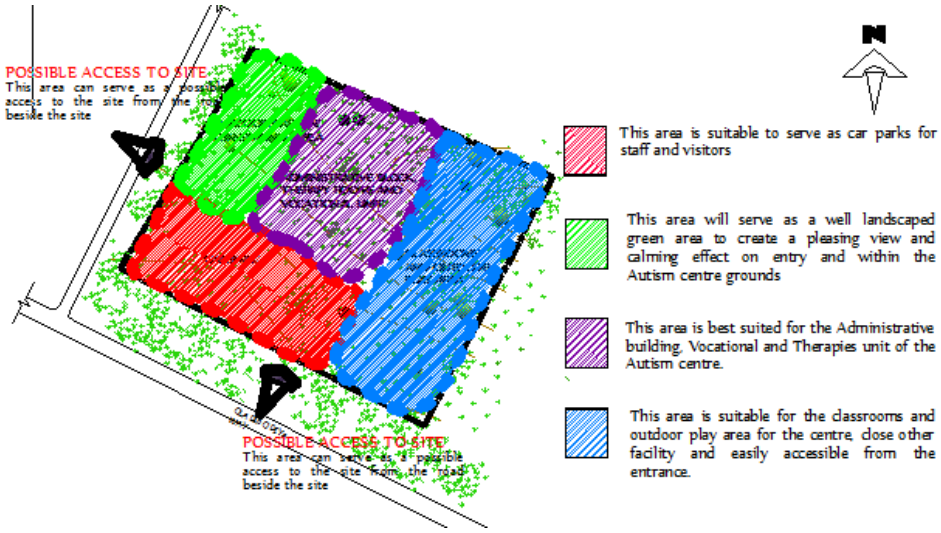


Figure 5.9: Site zoning of activities

5.6 Functional Flow

This shows the relationship between individual spaces within the autism centre it could be within a particular space or as it relates to other spaces. These areas comprises circulation, administration, therapies, vocational learning, classrooms and transition spaces. Figure 5.9 show the spatial relationship between all the facilities provided on the site.

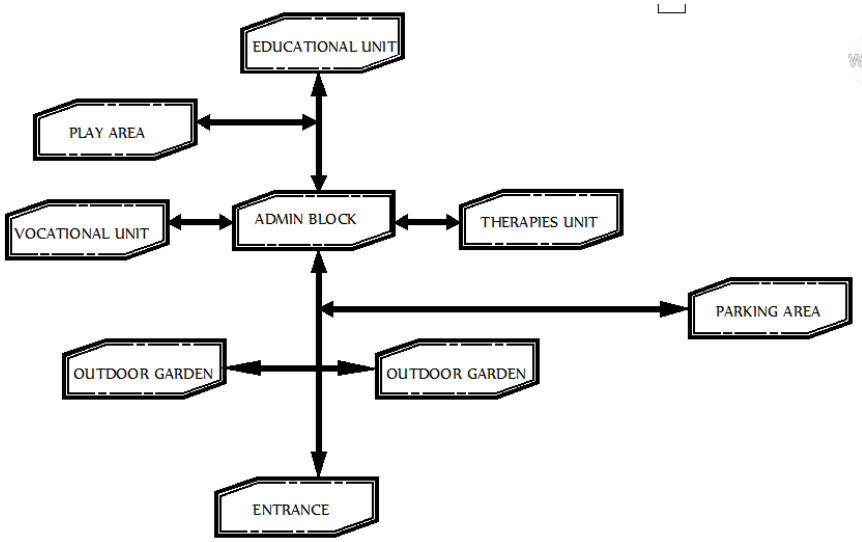


Figure 5.10: Functional flow diagram

6.0 DESIGN REPORT

6.1 Design Brief

The prevalence of autism has been on the increase over a period of ten years and the level of awareness is on the rise in Nigeria. Abuja being the Federal Capital Territory is a fast growing metropolitan city with a higher awareness of autism as well as provision of temporary facilities for the care of autism. Hence the proposal to design an autism centre in Abuja that will provide Diagnostic assessment, vocational therapies, Educational facilities as well as Administrative functions.

6.2 Schedule of Accomodation

Accuracy in allocating the appropriate spaces for activities will depend largely on the number of users at any giving time but there are standards for the minimum allotment which have been considered. Table 5.2 gives a summary of schedule of accommodation as obtained from standard requirements and case studies providing an estimate.

Table 6.1: Schedule of accommodation- Source: Neufert (2000)

ADMINISTRATIVE BLOCK					
Space/ Function	Parameter	Adopted	No of Units	Capacity	Total Area (sqm)
Reception	-	-	1	50	189.5sqm
Entrance Foyer	-	-	1	10	25sqm
Directors office	12-15sqm	25sqm	1	1	25sqm
Secretary office	12-15sqm	20sqm	1	4	23sqm
Records office	12-15sqm	15sqm	1	2	20sqm
Account office	12-15sqm	15sqm	1	2	23sqm
Child psychiatrist	12-15sqm	15sqm	1	1	18sqm
Parents room	22-25sqm	25sqm	1	15	45sqm
Occupational therapist	12-15sqm	15sqm	1	2	18.5sqm
Peadiatrician	12-15sqm	15sqm	1	1	18.9sqm
Doctors Lounge	12-15sqm	15sqm	1	15	45sqm
Training room	1.2sqm/person	1.2sqm/person	2	50	95sqm
Nursing station	25-30sqm	25sqm	1	5	25sqm
Doctors office	12-15sqm	15sqm	1	2	15sqm

Recovery room	-	-	1	4	45sqm
Kitchenette	15sqm	15sqm	1	4	16sqm
Speech therapists	12-15sqm	25sqm	2	2	28sqm
Clinical psychologist	12-15sqm	15sqm	1	1	18.9sqm
Behavioral therapist	12-15sqm	15sqm	1	1	18.5sqm
Neurologist	12-15sqm	15sqm	1	1	18.9sqm
Library	1.2sqm/person	1.2sqm	1	25	95sqm
Physical therapist	12-15sqm	15sqm	1	1	18.5sqm
Rest rooms	1.2sqm/person	1.4sqm	16	1	1.6
VOCATIONAL UNIT					
Care giver/ waiting	1.5-3sm/child	2sqm/child	1	20	62sqm
Exhibition/ display area	-	-	-	20	79sqm
Arts room	60-65sqm	70sqm	1	15	72sqm
Music room	65-70sqm	70sqm	1	15	72sqm
Crafts room	20-25sqm	30sqm	1	10	32sqm
Indoor play area	0.9sqm/child	0.9sqm/child	1	10	25sqm
Store	-	15sqm	1	-	15sqm
Rest rooms	1.2sqm	1.4sqm	5	1	1.8sqm
THERAPY UNIT					
Care givers/ waiting	1.5-3sqm/child	2sqm/child	1	20	58sqm
Computer therapy	1.5sqm/child	1.5sqm/child	1	15	60sqm
Behavioral therapy	1.5-3sqm/child	2sqm/child	1	10	43sqm
Physical therapy	1.5-3sqm/child	2sqm/child	1	8	49sqm
Speech therapy 1	1.5sqm/child	1.5sqm/child	1	5	38sqm
Speech therapy 2	1.5sqm/child	1.5sqm/child	1	3	33sqm
Sensory room 1	1.5sqm/child	2sqm/child	1	5	25sqm
Sensory room2	1.5sqm/child	2sqm/child	1	8	40sqm
Indoor play area	0.9sqm/child	0.9sqm	1	10	25sqm
Rest rooms	1.2sqm	1.4sqm	5	1	1.8sqm
EDUCATIONAL UNIT					
Care givers/waiting	1.5-3sqm/child	2sqm/child	1	10	44sqm
Classroom 1	1.5-3sqm/child	2sqm/child	4	12	41sqm
Classroom 2	1.5-3sqm/child	2sqm/child	4	15	54sqm
Classroom 3	1.5-3sqm/child	2sqm/child	4	15	59sqm
Escape spaces	-	2sqm	12	1	4sqm
One on one therapy	1.5sqm/child	1.5sqm/child	24	1	4sqm

