ENHANCING SECURITY RESPONSIVENESS THROUGH SPATIAL ORGANISATION IN THE DESIGN OF PARAMILITARY HEADQUARTERS IN NIGERIA: PROPOSED POLICE ZONAL HEADQUARTERS, ABUJA.

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NIGERIA

APRIL, 2015

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NIGERIA

APRIL, 2015

Declaration

I hereby declare that the work in this thesis titled "*Enhancing Security Responsiveness through Spatial Organization in the Design of Paramilitary Headquarters in Nigeria"* was performed by me in the Department of Architecture, under the supervision of Arc. M. H. Mukthar and Dr M L. Sagada.

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

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Name of Student	Signature	Date

Certification.

This thesis titled ENHANCING SECURITY RESPONSIVENESS THROUGH SPATIAL ORGANIZATION IN THE DESIGN OF PARAMILITARY HEADQUARTERS IN NIGERIA: PROPOSED POLICE ZONAL HEADQUARTERS ABUJA (ZONE 7), meets the regulations governing the award of the degree of Masters of Science in Architecture of the Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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Dedication

This thesis is dedicated to my parents, Alhaji Mu’azu Idris Hadejia and Hajiya Amina Haruna Makama.

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I thank the Almighty Allah for sparing my life to this day and seeing me through my times of thick and thin all in order to bring this project to fruition.

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Abstract

Nigerian paramilitary headquarters have, in the recent years faced multiple challenges as far as their home security is concerned. Several attacks by aggressors have been reported through media and eyewitnesses. This has proven that the building designs and spatial organization of the headquarters are vulnerable and penetrable and therefore need security enhancement. However, there has not been any comprehensive research to show that new security measures through spatial design, unique to paramilitary buildings have been introduced. For that reason, this study endeavours to fill in that research gap; the aim been to enhance security responsiveness in the design of paramilitary headquarters by ensuring apposite spatial organization. To bring this to fruition, survey method was adopted. Since considerable amount of relevant information about individual experiences of others is required, structured interview and visual survey were used as instruments of data collection. To narrow down the scope, case studies on three paramilitary institutions were carried out, namely; the Nigeria Police Force (NPF), the Nigeria Immigrations Service (NIS), and the Nigeria Customs Services (NCS). In order to collect data, stratified and subsequently purposive samplings were used in selecting the respondents. A total of six interviewees per institution were selected; out of which eleven (61.11%) were successful with an average interview duration of one hour. Comparative analyses of the three institutions were later carried out then were deliberated under some key physical security variables and checklist. Thereafter, the following findings were discovered: i) most paramilitary buildings are designed without in-depth acquaintance with security guide lines. This is because no written document for guidance on security issues for the planning, design, and construction of paramilitary installations to reduce vulnerability to terrorist attacks exist. Hence, their studies are said to be horizontal rather than vertical. ii) Some paramilitary buildings are only protected by adopting fire brigade security

measures. iii) The overall and primary focus of paramilitary personnel revolve around the following; Access control, parking, standoff distance and unobstructed space. iv) There exists often, insufficient site space for adopting some security standards. It was understood that a typical paramilitary setting demands very elaborate site to sufficiently gulp the features of a security responsive environment. v) Materials used are not blast resistant thus leaving the building vulnerable to attack. vi) In most cases, designers do not study and understand crime, criminals and criminal behaviour and how they operate before they set off. vii) Site selection is sometimes poor. Topography is not relatively flat. As such, the building envelope and site configuration can be easily monitored from afar without much stress. viii) Building materials used mostly require maintenance within a short period of time; hence it leads to frequent ingress and egress of maintenance companies which could be potential threats to building. In contribution to knowledge, this research has outlined various drawbacks associated with paramilitary headquarters' design and has proffered to them, possible solutions that have been showcased in the archetype design of a police zonal headquarters linked to this research. As a final note, findings from this research recommends that the ministry of police affairs in conjunction with the ministry of finance and interior ministry as well as all stakeholders should as a matter of urgency adopt the aforementioned findings as a tool for standardizing all future paramilitary headquarters designs.

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1.0 INTRODUCTION

1.1 Background of Study

Security master planning addresses the fundamental concepts of developing detailed security plans for every building project. This preliminary planning phase identifies threats, vulnerabilities, and recommendations to protect people, buildings, and assets (Koccaz, 2008). The layout of any site, industrial, commercial, residential or otherwise should be considered from a security point of view (Smith, 2003).

In the recent years, blast resistant designs were typically only used for facilities that housed or were in close proximity to explosive material or were known targets of attack. Munitions plants and storage facilities, strategic military and/or government facilities, and gas/oil refineries are a few examples of facilities that might have been designed specifically to display movement control within a facility (spatial organisation). However, humanity is living today in an environment of enhanced risk that requires protective design and the management of risk for most facilities. This state of risk, punctuated by several major events over the past seven years, has led to increase in security cautiousness in almost every soul around the country. Hence the Federal government now requires spatial and hazard mitigating design for all new and existing sensitive Federal facilities within the country. Some agencies and institutions are also now applying protective design standards to existing and newly leased facilities; the most targeted and consequently protective of this institutions being the Nigerian Paramilitary and military agencies.

It is generally assumed that such preventive measures were not needed in paramilitary building design until recently. The bitter truth is that, nothing has changed, only that

designers' past mistakes of neglecting building security responsiveness have been realized now due to the upheaval in the society as a result of emergence of insurgencies and militancy, which are on the quest of being corrected. Everyone, including the paramilitary is now scared and security conscious. The Nigerian Paramilitary now sees themselves as high-value potential targets of attacks for insurgents. Even though, it is impossible to totally eliminate the possibility of an attack, that possibility can meanwhile be moderated greatly through proper spatial organization. Security is sadly lacking but badly needed in the country. Only through this way can they be assured they are safe and thus be productive in their respective designated station of service.

Some of the major terrorist events that have helped to shape the way we, as a nation, have responded to insurgencies include:

The attack on police force headquarters (Louis Edet house), the Kano zonal headquarters attack, multiple attacks on police stations around the country, and more.

In the technological sector, electronic security systems are being integrated through a security management system, enabling all subsystems to communicate with each other. System components include security management, intrusion detection, access control, closed-circuit television, video imaging and identification, communications, and intercoms.

Although safeguarding important public and private buildings is essential in Nigeria, that necessity has, in most cases, been confronted by the placement of unsightly barriers that dominate and over shine the public space and create a fortified atmosphere. A major challenge that Architects and planners in Abuja face today is to develop effective perimeter

security measures that respect existing dramatic views, gracious open spaces, and the city's remarkable urban design (National Capital Planning Commission, 2013).

Notable incidents of terrorism and attacks on Nigerian facilities, have occurred yet little Architectural analysis have been performed after every event, this has typically resulted in poor attempt to proffer solutions to improve building performance, with the goal of enabling spatial organization to control occurrence of crime, and potential of a structure to withstand blast, and allow swift, complete building.

Smith (2003) asserts that progressive collapse is an initial local failure that spreads from element to element, eventually resulting in the collapse of an entire or disproportionately large part of a structure.

Koccaz (2008) further opined that protective design of buildings occurs by integrating protection from blast, fire, ballistic attack, and ill criteria. Protection is generally achieved through a combination of standoff and redundancy. Standoff refers to building setbacks from parking areas and public streets to mitigate the impact of truck bombs (Ball, 2010). Redundancy is necessary for preventing progressive collapse. Hardening and energy absorptive shields enhance critical structural elements where standoff alone is insufficient to reduce threats to tolerable levels. Each strategy alone can be effective, but the best solution combines all three.

In conclusion, this study will after identifying the basic problems with security in paramilitary buildings in Nigeria, fill the research gap by enhancing the effectiveness of criminal intrusion control through adoption of the four principles below

- Crime Prevention Through Environmental Design (CPTED).

- Physical security planning principles and
- Defensible spaces principles
- Anti-Terrorism site Design (ATD) Guidelines

1.2 Problem Statement

Security is a global problem. Most buildings demand protection without which its inhabitants will not put it to use peacefully. Concentration becomes a major problem in an unsecure environment due to fright. This is based on the idea that the proper design and effective use of the built environment can lead to a reduction in the incidence and fear of crime, and an improvement in the quality of life.

A keen observation suggests that Nigerian paramilitary building designs fail to safeguard their inhabitants. These manifests in crimes such as lethal insurgent attacks brought about not only by the unprofessional nature of the human security available but also by failure of designs to control, at conceptual stage, intrusion of aggressors and enhance security through spatial organisation thereby rendering the buildings insecure and their inhabitants unsafe.

1.3 Aim and Objectives

The aim of this study is therefore to enhance security responsiveness in paramilitary buildings in Nigeria through ensuring proper spatial configuration. This will be achieved through the following objectives.

- To identify the spatial features of a security responsive environment.
- To assess the spatial features of a security responsive environment.
- To ascertain the spatial characteristics of paramilitary premises.

- To enhance spatial preventive measures adopted to hinder the ingress of criminals in paramilitary buildings.
- To achieve a security responsive paramilitary environment through spatial organisation.

1.4 Research Questions

- What are the spatial features of a security responsive environment?
- How can the spatial features of a security responsive environment be assessed?
- What are the spatial characteristics of paramilitary premises?
- What are the spatial preventive measures adopted to hinder the ingress of criminals in paramilitary buildings?
- How can these guidelines be enhanced?
- How can security responsiveness be achieved in paramilitary complexes through spatial organisation?

1.5 Scope of Study

This study will cover areas of research on paramilitary buildings in Nigeria. As it will be so much challenging for the researcher to cover all the paramilitary institutions in the country, this study will be limited to the headquarters of some selected few. These include the Nigerian Police Force (NPF), the Nigerian Customs Service (NCS), and the Nigerian Immigration Service (NIS).

1.6 Justification

This is research will be of much benefit to the organizations in question, paramilitary institutions, as it will give them a more comfortable environment to serve and protect people, and maintain peace in every corner of the country as a whole.

2.0 LITERATURE REVIEW

2.1 Introduction

As its name implies, literature review involves the collation of ideas, views, positions and opinions, expressed in the writings of established authorities as well as findings of previous researchers in one's area of study (Issa, 2006). Also, Akinwumiju (2000) asserts that literature involves the systematic identification, location and analysis of documents containing information related to the research problem being studied. Therefore, since a literature review is an approach written in order to examine published information on a particular topic or area of study this chapter will aim at reviewing existing research carried out on "security responsiveness in paramilitary buildings" and related literature. Concepts of literature will be revised under the following topics; Security, Space and its impact on human security consciousness, and paramilitary. Information specific to designing a security responsive facility to prevent terrorism is, in nearly all cases, confined to published military and paramilitary literature. However a good number of sources on design facilities that hinder and sometimes prevent crime occurrence are available. Therefore the review will under an empirical format expand on those areas of literature that discuss concepts relevant to the research.

2.2 Security

This is defined by Encarta encyclopaedia dictionary as the state or feeling of being safe and protected. The Australian department of defence, intelligence and security, Department of Defence, Intelligence and Security, (2011) describes security as the protection and preservation of an organization's assets; people, property, information, activities, from sources of harm that could weaken, compromise or destroy them. Security is an integral part

of all activities as such commitment to the practice of good security, especially when it comes to protecting official defence information and material, is fundamental to the success of any paramilitary organization and the nation at large. In fact, it is a moral responsibility shouldered on every patriotic citizen (Roberts, 2011).

Within the last four years, security barriers have become common features surrounding most federal facilities, paramilitary and military buildings. This is as a result of multiple cases of bombings in police stations and other paramilitary facilities across the nation (National Capital Planning Commission, 2013).

Unified Facilities Criteria (2007) in Ball (2010), states that "Terrorism prevention", also described by the US Department of Defence (DoD) as "force protection" is achieved through a union of landscape and facility design standards

Despite protecting paramilitary buildings is a fundamental issue, that need has in most cases been tackled head on with introduction of various security elements to serve as barriers against intrusion. These barriers have created unsightly environments that look too clumsy, tight and fortified (National Capital Planning Commission, 2013).

2.3 Security responsiveness

This is defined as the state of showing positive reaction to something. A security responsive building should gulp substantial features needed in a security responsive environment.

Security in architecture is a fundamental consideration in all building types. The level of security requirement differs from one building to the other. Unlike other places of work, a paramilitary operating environment is exposed to countless security threats such as terrorism, espionage, covert entry, ballistic attacks (Department of Defence, Intelligence, and Security,

2011). This unique environment in turn requires special security considerations in order to protect a nation's security. According to Department of Defence, Intelligence and Security, (2011) security responsiveness is achieved mainly through the "***security-in-depth***" principle. Security-in-depth, (also known as Castle Approach) is an information assurance (IA) concept in which multiple layers of **security** controls (**defense**) are placed throughout a facility. It is based on the presumption that a series of protective measures is by far stronger than a solitary line of defence. This way, assets are not reliant on a particular measure for protection instead they complement and strengthen each other. They are grouped into Physical, personnel, information, information and communication technology (Department of Defence, Intelligence and Security, 2011).

Since this is an architecture based research, the study will due to the topic nature, concentrate more on the physical aspect; in other words known as physical security.

2.3.1 Physical security:

United States Department of defence headquarters, (2001) defines physical security as that part of security concerned with physical measures designed to safeguard personnel; to prevent unauthorized access to equipment, installations, material, and documents; and to safeguard against espionage, sabotage, damage, and theft.

It is said, physical security planning is not intended to create an impenetrable fortress. Instead, the aim is to make penetration difficult and time consuming (Gardener, 1995). A professional should be familiar with lots of security elements. CCTV, lightings, electronic access control systems are all tools of the trade. However, the emphasis is not mainly on the tools. It is how they are used that makes a difference. The normal trend is that a structure is built then secured, with physical security in consideration, it is secured then built. More

importantly, not just the building is secured but also the space around it. This way, the security program is integrated into the environment, not just added onto it.

Physical security according to (www.tbs-sct.gc.ca) strategies are based on;

- the concept of protection, detection, response, and recovery (PDRR),
- design based on a series of clearly discernable zones,
- control of access to restricted areas, and
- The capability to increase security during emergencies and increased threat situations.

2.3.2 The Integrated Protective System:

Protective systems integrate physical protective measures and security to protect assets against a design-basis threat. Characteristics of an integrated protective system are as follows: deterrence, detection, delay, denial/ defeat.

The following topics describe standardized guides to achieving a security responsive milieu

- Crime Prevention through Environmental Design (CPTED).
- Defensible spaces.
- Anti-Terrorism Design (ATD) guidelines.
- Design and organization of personal spaces.

2.3.3 Crime prevention through environmental design (CPTED):

"Crime Prevention is defined as the anticipation, recognition and appraisal of a crime risk and the initiation design and of some action to remove or reduce it. CPTED takes crime prevention one step further by studying the site working with the development community and public development agencies in an attempt to create safer designs in new and existing

developments." Also pronounced "septed" (Gardener, 1995), CPTED is a design concept formulated by a renowned sociologist, C. Jeffrey Ray in 1971. Though his findings were not famous then, he postulated that the occurrence of crime could be reduced there by promoting positive social behaviour. In 1971, Jeffrey Ray opined that proper design and effective use of the built environment can lead to a reduction in the fear and incidence of crime" (National Centre for Injury Prevention and Control, 2013). CPTED strategies have developed with time. As such it makes possible, designs that offer protection without resorting to the prison camp approach to security. Use of fortress-type construction is minimized, and where necessary, integrated into the overall design, reducing negative visual impact. This approach is also cost-effective, since hardware applications are made during construction rather than added as afterthought (Gardener, 1995). Not only have they contributed to the sociological field, but have created a breakthrough and extended the frontiers of knowledge in the world of urban design and Architecture. Jane Jacobs and Oscar Newman; a United States based Architect, adopted these findings and asserted that CPTED has explored the relationship between the built environment and criminal behaviour by presenting strategies and guidelines which, as a property owner, builder, or modeller, one can adopt to reduce the fear and incidence of crime thereby improving the quality of life (CPTED Committee, 2000). Few years later Jeffrey Ray had put forward his argument. Oscar Newman wrote the book "Creating defensible spaces" In this book, he explains much about principles guiding the design of a facility by putting into consideration incidences of crime at design phase.

It depends on the involvement of building users to reduce crime and deter criminals. It has the ability to bring people of different incomes and race together in a mutually beneficial union (Newman, 1996).

The purpose of CPTED design is;

- To keep members of the developing community in the know regarding the concept of crime prevention through environmental design and allow them proffer possible solutions to it.
- To acquaint Architects, planners, property developers and other stakeholders on crime prevention guidelines with the purpose of adopting CPTED design principles during the conceptual stages of designs.
- To expose various methods which pose antagonistic consequence on crime tendencies.

CPTED hinges on five basic guiding principles namely; Natural surveillance, Natural access control, Territorial reinforcement, Lighting and Maintenance.

2.3.3.1 Natural surveillance:

Also termed casual surveillance, natural surveillance is inclined to a concept of designing and locating facilities in a site to maximize visibility, keeping intruders under surveillance (CPTED Committee, 2000). The belief is that conspicuousness will increase visual control and deter crime possibilities. Since Crime Prevention Through Environmental Design, CPTED, is based on the idea that the proper design and effective use of the built environment can lead to a reduction in the incidence and fear of crime, and an improvement in the quality of life. Surveillance is the most essential facet in the protection of a defensible space (Gardener, 1995). Criminals are least likely to act when there is a high risk of their actions being witnessed. According to CPTED planning scheme policy design guidelines that showcase natural surveillance include the following;

- Locate development to overlook open space and/or adjacent development create building frontages that include a sense of activity.
- Establish clear sightlines through the sensitive location of buildings and other site features.
- Design pathways, underpasses and other spaces to minimize sudden changes of grade and blind corners, in order to maximize clear sightlines.
- Maximize the visibility of high risk areas such as car parks (public and employee), stairwells and underpasses.
- Design site layout so that pedestrian corridors and destination points are easily identifiable, and have generous sightlines. See plate I.

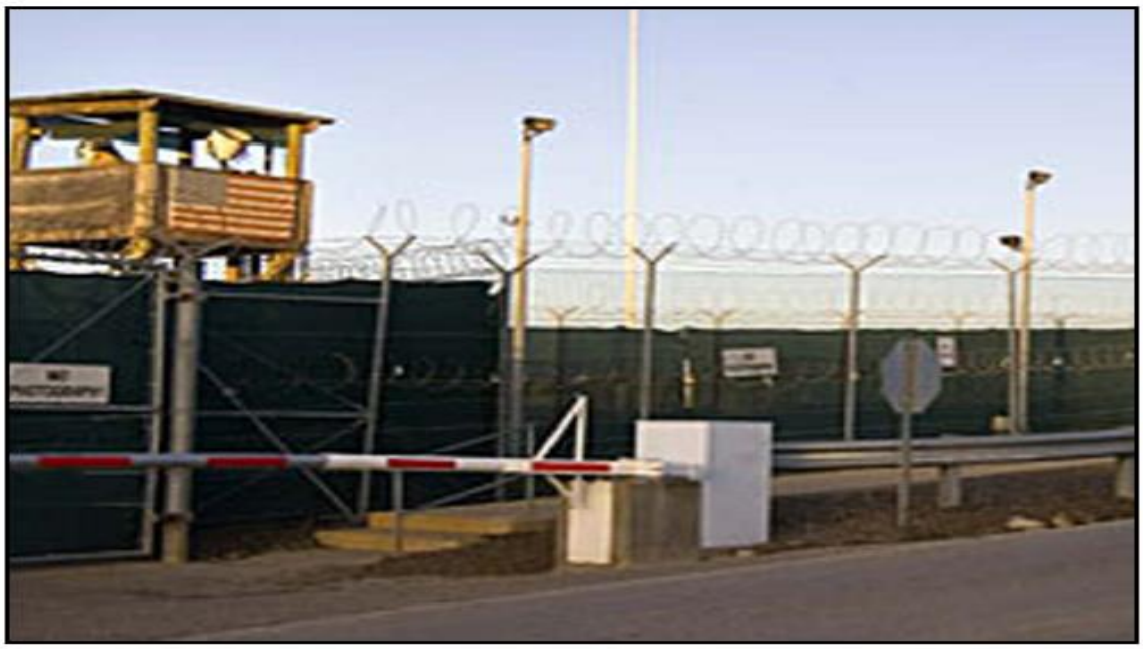


Plate I: Overwatch.

Source: Gardener (1995).

Above is an over watch tower displaying an element of natural surveillance.

2.3.3.2 Natural access control:

The prime motive of natural access is to deny entry into a facility or crime target and to create a perception of risk to offenders (CPTED committee, 2001). This control elements could either be physical or mechanical. It employs elements such as shrubs, gates, fences to prevent access to crime target and to create within the offenders' minds the notion that there is high risk in selecting a target. Figs 2.1 and 2.2. show some access control measures including a cable-beam barrier, reinforced concrete fence, serpentine pass and a sliding gate. Natural access control elements include the following as shown below;

- Cable-beam barrier
- Retractable bollards
- Drum-type barriers
- Sliding gate barrier
- Tire shredder
- Serpentine entrance

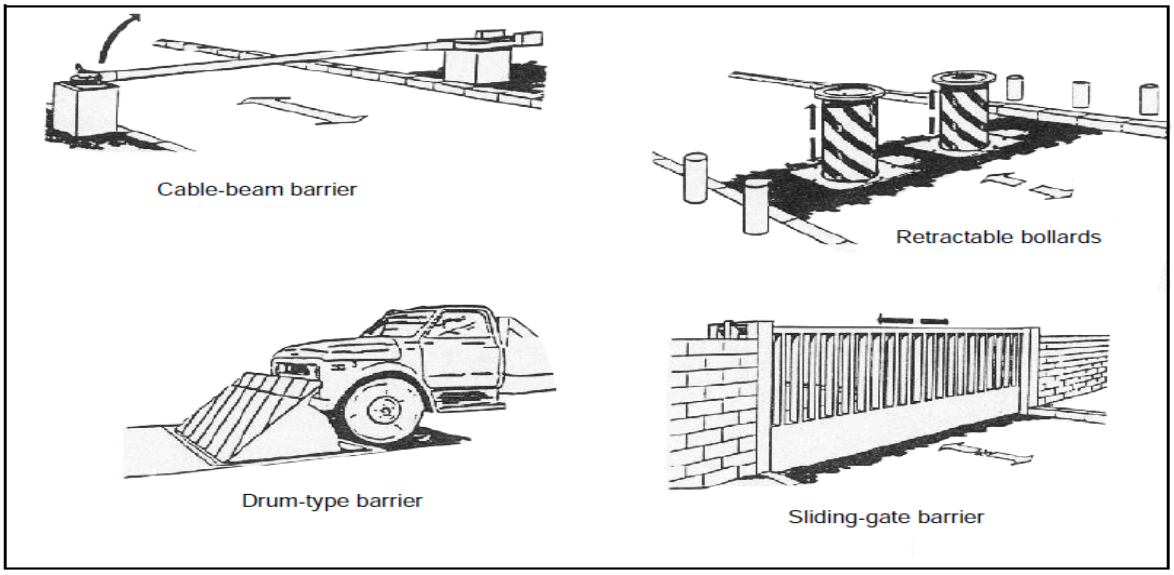


Figure 2.1: Active barrier

Source: Gardener (1995)

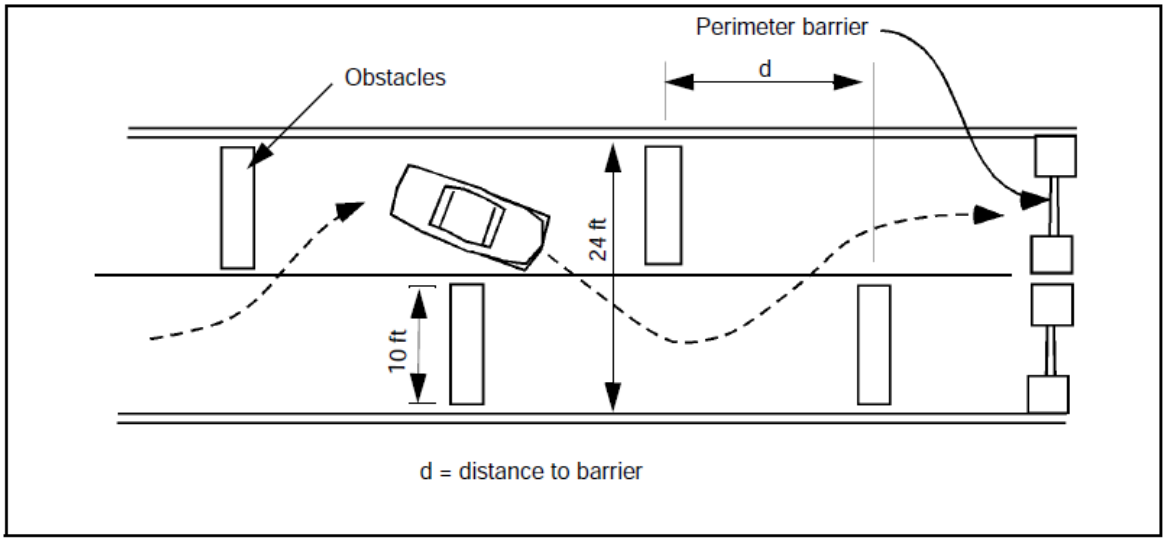


Figure 2.2: Serpentine pass

Source: Gardener (1995**)**

2.3.3.3 Territorial reinforcement:

The whole concept of territorial reinforcement depends on how to build a sense of space ownership extending the sphere of territorial influence that will be perceived by offenders. A lot of individuals develop interest, concern and care for things they own or in which they are involved (CPTED committee, 2001). As a result, a design should clearly delineate private spaces to enhance the "ownership" factor.