Speech therapy 1	1.5sqm/child	1.5sqm/child	2	4	31sqm
Speech therapy 2	1.5sqm/child	1.5sqm/child	2	8	57sqm
Store	-	10sqm	2	-	10sqm
Rest rooms	1.2sqm	1.4sqm	1	15	35sqm

6.3 General Design Considerations

These considerations include

6.3.1 Site zoning and planning

In the planning and zoning of site, the various units and facilities provided have to be properly located. Factors to be considered include classification of activities based on stimulus levels, level of noise in each area and security.

6.3.2 Circulation

Circulation space should be as wide as possible and free of all encumbrances hence the design will adopt a curved pattern that provides the flexibility needed while eliminating shape edges and sudden turns.

6.3.3 Natural lighting and ventilation

Natural lighting should be maximally incorporated into the design since it is uplifting and can help to ease anxiety in people with ASD but glare and dazzling sunlight should be avoided as it leads to over stimulation. Natural ventilation is also healthier and helps to provide a more balanced environment. Hence the need for proper orientation of buildings to avoid glare and maximize ventilation.

6.3.4 Outdoor spaces

Well landscaped outdoor spaces have been provided in the design. These are to serve as transition areas to provide a calming effect on user of the centre as well as serve as create the opportunity for them to interact with others.

6.4 Design Concept

The design concept is based on a sensory zoning concept. Sensory zoning as opposed to conventional functional zoning is preferable for this particular design. This involves the spatial groupings of activities following an autistic logic and involves sensorial compatible functions. The autistic logic deals with the level of stimulus produced by each activity, of which there are high stimulus activities like music, computer therapy and low stimulus activities like classroom learning, one on one speech therapy. These activities must be adequately separated from each other with properly demarcated and designed transition zones so as to aid the movement from one activity to the other with the least amount of discomfort. This is illustrated in Fig 6.1

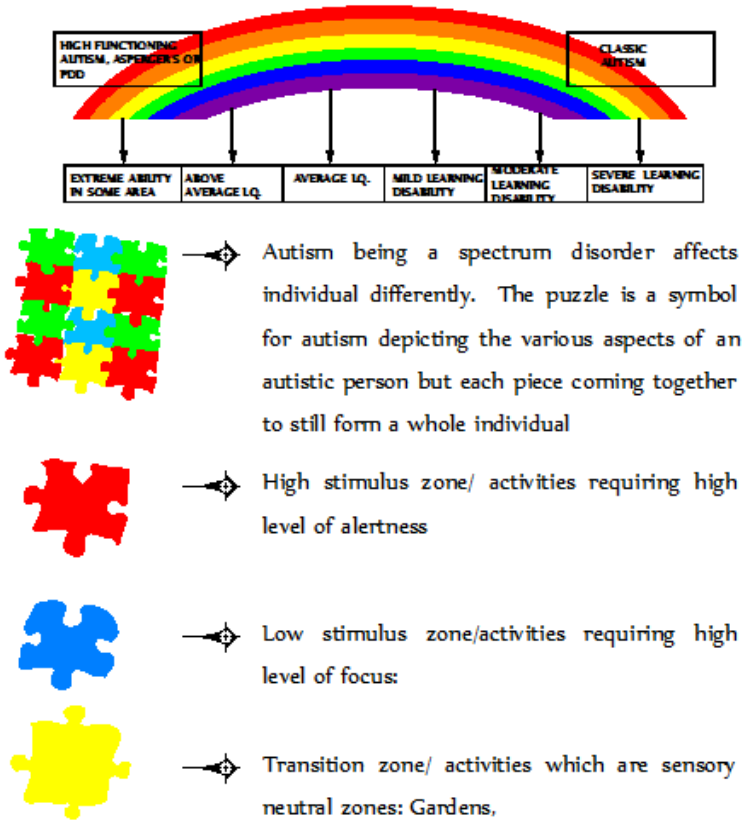


Figure 6.1: Design concept

The concept above is a site concept. Autism as a spectrum disorder affects individuals differently and one of the symbols used to represent autism is the puzzle signifying the puzzling nature of the disorder but with the various characteristics of autism coming together as pieces in a puzzle to make up a complete individual. Hence different pieces of the puzzle where picked to represent the activities associated with autism the red signifies the high stimulus activities, the blue low stimulus and the yellow for transition zones. When high stimulus activities are directly linked to low stimulus activities the child experiences a sensory over load which could lead to tantrums, this is shown by the red and blue pieces of the puzzle not fitting in together in Figure 6.1a.

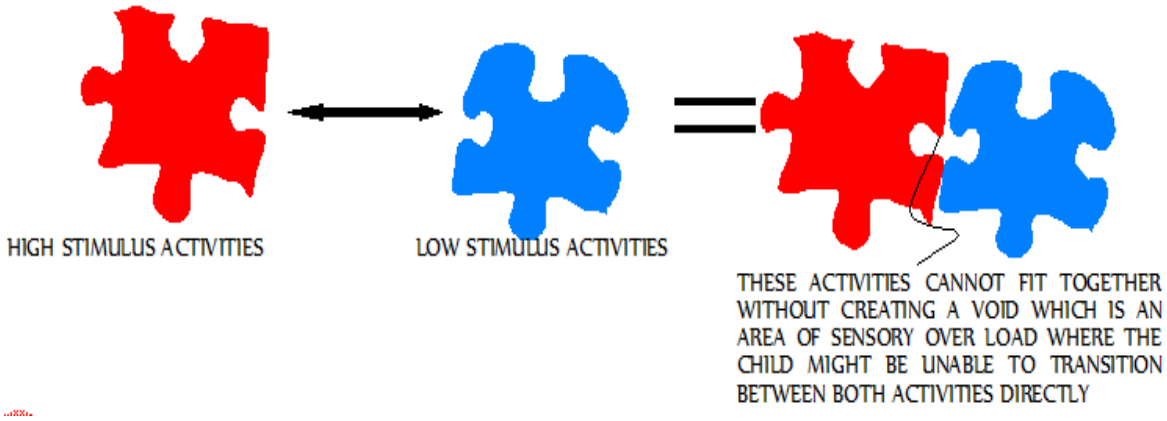


Figure 6.2: Design concept

Hence the need for a transition zone to provide a calming effect and ease movement from one activity to the other with minimum fuss as shown in Figure 6.1b. The design focuses on clarity, openness and ease of circulation with transition spaces serving as focal points within the design.

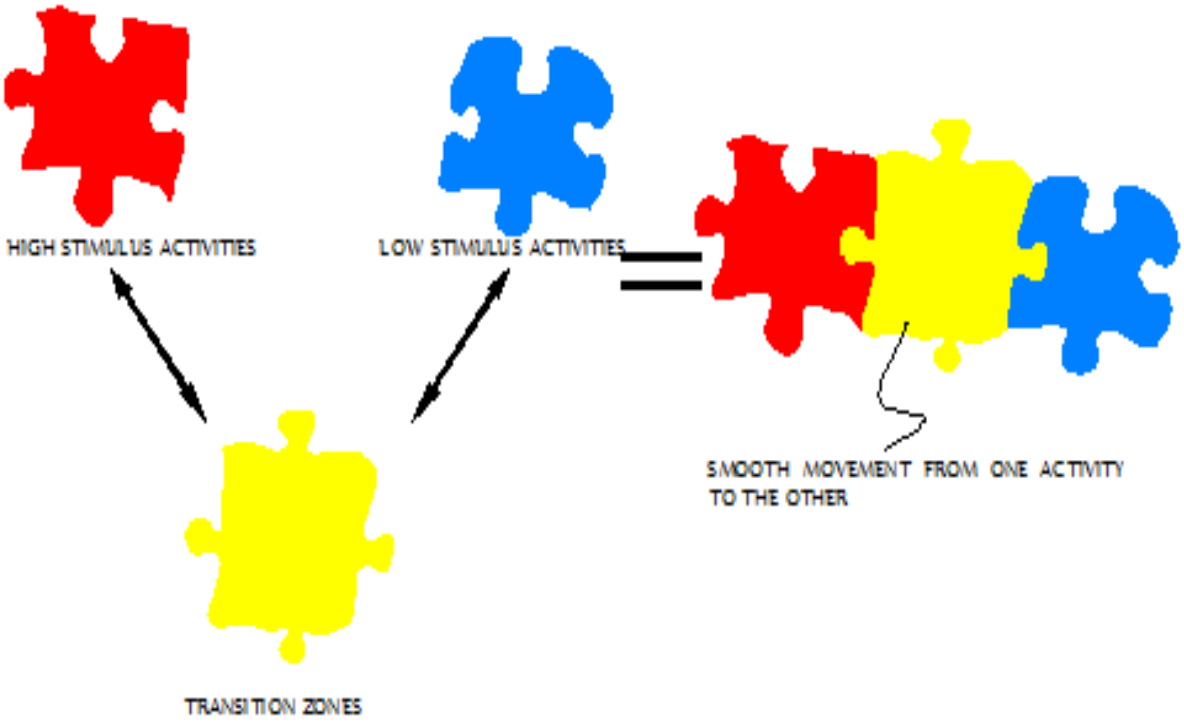


Figure 6.3: Design concept

6.5 Design Proposal

The site is arranged such that on entering the site the parking is to the left with a road leading directly in front of the administrative building. This road leads to the ambulance parking with a walkway beside. To the right is an outdoor garden which is directly in front of the administrative building. The outdoor garden was so located to serve as a transition zone as well as a place in which other children from other schools can come and interact with the children in the autism centre. From the parking area, a covered walkway leads directly to the classrooms which are directly behind the administrative building for children enrolled in the educational programme as shown in Figure 6.2.

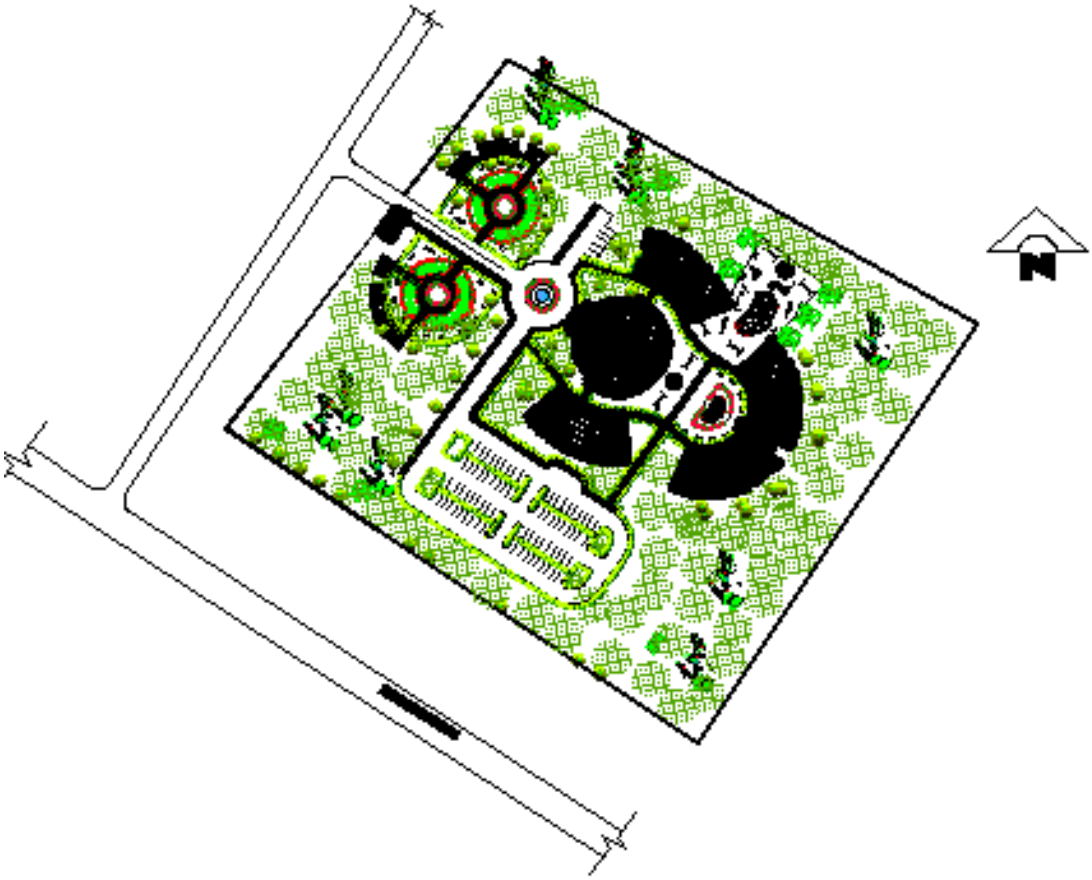


Figure 6.4: Site layout for proposed design

Certain facilities such as the administrative building, therapies and vocational unit are directly linked and grouped together; this is based on sensory zoning which has been earlier defined as a grouping of activities following an autistic logic based on the level of stimulus produced by the activity. The classroom which are low stimulus activities are located towards the rear of these 3 buildings separated by a wide space known as a transition zone which has been designed to be a garden. The pattern for circulation is also highlighted as shown in Figure 6.3.