A sense of territoriality is fostered by architecture that allows easy identification of certain areas as the exclusive domain of a particular individual or group. This feeling is enhanced when the area involved is one in which the individual can relate to with a sense of pride and ownership. It is not enough for a person simply to be *able* to defend his environment, he must also *want* to defend it. That *"want"* results from territorial feelings of pride and ownership (Gardener, 1995).

Territorial reinforcement employs such design elements as sidewalks, landscaping, and porches to help distinguish between public and private areas and helps users exhibit signs of "ownership" that send "hands off" messages to would-be offenders.

2.3.3.4 Maintenance:

According to CPTED Committee (2001), Care and maintenance allow for the continued use of a space for its intended purpose. Deterioration and blight indicate less concern and control by the intended users of a site and signifies a greater tolerance of disorder. Proper maintenance protects the public health, safety and welfare in all existing structures, residential and non-residential, and on all existing premises by establishing minimum requirements and acceptable standards. Maintenance is the responsibility of the owners, operators and occupants.

2.3.3.5 Lighting:

Lighting is one of the basic security considerations in the design of all buildings. It takes into cognizance the concepts of openness and lighting to improve visibility or security on surveillance; ability of the security agents to monitor movements properly based on luminance. It is generally believed that adequate lighting is one of the most efficient criminal activity deterrents (Gardener, 1995). In parking facilities, Lighting is generally regarded as the most important security feature. Adequate lighting deters crime and brings forth a more secure environment (Smith, 1996). The following lighting consideration will promote efficiency in the design of a security responsive buildings:

- Maximize the opportunities for penetration of natural light into spaces
- Use of multiple lights rather than single fittings to provide consistent lighting levels and to reduce contrast between shadow and light
- Ensure all inset spaces, access and egress routes and signage are well lit
- Avoid lighting areas not intended for night time use
- Ensure that lighting illuminates pathways and potential entrapment spaces rather than windows and roads
- Place lighting in a position that will not be blocked by mature vegetation
- Identify and light 'safe routes'
- Avoid placement of 'unshielded' lighting at eye level
- Install lighting fixtures which are high mounted, vandal resistant and deflect light downwards.

2.4 Other Physical Security Terminology:

There exist some definitions we need to understand in order to explain physical security. According to US military handbook (1993), some of those basic parameters relevant to this topic include;

2.4.1 Threats:

This is defined by the Encarta dictionary as an indication that something bad or unpleasant is going to happen.

2.4.1.1 Types of threats:

- Design threat: This is concerned with the vast range of anticipated attack risks during the entire lifespan of a building.
- Threat estimate:

  This is a short term prediction of prospective threats due to recent Intel on attack. Threat estimate is of utmost importance in cases where physical planning guidelines have not been implemented during the conceptual stage of design.

2.4.1.2 Security system elements:

There are various elements relevant to security policy designs. Those most relevant to architectural design are delay and detection (Treasury Board of Canada, 2013).

- Delay: This is an attempt to slow down the penetration rate of offenders through the use of active and passive measures such as barriers before they reach their objective.
- Detection: Alerts security operatives at intrusion point for quick response.

2.4.1.3 Site security considerations:

Three concepts are important when developing effective building security programs:

- *Learn from the past.* Previous acts of terrorism, violence, and disasters are instructive because they point out what happens due to lack of preparedness, when risks are not fully considered or addressed. During the twentieth century, most building codes and standards did not anticipate the range or likelihood of terrorist threats, or the magnitude of destruction from natural disasters. The examination of what happened and why brings about important changes to building codes and industry standards, thereby improving public health, safety, and welfare, and preventing loss of life.
- *Integrate design, technology, and operations*. Building owners and project teams determine security requirements by conducting a risk assessment and vulnerability analysis. This information is used to establish priorities and solutions for protecting sites and facilities. The most successful security programs integrate good design and appropriate technology with building operational policies and emergency procedures.
- *Plan and design transparent security.* Security need not be obtrusive, obvious, or restrictive to be effective. Installing concrete barriers in front of buildings may discourage vehicular bomb threats, but will not necessarily ensure greater security within buildings unless other elements are addressed. Transparent security, not visible to the public eye, can be achieved through ensuring the following;
  - Informed planning, design, and facility operations.
  - Eliminate potential hiding places near the facility.
  - Provide unobstructed view around the facility.
  - Site facility within view of other occupied facilities on installation.

- Locate assets stored on site outside of the facility within view of occupied rooms of the facility.
- Minimize need for signage or other indications of asset location.
- Provide adequate facility separation from installation boundary.
- Eliminate lines of approach perpendicular to building.
- Minimize vehicle access points.
- Avoid parking beneath facilities.
- Locate parking as far from facility as practical.
- Secure access to power/heat plants, gas mains, water supplies, electrical service.
- Locate public parking areas within view of occupied rooms on facilities.
- Site facility away from vantage points.

Also according to Ball (2010), major topics evaluated in Installation Design Guidelines (ATD) are stated as follows:

- Standoff distance
- Building siting and orientation
- Landscape considerations
- Lighting
- Perimeter control
- Gates and entrances
- Parking

2.4.1.4 Asset types:

These are properties to which value can be assigned. They are usually the primary targets in cases of criminal intrusion. As highlighted by DoA headquarters (2001). Assets value can be ascertained by considering the three elements below:

• The criticality of the asset for its user and the organisation as a whole.

• How easily the asset can be replaced.

• Some measure of the asset's relative value.

Types of assets include the following;

- Pilferable items**:**

These include merchandise, tools, personal computers, communication aids etc.

- Money: These include raw cash or its equivalent in form of draft, cheque, valuable stones etc.
- Arms, ammunition and explosives (AA&E): These include rifles, small arms, nuclear, etc.
- Information**:** These include top secret information such as classified records, personal records, inventory records, proprietary etc.
- Mission critical personnel: They include high-ranking officers, heads of weapon units, commanders etc.

2.4.1.5 Aggressor characteristics:

Aggressors are people who perform hostile acts against military assets including equipment, personnel, or operations. Below are possible aggressor objectives and how they relate to the general classes of aggressors.

2.4.1.6 Aggressor objectives:

- To inflict injury or death on people
- To destroy or damage facilities, property, equipment or resources
- To steal equipment, material or information (espionage)
- To create hostile publicity

2.4.1.7 Aggressor types:

According to the U.S. physical security handbook, aggressors can be classified into the following groups.

- Criminals- This group could be unsophisticated, sophisticated career criminals or highly sophisticated. Their common goal is theft of assets.
- Protestants- If active or violent, Protestants are classified as intermediate threat, but low threats if passive. They are divided into two groups; vandals or activists and extremist. The two groups act out of discontent, frustration, or anger against the actions of other social or political groups. Their prime intent is to create publicity and cause destruction.
- Terrorists – This group of aggressors is sophisticated, skilled with ammunition and tools, and possess a quasi-excellent planning ability. They are ideologically, politically or issue- oriented as they commonly work in small, well-organised collection. They are identified based on their place of operation. Those who operate within a nation are considered political extremist or part of supremacy groups. Others who operate outside a nation show paramilitary capabilities and use a broad range of military and improvised weapons. They range from intermediate, through advanced to maximum level threats and are typically better

organized and equipped thus have the potential to inflict more severe attacks. Terrorists' primary goal is theft, cause death, destruction or publicity.

- Subversives- These are particularly foreign aggressors or groups planning to overthrow a government. These include saboteurs and spies. They could be classified under advanced and maximum threats depending on the situation. The primary aim is to cause publicity or kill.

2.4.1.8 Aggressor tactics:

Different aggressor tactics, as explained by the physical security planning manual, could possibly be adopted by criminals. As a result, facility planners have identified various forms of threat in standardized format. These aid designers in suggesting required solutions against tools and weapons used by intruders. Below are the forms of tactics employed by aggressors:

- Forced entry**:** In this form, an aggressor uses force entry tools to gain access. Guards may be overpowered using less sophisticated weapons. The principal goal here is theft vandalism, information compromise, or operations disruption.
- Ballistic attacks: Aggressors here use missiles that maintain a course determined by their initial orientation e.g. pistols, missiles, rifles and submachine guns.
- Standoff weapons: Military weapons or improvised versions of military weapons are fired at a facility from a significant distance. These include direct and indirect line-of-sight weapons such as antitank rocket-propelled grenade weapons. The aggressor's goal is to injure or kill the facility's occupants, and to damage or destroy assets.

- Moving Vehicle Bomb: An aggressor drives an explosives-laden car or truck into a facility and detonates the explosives. The aggressor's goal is to destroy the facility and kill people within the blast area.
- Stationary Bomb: An aggressor places a package or parks an explosives-laden car or truck near a facility. The aggressor then detonates the explosives either by time delay or remote control.

2.5 Space

Dursun (2009), asserts that space is the core of architecture. It is more than a simple volume that surrounds us. According to Lefebvre's definition, space is a social product (Lefebvre, 1998). Space can be identified in two forms; physical form, and abstract and complex form. He explains that space is supported, modified, and produced by social relations.

"Environments are thought before they are built" (Rapoport, 1982:98 in Pearson and Richards, 2005). Preziosi (1983) equally asserts that we build in order to think and act. Winston Churchill says 'first we shape our buildings and afterwards our buildings shape us'. Space commands bodies, prescribing or proscribing gesture, routes and distances to be covered. This means Monumentality always embodies and imposes a clearly intelligible, message. This is why, beneath signs and surfaces which seem to express collective will and thought, we perceive monumental buildings as expressing the arbitrariness of power (Lefebvre, 1991). As Gregory and Urry have pointed out, as a result of structuration theory, 'spatial structure is now seen not merely as an arena in which social life unfolds, but rather as a medium through which social relations are produced and reproduced' (Gregory and Urry 1985:3).

2.5.1 Spatial needs

There are certain emotional needs humans expect space to help them satisfy (Lawson, 2001). These needs take different forms depending on physical health, personality, social context and age. However, most people despise that feeling of being bored and therefore, require some sense of amusement and entertainment. This could be perceived as a demand for stimulation, expecting the surrounding space to provide. For most people, they seem to run away from substantial degree of uncertainty and dynamism requiring level of stability and structure for themselves. This is viewed as desire for security and so need the space to be secure (Lawson, 2001). Others have this strong desire to belong somewhere. A great number of people who have moved from one place to another usually have a strong affinity with their original base that they feel the urge to return in later life; home sweet home. This is perceived as the need for identity or the need to be located in space or to belong somewhere.

These spatial needs are examples of what our inhabited space may seem to satisfy. According to Ardrey (1967), these three spatial needs; stimulation, security, and identity, could help explain the reasons for territorial behaviour.

2.5.2 Forms of Space

Physical form of space: This can be easily identified and explained by its solid characteristics. These include; length, width, scale, geometry, and also texture, colour light etc. Lawson (2005) also explains architectural and urban space as containers to accommodate, separate, structure and organise, facilitate, heighten, and in addition, celebrate spatial behaviour.

Abstract and Complex form of space: This characteristics of space is difficult to talk about. It includes code, rules, and abstract parts shaping meaningful things in space. They also include factors such as

2.5.3 Space Distance Zones (Human Distance)

2.5.3.1 Intimate space:

According to Hall (1988), this is the distance of playful wrestling and lovemaking. It is described as the space within the half a meter distance; a distance within which one person can touch another. Within this distance, body odour, breadth and perfume may be smelt, we may feel body heat also. When facing each other, one can see the other's face in sufficient detail to accurately appreciate emotion unless carefully concealed as in the case of niqabs or masks. This is tagged as a distance of trust and intimate activity (Lawson, 2001). Socially, it is difficult if not impossible to ignore someone within this distance. As a result, some form of acknowledgement at the very least is expected from one party. Public display of such affections associated with this distance is disapproved and seen as unethical in a number of situations and cultures. At this distance, one can communicate privately only by whispering.

2.5.3.2 Personal space

According to Igrashi, Stade and Vriens (2009), personal space is defined as "an area with an invisible boundary surrounding a person's body into which intruders may not come. It is a dynamic and active process of moving towards and away from others. He further explains that Hediger discovered in 1950 that animals remarkably maintain relatively constant distance between one another. This explains that there is an interplay of personal distance: distance apart that animals keep from each other. It runs out from intimate distance to about 1.2m. Behaviour associated with personal space involves attraction and retracting forces or

in other words withdrawal and protective reactions to intrusion or too much close contact to by strangers, and need to be in close proximity with familiar people respectively. Personal space is influenced by the certain factors which include; cultural norms, gender, personality, situational elements, interpersonal relationship etc. when looking directly at someone, that persons face is clearly visible in the fovea (the small central part of the retina that allows for the detection of fine detail, and has very high acuity). A person standing within this distance fills the viewer's foveal field of vision (Hall, 2001). By contrast, a human's peripheral field of vision specialises in motion. This is why it is actually difficult to conceal emotion at this distance. Once at this distance, for example, one can easily notice beads of sweat that might form on the face of a student presenting his external defence. For this reason, negotiations should be conducted at a further distance than this.

2.5.3.3 Social space

Social distance, according to Lawson (2001), is collectively conceived to run from about 1.2m to 4m. Hall (1988), defines it as the zone of impersonal trans-action. The inner circumference of this distance is that which is used in polite society under normal situations. One's face can still be seen clearly but not intimately hence conversations can be carried out using normal voice levels under most conditions. Within the outer circumference of the social distance, it is completely acceptable to ignore somebody's existence leaving no offence. For this reason, it is mandatory for one within the outer social space to indicate more clearly that they are talking to someone and that their attention is with that person (Lawson, 2001). This could be achieved by, as a matter of necessity, looking at each other straight in the eye to establish a shared eye contact. Gestures such as nodding and smiling indicate one is still in the conversation. Beyond this distance, one effectively relinquish their hold over or contact with other people in space and ignore them without infringing etiquette. Social

distance is the most important to understand in making lots of behavioural settings work well.

2.5.3.4 Public space

This is regarded as the outermost and final in the category of human distance. Lawson (2001), explains that; it runs outwards from the external core of the social distance. "It is the distance of the lecture hall, mass meetings, and interactions with powerful figures until such time as they bid you to come closer" (Hall, 1988). This distance runs from 4m and above. At the very near range of public distance, one can hold a conversation with a slightly raised voice. However, as one moves further away to about 8m, they will have to boost up their voice level to what is thought to be theatrical in nature. At this deeper distance, limited clear detail on faces can be viewed; this being of the reasons why the police uniform is conspicuous; also the reason for extravagant makeups used by performers in theatres. For the above reasons, public distance is normally one at which somebody ignores other people in space. However such distance is utilised for one reason or the other.

2.5.4 Spatial organisation:

Space in architecture is planned based on certain guiding principles. These principles are influenced by several factors unique to the type of building and settlement to be designed. In design, it is very important to conceive and mull over architectural space around us by deciphering its nature and discovering the significance in its built forms (Dursun, 2009). Culture also plays a vital role in such planning processes. These guidelines are well referred to as "***Organisational layout***". According to design theory, there are five (5) basic types of organisational layouts namely; linear pattern, hierarchical pattern, radial pattern, grid or gridiron pattern and concentric or circular pattern.

3.0 METHODOLOGY

3.1 Introduction

A research methodology defines what the activity of a research is. It also defines how to proceed, how to measure progress, and what constitutes success of that research (http://www.cs.indiana.edu/mit.research.how.to/.html). Research methodology assumes the function of the processing machine in a research. This chapter outlines in plain text how the study will be carried out. It will state the various subheadings under which the researcher will explain the study procedure during his course of action. These strap lines include; research method, population of study, sampling method, research instrument (instrument of data collection), procedure for data collection, procedure for data analysis, and conclusion.

3.2 Research Method

Imoisili (1996:61) in Abubakar (2011) explains that, Purposes and circumstances are the major prompting considerations when selecting a research method during the process of carrying out a study. O'Leary (2004, p. 150) remarks "Collecting credible data is a tough task, and it is worth remembering that one method of data collection is not inherently better than another." Therefore, which data collection method to use would depend upon the research goals and the advantages and disadvantages of each method .This research topic; "Enhancing security responsiveness through spatial organization in the design of paramilitary headquarters in Nigeria", aims at collecting data from three major paramilitary institutions. The purpose of data collection here is to have a spontaneous panorama of the effectiveness of space design with respect to security (aggressor ingress and egress and also building responsiveness) in these headquarters. But such data will, under the current

circumstance (mistrust for strangers due to insecurity), pose a difficult access. Since it is a design based research, case study method will be employed to carry out the study.

3.3 Case Study Research Method

This is an empirical inquiry by an individual or organization that investigates a phenomenon within its real-life context. It is the study of a person, a small group, a single situation, or a specific "case," called a case study. It involves extensive research, including documented evidence of a particular issue or situation; symptoms, reactions, effects of certain stimuli, and the conclusion reached following the study (http://www.wisegeek.org/what-is-a-case-study.htm). Johansson (2003) asserts that an important feature of case study methodology is that various methods are being integrated in order to look into a case from different perspectives, that is, to triangulate by combining methodologies. A case study may show a correlation between two factors, whether or not a causal relationship can also be proven. It may sound complicated, but it's really quite simple. Designed to ask the questions "how" and "why" of an event, procedure or phenomena, case studies are qualitative researches. The moment one decides on a case to be studied, that person needs to visit the site and talk to experts. It is believed that a designer's work hinges on comparisons between known cases from the repertoire and the actual design situation (Schön, 1991).

3.3.1 Procedure for conducting a case study

Tellis (1997) outlined the following stages to be followed in carrying out a case study research;

3.3.1.1 Design the case study protocol:

a. Determine the required skills: Tellis (1997) opined that a researcher must display the qualities of a "senior" investigator. He must exhibit the ability to ask good questions

and to interpret the responses, be a good listener, be adaptive and flexible so as to react to various situations, have a firm grasp of issues being studied, and be unbiased by preconceived notions (Yin, 1994).

b. develop and review the protocol

3.3.1.2 Conduct the case study:

a. Prepare for data collection

b. Conduct interviews

3.3.1.3 Analyze case study evidence:

Data collected during the course of the study will be examined in great detail and the result will be presented in the required format.

a. analytic strategy

3.3.1.4 Develop conclusions, recommendations, and implications based on the evidence

This research is geared towards carrying out a case study on three paramilitary buildings in Nigeria; the Nigerian police headquarters (Louis Edet house), the Nigerian immigration service headquarters and the Nigerian custom service headquarters

3.4 Population of the Study

In accordance with the scope of study as stated earlier, the population of study will encompass staffs of the three selected paramilitary institution which comprise the Nigerian police headquarters (Louis Edet house), the Nigerian immigration service headquarters and the Nigerian custom service headquarters.

3.5 Research Instrument

In a research where user opinion on key factors is required, the most efficient instrument for data collection is interview. Other instruments that are going to be used include visual survey, and checklist.

Interview method will be used to collect classified data from key informants using an interview guide. These include unit commanders, departmental heads or their representatives, key officers and possibly other stakeholders.

According to Woods (2011, p. 1), "The interview method is a conversation with a purpose"

Interviews are believed to be ways of collecting data through conversations. It enables the researcher to examine the level of understanding of respondents about a particular topic - usually in slightly deeper detail than with a questionnaire. Kvale (1996, p. 14) regarded interviews as "… an interchange of views between two or more people on a topic of mutual interest, he sees the centrality of human interaction for knowledge production, and emphasizes the social situations of research data."

Interviews are ways in which people chat together and exchange their views. This way, the interviewees get to discuss on their perception and interpretation of the subject matter (Kajornboon, 2005).

Woods (2011) further asserts that interviews are non-experimental in design. They are used widely to supplement and extend one's knowledge about individual(s) thoughts, feelings and behaviours, meanings, interpretations, etc. One of the best ways to achieve this is by the interviewer collecting detailed personal information from individuals on one-on-one basis.

3.6 Sampling Method

In a case study approach, the most suitable sampling method to be used is stratified then random sampling. Where data will be collected from key informants, will. Like it was authenticated, in cases where an established sample frame is not available, a small or medium sample size of the purported population, say 5% to 10%, will do (http://www.ReportBD.com).

All samples are drawn from the entire population using stratified method. Stratified sampling, a proportional sample from whole population, is a sample of population that is proportionally representative of all types of people of interest in the survey

3.7 Procedure for Data Collection

Where high response rates, clarifying questions, if necessary, is permissible; control over respondent selection; liberty to use longer, more complex questions; and easy motivation of respondent are needed, the best instrument of data collection to be used is the interview. Corbetta (2003, p.269) states that structured interviews are "*…Interviews in which all respondents are asked the same questions with the same wording and in the same sequence."* Where all interviewees are to be given precisely an even context of questioning, that is, all respondents receive exactly the same interview stimulus, structured interview should be the best option to be adopted (Bhamini, 2007). It would be best if questions can be read out in the same tone by the interviewer in order not to influence the interviewees' response (Gray, 2004, p. 215). Therefore, a carefully prepared list of structured or standardized interview questions was formulated and used as a fulcrum of discussion during the interview session (see appendix A). This has control over the topics and the format of the interview (Bhamini, 2007). It is due to the detailed guide which is a product of the research questions used. Since

questionnaires will be interviews with each key informing officer. The strengths of structured interviews are that the researcher adopted 95% vote of confidence and 5% margin of error will as a scale for number of questionnaires to be distributed, considering time and accessibility. Some few officers will be employed to assist in distribution and retrieval of interview guides. Also the researcher physically paid a visit to the three paramilitary organizations with a checklist and carry out a visual survey in order to take record of the existing spatial organization for evaluation.

Interviews with selected respondents were conducted in person and over the phone depending on their location and availability. Interviews were recorded in writing and in a digital recorder. The digital files were transcribed, reviewed and responses were grouped according to recurring themes in them, as described in this chapter.

3.8 Procedure for Data Analysis

After accumulation, data collected by the researcher will be analysed reviewed and presented in the next chapter. The procedure for data analysis will be as follows:

Objective one will be examined using descriptive analysis method for evaluating the data collated from the questionnaire

The second objective will be analysed using content analysis by examining data collected through interviews and visual survey

For the third objective, data will be analysed by using descriptive statistics on some questionnaire results.

And lastly, the fourth objective will be analysed based on the result of the above three to ensure a security responsive design.

3.9 Conclusion

In conclusion, this chapter aims at apparently explaining the process of carrying out the research (methodology) by putting together all data collected through interview, questionnaire and visual survey through careful analysis. Case study method was used in carrying out the study due to its advantages and it being the most efficient method for carrying out such a study. Its findings will be presented in the next chapter accordingly.

4.0 DATA ANALYSIS AND PRESENTATION

4.1 Introduction

The primary goal of the research is to come up with an architectural design strategy that, to a better extent, tries to inhibit and keep terrorists as far away from inhabited paramilitary buildings in Nigeria as possible. In the preceding chapter a case study methodology was adopted. As was explained earlier, data was collected from three paramilitary institutions (NPF, NCS, and NIS) and their corresponding building design and maintenance consultants using a structured interview. Also, a checklist was prepared and used as guide in evaluating the key variables in this research.

This chapter constitutes a comparative study on the aforementioned paramilitary institution. Here, the analytical research component is '"security responsiveness". Part of the results revealed in this chapter demonstrates differences in perspectives between paramilitary planning personnel. However, the interview responses are categorized according to the three groups of respondents and analysed through data triangulation to better understand the viewpoint of the three institutions.

The data collected was computed, tabulated, recorded, and summarized using descriptive analysis method of analysing case studies. This was produced in accordance with the interviews.

Since interviews are interchange of views between two or more people on a topic of mutual interest (Kvale, (1996, p. 14) and that the interviewees according to Kajornboon (2005), are able to discuss their perception and interpretation in regards to a given situation, each

question will ab-initio be classified and tabulated with respect to the respondent. Subsequently, a comparative analysis of the three organizations will follow.

Interviewing multiple informants provides a rich collection of data to be analyzed. The interviews provided insight into the perceptions of paramilitary personnel about security responsiveness implementation process. In addition, the interviews revealed unique situations and challenges with the implementation of these requirements on specific projects.

4.2 Data Analysis

In carrying out the interview, purposive sampling was used in the selection of sample size. With an average interview duration of 1hour, six respondents were selected in each of the three paramilitary institutions. According to Moser and Kalton, (1977); if the final turnover of a data collection instrument is not less than 30%, the result is said to be unbiased and thus sufficient for validation of the data collection method. Based on the total response (the number of interviewed respondents), 61.11% of the total population were interviewed and are considered adequate for analysis. As shown in table 4.1, four (4) officers and one (1) consultant of the Nigerian police force, three (3) officers and (1) consultant of the Nigerian immigration service, and one (1) officer and also one (1) consultant of the Nigerian customs service were interviewed.

Table 4.1: Respondents Statistics

Paramilitary Institution	Respondent	No. Of Respondents	Percentage
NPF	Officers	4	22.22
	Consultants	1	5.56
NIS	Officers	3	16.67
	Consultants	1	5.56
NCS	Officers	1	5.56
	Consultants	1	5.56
Total		**11**	**61.11**

Source: Author's field work (2014)

4.2.1 Case Study 1: The Nigeria Police Force

4.2.1.1 Introduction

The Nigerian Police Force headquarters, also known as, Louis Edet house is located along Shehu Shagari way, central business district, Abuja. Built in modern architectural style, the police headquarters is a white finished high-rise building made mostly of precast concrete that tappers towards the building top. It consists of seven floors, which house the seven departments of the police force. Built and maintained by Julius Berger plc, the German multistory structure is located alongside other security agencies in a concentric organizational pattern purposely to secure the state house. The structure has a rectilinear nature with a central atrium, in each wing that runs from the ground floor through the seventh. The building is divided into wings according to the organization's sections and subdivisions.

4.2.1.2 Informants Profile

All respondents work for the Nigerian Police Force in their discrete designated capacity. The shortest service duration of the interviewees recorded was 29 years with the longest being 37 years. It was deduced that more than half of the respondents have worked for the Nigeria police for more than 30 years and only one of them did not have a college degree. The professions represented include: Civil Engineering, Architecture, Electrical Engineering, and Building Engineering.

Table 4.2: Informants Profile

S/N	Employer	Position	Years In Service	Years In Current Position	Specialized Area Of Eduction	Highest Level Of Education
1	NPF	CP (works)	34	4	Electrical Engineer	Master's Degree
2	NPF	CSP (OC, maintenance)	29	2	Civil Engineer	Bachelor's Degree
3	NPF	CSP (OC, works)	30	3	Builder	Diploma
4	Tomoro Architects	Principal architect (Tomoro Architects)	37	30 (as a permanent consultant)	Architect	Master's Degree

Source: NPF (2014)

4.2.1.3 Physical security considerations

Exterior site-related physical security

- Site Planning and landscaping: The building's perimeter fence satisfies the minimum distance of ten meters (10m) from any roadway or parking area. The minimum distance of trash cans from the facility was also adhered to a little extent. However, it was observed that the main inhabited facility does not comply with the 45m standoff standard between an inhabited building and the perimeter fencing. Location of walkways is poor as opposed to cpted concept of natural surveillance.

- Site access control: Access control has being addressed, through the installment of electronic barriers. The entrance gate, having a see-through design, aids visual access into the site. Installed at the main gate entrance is a group of electronic balusters positioned to hinder access for unauthorized vehicles. This complies with cpteds concept of natural access control. Security lighting does not exist at the forefront of the perimeter fence. Hence this could be a blind spot that can host a criminal activity.
- Site security elements: The whole site is networked and controlled under a central Closed Circuit Television (CCTV) camera. The perimeter fence does not have control for rapid response. Only the approach and rear elevations have

Hardening mechanisms: General mechanisms adopted to stop the building from attacks were not very much considered. To a great extent, ballistics could be controlled. However, standoff weapons and bomb blast cannot be impeded.

- Design threat**:** over the past three years, various tragic events ranging from threats through, assassination attempts on staffs to destruction of official property using improvised explosives has been baffling the police. This occurrence sprung up the need for threat estimates, which in turn demands upgrade in the building's security system. Materials used in construction are relatively satisfactory, that is to say, they are repulsive to some categories of aggressor attacks. On a scale of 1- 5, the walls in sensitive areas such as the armoury are graded 3, with 1 being the strongest and 5 the weakest in resistance to impact
- Spatial Organization: the main inhabited facility is positioned roughly at the centre of the site. To its façade, the Inspector General's parking space is located adjacent to the entrance. There exist also, a motorway, and a helistop designed in order of

increasing distance from the building. To the rear of the facility is a motorway sandwiched by a parking facility for mid ranking officers and a common parking space for low ranking officers and visitors. The left wing of the site houses a large parking area strictly for operation vehicles, pilot vehicles, riders and other escorts. Also to the same side of the site are the police cooperative office and others, which are temporary structures positioned near the perimeter fence. The right wing of the site is a large undeveloped land currently utilized for new vehicles. This land is bordered by an access road which takes you to the facade or the generator house at the extreme right corner of the site. It was observed that the building does not satisfy the standoff distance conditions of inhabited buildings as represented in table 4.3. The rear parking lots meant for mid ranking officers is too close to the building and possess potential threats to the main facility. Also in the same table, it is demonstrated that the low occupancy building that houses the police cooperative office falls within a distance less than the minimum standard from site's the perimeter fence as shown in the figure below;

Table 4.3: Standoff Distance Check List for High and Low Occupancy Buildings

Location	Applicable Level of Protection	Minimum Stand Off Distance (High Occupancy)	Applied Standoff Distance	Minimum Stand Off Distance(Low Occupancy)	Applied Standoff Distance
Parking	High	25m	Not satisfactory	10m	Not satisfactory
Trash Can	Low	10m	Not satisfactory	10m	Not satisfactory
Perimeter Fence	Medium	45m	Not satisfactory	10m	Not satisfactory

Source: NPF (2014)

- Services and Facilities: Mechanical systems such as elevators have some level of security. One must have to pass through two security checks and an electronic checkpoint before accessing any vertical means of transport. All the building's wing s are linked to one big network through CCTV cameras
- Assets: According to the interview respondents, the main assets include;
    - The building
    - The inspector general's office
    - Underground parking space for the topmost officers (A.I.G.s and D.I.G.s)
    - Criminal Investigation Department (CID)
    - Arms, Ammunition and Explosives- this refers specifically to those weapons stored in the armoury.
    - The helistop
    - Information
    - Vehicles- this refers to all cars, trucks, tanks, on all parking areas throughout the site. They are potential places of attack and explosives planting.
    - Mission critical personnel: These include high ranking officers, commanders, armoury guards, communication and intelligence officers.

Table 4.4: Checklist for asset categories and potential aggressor types

Variable/asset categories	Criminal			Protestants	Terrorists	Subverives (spies/saboteur
	Casual	Career	Highly org.			
Information						X(spies)
Vehicles		X		X		
Mission critical personnel				X	X	X(saboteur)
Arms, Ammunition, and Explosives			X		X	X
Military/ Civilian personnel				X	X	X(saboteur)
Building			X	X	X	

Source: Author's field work (2014)

Table 4.5: Asset category and security system ingress/ egress denial

Asset Category	Security System	
	Ingress Denial	Egress Denial
Information	X	
Vehicles		
Military critical	X	
Other		X
Mission Critical Personnel		
Assassination	X	
Kidnapping	X	
Hostage		X
Arms, Ammunition and Explosives (AA&E)	X	
Military/ Civilian Personnel		
Kidnapping		X
Hostage		X

Building			
Military	X		
Other		X	

Source: Author's field work (2014)

Table 4.6: Interview analysis table

Concepts	Variables	Remark		
		Satisfactory	Average	Unsatisfactory
Natural surveillance	Architectural design		X	
	Lighting		X	
	Visual connection (clear sightlines)			X
	Security system elements		X	
	Site security control			X
	Building materials		X	
	Offsite vantage points due to orientation		X	
	Offsite landscaping			X
Natural Access Control	Unobstructed space (Visual barrier)			X
	Access control points (Physical barrier)	X		
Territorial Reinforcement	Landscape			X
	Spatial control			X
	Doors and Gates		X	
	Perimeter control		X	
	Standoff distance			X
Traffic control techniques			X	
Parking				X
Landuse compatibility			X	
Building siting and control		X		

Source: NPF (2014)

4.2.2 Case Study 2: Nigerian Immigration Service

4.2.2.1 Introduction

The Nigeria Immigration Service (NIS) is located along Umar Musa Yar'adua way, otherwise known as airport road. Being an international security service institution, the site was picked somewhere close to the Nnamdi Azikiwe international airport within Sauka locality to ease access for the staffs and also travelers. The design adopted is a typical example of modern architecture as it was built mostly out of reinforced concrete. It houses two major facilities; the main building which runs up to three floors and the other which is a duplex popularly known in the environment as glass 'house' or 'passport office'. Other facilities include a mosque, a Zenith bank local branch and also few uncompleted structures.

4.2.2.2 Informants profile

All respondents in this category also work for the Nigeria Immigration Service. Out of the six (6) informants that were to be interviewed, only four (4) were successful. Three (3) of the respondents were officers from the immigration service and one (1) from AIM consultants, the designers and consultants of the facility. According to the table below, only one (1) respondent has served in the NIS for more than 20 years. All respondents have a minimum of a college degree. Informants' areas of specialty are Architecture and Structural engineering. The shortest service time recorded was four (4) years while the longest was twenty one (21) years.

Table 4.7: Informants profile

S/N	Employer	Position	Years In Service	Years In Current Position	Specialized Area of Education	Highest Level of Education
1	NIS	CSI (OC, works)	21	4	Architect	Master's Degree
2	NIS	ASI (works)	5	5	Architect	Bachelor's Degree
3	NIS	ASI (works)	4	5	Structural Engineer	Master's Degree
4	Self employed	Senior architect (AIM Consltants)	-	-	Architect	Master's Degree

Source: NIS (2014)

4.2.2.3 Physical security considerations

Exterior-site related physical security

- Site planning and landscaping: The site has nothing fancy to write home about although, to a little extent, there is some degree of physical security measures adopted. The minimum standoff distance for parking areas, perimeter fencing and trash cans are satisfactory. Perimeter fencing is to a little extent satisfactory as there was no presence of some horticultural plants to obstruct view of a potential aggressor. As observed via visual survey, the provision made for unobstructed space for easy detection of suspicious movements around the building as a security measure and control mechanism was satisfactory.
- Site access control: The provision for a means of ingress and egress in this building as observed was made from a locally improvised serpentine pass. The main entrance gate to access the facility was made from hollow metal stripes which allow for

immediate visual contact with the aggressor. Barbed wire as an access inhibitor usually provided on perimeter fences was not available

Site security elements: The whole site is kept under strict observation from a central Closed Circuit Television (CCTV) camera. There was no visible security lighting as required to scare away aggressors most especially at night signalling to the aggressors that they are being watched.

Design threat: Over the years, there has not been any reported case of aggressor attack on this building. The materials used in the construction of this building considering the period it was constructed and commissioned are relatively unsatisfactory for standing the test of time and with proper maintenance, the structure is vulnerable despite its zero number of assaults.

Spatial organization: It was observed that the positioning of the main inhabited facility is satisfactory. From the main entrance into the facility, there exist parking lots for the CG, DCGs and VIP. Furthermore, there is considerable number of parking lots for visitors who throng the facility either applying for a new passport or renewing an old one. The positioning of security post (gate house) is satisfactory as the security of the facility is concerned. The generator house is located at the extreme end of the right hand of the facility with a considerable distance to mitigate noise from the generator while it is on.

Services and facilities: For a building that is three (3) floors high only, the only means of vertical transport used was only staircases positioned

Asset types: A unanimous opinion according to the respondents is that the main asset in the building is the Comptroller General and his entire office staff whom gulped

the entire second floor. Others include the passport production room and connection room. This is because they are the heart of classified records and personal information about millions of people ranging from the common citizens through business tycoons to top government officials. Another asset the informants pointed out is the armoury. Its location remains anonymous due to security reasons.

Table 4.8**:** Interview analysis table

Concepts	**Variables**	**Remark**		
		Satisfactory	Average	**Unsatisfactory**
Natural surveillance	Architectural design			**X**
	Lighting			**X**
	Visual connection (clear sightlines)			**X**
	Security system elements			**X**
	Site security control		X	
	Building materials			**X**
	Offsite vantage points due to orientation			**X**
	Offsite landscaping			**X**
Natural Access Control	Unobstructed space (Visual barrier)			**X**
	Access control points (Physical barrier)			**X**
Territorial Reinforcement	Landscape			**X**

	Spatial control			X	
	Doors and Gates				**X**
	Perimeter control				**X**
	Standoff distance		X		
Traffic control techniques				X	
Parking				X	
Land use compatibility					**X**
Building siting and control			X		

Source: NIS (2014)

4.2.3 Case Study 3: Nigerian Custom Service

4.2.3.1 Introduction

The Nigeria Custom Service corporate headquarters, which is yet to be inhabited, is located along Tigris crescent Maitama, Abuja. Its current headquarters is located at Wuse zone five (5), Abuja. According to the respondents, the first site allocated was behind National mosque but was later revoked by the Federal Capital Development Authority. One of the respondents lamented that the NCS been the second largest revenue generating institution yet, lacking a purposely designed headquarters led to the construction of the corporate headquarters at Maitama. This new facility is a multistory masterpiece built in a postmodern architectural style that stands out within its environs. The structure includes two identical towers connected by a bridge circumscribing a deep courtyard. Behind the building is a multilevel car park that runs up to four floors.

4.2.3.2 Informants profile

Respondents from the NCS are all staffs who have worked for over thirty (30) years. Of the three interviewed institutions, the NCS had the fewest successful informants. As shown in

table 4.9 below; they include one staff of the custom service with a Bachelor of Science degree in building and one staff of Design Cost Associates, a comprehensive consultancy firm that is supervising the construction. He holds a Master of Science degree in quantity surveying.

Table 4.9: Informants profile

S/N	Employer	Position	Years In Service	Years In Current Position	Specialized Area Of Education	Highest Level Of Education
1	NCS	DCC (works)	30	4	Builder	Bachelors Degree
2	Self employed	Senior architect (Design Cost Associates)	-	-	Quantity suveyor	Masters Degree

Source: NCS (2014)

4.2.3.3 Physical security considerations

- Exterior-site related physical security
- Site planning and landscaping: The distance from perimeter fencing to high occupancy buildings standard of ATD designs is unsatisfactory. Also the multilevel parking could pose great threats as aggressors can attack even at less than sniper distance. For this reason it has failed the standoff distance requirements of buildings from parking areas and roads. Site furniture such as trash containers haven't been put in place yet but it can be deducted that, the safe distance is unsatisfactory since fence to high occupancy building standard has failed.
- Site access control: There is little or no attention given to site access control in this regard. According to the first respondent, CCTV cameras have been

strategically designed. This is to say, all ingress and egress attempts around the perimeter fencing have been thought through. But going by ATD site design standards, CCTV cameras alone will not strengthen ingress and egress denial.

- Site security elements : Similar to others, a network of CCTV cameras was positioned around the site. “The NCS is very security cautious”, a respondent explained. As such there is need for upgrade in the security system. Despite the care for safety, the elements have not met the requirements of infallible site security.
- Design threat: The Nigeria Customs headquarters is susceptible to insurgence due to its presence in a confined area. Tigris crescent is a very busy boulevard due to the presence of Corporate Affairs Commission (CAC), the Federal high court, and Tertiary Education Trust (TET) fund building complexes. The operation nature of the buildings attracts a lot of crowd leaving the environment susceptible to attack.
- Spatial organization: Having access to any of the surrounding building could cause havoc to the site. The rear entrance is exposed hence could serve as an easy ingress point for uninvited guests. People are bound to hang around the parking area. Consequently locating the multilevel parking in its current position provides a clear panorama for aggressors.
- Services and facilities: Services available in the building are elevators and staircases. There are two staircase and two elevator shafts in each wing (A and B) and two staircases and an elevator shaft in the tower.

- Asset types: As explained by the first respondent, everybody's life is important as such a general security measure should be adopted in all paramilitary buildings since they are the targets according to design threats. Nevertheless, the comptroller should be the prime target. For this reason, he is the principal asset and they have to protect him with all their might. He lamented that; absolute security should be dealt with right from the conceptual stage of the design. Been the second highest revenue generating institution in the country, there is need for serious safeguard of classified information.

Table 4.10**:** Interview analysis table

Concepts	**Variables**	**Remark**		
		Satisfactory	Average	**Unsatisfactory**
Natural surveillance	Architectural design			**X**
	Lighting		X	
	Visual connection (clear sightlines)			**X**
	Security system elements		X	
	Site security control		X	
	Building materials			**X**
	Offsite vantage points due to orientation			**X**
	Offsite landscaping			**X**

Natural Access Control	Unobstructed space (Visual barrier)				**X**
	Access control points (Physical barrier)	X			
Territorial Reinforcement	Landscape				**X**
	Spatial control				**X**
	Doors and Gates			X	
	Perimeter control			X	
	Standoff distance				**X**
Traffic control techniques				X	
Parking					**X**
Land use compatibility					**X**
Building siting and control					**X**

Source: NCS (2014)

4.3 Summary of Case Study Discussions

The guidelines and data analysis are based upon the best currently available research and test data the researcher could get hold of and will be revised or expanded as additional research data become available. The contents include procedures for planning and designing an integrated physical security system for new facilities as well as the retrofit of existing facilities. The focus is on enhancing security responsiveness of paramilitary buildings using physical security strategies thereby protecting against all types of aggressor tactics (forced entry, and ballistic and standoff weapons) etc.

4.3.1 Research question one

What are the features of a security responsive environment?

The research has identified the features of a security responsive environment. This was achieved through case study.

The features of a security responsive environment include

- Natural surveillance
- Natural Access control
- Territorial reinforcement
- Lighting

4.3.2 Research question two

How can the spatial features of a security responsive environment be assessed?

The features of a security responsive environment were assessed through visual survey using a well organised check list and it was found out that;

In The Nigeria police headquarters, the following variables where found to be;

- Satisfactory: Access control points and Building siting and control
- Average: Land use compatibility, Traffic control techniques, Perimeter fencing, Doors and Gates, Offsite vantage points, Building materials, Security system elements, Lighting, and Architectural design.
- Unsatisfactory: Visual connection, Site security elements Offsite landscaping, unobstructed space, landscape, spatial control, Doors and Gates, Perimeter fence, Standoff distance, parking.

In The Nigeria Immigration Service building, the following were discovered;

- Satisfactory: Standoff distance, Building siting and control.
- Average: Parking, Traffic control, spatial control and site security control.
- Unsatisfactory: Lighting, Architectural design, unobstructed space, Access control points, Landscape, Doors and Gates, Perimeter fence, visual connection, security system elements, building materials, offsite vantage points, offsite landscape, and Land use compatibility.

In The Nigeria Custom Service building, the following were discovered;

Satisfactory: Access control points.

- Average: Security system elements, traffic control techniques, Perimeter fencing, Doors and Gates and lighting.
- Unsatisfactory: Architectural design, visual connection, building materials, offsite vantage points, offsite landscaping, unobstructed space, landscaping, spatial control, parking, land use compatibility, and building siting and control

Research question three

What are the spatial characteristics of paramilitary premises?

The research data outlined the following elements as major and most common characteristics of a paramilitary environment;

- Site Zoning (Security)
- Heightened security

- Crime Prevention Through Environmental Design (CPTED) principles.
- Physical security site selection criteria.
- Site analysis (Security).
- Organisational concept.
- Functional flow.
- Vehicular/ pedestrian movement and traffic circulation.

4.3.3 Research question four

What are the spatial preventive measures adopted to hinder the ingress of criminals in paramilitary buildings?

According to the data collected, the preventive measures adopted to hinder the ingress of criminals are through proper utilization of physical security guidelines during design stage. That is to say, all paramilitary buildings designers should use these guidelines as a manual right from the conceptual stage.

4.3.4 Research question five

- How can these preventive measures be enhanced?

These paramilitary preventive measures could be enhanced through the following ways;

- By enlightening the security personnel in charge of works departments in all paramilitary institutions.
- By making sure the consultants and contractors read, use and strictly comply to physical security guidelines unique to the site and paramilitary organization in question.