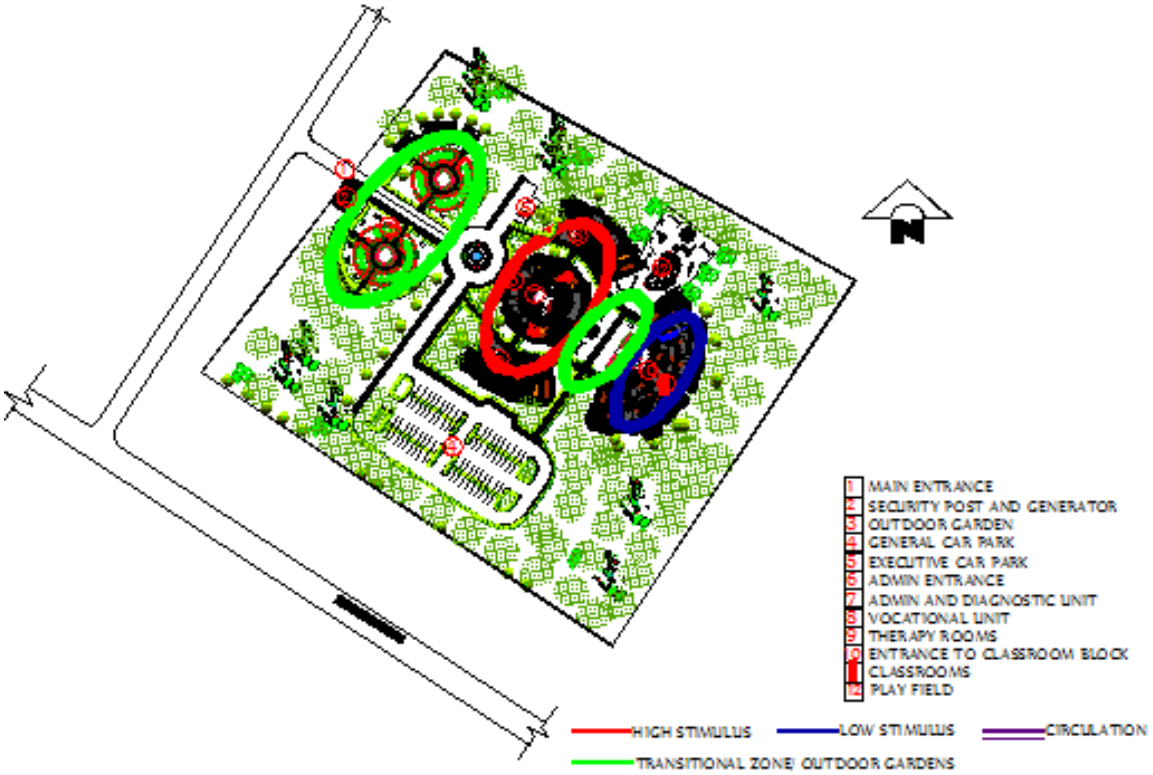


Figure 6.5: Sensory zoning and circulation scheme

The administrative building consists of 2 floors, ground and upper floors. On the ground floor are offices for some of the various therapists that care for the children, a reception area, rest rooms, a sick bay, a training room that accommodates about 60 people at a time and parent room for parents that might be waiting for their children to finish a therapy session. The upper floor consists of more offices, a doctor's lounge and kitchenette, rest rooms, another training room and a library. These are shown in figures 6.4 and 6.5 respectively.

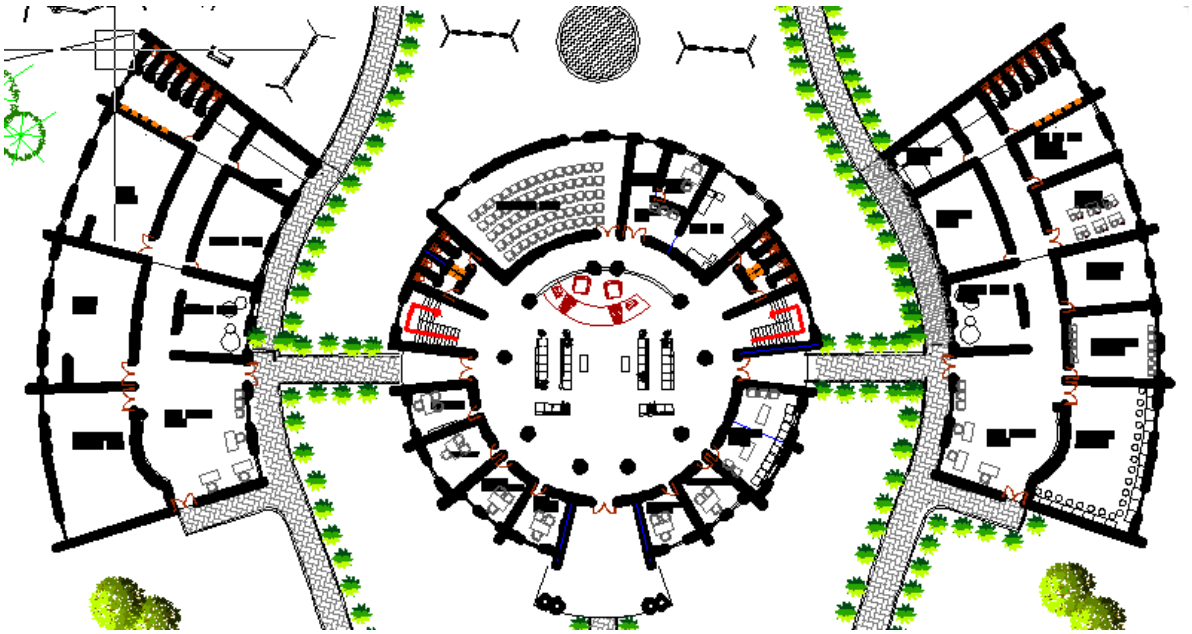


Figure 6.6: Ground Floor plans for Administrative block, therapy and vocational unit

The vocational unit is made up of a single floor and provides facilities such as an exhibition space, arts room, crafts room, music room, rest rooms, indoor play area and an a caregivers office that doubles as awaiting area as shown in figure 6.4.

The therapy unit is also made up of a single floor and consists spaces for computer therapy, occupational therapy, speech rooms for individual and group speech therapies, sensory rooms for group and individual sessions, rest rooms, indoor play area and an area for caregivers as shown in figure 6.4

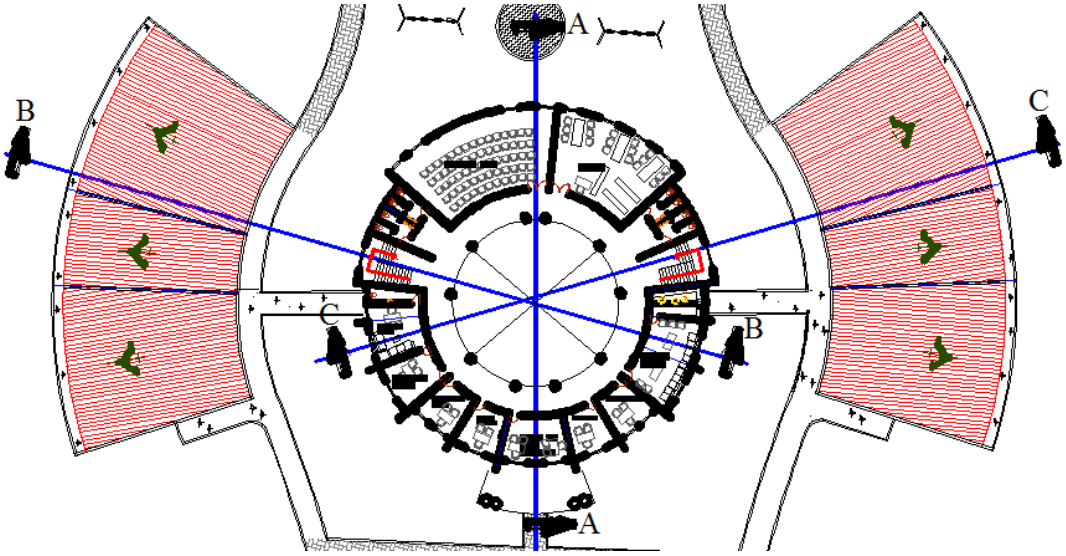


Figure 6.7: First Floor plans for Administrative block and roof plan for therapy and vocational unit