- Through proper allocation of land meant to house paramilitary buildings by the government.
- Through the use of blast resistant building materials

4.3.5 Research question six

- How can security responsiveness through spatial organisation be achieved in paramilitary complexes?

This research question will be answered by the architectural design in later chapters (6 and 7).

5.0 RESULTS AND DISCUSSION OF FINDINGS

5.1 Preamble

This study assessed the level of security responsiveness in some randomly selected paramilitary buildings. It specifically evaluates the impact of current trend of spatial organization on paramilitary headquarters designs. Data collated through interviews and visual surveys were assessed and the following findings were discovered.

5.2 Discussion of Findings

Analysis of the literature, interviews, and visual survey reveals strengths and weaknesses of the implementation process of security responsiveness in paramilitary buildings. Most paramilitary buildings are designed without in-depth acquaintance with security guide lines. As such their studies are horizontal rather than vertical. This is because no written document for guidance on security issues for the planning, design, and construction of paramilitary installations to reduce vulnerability to terrorist attacks exist.

Another stone uncovered reveals that some paramilitary buildings are protected by adopting already existing even though not effective, similar security measures. That is to say, they adopt strategies seen elsewhere. It is important to carry out an analysis on each site and institution then assess which guidelines are most appropriate rather than use a blanket application of the same guidelines for every building.

The general perception of the respondents is that in the area of paramilitary buildings' security responsiveness, the overall and primary focus of paramilitary personnel includes; Access control, parking, standoff distance and unobstructed space. As stated in previous chapters, many other design concepts are important to consider. However, these four are

mandatory for every project with a primary gathering facility; therefore, they become the focus of attention while other variables are given less or no attention in most cases.

Based on the case study survey, one of the products of the research is that there exist often, insufficient site space for adopting some standards. It was understood that a typical paramilitary setting demands very elaborate site to sufficiently utilize the features of a security responsive environment. This is due to the fact that standoff distances dramatically reduce the amount of space the designer has to work with leaving a site constraint for designers. Also, setbacks for force protection from a facility to a road or parking area are so great that it really impacts on the remaining space available. It creates these giant voids and consumes a lot of real estate. Some respondent lamented that it is due to the land available as allocated by the government which also results from population explosion and increased demand for lands in Abuja municipality where these buildings must be situated.

Materials used are not blast resistant thus leaving the building vulnerable to attack and subsequently damage or possibly collapse. Also the structural system adopted in the design might be found wanting when subjected to acute explosive forces.

Vehicular access is not restricted right from the designs conceptual stage. Control points are later introduced as a fire brigade approach to controlling ingress. In return this leads to harassment and segregation of staffs that are supposed to park within a reasonable distance from their offices. This shows that access control methods are alien thus ineffective.

Site selection is poor. Topography is not relatively flat. As such, the building envelope and site configuration can be easily monitored from afar without much stress and trepidation.

Building materials used mostly require maintenance within a short period of time after project completion; hence this leads to frequent ingress and egress of maintenance companies which could be potential threats to building.

6.0 PRELIMINARY DESIGN.

6.1 Introduction

This research has revealed areas for improvement to the anti-terrorism/force protection process. In this chapter, an overview of the research findings discovered from the previous chapters is showcased in the design. Lucid explanation on the design preliminaries is given under the following sub-topics;

6.2 The Brief

This provides information on what is required of a design. The proposal will consume the features required in the design of Nigerian paramilitary headquarters. It will be in such a way that every zonal headquarters can see the design as a prototype for the police' consultants during design. In designing this building, the following goals were put in mind.

- To integrate the thesis findings in a design to produce a typical police headquarters
- To produce a guiding light which other Nigerian paramilitary institutions could make reference to while designing their office buildings.
- To control crime rate through physical means (spatial organization), thereby taming the level of over-reliance on electronic gadgets to deter any form of social violation on the buildings.

6.2.1 Client's brief

The Federal government of Nigeria is so disturbed concerning the upsurge of recurrent bombings and attacks on its facilities, the most common of which are the Nigeria police Force buildings. This social tumour has resulted in countless injuries, sometimes death on the police personnel. As a result the preservation of peace within the nation has become an

albatross even to the police due to the inflicted fear of being attacked and losing everything at any moment. For this reason, the government decided to put up facilities, starting with Abuja zonal headquarters, that will to a very great extent deter, detect, delay, and deny any form of attacks. The design requirements as proposed by the ministry of police affairs are stated as follows;

- AIGs Office
- Cps office
- DCs office
- Offices
- Administration (‘A’ department)
- Operations (‘B’ Department
- Logistics and Supply (‘C’ Department)
- Criminal Investigation Department (‘D’ Department)
- Training (‘E’ Department)
- Information Computer Technology (‘F’ Department)
- Research and Planning (‘G’ Department)
- Works workshop consisting of wood, tailoring, plumbing and electrical stores.
- Transport workshop
- Penitentiary
- Staff parking
- Visitors parking
- Kitchen
- Gymnasium

- Library
- Cafeteria

6.3 Design Case Studies

In order to get familiar with the existing design problems, case studies were carried out on three police zonal headquarters namely; Zone 7 headquarters, Abuja; Zone 1 headquarters , Kano; and the police force national headquarters (Louis Edet house), Abuja. Also, international case studies were carried out on Sarasota police department headquarters, Florida and the Greater Manchester police force headquarters, central park, new east Manchester.

6.3.1 Case study 1: Zone 1 headquarters, Kano.

6.3.1.1 Introduction:

Zone 1 headquarters is based at Kano state. The Assistant Inspector General in charge of this zone has Katsina, Jigawa and Kano states under his command.

6.3.1.2 Spatial organisation

Site layout is made up of six number blocks viz: administrative/ A.I.G. block, communication office, transport department including a workshop and petrol island, Criminal Investigation Department. (C.I.D.), works department containing a workshop, quarter guard, and a mosque.



Plate II: Admin Block.

Source: Author’s field work.



Plate III: Zone 1 Mosque.

Source: Autor’ field work.

6.3.1.3 Location:

Zone 1 police headquarters is located along BUK road in Sharada district of Kano state

6.3.1.4 Features

Features include modern design principles adopted to portray simplicity and uniqueness. This has been the police's greatest design problems as it has since become archaic. This prototype design does not respond to the needs of its users, functionally, and structurally.

6.3.1.5 Building materials and Construction techniques

The entire facility is generally built in sandcrete blocks and reinforced concrete in few locations. Glazing is conventional with no special specifications. Other materials used include, wood, PVC, Aluminium. The design does not respond to ballistic attacks. Hence, it is not resistant to blasts.

6.3.2 Case study 2: Zone 7 headquarters, Abuja.

6.3.2.1 Introduction:

The zone 7 headquarters is one of the 12 zonal divisions of the police force. It is according to its name the seventh in the hierarchy of police zonal categorisation; having Abuja, Kaduna, Niger and Nassarawa states under its command with Abuja as its zonal headquarters. This zone is headed by an Assistant Inspector General (A.I.G.)

6.3.2.2 Spatial organisation

This building is one of the zonal headquarters that were not designed based on the police's functional requirements. It was originally designed as an office building for the Federal Capital Development Authority (F.C.D.A.). As such, it has a poor spatial organisation. All the departments are compacted within the same building block.

6.3.2.3 Location

Zone seven police headquarters is located at the heart of Zone 5, Wuse, Abuja.

6.3.2.4 Features

The building has no specific design features for a police facility as it was allocated to the police by the Federal Capital Development Authority (FCDA). It is designed in a modern architecture fashion.

6.3.2.5 Building materials and Construction techniques

Building materials used include sandcrete blocks, reinforced concrete, wood, steel, Aluminium, asphalt, glass, asbestos and granite.

6.3.3 Case study 3: Force headquarters (Louis Edet house), Abuja.

6.3.3.1 Introduction:

The police force headquarters is one of the largest buildings that stand out among others in its vicinity. Also called Louis Edet, named after the first indigenous Inspector General of police, it is a white painted structure that runs up to nine floors including the ground floor and a basement. Its foundation ceremony was laid by General Abdulsalaam Abubakar in 1999 and was launched officially by Chief Olusegun Obasanjo in 2001.

6.3.3.2 Spatial organisation:

There is no significant sustainable measure that can be pointed out in the whole facility except use of concrete as the basic building material as the whole structure is entirely built in precast concrete. This is said to be sustainable because concrete is readily available in Abuja.



Plate IV: Acces control

Source: Author (2014)

6.3.3.3 Location:

Louis Edet house is located along Shehu Shagari way in the heart of the central business district of Abuja city.

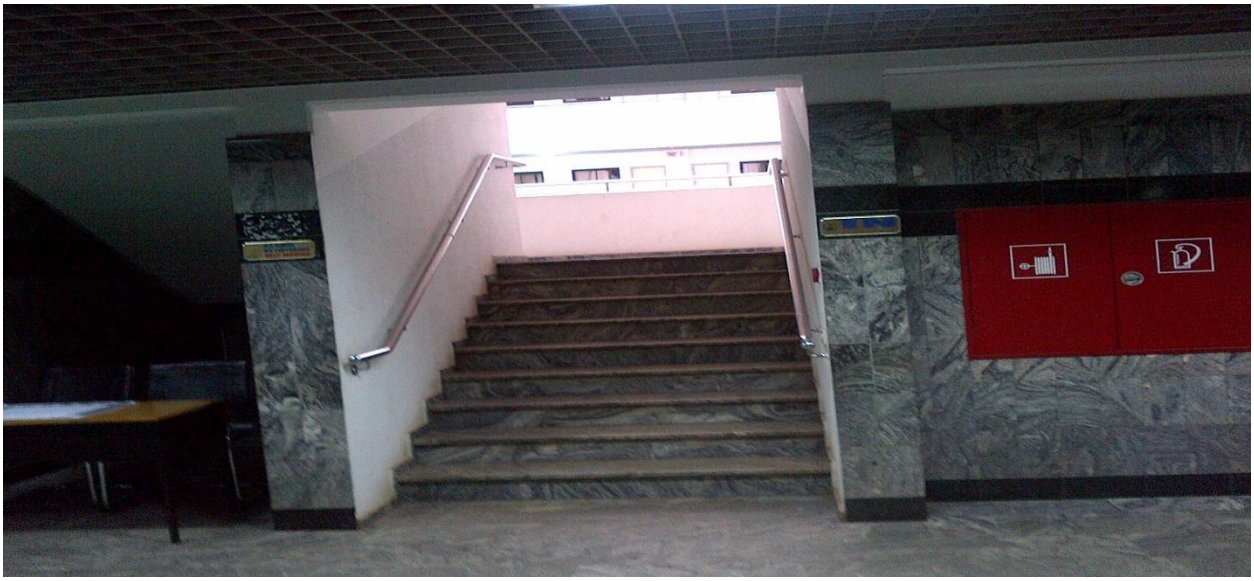


Plate V: Staircase security at landing

Source: Author's fieldwork (2014)

6.3.3.4 Features:

Closed plan system, two wing system with a courtyard in each.



Plate VI: Access control.

Source: Author' fieldwork.

6.3.3.5 Building materials and Construction techniques:

Construction techniques. Floor system adopted is the monolithic slab.

6.3.4 Case study 4: Sarasota police department headquarters, Florida.

6.3.4.1 Introduction

Sarasota P.D. is an urban infill project and a catalyst for future development in the government centre, this design responds to the need to be a sustainable, survivable, yet open and inviting public building that maintains all critical functions.



Plate VII: Sarasota Police Headquarters

Source: Author's fieldwork

6.3.4.2 Spatial organisation

Space is very much optimised in the design of Sarasota headquarters. Most of the physical security measures were inculcated despite the location being in a densely populated area of the city

6.3.4.3 Location

Sarasota police department headquarters is located in Sarasota, Southwest Florida, United States of America.

6.3.4.4 Features

The building is designed in a high-tech architecture fashion

6.3.4.5 Building materials and Construction techniques

It is about 102,000sq ft, consistiing of 6 stories with 3 levels parking. Category Five storm resistant screen walls that shade the building. Materials used include, glass steel, alucobond and reinforced concrete.



Plate VIII: Sarasota Police Headquarters

Source: Author's fieldwork

6.3.5 Case study 5: Greater Manchester police force headquarters, new east Manchester.

6.3.5.1 Introduction

The winner of the British Council of Offices North award for best corporate workplace, creates a modern, state-of-the-art corporate office facility which will elevate Greater Manchester Police to a world-class leader in business as well as law enforcement.

6.3.5.2 Spatial organisation

Greater Manchester Headquarters is designed in a radial pattern.

6.3.5.3 Location

The Greater Manchester Police force Headquarters is located at New East Manchester, United Kingdom.

6.3.5.4 Features

It is about 600,000 sq. ft. consisting of 6 stories, break out pods, central atrium, and open plan design.

6.3.5.5 Building materials and Construction techniques

Building materials used include; steel, reinforced concrete, Aluco-bond, and Glass.

6.4 Study Area (Profile).

The proposed police zone 7 headquarters is set to be located in the Federal capital Territory (FCT) Abuja. It is situated marginally to the west of the centre of the country. It borders Kaduna and Niger states to the north. The south borders Kogi state. The eastern boundary borders Nassarawa state, while some part of Niger borders it to the west. Abuja has a total of eight local governments which are Abaji, Abuja Central, Bwari, Gwagwalada, Kuje, Kwali, Rubochi, and Yaba. The Abuja city was planned by Oscar Newman among others using Le Corbusier’s concept of city planning. After 15 years of planning and construction, it officially became Nigeria's capital on 12 December 1991, replacing Lagos. It covers a geographical area of about 2,824 square miles (7,315 square km) with a Population of 776,298, (2006 estimate). Abuja lies within latitude 7° 25' N and 9° 20° north of the Equator and longitude 5° 45'E and 7° 39'E. This is illustrated in fig. 6.1 below

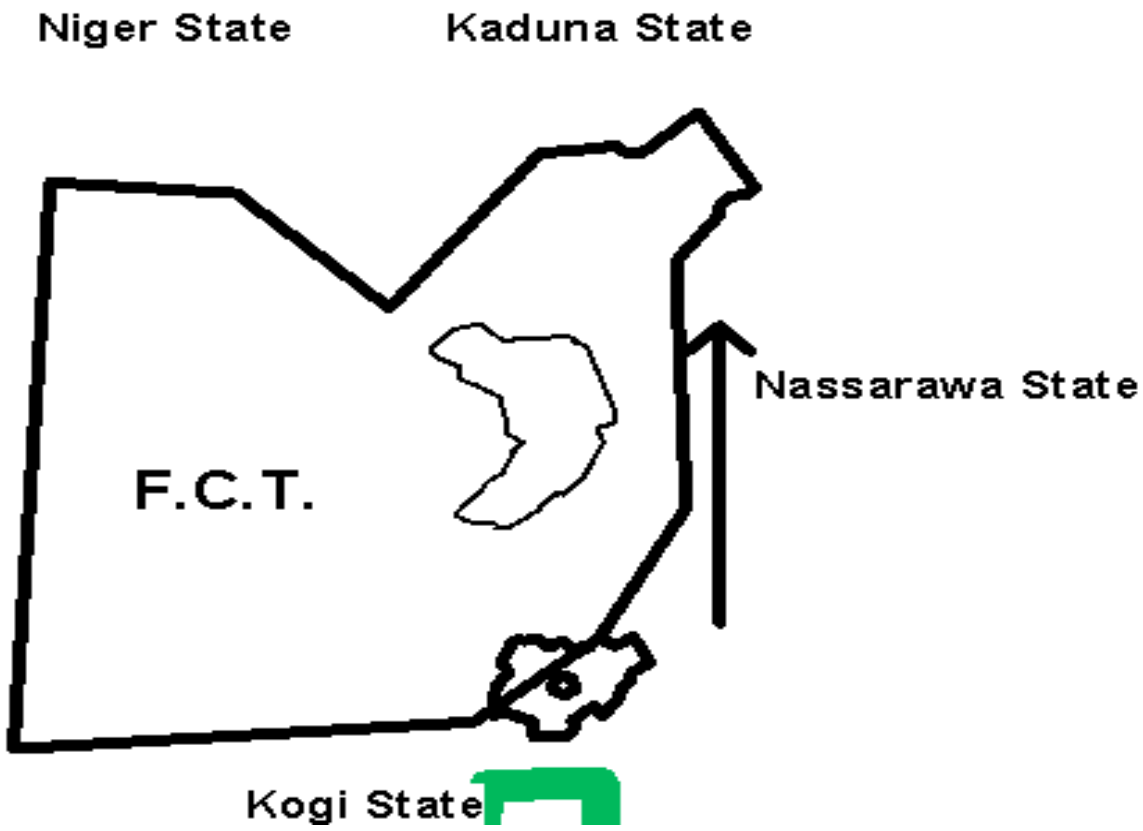


Figure 6.1: Map showing Abuja

Source: Jibril E. et al, 2010

6.5 Socio-cultural environment.

A good number of archaeological findings show that unprecedented FCT indigenes belong to the Kwa language group whom were mostly found around the Niger-Benue confluence and are known to have settled in the area centuries before the incursion of the Kanuri in the jihad of the 19th century. Other tribes settling in the FCT are Bassa, Gade, Gwandara, Koro and Ganagana, all of whose pedigree is linked to the Kwa tribe dominant in the present middle belt area.

6.6 Population.

According to the 2006 National Population Commission (NPC) result, Abuja had a population of 776,298. The population of Abuja increases sporadically as a result of day-to-day influx of Nigerians ranging from bootstrappers to greener pasture seekers into the city. This is believed to be due to its soaring status in administrative and political activities and constructions.

6.7 Land Use.

The site is located within the central business district also called central business area. This zone houses only government facilities and state buildings and corporate organisations offices. Institutional buildings close to the site include; the Federal Capital Development Authority (FCDA) Headquarters, Federal Court of Appeal, the Ministry of Finance, the Police Force Headquarters) (Louis Edet house) and more. See fig. 6.2 for details.

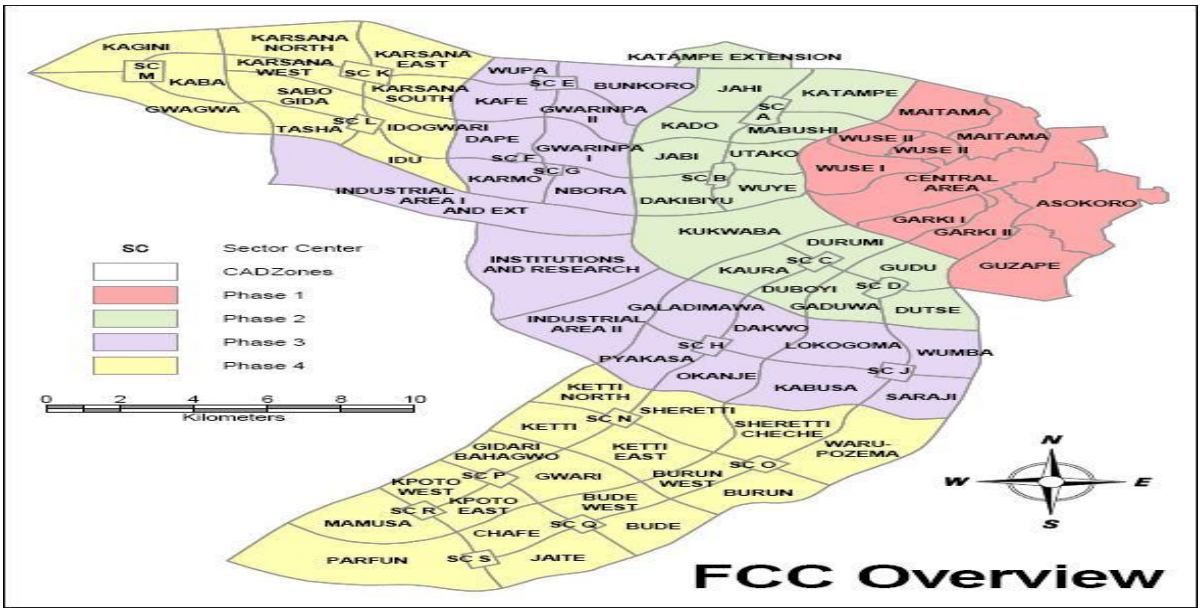


Figure 6.2: Map of Abuja showing phase 1-4.

Source: AGIS, 2014.

6.8 Physiography.

Abuja's geography and every character, is defined by the two renowned rock formations around it—the *Zuma Rock* and the *Aso Rock*. The Zuma Rock is called the "Gateway to Abuja," as the Federal Capital Territory begins at its base. The Aso Rock, a 400-meter monolith left by water erosion, is located at the head of Abuja city, which provides the backdrop for the city's government district, which is laid out along three axes representing the executive, legislative, and judicial branches.

6.9 Geology.

The geological equation of Abuja is made up of the following types of rocks, plateau, plains and hills:

(i) The igneous rocks made up of biotite, granite, rhyolite, syenite, gabbro diorite. The granites account for most of the rock domes and massive hills in the north-eastern and north-western parts of the territory, including the Bwari-Aso hills.

(ii) The migmatites and gneiss complex which are metamorphic rocks consisting mostly of migmatite, granite, gneiss and porphyritic gneiss occur on the Gwagwa, Iku-Gurara and Robo plains.

(iii) Schists, including biotite/muscovite schists, muscovite and tale schists with quartzite intrusive account for most of the rugged landscape in the eastern and southern parts of the FCT. The migmatite, granite, gneiss and biotite granite underline the site of the FCT. These are rocks of medium to high strength which provide suitable locations for engineering structures.

The rocks of the FCT are generally quartz-rich, acidic types which account for the generally sandy nature of the soil, especially on the Iku Gurara, Robo and Rubochi plains (fct.gov.ng/fcta).

6.10 Soils

The two main types of soils in FCT are the sedimentary belt in the southern and south-western extremities of the territory and the pre-Cambrian Basement complex rock country which accounts for more than 80 percent of the territory. The sedimentary formation, being part of the Nupe land sandstones, consists mainly of fine grained sandstones with inclusions of grits, siltstone and clay lens.

The Gwagwa plains have the most fertile soils and the best agricultural lands of all the plains of the FCT while the high sand content of most soils within the FCT accounts for the relatively high erosion status. There is however, one major advantage about the type of rocks and soils found in the FCT because of the availability of construction materials in the form of building stones, quartz and pistol tic gravel, building sands and earth for use as foundation materials (fct.gov.ng/fcta).

6.11 Site

A comprehensive site analysis was carried out under the following sub-topics

6.11.1 Site selection criteria

In the process of selecting a site, site selection criteria were set up to provide a comprehensive and assessable evaluation of the several differences of the preselected site choices to locate the police zonal headquarters. These criteria were used to compare the sites to produce the most viable alternative among them. Despite the challenges of getting a

feasible site for the organisation, three sites tagged A, B and C were compared using the following factors adopted to locate a paramilitary headquarters; Security, Operational efficiency, Accessibility, Parking, Relationship to major arteries, and Proximity to associated bureau.

6.11.1.1 Security:

This criterion is, as the name implies, undoubtedly the heart of the selection process as it relates to the thesis title. It considers buildings/ sites adjacent to the site, proximity of other military and paramilitary facilities, landform and also possible potential threats within the vicinity. Site B has the highest number of security facilities close to it followed by Site A then C. The closest of all is the police force headquarters, followed by the National court of Appeal, SSS headquarters, then Army, Air force and Navy headquarters.