There are 2 wings for the block of classrooms linked together by a small waiting area each has 2 floors with 6 classrooms, 3 on the ground floor and 3 on the upper floor, a speech room on each floor, rest room for staff and children, indoor play area, a store and offices for the care givers. Each classroom can accommodate between 10 to 15 children each and is zoned with areas for group activities, one on one instruction and escape spaces provided and clearly demarcated as shown in figure 6.6 and 6.7 respectively.

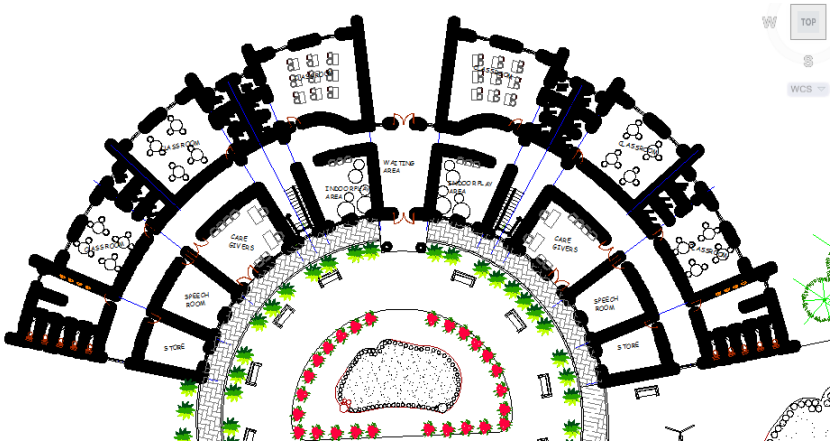


Figure 6.8: Ground floor plan for classroom block

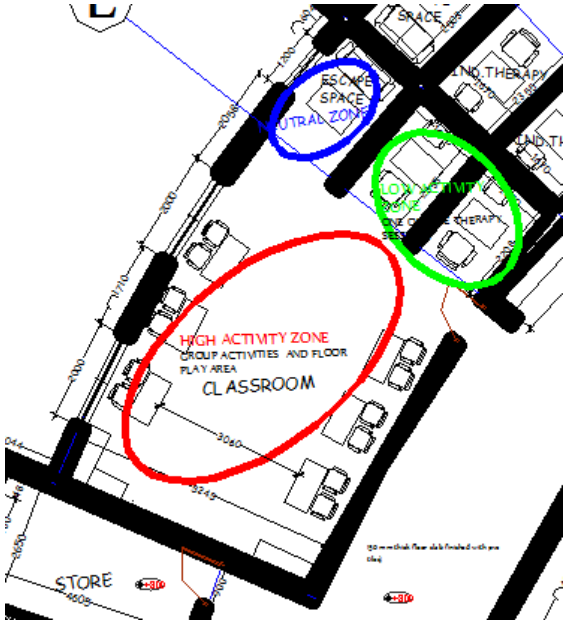


Figure 6.9: Arrangement of a typical classroom for children age 3-6

The classroom arrangement in figure 6.7 allows for group play in the middle of the classroom and is for younger children between ages 3-6. The classroom arrangement in figure 6.8 is for older children from ages 7-10.

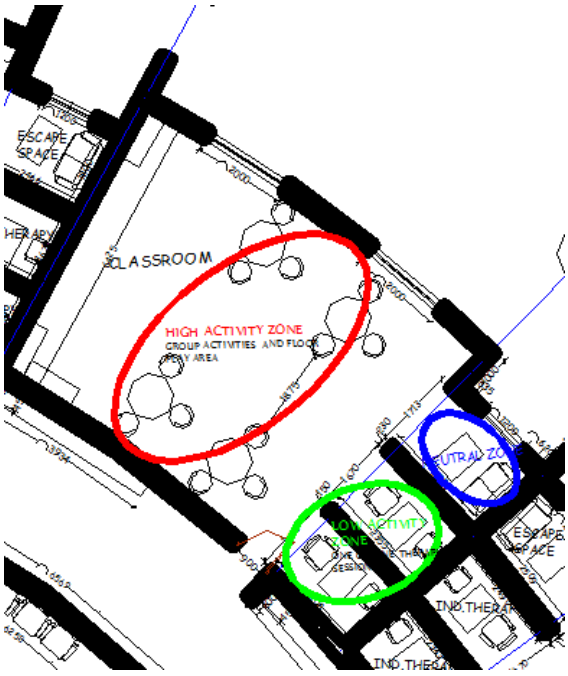


Figure 6.10: Arrangement of a typical classroom for children age 7 to 9

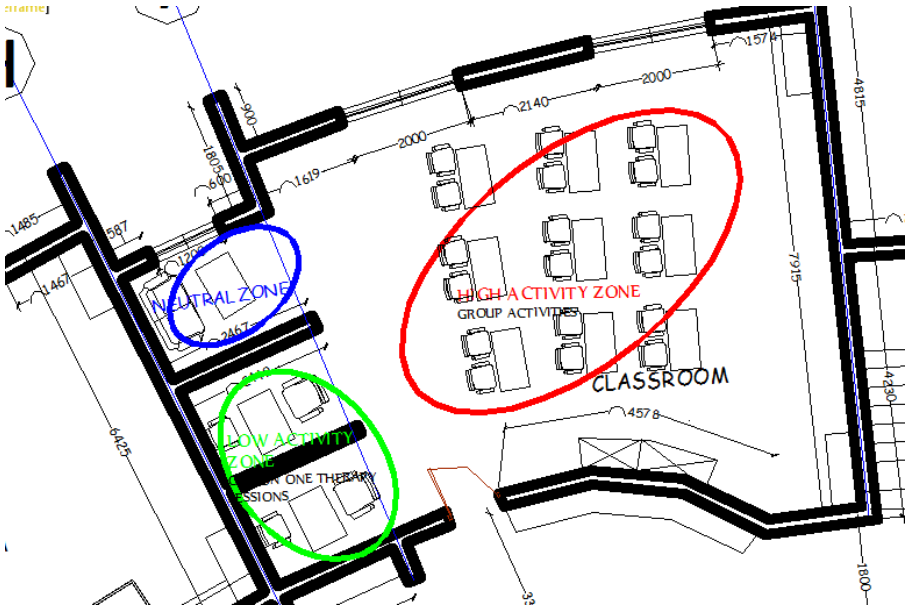


Figure 6.11: Arrangement of a typical classroom for older children age 10 to 13

The walls of the one on one therapy session areas and for the speech rooms are acoustically treated with acoustic mineral wool infill and covered with 19mm thick acoustic plaster board as shown in the detail in figure 6.9 this is to prevent transmission of sound between the two spaces which could be distracting to autistic children.