6.11.1.2 Operational efficiency

This refers to the ease with which the police officers work and report their operations.

6.11.1.3 Accessibility

This refers to the sites location and distance from the heart of the city, i.e. the central business district. The closer the site, the more accessible the site is for staff and visitors. Sites A and C were rated average due to their location close to old parade ground and along airport road respectively. Whereas, site B was rated "strong" because it is located though at the extreme, but still within the central business area.

6.11.1.4 Parking

The issue of parking was raised as a factor due to stationary car bomb incidence. The staffs must have enough parking spaces within a specified minimum standard of standoff distance. Also for visitors, offsite parking is the best option to control unauthorized ingress of

strangers into a site. As such, a very vast piece of land is needed to properly design such. Here, Site A has the largest land area followed by Site B then C.

Relationship to major arteries: reasons why this factor was used as a scale of comparison include but are not limited to fire escape and security threat evacuation reasons. The goal here is that the site should have an express access to major roads. In this case, site B has the strongest advantage as it is connected to Ahmadu Bello way and a major road that links with the outskirts of the city in both directions. Site A too was rated "strong" because it has access to two major roads. Site C on the other hand is connected to one major road only.

6.11.1.5 Proximity to associated bureau

This refers to propinquity to other security inclined institutions. Most important of these been courts and the State Security Service (SSS) headquarters. This is considered in other to provide a time saving correlation between the security personnel. Here only Site B has a strong rating, others (Sites A and C) been weak.

The site selection criteria evaluation table is shown in fig. 6.3 below;

	SELECTION CRITERIA	SITE A	SITE B	SITE C	REMARK
1	Security	Average	Strong	Weak	Site A's location is the most secure
2	Operational Efficiency	Weak	Strong	Weak	Site B is most centralized
3	Accessibility	Average	Strong	Average	Site B is closer to the Abuja CBD
4	Parking	Strong	Average	Weak	Site A is has the large stores
5	Location	Average	Strong	Average	Site B's location is the best
6	Relationship to major arteries	Strong	Strong	Average	Site B is connected to more major roads
7	Proximity to associated bureau	Weak	Strong	Weak	Site B is closer to commercial depts.
	MODE:	Average	Strong	Weak	Site B is the mode
	Weighing Scale: Good , Fair and Poor				
	Selected Site: Site B				

Figure 6.3 : Site selection criteria evaluation table

Source: Author, 2014

6.11.2 The proposed site

Site B was chosen after the three nominated sites were subjected to a site selection criteria.

Located in the cadastral zone in Abuja. Fig. 6.4 shows a goggle earth image of the site.



Figure 6.4: Map extract showing site boundaries

Source: Google Earth, 2014

6.11.3 Site location

As can be observed in fig. 6.5 below, the site is located in the central business district of Abuja. This falls under the Abuja Municipal Area Council (AMAC). AMAC is located in the western flange of the federal capital territory, Abuja. Being Nigeria's capital, Abuja is located roughly at the middle when viewed from a map. Nigeria in turn is one of the largest and most influential countries in West Africa.

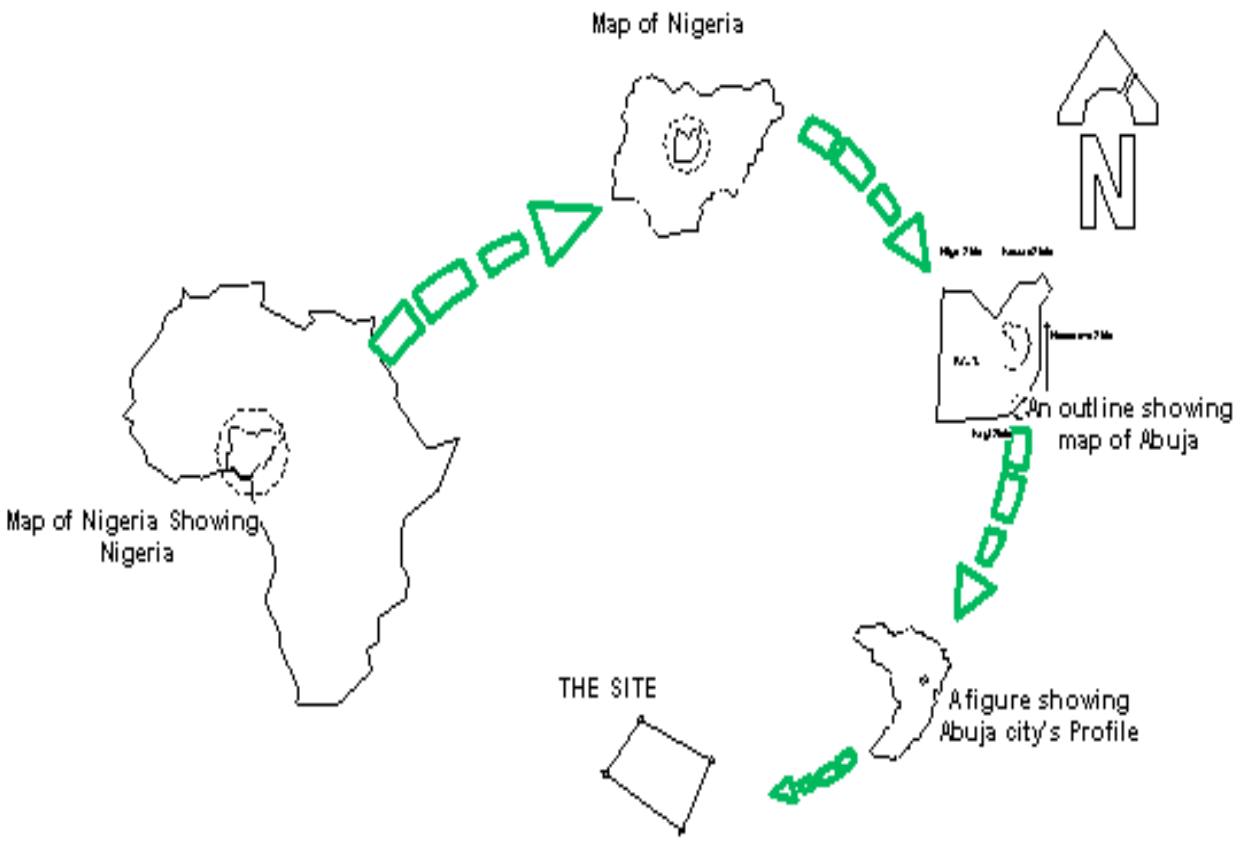


Figure 6.5: Site location

Source: Author, 2014

6.11.4 Topography

The site's slope is gentle as such could be said to be a relatively flat land.

6.11.5 Site climate

The Abuja city, under the koppen system of climate classification features a tropical wet and dry climate. It has two distinct seasons, namely the warm, humid, rainy season which spans between March and October and a blistering dry season spanning from October to march. In between these two seasons exists a pretty short weather condition called the "harmattan". As illustrated in fig. 6.6 below, it is a cold, dry, light and dusty breeze which accompanies the tropical continental air mass, otherwise known as the north-east trade wind.

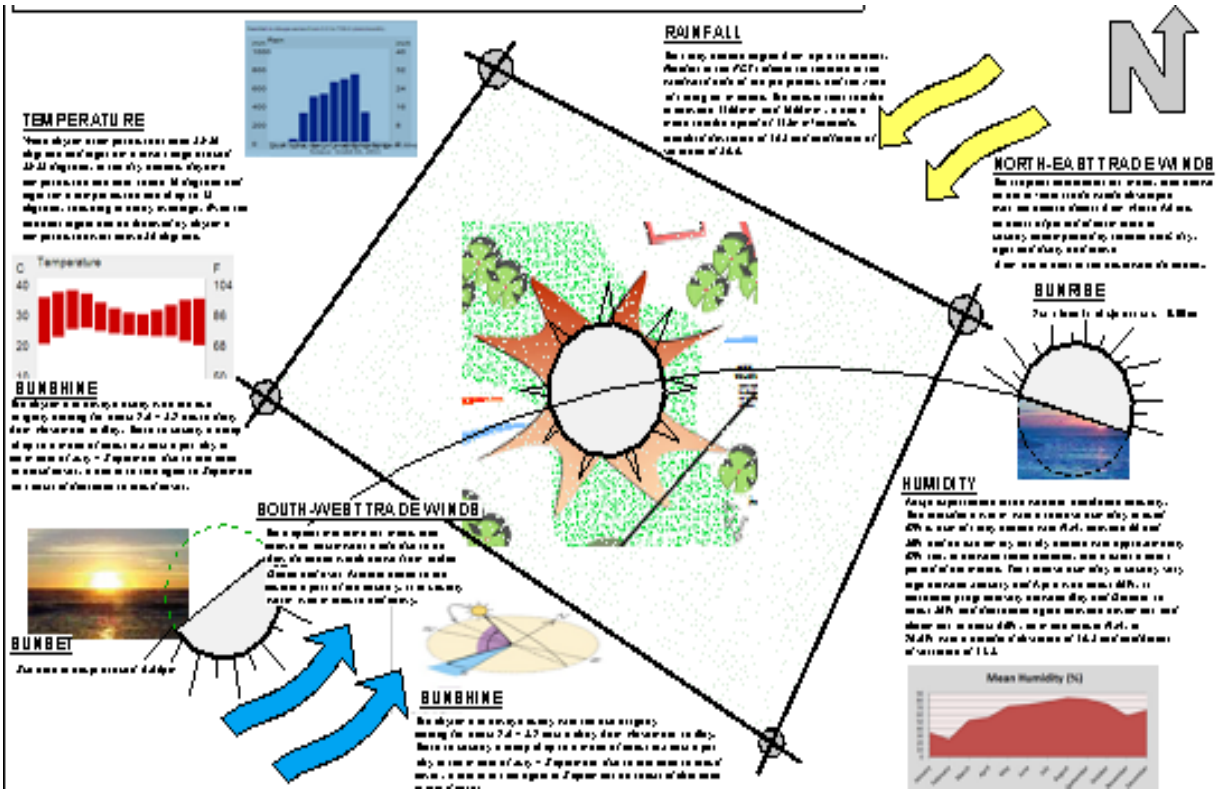


Figure 6.6: Climate analysis

Source: Author, 2014

6.11.5.1 Rainfall

Abuja's rainy season begins from April and ends in October. Rainfall in the FCT reflects its location as it falls on the windward side of the Jos plateau and zone of rising air masses. The annual total rainfall ranges between 110mm and 160mm. It has a mean rainfall speed of 118mm/sec. Standard deviation of 102 and coefficient of 86.5. Subsequently, dry season sets in; lasting from November to January having very hot days. Fig. 6.7 below shows a chart of the annual rainfall in Abuja.

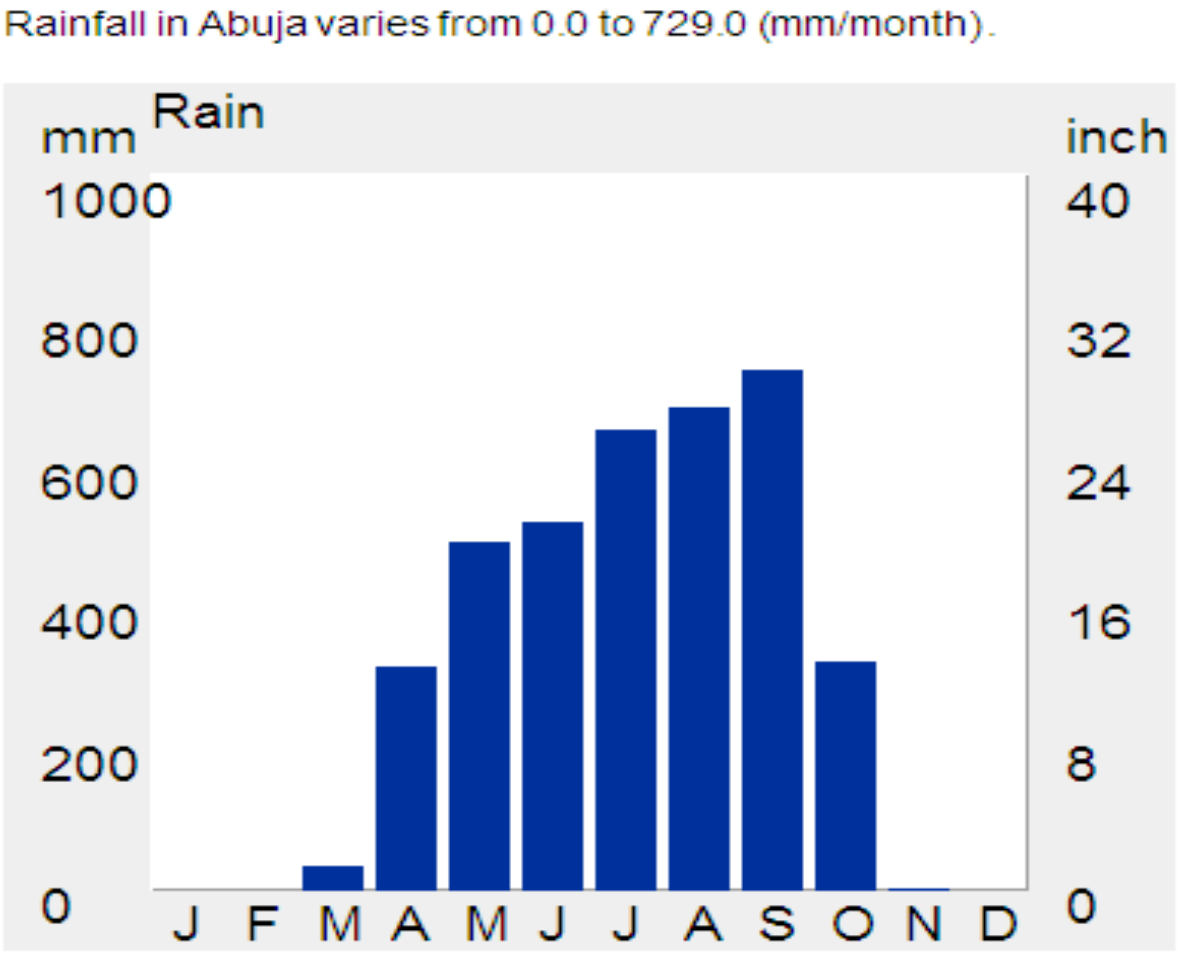


Figure 6.7: Annual rainfall in Abuja

Source: (Abdulrahim, 2014)

6.11.5.2 Temperature

Daytime temperature varies with season in Abuja. During rainy seasons, daytime temperature reaches 28-30 degrees and at night, falls to 22-23 degrees. In the dry season, daytime temperatures can soar reach 40 degrees and at night, can drop to 12 degrees resulting in chilly evenings. Even the chilliest nights can be followed by daytime temperatures well above 30 degrees. See fig. 6.8

Temperatures in Abuja range from 18.45 to 36.05 (Celcius).

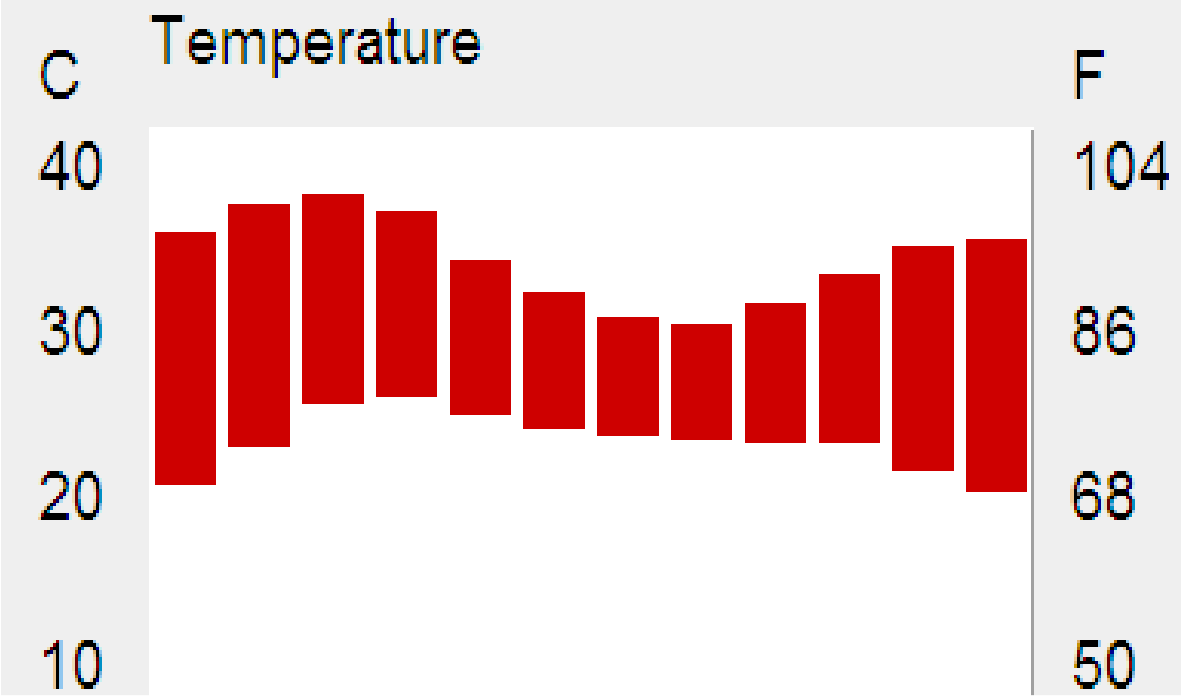


Figure 6.8: Abuja mean annual temperature chart.

Source: Abdulrahim, 2014.

6.11.5.3 Relative humidity

Abuja experiences three weather conditions annually. This includes a warm with a relative humidity around 67%c, humid rainy season with R.H. between 60 and 80% and an extremely hot dry season with approximately 67% too. In between these seasons, there exist a short period of harmattan. The relative humidity is usually very high between January and April with about 55%. It increases progressively between May and October to about 86% and decreases again between November and December to about 65%. Its mean annual R.H. is 75.5% with a standard deviation of 10.8 and coefficient of variation of 14.3. See fig. 6.9

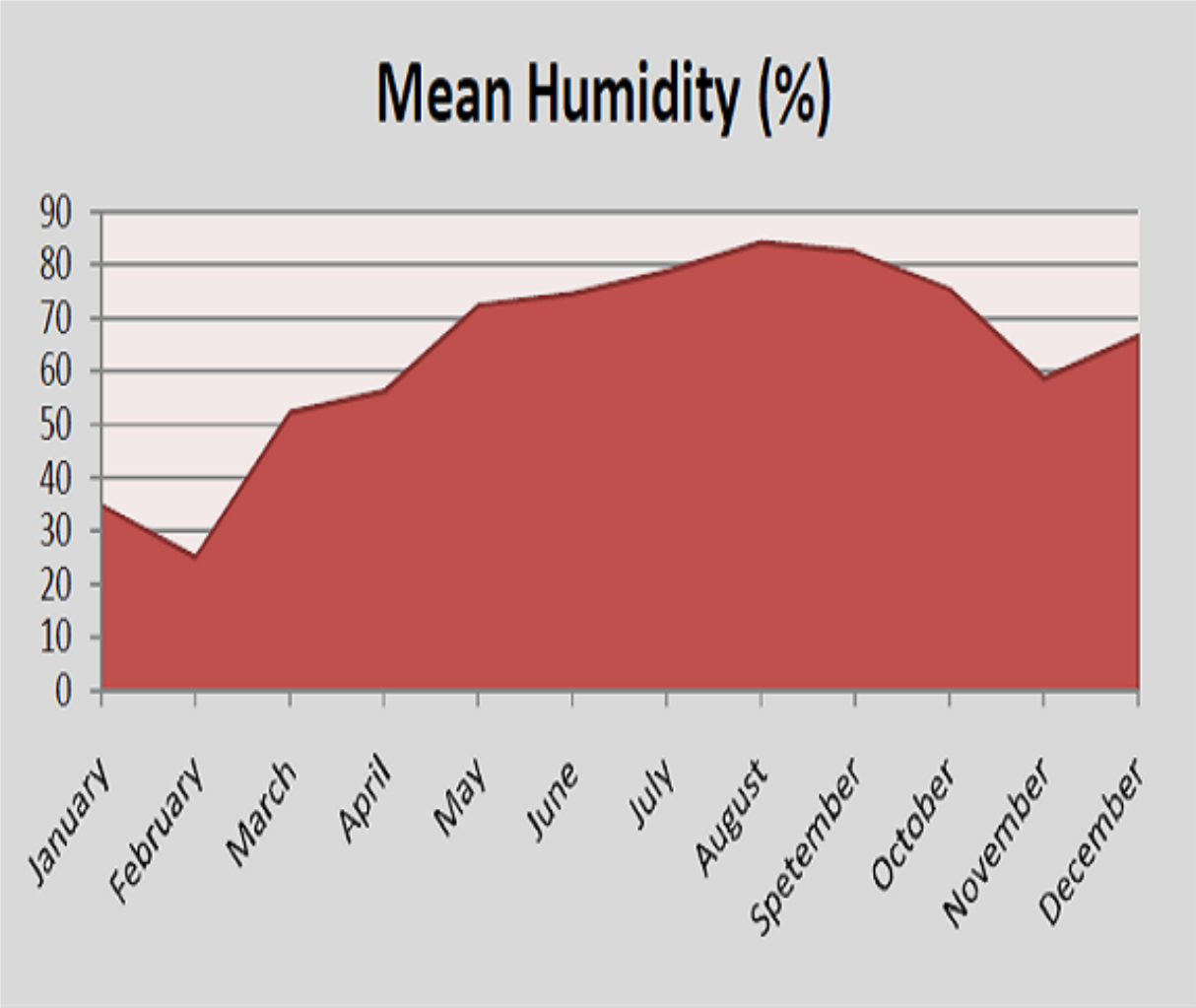


Figure 6.9: Abuja annual relative humidity

Source: Abdulrahim, 2014.

6.11.5.4 Sunshine

The daytime is always sunny with the sun brightly shining for about 7.5 – 8.7 hours daily from November to May. There is usually a steep drop to a mean of about six hours per day in the month of July – September due to increase in cloud cover. It starts to rise again in September as result of decrease in cloud cover as explained in fig. 6.10.