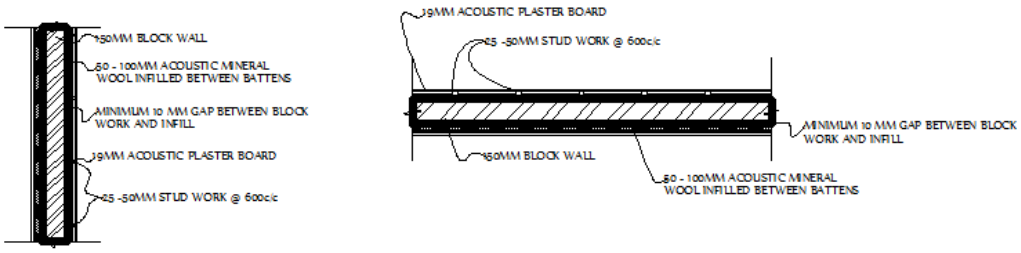


Figure 6.12: Wall detail for speech room and one on one therapy spaces

A walking beam is incorporated into the walkways leading to the classrooms from the car park as well as that leading from the classroom to the vocational and therapy unit this is to help guide the children along as they walk. The play area is between the classroom block

and the therapy unit, it is tucked well into the site for safety reasons and all around it is a wooden picket fence to serve as a subtle enclosure so the children cannot wonder off to other areas. See figure 6.10.

Figure 6.13: 3D view of play area

Also between the classroom blocks and other building is a small transition area that helps to ease movement from one activity to the other by providing a calming effect. Incorporated into this transition zone is a small play area and a sand pit as shown in figure 6.12

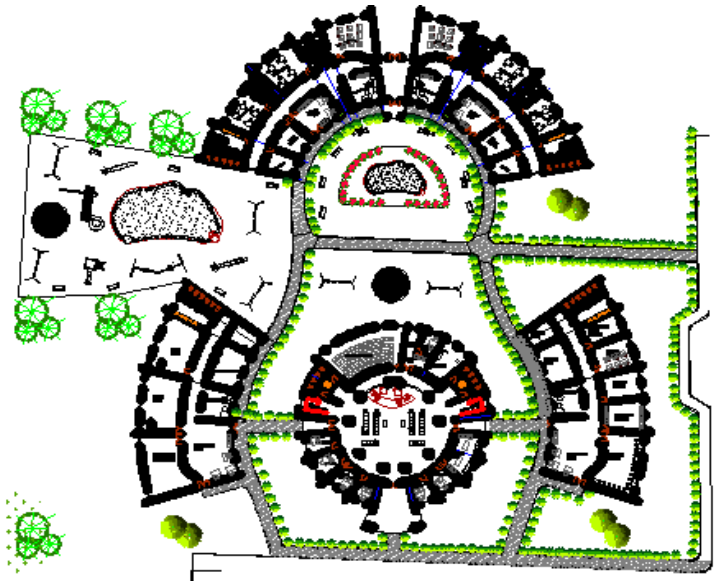


Figure 6.14: Play area and transition space between the high stimulus and low stimulus zone.

The façade of the building is design using vertical fins for sunshading and with wide window openings to allow adequate sunlight into the building and reduce the need for mechanical lighting. See figure 6.13

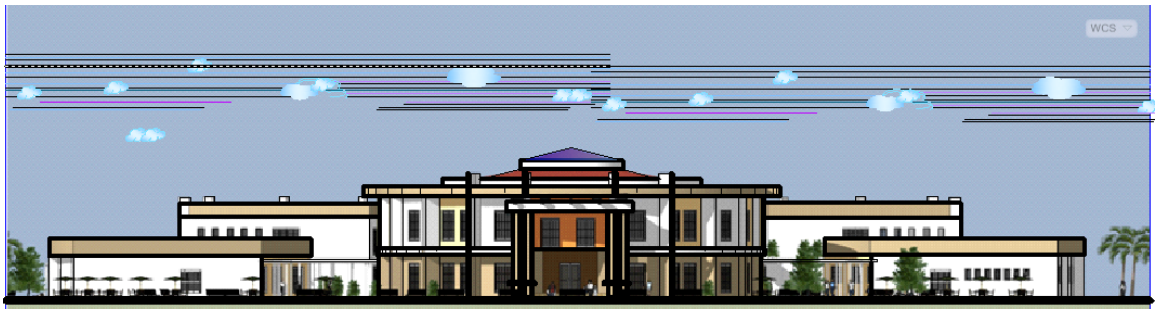


Figure 6.15: Approach view of centre

7.0 SUMMARY AND CONCLUSION

7.1 Summary of Findings

The awareness of autism as a developmental disability is increasing worldwide, building codes and standards have been developed to cater to the needs of users with physical disabilities yet that for those with disabilities that cannot be seen physically are ignored or pushed to the background. The research work is built on the premise that the built environment can aid the process of healing and induce a positive state of well being amongst its users.

Deducing from various literatures and abstracting information from the cases studied, the research has shown that there is a need for certain considerations to be given to the environment of care for autistic individuals these considerations include

1. Materials and finishes used must provide adequate sound insulation
2. Provision of transition spaces as a means to aid the recovery of the children
3. Sensory zoning of activities which is the grouping of activities based on stimulus level experienced.
4. Spatial sequencing and provision of compartments so activities are clearly defined.
5. Safety considerations in terms of materials used, location of activities and ease of observation.
6. For the site proper location away from noise, proper orientation, provision of greenery and adequate play areas.

7.2 Conclusion

1. The application of the architectural features highlighted in the design of autism centers can help to create a sense of well being and ultimately help to integrate autistic children into the society.
2. To maximize the use of these architectural features, the building form and location must also be considered. This emphasizes how architecture itself serves to create a healing environment.
3. The application of these features provides an environment that is friendly not only for the children but also for their care giver and is welcoming to other children whereby they can interact with one another and have adequate contact with nature as well.
4. Locating the centre in a city like Abuja will help increase awareness of autism and influence future development of similar centres in other states over a period of time, hence improving early intervention for autism and combating the prevalence.

7.3 Recommendations

The following are therefore recommended for use in autism centres

1. Sensory zoning of activities to aid smooth transitioning from high to low stimulus activities
2. The use of transition spaces to create a calming effect on autistic children.
3. The incorporation of the walking beam in walkways that help to guide the children along as the move in outdoor areas
4. Compartmentalization of spaces to reduce auditory and visual distractions.

5. The use of circulation spaces not only for movement but as transition areas incorporating play into these spaces.

7.4 Contribution to Knowledge

The key contributions of this research are

1. The study has demonstrated the use of transition spaces within the site and in the buildings to create a sense of calm and ease movement between activities for the children with minimal fuss and distractions
2. The study has also demonstrated the use of neutral sensory zones within activity areas as a place to provide respite while learning and allow the children to readjust to activities taking place.

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APPENDIX

Appendix 1: Survey Checklist Items

Acoustics: Materials and finishes used

Item	A	MA	NA	Remark
Walls				
Floors				
Ceiling				
Windows: Number and size				
Doors				
Consistency in materials used				

Spatial sequencing, escape spaces and compartmentalization

Item	A	MA	NA	Remark
Spatial sequencing: varying sizes of spaces				
Communal work spaces				
Individual work spaces				
Quiet spaces				
Sensory spaces				
Clear demarcation of activities				
Provision of compartment to minimize distractions				

Transition spaces, sensory zoning and safety

Item	A	MA	NA	Remark
Provision of neutral sensory areas				
Adequate grouping of activities based on stimulus level experienced				

Safety considerations				

Site and external spaces.

Item	**Remark**
General layout	
Access arrangements	
Building orientation	
Light (Daylighting and Artificial lighting)	
Noise infiltration (External and background noise)	
Landscape elements	
Recreation/ play areas	

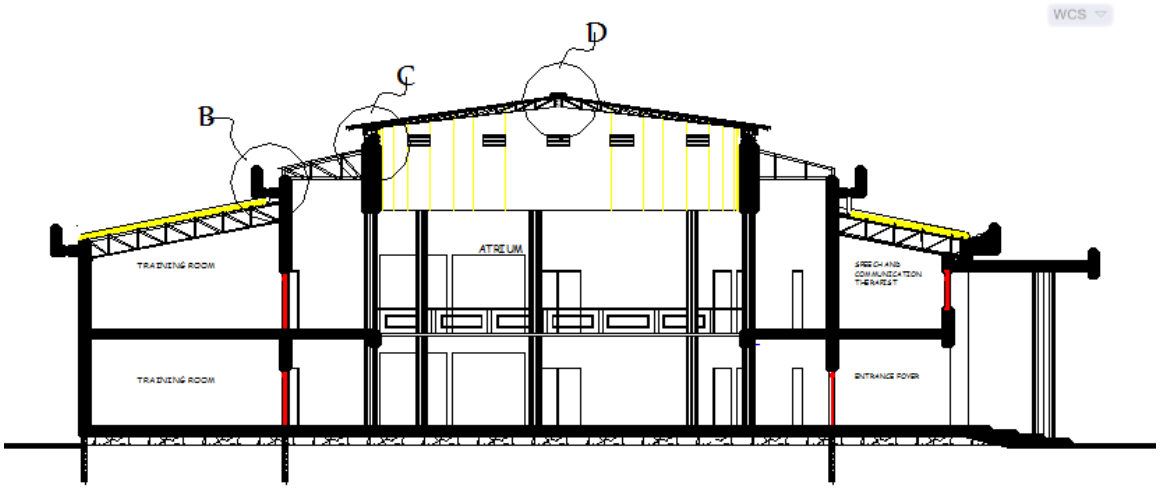
LEGEND: A – Adequate, MA – Moderately Adequate, NA – Not Adequate

Appendix 2: Interview Guide for Administrators and Care givers

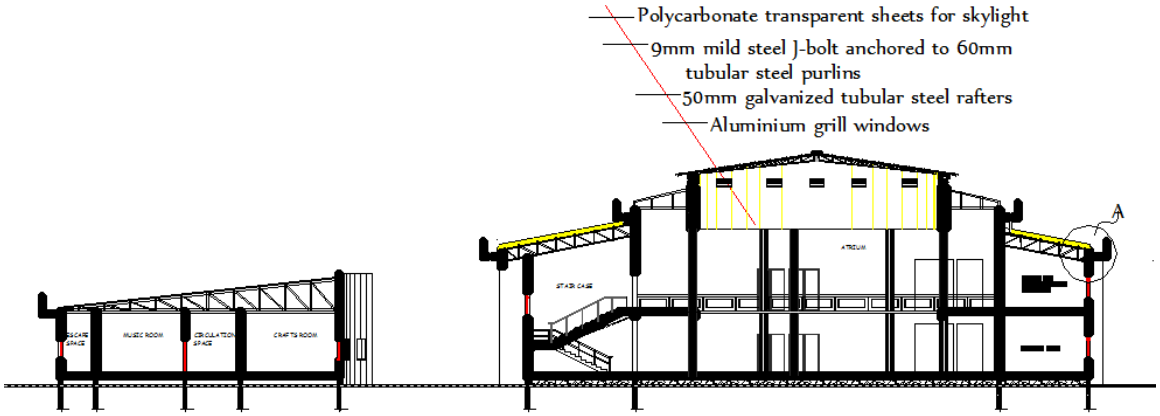
1. When was the centre established?
2. Was the centre (building) originally designed as an autism centre?
3. If yes to question 3, was the centre designed by a professional?
4. What motivated the establishment of the centre and how was it financed?
5. If the building was not originally designed as an autism centre, where there any specific modifications made to the current building being used which meets the specific needs of the children (ie social interaction, communication and restrictive behaviours) ? E.g. color of surfaces, shape and size of spaces, texture of materials used for ceiling, walls and floors, lighting and ease of access to spaces, provision of internal and outdoor play areas .
6. What particular safety needs do the children have with respect to the environment of their care and was it considered in the use of the current building? How?
7. What facilities are available right now?
8. What are other facilities are required to cater to the needs of the children?
9. What physical features in the environment have you noticed is beneficial in meeting the specific needs of the children? E.g. color of surfaces, texture of materials used for ceilings, walls and floors, lighting of spaces, ease of access and size of spaces, recreational areas, outdoor spaces/ play areas.
10. To what extent has any consideration been given to acoustics, spatial sequencing, provision of escape spaces, compartmentalization within spaces, provision of transition zones, sensory zoning of activities and safety been considered in this centre and what effects has it had on the well being of these children.
11. What kind of injury has been observed to occur in this environment and how often does it occur?
12. What strategies have been employed to militate against these accidents?
13. Are there any other features of the physical environment that you have noticed increases the chances of injury or accidents to the children? If yes what are they and what kind of modification would you suggest?

14. What other items would you like to suggest can be added or subtracted to improve the physical environment for

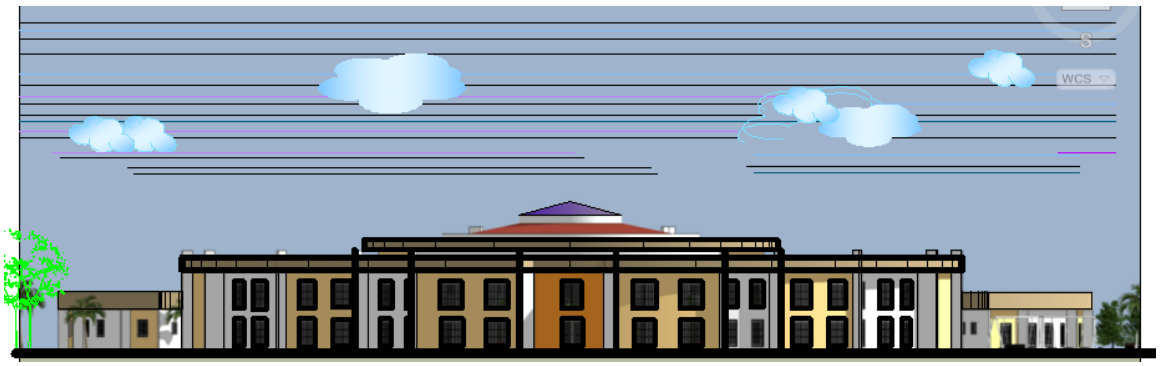
    1. The children
    2. Their care givers