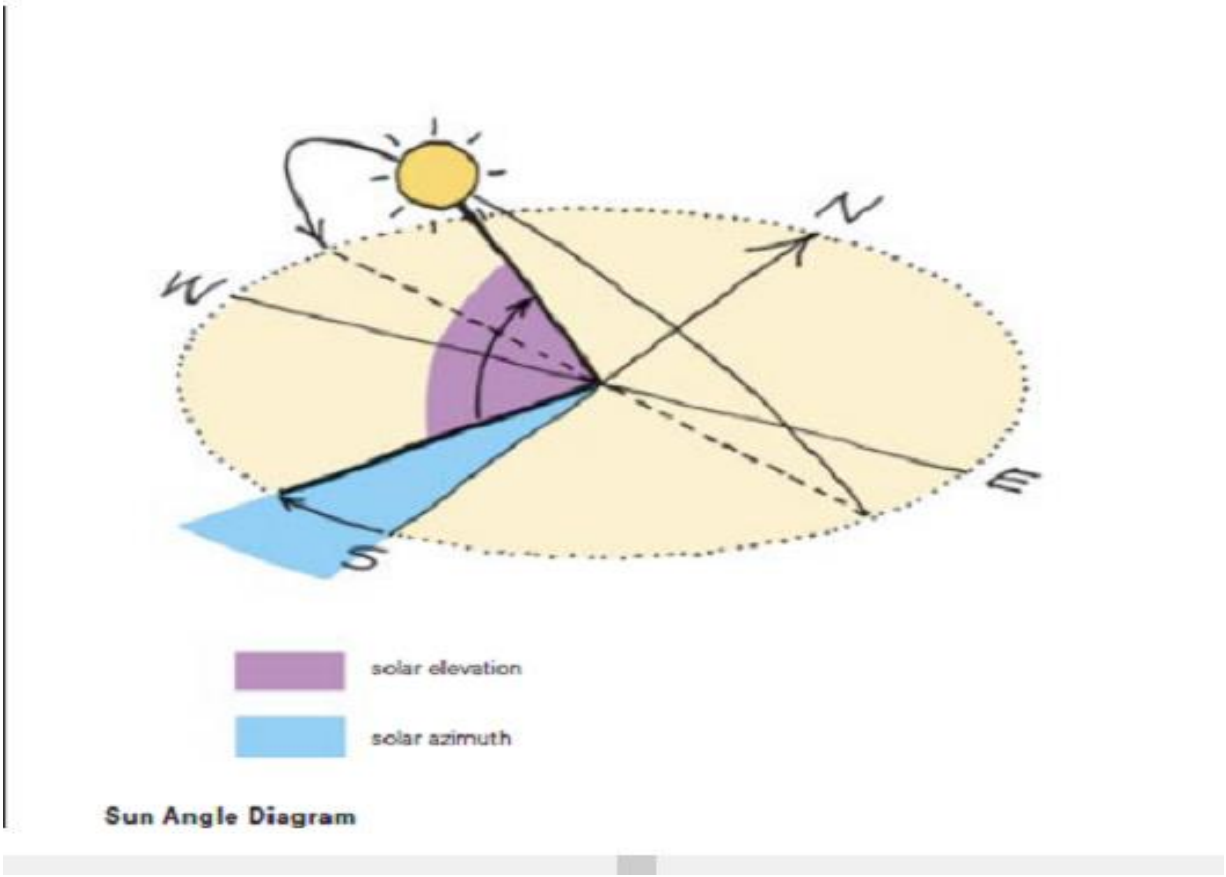


Figure 6.10: Sun angle diagram showing solar elevation and azimuth.

Source: Abdulrahim, 2014.

6.11.5.5 Wind

The tropical continental air mass, also known as north -east trade winds develops over the Sahara desert from North Africa. Its short of period of harmattan is usually accompanied by intense cold, dry, light and dusty and blows from north east to the southwest direction.

The tropical maritime air mass, also known as south-west trade due to its flow direction winds blows from Indian Ocean and over Atlantic Ocean to the southern part of the country. It is usually warm with moisture and heavy. See fig. 6.11.

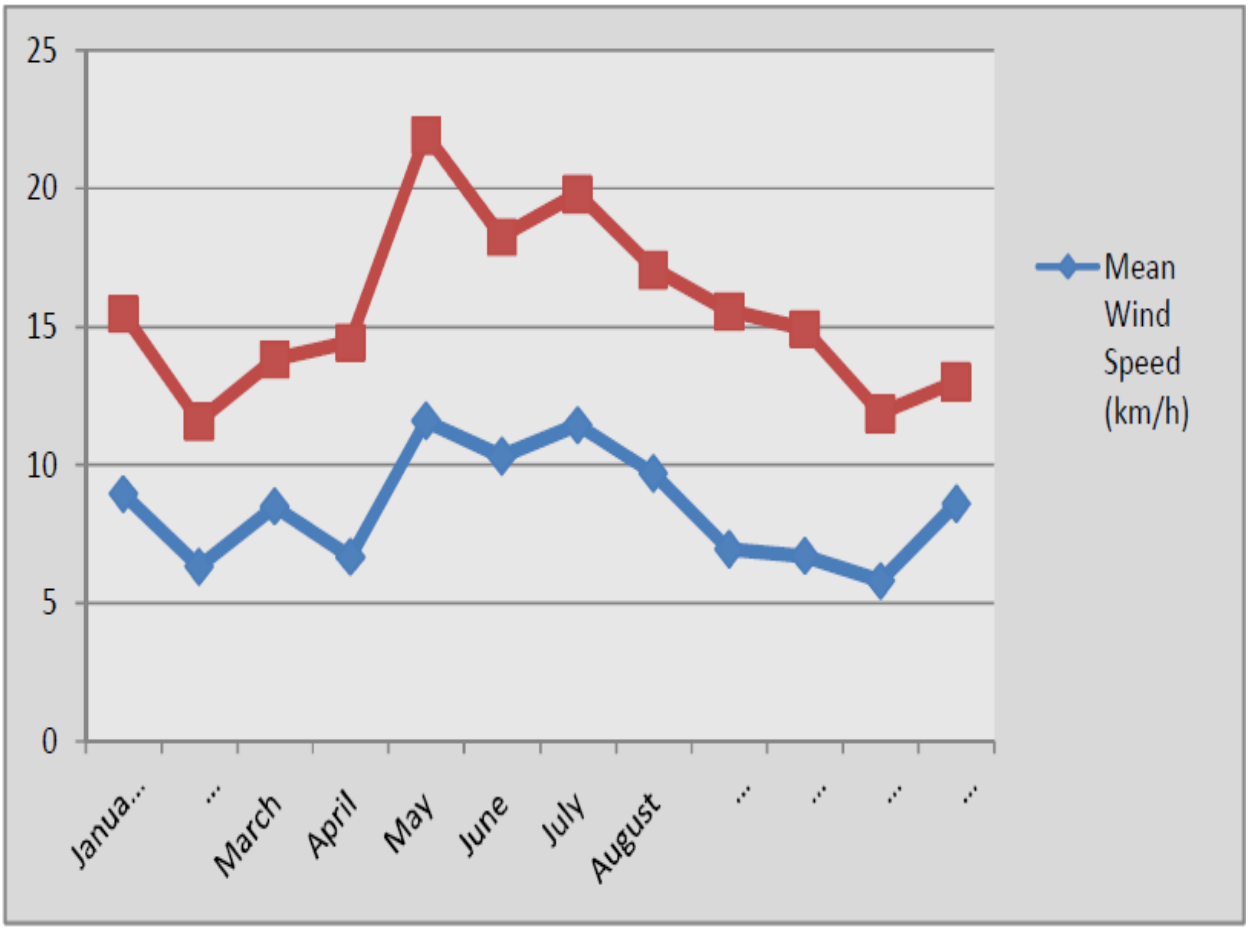


Figure 6.11: Frequency polygon of mean wind speed.

Source: www.gaisma.com, 2014

6.11.6 Noise

Noise source in the site comes mainly from the adjoin access roads. To the border bounding the site through Ahmadu Bello way, which is the north-west direction, there exists incessant noise production. This is because Ahmadu Bello way is the longest and most centralised of all roads in Abuja city. It is at all times of the day, mostly flooded with lots of cars which produce various sorts of noise emanating from engines, exhaust systems, horns, frustrated drivers and in some cases even car accidents. This is the more reason why it was categorised

under the public zone in the site. Towards the south-western direction, the site receives recurrent vehicular noise pollution though less severe than that from Ahmadu Bello way.

6.11.7 Site security

The site security considerations where evaluated under the following

6.11.7.1 Easements through site and emergency lanes

During site selection and lease negotiation, the possibility of any easements within or adjacent to the facility that could affect the security of personnel or assets should be examined. Easements that permit access to a site by utility crews, the public or emergency personnel limit the tenant's ability to control access; this may result in unauthorized people gaining access to the tenant's facility, employees or equipment.

6.11.7.2 Site perimeter control

The site constraint is achieved easily by adopting crime prevention through environmental design (CPTED) principles. As a result the vast piece of relatively flat land gives room for a clear natural surveillance thereby controlling access and enhancing territorial reinforcement.

6.11.7.3 Adjacent facilities and use

Consideration was given to adjacent occupants and use during the site selection process. Potential impact of adjacent occupants on the safety of the employees and on service delivery was taken into account. Also, the impact of the police operations on adjacent occupants (whether governmental or non-governmental) where carefully thought through.

6.11.7.4 Exterior signs

In a case where signs identify facilities occupied by federal government departments and agencies they must comply with the provincial law. The FCT Central Business District is furnished with enough street furniture that gives clear signs for parking and service areas. In

concurrence with the FCT provincial law, there exist clear displays of trespass notice to define that it is a paramilitary facility and thus a restricted facility.

6.11.7.5 Proximity to major arteries

In the event of any security emergency situation, staff evacuation will easily be catered for as the site has access to two major roads Ahmadu Bello way and a newly constructed one.

6.11.7.6 Site overview and topography

The design, layout and proposed location of buildings will facilitate natural surveillance by the police and the public from the surrounding area (e.g., from the nearby roadways or other buildings) in such a way as to enhance scouting and control. This way, the design becomes camera-ready in case of an emergency.

6.11.7.7 Landscape design

Generally, Landscapes support protection of a building's, detection of intruders, and response to security incidents. The site pre selection process gave rise to a site that supports growth of shrubs that are naturally stunted. Landscape security features adopted include:

- clearly marked boundaries;
- circulation routes designed to promote natural surveillance;
- no cover for intruders;
- unobstructed views for security personnel, employees and the public of potential problem areas (e.g., where criminal activities might occur); and
- Avoidance of materials and furniture that might expose the facility to increased risk during a heightened state of security (e.g., if a demonstration turns violent).

The sites landscape design applied the principles of crime prevention through environmental design.

6.11.7.8 Accessibility

The site as explained earlier has two major access roads. Nevertheless, this entry/exit points are heavily controlled by various security access control measures. These include, robust perimeter fencing, gate check, collapsible pavements, reinforced and retractable bollards, offsite parking and so on.

6.11.7.9 Fire emergency services

Considering the site location the police authority will find it easy to follow the FCDA's directives apropos water supply requirements for fire fighting.

6.11.7.10 Proximity to associated bureau

This is one of the most important among all factors. Parallel to the site along the adjoining road (shehu shagari way), lies the police national headquarters (Louis Edet house). Also along the same road is the federal court of appeal building. To the eastern border of the site, there stands the police senior staff. Across the road in the western border lies the Federal Capital Development Authority (FCDA) headquarters.

6.11.7.11 Services and utilities entry/ exit points

Since it is double faced, the site has a perfect for providing and safeguarding or controlling service and utility entrance and exit points to ensure the building's life safety measures and assets are not compromised by unauthorized access.

All the features discussed above are be briefly explained in fig. 6.12 below

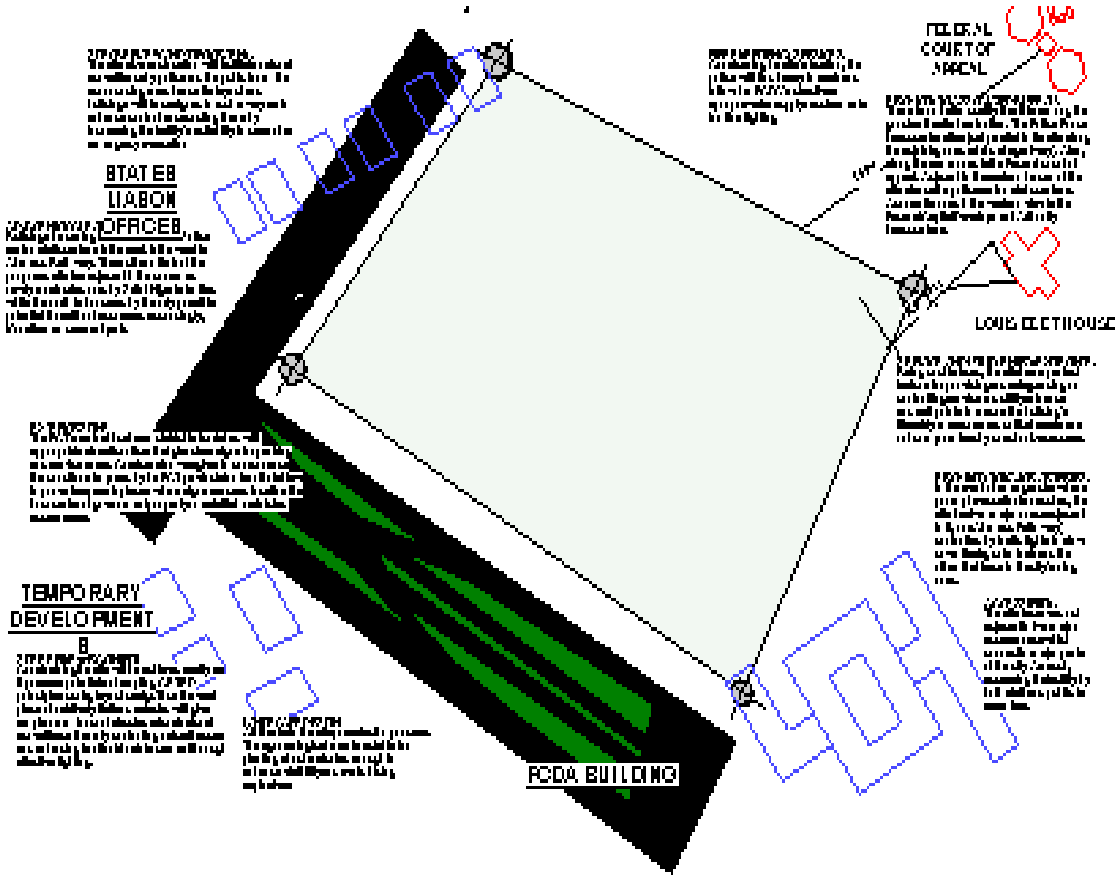


Figure 6.12: Site security analysis.

Source: Author, 2014.

6.11.8 Services and vegetation

As a result of the site location, the site possesses the basic services provided by the Federal Capital Development Authority (FCDA). The different services on the site exist include;

6.11.8.1 Accessibility

Two major roads provide access to the site. The site's major access is through Ahmadu Bello Way which is at the western wing. An alternative access strictly for workshops, services and emergency exit is located towards the north of the site.

6.11.8.2 Electricity

Electric power supplied to the site is underground. It is based on the new Multi-Year Tariff Order (MYTO 2), as such falls under the tariff class, commercial C3.

6.11.8.3 Sewage treatment

The FCT authority through the Abuja Environmental Protection Board (AEPB) treats waste water in a 131,200m^3 plant at wupa. Water drains into manholes on the access road then subsequently to the plant.

6.11.8.4 Water services

Pipe borne water is sourced through the Abuja municipal water board. Drinking water is received partly from the Gurara dam as an alternative to boost supply and mitigate against drought. A river cuts across from the south-eastern to the northern direction of the site.

6.11.8.5 Vegetation

The FCT falls within the Guinea savannah vegetation zone of the country. Some varieties of plants found around the location are shrubs of less than 0.5m. Their existence gives the site a pleasant landscape as well as provides an unobstructed view which in turn avoids blind spots for hiding explosives.

6.11.8.6 Soil configuration

Soil type in the site is shallow and sandy in nature. As such the site is vulnerable to erosion. However, the availability of rocks in Abuja makes construction materials such as building stones, pistholic gravel and quartz cheap and readily obtainable for use in laying solid foundations for buildings. See fig. 6.13.

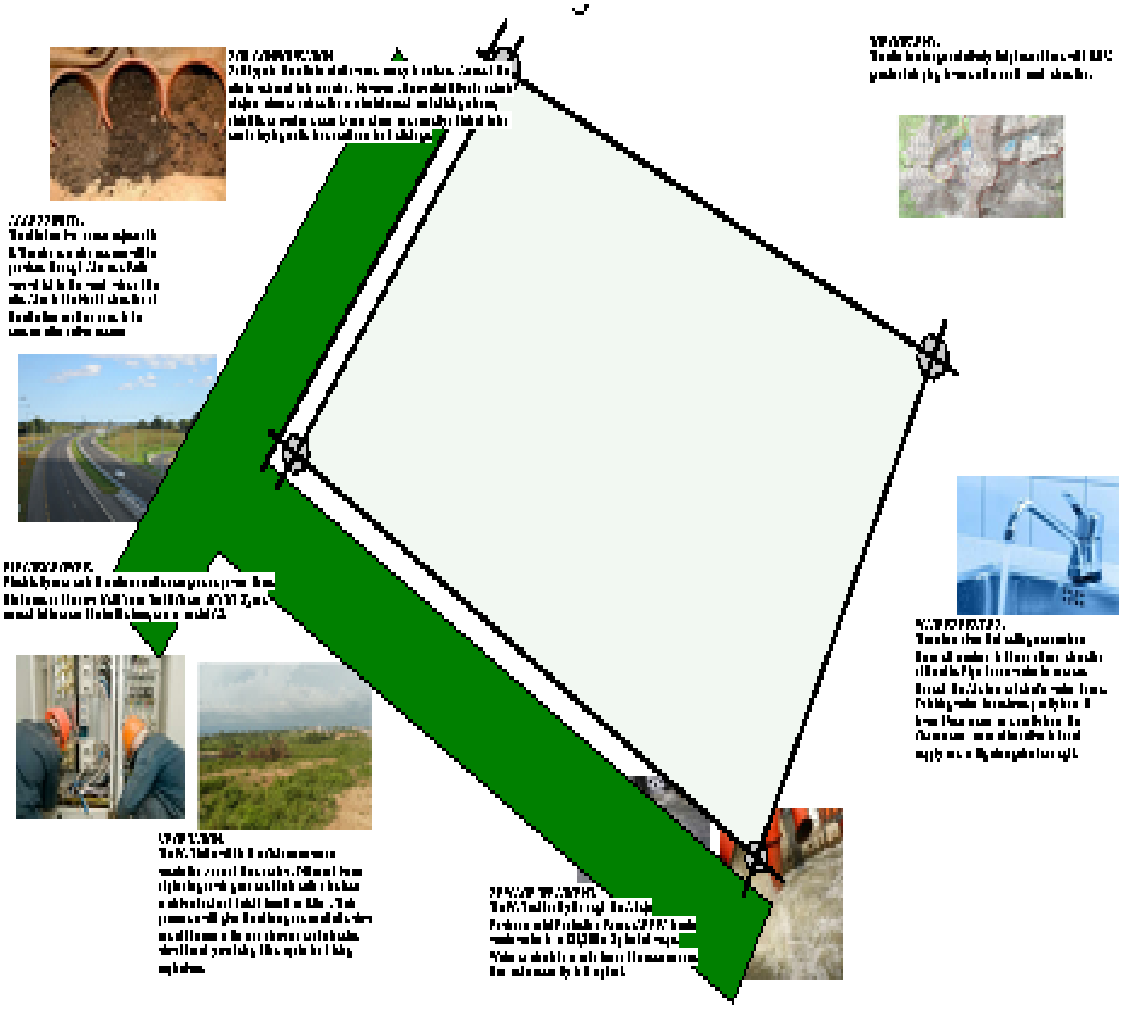


Figure 6.13: Services analysis.

Source: Author, 2014.

6.11.9 Site zoning

Since the aim is to produce a security responsive building, the site was zoned according to security and Noise. They include Private/ Quiet zone consisting of the “security” and “High security” zone. Next is the semi-private/ semi quiet zone consisting of the “Operation” and “Reception” zone. Lastly comes the public/ Noise zone consisting of the “public zone”. See fig. 6.14.

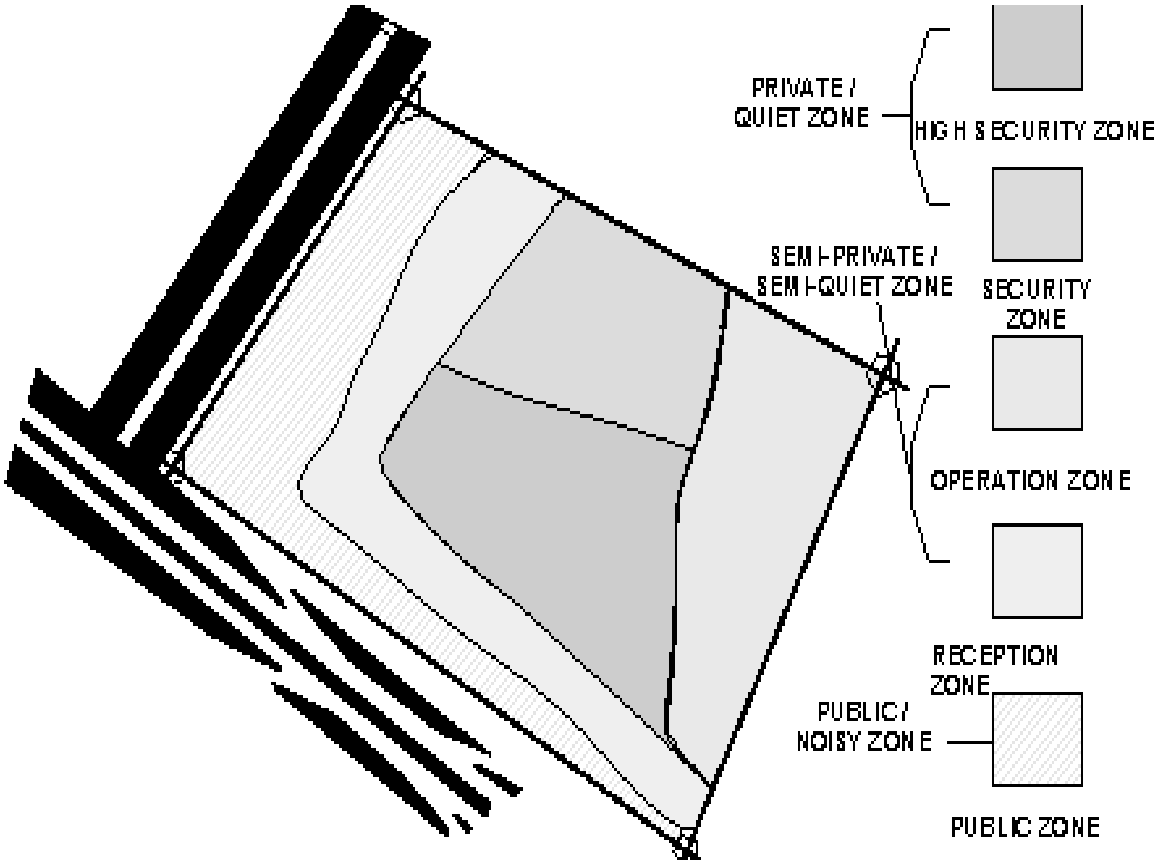


Figure 6.14: Site Zoning.

Source: Author, 2014.

6.12 Organisational/ site concept.

In planning, a site is meant to be designed in conjunction with the proposed building's type and functional requirements. Since security responsiveness is the goal, radial pattern was chosen for its relative security. It is tagged with more potential to control access than other patterns. Moreover, the police headquarters houses seven departments, as such radial pattern gives broad spectrum for facility sharing. Also in cases of fire outbreaks and security breach, radial pattern aids the process of taming both incidents down leaving a less severe impact.

Radial pattern also encourages flexible expansion in case of any future space demands. See fig. 6.15 for details.

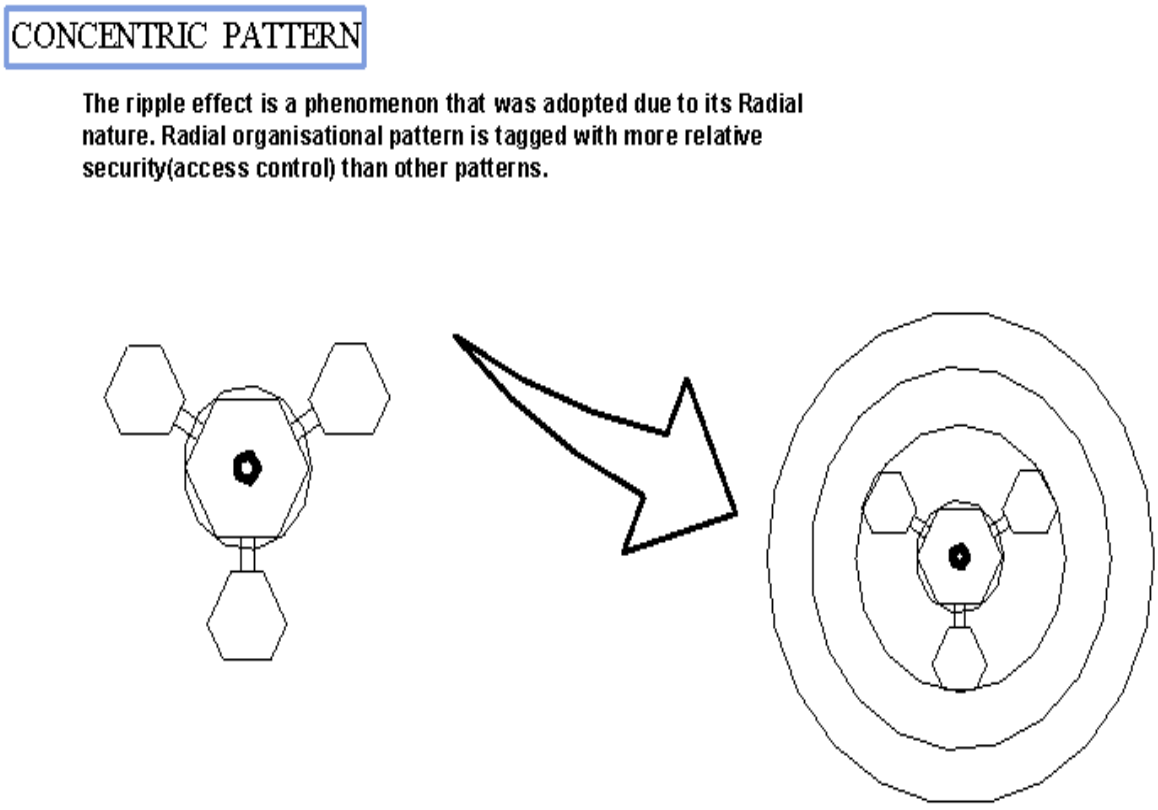


Figure 6.15: Site concept.

Source: Author, 2014.

6.13 Design concept

This design was inspired by a concept termed “the honeycomb conjecture”. It is based on the theory that any partition of a plane into two regions of equal area has a perimeter at least that of a regular hexagonal honeycomb tiling. The geometricians proved that a hexagon inscribed in a circular figure encloses the greatest amount of space. This is due to the fact that bees want a tight, secure structure that is as simple to build as possible. The key words

"tight", "secure" and "easy to build" are translated into building design and construction terms as "spatial organisation", "security responsive" and "sustainable" respectively.

Also, since the primary function of the police force is to serve and protect citizens. A tortoise shell inspired a sense of protection for the design. This is because the shell protects a tortoise from all sorts of potential danger. As such a structurally stable and spatially organised honey comb design combined with a tortoise shell roof and shading element produced the design shape as illustrated in fig. 6.16.

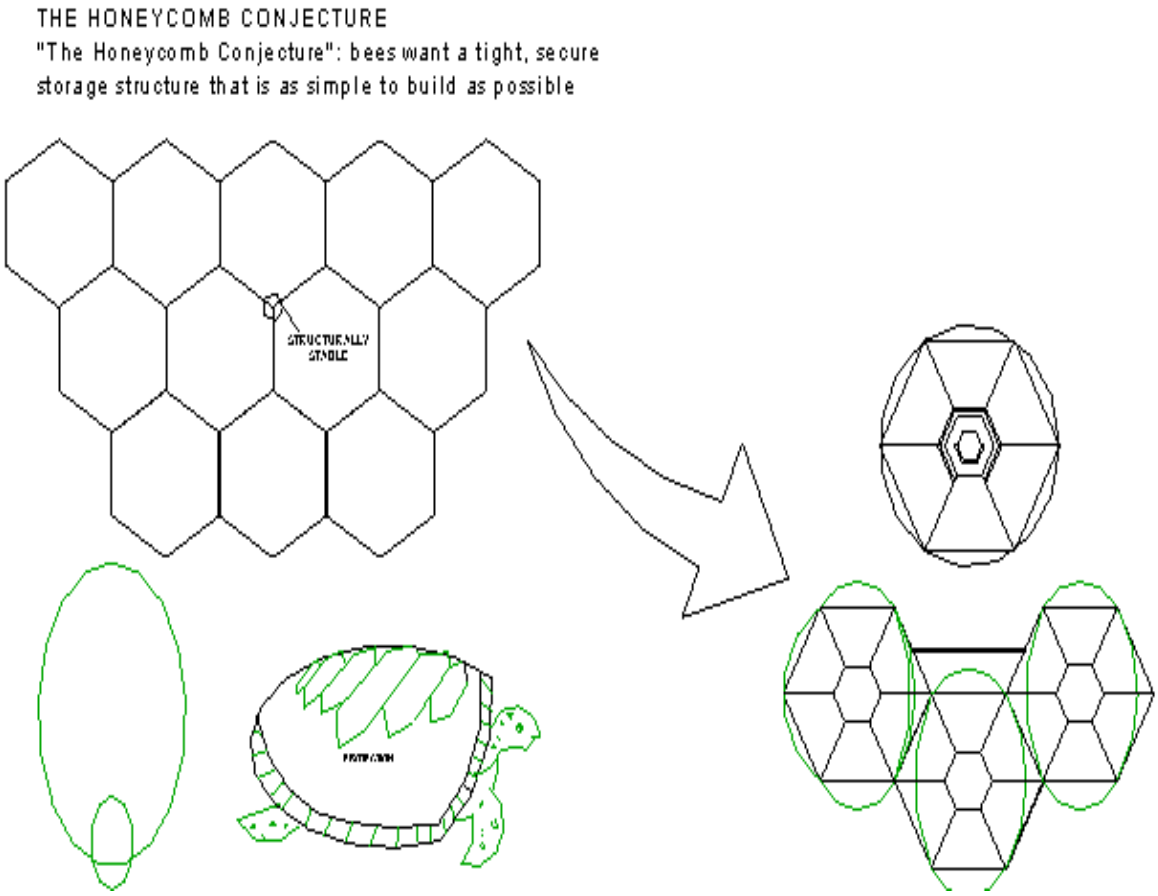


Figure 6.16: Design concept sketch

Source: Author, 2014

6.14 Bubble diagram

A bubble diagram of the proposed police zone 7 headquarters building showing the interconnection between the various departments is shown in fig below. It also shows there is an existing symphony between the departments and related auxiliary facilities as illustrated in fig. 6.17 below.

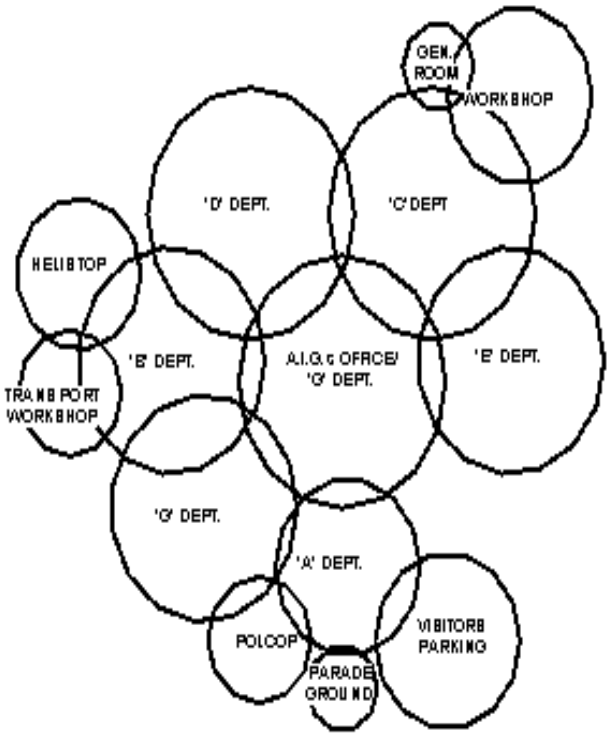


Figure 6.17: Bubble diagram showing the functional relationship between various units of the headquarters.

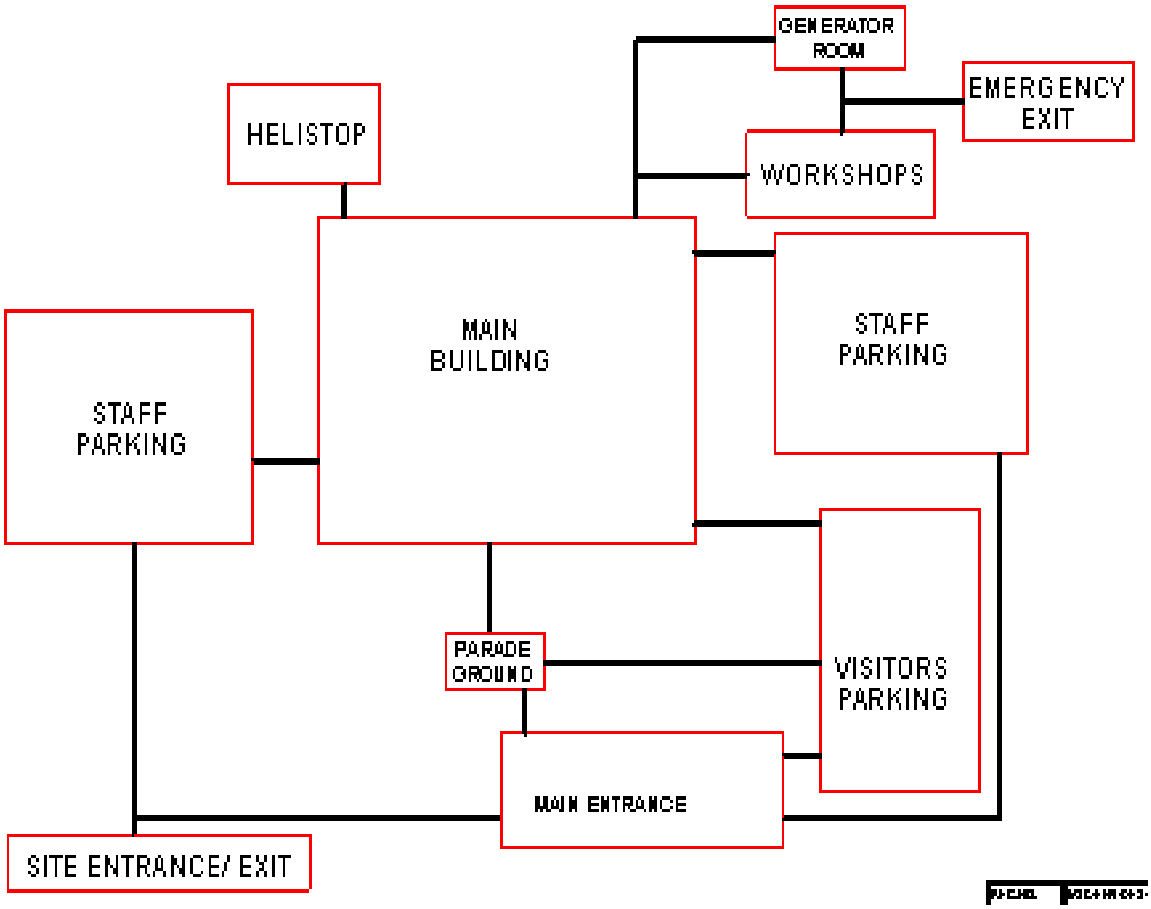
Source: Author, 2014

6.15 Functional flow chart

The proposed police zone 7 headquarters, Abuja consists of the following divisions; the main building which houses seven departments (Administration, Operations, Logistics and Supply, Criminal Investigation, Training, Communications, and Research and planning),

visitors car park, staff and operation vehicles car park, helistop, transport workshop, works workshop, a penitentiary, generator house, and two security entrance gate houses. This matrix of relationship is illustrated in fig 6.18 below.

Figure 6.18: Functional flow chart showing interconnection between one unit and another in the headquarters



Source: Author, 2014

6.16 Schedule of accommodation

A comprehensive schedule of accommodation of the entire spaces in the facility were carried out. See figs. 6.19-6.21 for details.

S/N	SPACE DESCRIPTION	AREA(M)	NUMBER	NET AREA	S/N	SPACE DESCRIPTION	AREA(M)	NUMBER	NET AREA
	C.I.B.	24	1	24		Machine room	1	1	1
	Police Cooperative	30	1	30		Doctor	12	1	12
	Operations unit	24	1	24		Pharmacy	9	1	9
	Clinic ward	27	1	27		Charge room	12	1	12
	Anti Fraud	12	1	1		O/C Signal	16	1	16
	Tailoring shop	9	1	9		2i/C Signal	12	1	12
	Quarter master	16	1	16		O/C Legal	16	1	16
	Provost	12	1	12		O/C X-Squad	16	1	16
	Procurement	12	1	12		X-Squad	24	1	24
	Works Office	24	1	24		O/C C.I.D.	16	1	16
	Quarter Guard	16	2	32		2i/C C.I.D.	12	1	12
	Reception check	42	1	42		O/C Q-MASTER	16	1	16
	Generator House	36	1	36		Cell 2	2.7	10	27
	Underground Parking	1	1	1		Sentry box	3	10	30

Figure 6.19: Schedule of Accommodation table

Source: Author

S/N	SPACE DESCRIPTION	AREA(M)	NUMBER	NET AREA	S/N	SPACE DESCRIPTION	AREA(M)	NUMBER	NET AREA
	Special Operations	42	1	42		Visitors room	15	2	30
	Old Records Storage	12	1	42		Examination room	18	2	39
	Electrical room	9	4	36		Cafeteria	240	1	240
	Class room	36	4	144		Kitchen	42	1	42
	Fire Arms range	225	1	225		Laundary	30	1	30
	Photographing	12	1	12		Pantry	12	1	12
	Photo Dark room	12	1	12		Print/ Shakedown	12	1	12
	Line up room	16	1	16		Police Court room	35	1	35
	Identification records	13	1	13		O.C. Legal's office	45	1	45
	Physician's Office	21	1	21		Clerk's room	20	1	20
	Monitoring Unit	51	1	51		T.V.B.	16	1	16
	Detectives Office	16	4	64		Briefing Room	18	2	36
	Interogation room	15	1	15		Zonal P.R.O.	20	1	20
	Interview room	12	3	36		Cell 1	4	12	192

Figure 6.20: Schedule of Accommodation table 2

Source: Author

S/N	SPACE DESCRIPTION	AREA(M2)	NUMBER	NET AREA
	AIG's Office	108	1	108
	AIG's P.A.	45	1	45
	AIG's Sec.	15	1	15
	AIG's Escort	20	1	20
	DC's Office	72	2	144
	AC's Office	51	3	153
	CSP's Office	45	5	225
	SP's Office	36	5	180
	OC works office	45	1	45
	OC Transport's Office	45	1	45
	Budget Office	18	1	18
	Administrative Office	27	1	27
	Central Info. Centre	22	1	22
	Central Recs. Centre	22	1	22

S/N	SPACE DESCRIPTION	AREA(M2)	NUMBER	NET AREA
	Dispatch Unit	13	1	13
	Patrol Commander	15	1	15
	Secretariat Pool	30	1	30
	Interogation	45	2	90
	Conference	135	1	135
	Evidence room	16	2	32
	Gymnasium	118	1	118
	Squad/Recall room	18	2	36
	Library	36	1	36
	Map room	30	1	30
	Briefing room	48	1	96
	Arms & Amunition	36	1	36
	Laboratory	20	1	20
	Shift Supervisor	12	1	12

Figure 6.21: Schedule of Accommodation table 3

Source: Author

6.17 Implication of the above analysis on the design of paramilitary headquarters in Nigeria.

Several parameters have been discussed in the above topics. The results of these, was carefully considered during the design and planning stage. However, very few of the parameters were compromised to a little extent as a result of design constraints associated with security responsive and blast resistant designs. According to CPTED (2003), aesthetics and some design considerations like cost had to be compromised when designing a paramilitary building. These analyses however were, against all possible constraint, adhered to in order to achieve the desired proposed building.

6.18 Blast Analysis

Building response to blast loadings estimation is considered an adamant step in evaluating potential damage a building can sustain and the probability of having casualties among building occupants (AICE, 1996). Blast-resistant structures are typically relatively simple configurations, and blast loadings can be reasonably represented as idealized simple pulse shapes such that approximate evaluation techniques can be used to evaluate the response to explosion loadings.

The plan-shape of a building has a significant influence on the magnitude of the blast load it is likely to experience. Complex shapes that cause multiple reflections of the blast wave should be discouraged.

Buildings that are partially or fully embedded perform better in blast resistance. This due to the area they cover. They take advantage of the shock absorbing property of the soil they cover which can also protect against nuclear explosion.

Highest exterior threats should be protected by the greatest distance to the highest value assets. Foyer areas should be protected with reinforced concrete walls; double-dooring should be used and the doors should be arranged eccentrically within a corridor to prevent the blast pressure entering the internals of the building. Entrance to the building should be controlled and be separated from other parts of the building by robust construction for greater physical protection. An underpass beneath or car parking below or within the building should be avoided unless access to it can be effectively controlled (Koccaz et al, 2008)

In order to design a befitting site plan,

6.19 Roofing

The building's roofing design is informed from the tortoise shell design concept. As stated in the concept above, a tortoise derives its protection from this shell, the roofing material specified is one that has the structural performance to withstand blast. The architectural and structural design for blast resistant buildings recommends that roofing materials must not be lightweight, i.e. it must be solid and dense enough to, in connection to its trusses, hold down itself in cases of bomb blasts to reduce injuries caused by flying exploded parts. Also it is recommended that it must not project in such a way as to give blast waves a room for uplifting it easily.

6.20 Foundation

Structural form is a parameter that greatly affects the blast loads on the building. (Koccaz et al, 2008). Considering the proposed design in question, a careful analysis needs to be carried out on the building's substructure. Subject to a structural engineer's approval, a preferred foundation type will be raft. This is due to its ability to float and withstand vibrations. Special detailing needs to be done for it to meet the blast resistance requirement.

6.21 Finishing

The building envelope is designed to be finished with the following materials.

- Pre-stressed Steel
- Oriented Standard board
- Reinforced Concrete
- Wood
- Bullet proof Glazing

6.22 Lighting:

According to Smith (1996), lighting is considered to be the most important security feature in buildings especially in parking facilities. Adequate lighting is believed to be a strong deterrent of crime which in turn produces a better secure atmosphere. Light and its behavior could be discussed under a vast topic. However, only three basic principles related to building security will be discussed to illustrate how lighting will work in the design. These include; Illuminance, Uniformity, and Glare.

6.22.1 Illuminance

This is defined as the intensity or density of light impinging on a surface, measured in foot-candles (English units) or lux (metric units) (IESNA Committee, 2003). In this design, the two primary planes for measuring of illuminance; vertical and horizontal illuminance were incorporated. Horizontal luminance illuminates through a broad range of view and is clear along various sightlines but does little aid in the visibility of vertical objects such as keyholes and signs. As such, vertical illuminance plays more important role in security lighting because of the need to identify people. There should be sufficient light to positively identify a face and read body language as either familiar, unfamiliar or threatening at a distance of at least 9 m from the viewer. It is measured at 1.5m above grade. (IESNA Committee, 2003).

6.22.2 Uniformity

This is an important factor in the design of a facility's lighting. The human eye is naturally unable to adjust rapidly to change in luminance. Passing from light to dark areas and vice versa creates a temporary blind spot, subjecting individuals on streets and drivers in parking areas to potential threats on streets and drivers in parking areas. As such the entire lighting were placed at uniform distance maintaining an appropriate uniformity ratio to provide same

level of luminance. The uniformity ratio impedes visibility problems and is expressed as the maximum or average illuminance divided by the minimum illuminance (Smith, 1996).

6.22.3 Glare

This mostly has effect on drivers. It is the inability of an individual to perceive depth correctly. It is common to elderly people and those with impaired vision. Glare is minimized in this design through careful selection and positioning of fixtures. This was achieved through specification of light fittings with inbuilt shield. In the case of streetlights and garden lights, hard and soft landscapes are positioned to control potential glare.

6.23 Ventilation

Consideration for ventilation was giving under the two basic subtopics; natural and artificial.

6.23.1 Natural

Natural ventilation refers to process of achieving thermal comfort, adequate relative humidity, and the desired indoor temperature in a room.

The building consists of five (5) number court yards having a diameter of about 20m. These courtyards are covered at the top by a suspended glazed roof supported by steel trusses beneath. Three of the five courtyards rise up to nine floors while the remaining two stop at seven floors alone. The courtyards serve as the areas of negative air pressure while the external envelope of the structures having courtyards serve as areas of positive air pressure. This way, all windows in the facility satisfy the principle of cross ventilation. Most open to external envelope while a few open to courtyards within the structure.

Also, the adamant problem of wind shadow effect that is common to most central business districts around the world, where the site is located due to dense development and

consequently insufficient space, was potentially solved during the design stage by ensuring wide courtyards equivalent to H=H1 + H2 / 2 as the standard requires.

6.23.2 Artificial

Heat, Ventilation, Air- Conditioning (HVAC) System.

7.0 DESIGN REPORT

7.1 Introduction

This chapter as the name implies reports data on the architectural drawings of the proposed police zone 7 headquarters, Abuja. In this chapter, the building planning, design, construction, and maintenance data are discussed. It discusses the building's behaviour in response to a broad spectrum of potential security incidents. The chapter furthermore, describes how research findings stated in previous chapters have been applied to the design. According to Forensic (2012), there is no perfect security solution when determining how to address the security of a property. Flawless crime prevention is not reasonably obtainable and not required, but providing reasonable security is of possible and of utmost importance. A comprehensive explanation will be given under the following headings; Design framework, Design requirements, Design philosophy, Site Plan design, Floor Plans, Elevations, Architectural working drawings and Details, Service drawings.