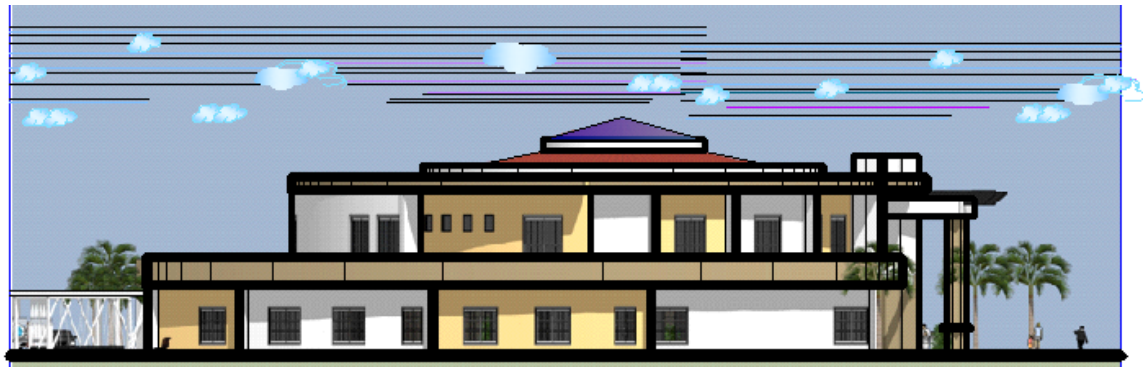
Appendix 3: Section A-A



Appendix 4: Section B-B



Appendix 5: Rear view of Administrative building, Vocational and Therapy unit

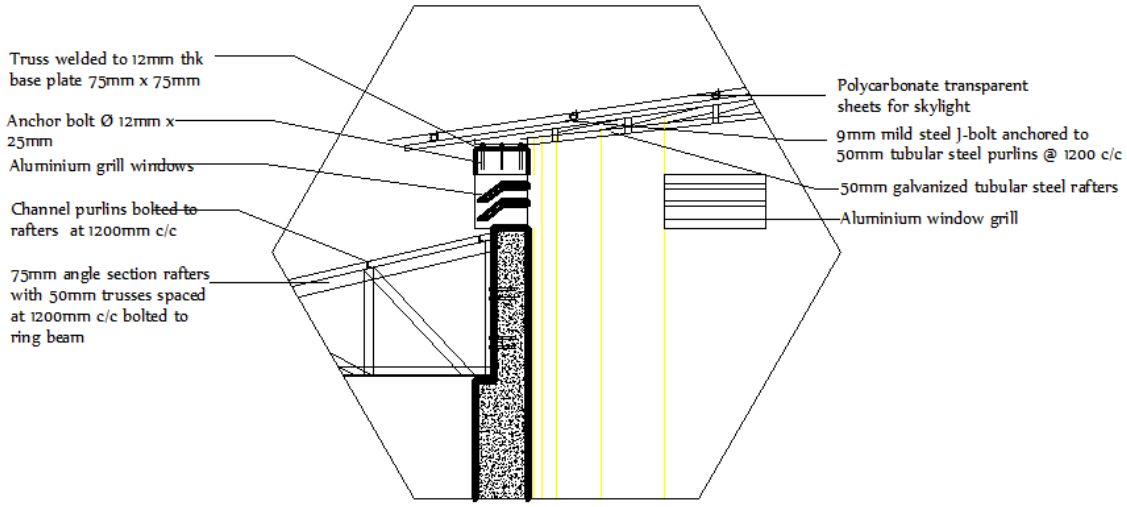


Appendix 6: Typical side view of Administrative building, Vocational and Therapy unit

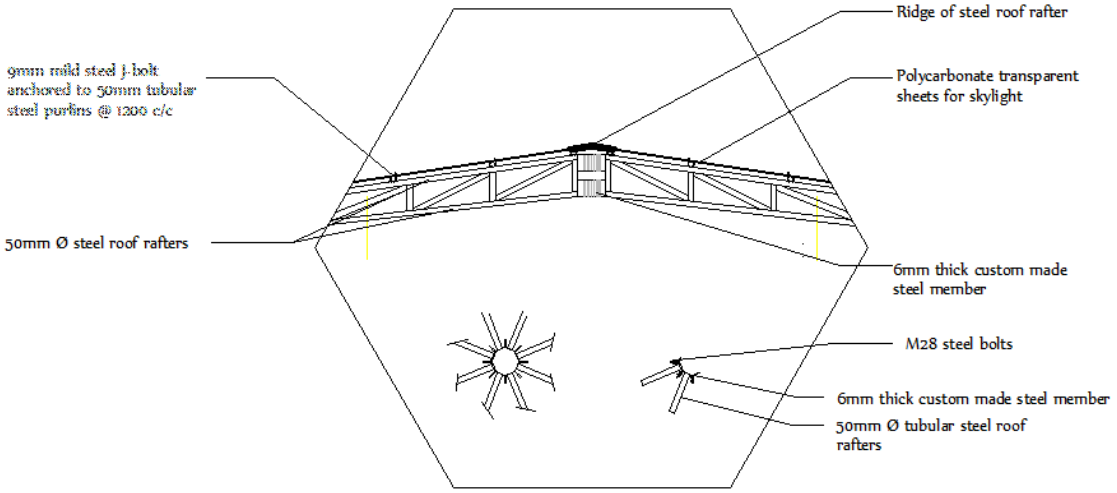
Appendix 7: Approach view of Educational unit

Appendix 8: Rear view of Educational unit

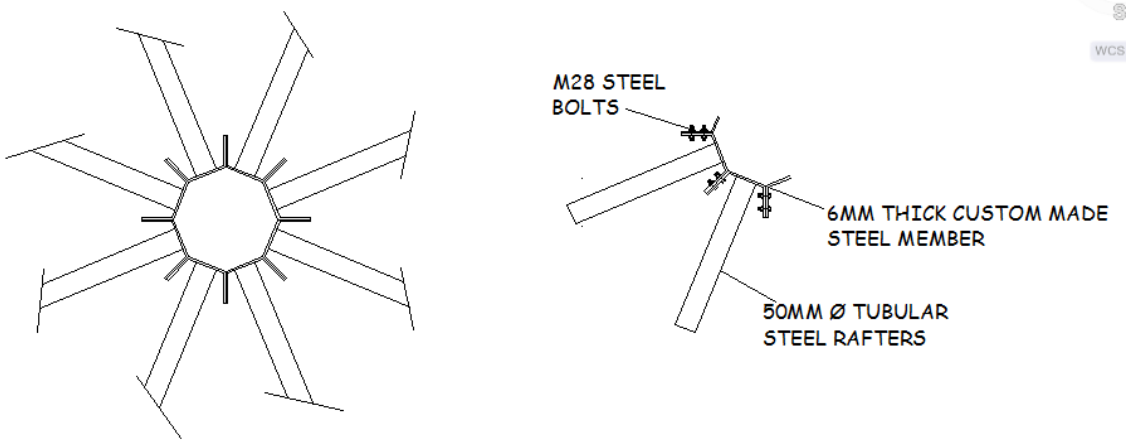
Appendix 9: Typical side view of Educational unit



Appendix 10: Detail at B



Appendix 11: Detail at A



Appendix 12: Detail at A