7.2 Design Framework

In office design, this building meets all relevant criteria to fall under the class B+ office building classification. The proposed police headquarters will adopt a combination of two types of office design layouts; The Traditional office space (use of doors & walls) and Cubicle office space. The cubicle office space layout is of good advantage to this topic because;

- It boosts Natural surveillance
- Increases intercommunication
- Social interaction

- Territorial reinforcement (every staff is known in case of covert entry or espionage)

Office buildings should offer owners and users;

- Increased worker satisfaction
- Productivity
- Health
- Flexibility
- Energy and environmental performance
- Accessibility
- Comfort
- Safety

7.2.1 Class B+

This subcategory of Class B includes newly constructed buildings with excellent design and technical characteristics, above the level of Class B buildings but still not responding to all compulsory requirements for a buildings of Class A. Very often Class B+ buildings meet all the requirements of Class A except for the excellent location. Considering criteria described here, a Class B+ office building is one that meets more than 12 of the compulsory requirements for Class B but does not have all 22 characteristics of Class A.

Generally**,** buildings of this Class are characterized with good location of a newly built or newly reconstructed building, good construction solutions and maintenance, little functional obsolescence and deterioration.

Buildings with a very good location from an earlier period but still very well maintained can also fit into that category. Tenant standards are above average.

At present, a main requirement, with an option to a future change, is the building to be constructed after1989.

For an office facility to be classified as such, it must possess the following;

1. High rent levels. Rent levels should be above the average for the particular city.
2. Professional property management.
3. Use of high-quality building materials.
4. Floor to ceiling height responding to the regulatory requirements for this type of buildings but not less than 2,70m.
5. Flexibility of internal design –'open space type'.
6. Under floor cabling system (raised floors) and suspended ceilings.
7. 24-hours security and access control.
8. High speed lifts with waiting time max up to 30 seconds. At least 2 lifts with a capacity of at least for 6 people.
9. HVAC system to provide heating, cooling and humidity control of the air and control of microclimate in the office according to the EU HVAC standards.
10. Dual power supply with automatic switch.
11. Room depth 18-20m between windows.
12. Common areas not more than12 percent of TBA.
13. Building Management System.
14. Luxury meeting rooms and a large impressive lobby.
15. Food and rest areas for staff/ restaurant, café, fitness/ for the buildings designed for more than 250 people.
16. Modern window panes, high-quality window frames, sun-protection glass.

Office buildings of the class are remarkable for their beautiful and modern suspended facades which adds on to their prestige. See plate II for more deails.



Plate IX: Class B+ office building.

Source: Forensic, 2012.

Office space is provided with a HVAC system for control of microclimate in accordance with the EU standards as illustrated in plate III below.



Plate X: HVAC system.

Source: Forensic, 2012.

A building with a sprinkler system used installed in a suspended ceiling and used for automatic fire extinguishing. See plate IV.



Plate XI: Sprinklers

Source: Forensic, 2012.

A very impressive solution of raised floor made of transparent glass panels to show the cabling underneath is illustrated in plate V below.



Plate XII: Raised floor.

Source: Forensic, 2012.

7.3 Design Considerations

7.3.1 Vehicular/ pedestrian movement

Series of checks at the site entrance are stationed to avoid unauthorised access into the facility. The first check point searches vehicles; a cleared vehicle proceeds to the next while any suspicious vehicle is denied access. Human identity is verified at the second checkpoint. Pre-cleared individuals are denied access. The last check point is positioned at the gate entrance. It verifies the 1st two checks from the personnel on duty. Any unverified vehicle or pedestrian is denied access. The last checkpoint is located at the gate house. As such, pedestrians sign a register and are giving a floor tag with which one cannot access any floor beyond. Vehicular movement is controlled by reinforced bollards and curbs. Also beneath

the pedestrian pathways is a collapsible material that is design to carry human and bicycle weights. The pavement collapses in the event of vehicular crossing thereby preventing access (moving vehicle bombs).

7.3.2 Traffic circulation

To ensure proper access control, a one way vehicular access design was employed. Traffic control was properly dealt with especially at the entrance checkpoints. Both the entrance and exit roads are wide enough to allow two cars at a time. In cases of access denial, turning points are strategically positioned in order to decongest traffic and allow faster flow of cars. See fig. 7.1.

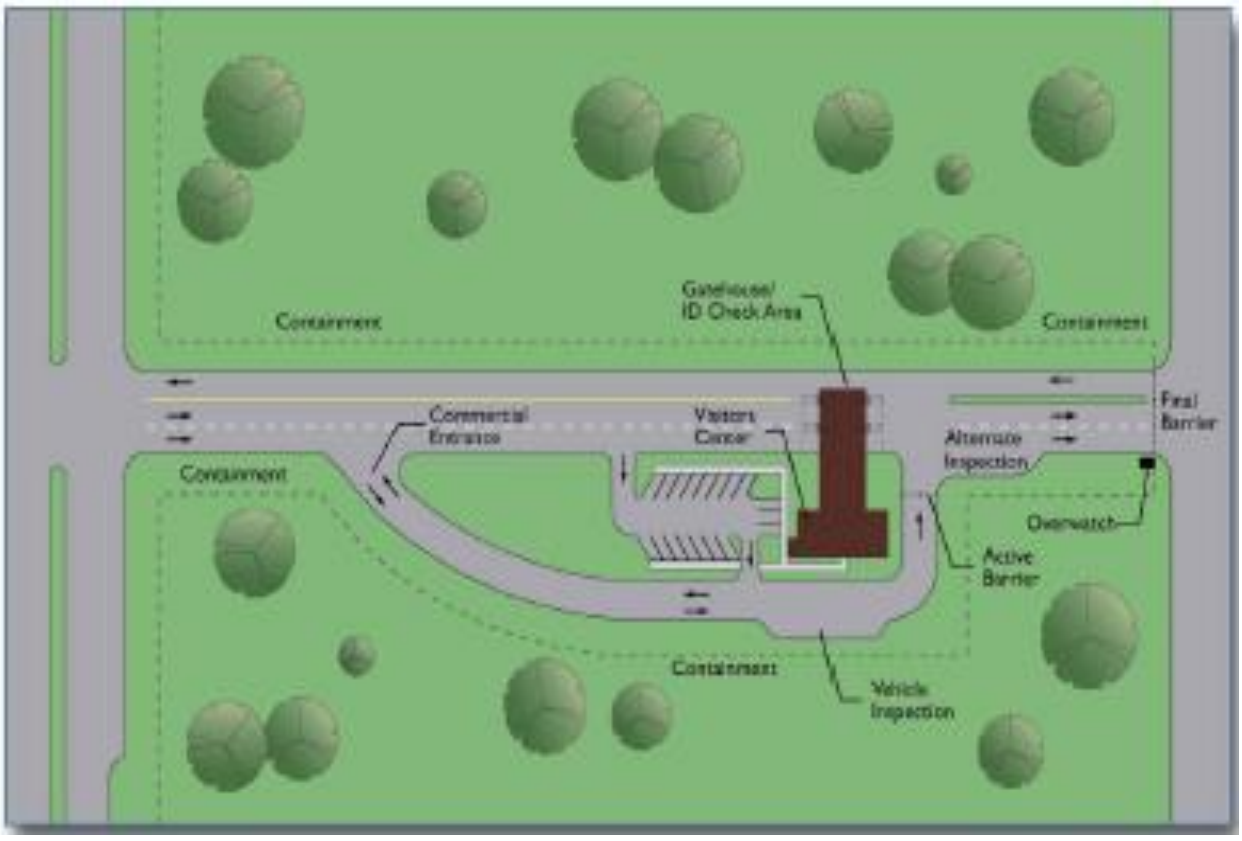


Figure 7.1: Entrance traffic control

Source: Author, 1976.

7.3.3 Parking pattern

In parking, reasonable security measures are employed to deter or prevent criminal activity. Because parking facilities comprise a large volume of space with relatively low

Level of activity, violent crime is more likely to occur in a parking facility than in other commercial facilities (Smith, 1996). For a security measure to be deterrent it has to be passive; meaning it has to have a psychological effect on a potential criminal. This involves the incorporation of CPTED principles. These were applied to the design in the following ways;

- Parking adheres to a miSnimum of 25m standoff distance from any building. This is only applicable to staff parking. See fig 7.2

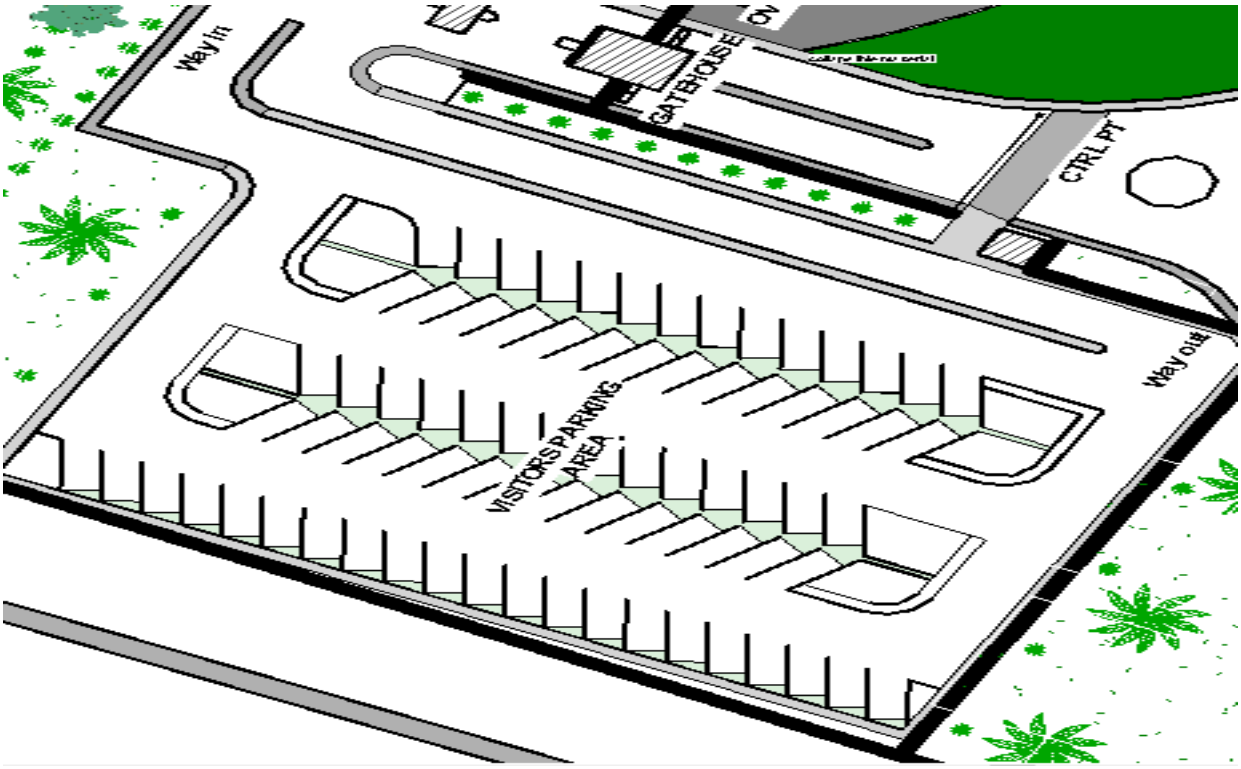


Figure 7.2: Visitors parking.

Source: Author, 2014.

- As for visitors, an offsite parking was employed in order to keep away potential threats to the building. See fig
- All parking lots are positioned at 45 degrees. This is due to the fact data 45 deg. parking gives a long distance view of a parked car and it allows one to see whoever is coming from the one way direction. It avoids possible blind spots against those who have parked already.
- Parking lots are properly illuminated
- Wide range of one way tinted glazing is used to aid natural surveillance in such a way that a potential criminal has the feeling of been watched from the inside
- Visitors' parking is positioned offsite and close to an activity area (the gate house) to enhance natural surveillance. Also the junior staff parking area is positioned close to the transport workshop for the same reason as shown in fig.
- Exterior signs indicating the area is patrolled by securities 24hrs a day

For a security measure to be preventive, it must be active i.e. it must be designed in such a way as to physically stop a to-be criminal from committing a crime. Measures employed for this purpose include;

- Security guards at the entrance of all car parks
- Cable beam gates positioned at car park entrances.

A parking bay of 2.5 x 5.0m was provided throughout the site except for the works workshop and generator room where Lorries and big trucks are expected. See fig. 7.3.

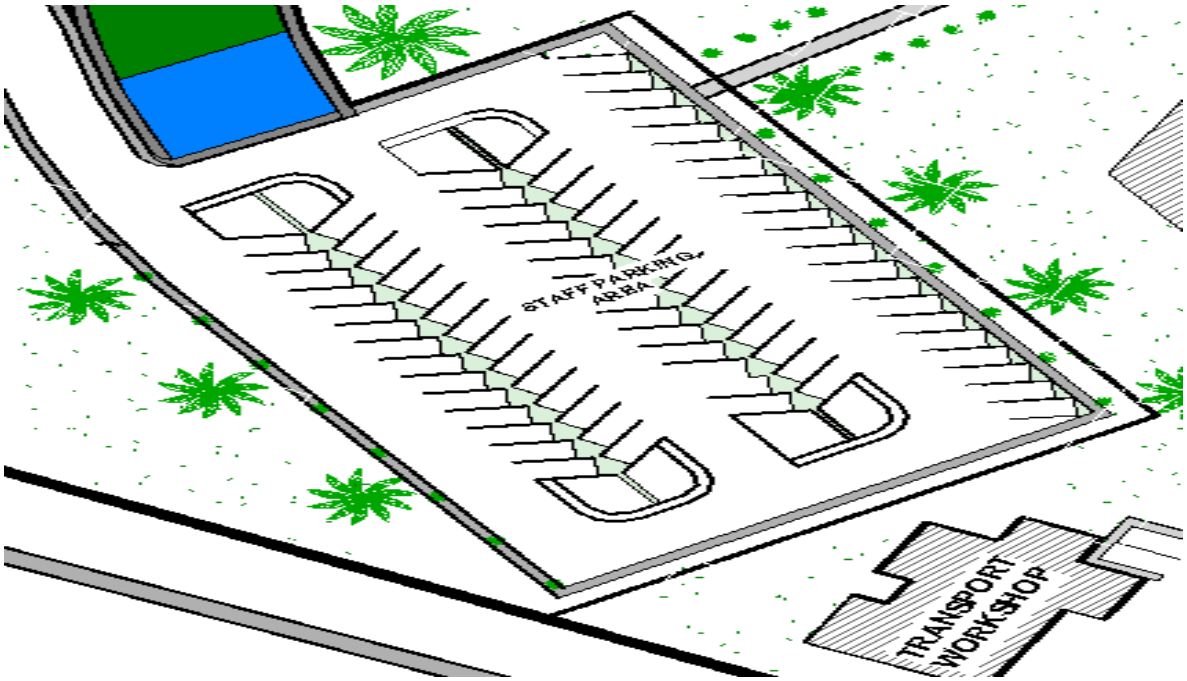


Figure 7.3: Staff parking.

Source: Author, 2014.

7.3.4 Services

Services provided in the site include, refuse disposal, electricity supply, water supply and plumbing system, drainage system.

7.3.4.1 Refuse disposal

Refused disposal is an in-house activity of the police force. The 'C' department is responsible for controlling all wastes within the site perimeter. Trash cans are placed at various positions. According to Ball (2010) Anti-terrorism guidelines sets a minimum standoff distance from trash cans to a building wall. A 10m minimum distance is required for inhabited buildings as shown in fig. As for primary gathering buildings a 25m minimum standoff was adhered to (see fig.). Two incinerators are located at the far rear of the site. Trash cans are to be emptied twice on a daily basis. This is done to ensure no explosives are hidden inside.

7.3.4.2 Electricity supply

Underground system of cabling is the source of electricity to the site. Subject to the electrical engineers approval, a conduit system of wiring is suggested for use in powering the building. Behind the central staircases of each cell, an electrical room is positioned. All offices on a floor have their power linked to the electrical room. This way, repairs can be easily detected and rectified without turning off the whole building's power system, as power down weakens to a considerable extenQt the security strength of a facility. In the event of power failure, two generators will provide alternative power supply. One will be active while the other is kept standby as backup in case the other fails.

Location	Building Category	Applicable Level of Protection	Conventional Construction Standoff Distance	Minimum Standoff Distance	Applicable Explosive Weight
Controlled Perimeter or Parking and Roadways without a Controlled Perimeter	Billeting and High Occupancy Family Housing	Low	45 m (148 ft.)	25 m (82 ft.)	I
	Primary Gathering Building	Low	45 m (148 ft.)	25 m (82 ft.)	I
	Inhabited Building	Very Low	25 m (82 ft.)	10 m (33 ft.)	I
Parking and Roadways within a Controlled Perimeter	Billeting and High Occupancy Family Housing	Low	25 m (82 ft.)	10 m (33 ft.)	II
	Primary Gathering Building	Low	25 m (82 ft.)	10 m (33 ft.)	II
	Inhabited Building	Very Low	10 m (33 ft.)	10 m (33 ft.)	II
Trash Containers	Billeting and High Occupancy Family Housing	Low	25 m (82 ft.)	10 m (33 ft.)	II
	Primary Gathering Building	Low	25 m (82 ft.)	10 m (33 ft.)	II
	Inhabited Building	Very Low	10 m (33 ft.)	10 m (33 ft.)	II

Plate XIII: Standoff distance table.

Source: Ball, 2010.

7.3.4.3 Landscaping

Landscaping strictly adhere to the principles of crime prevention through environmental design. All plants within the unobstructed zone are less than 0.5m and are also bushy less in nature. Those plants away from the 45m standoff distance must leave a clear view to avoid

blind spots. Recommended plants include; windmill palm, palm tree, etc. Also soft landscape elements complement the hard landscape preventing urban heat island. Tall trees planted beside the exterior face of the perimeter fence inhibit clear view of the site's interior for passers-by. These trees also serve as wind breakers. They shade parking areas, pedestrian walkways and also add beauty to the potentially rigid looking environment. Artificial water bodies were created for use in case of fire emergencies and to add a sense of tranquillity to the environment.

7.3.4.4 Vertical circulation system

In office buildings the need for a swift and reliable vertical circulation is of paramount importance to office work productivity (FORTON, 2014). Two systems were employed in the building design: elevators and staircases. Each of the four honeycomb cells has a single elevator shaft consisting of two elevators. These add up to eight no. elevators in the entire building. All elevators are panoramic. That is to say, things and people outside the elevator are visible from the inside and vice-versa. This way, natural surveillance is boosted. The design requirement here suggests a minimum waiting time of 30s. An alternative means for vertical circulation provided is the staircase. There is, in total, four staircases in the building; each cell having one; and two escape staircases adjoined to the central courtyard of the building. This makes a total of six staircases in the entire structure.

7.3.4.5 Lighting

As for lighting, enough luminance was given attention to. The site is well lit with street lights and floor mounted lights. This is important to encourage natural surveillance at night. All sensitive areas are kept in daylight round the clock. These include staircases, parking lots, see plate VII.



Plate XIV: Lighting in staircases.

Source: Gardener, 1995.

7.3.5 Drainage

The site drains through the Abuja Central drainage system. It is relatively flat, with a very gentle gradient sloping towards the south-east direction (rear) of the site

7.4 Functional Divisions

Division of function in the building was done according to floors. The main factors considered here were, police-civilian contacts and nature of assets.

7.5 Site Plan

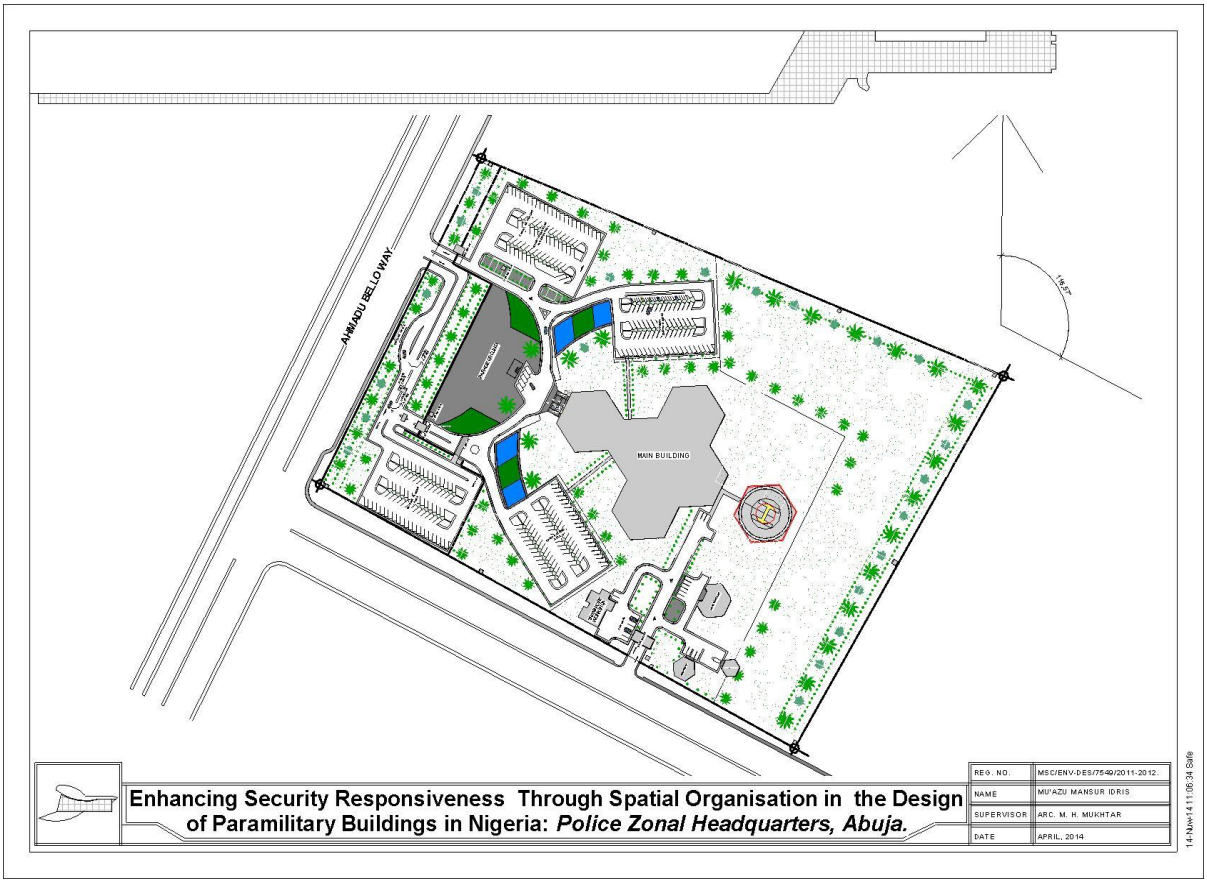


Figure 7.4: Site plan

Source: Author, 2014

7.6 Floor Plans

7.6.1 Main Building

7.6.1.1 Ground floor (admin, 'A', department)

This floor consists mainly of offices under 'A' department, i.e. Administration. This is because of the department's connection to the public. People lay complaints and pass on information to offices in this department. Common facilities such as cafeteria, gymnasium, are positioned on this floor to avoid traffic on upper floors see fig. 7.5. 'A' department houses the following offices below;

- Reception
- Provost
- CIB Screening desk
- Shift supervisor
- OC Admin
- DCO Admin
- Zonal PRO
- Public relations office
- Cloak room
- Utility
- Library
- Old records storage
- OC Finance
- OC Budget
- Budget office
- Police cooperative
- Central Information Centre
- Gymnasium
- Highly confidential storage
- Dispatch office
- Central Records Centre
- Cafeteria
- Kitchen

- Pantry
- Sprinkler pump room
- Other offices

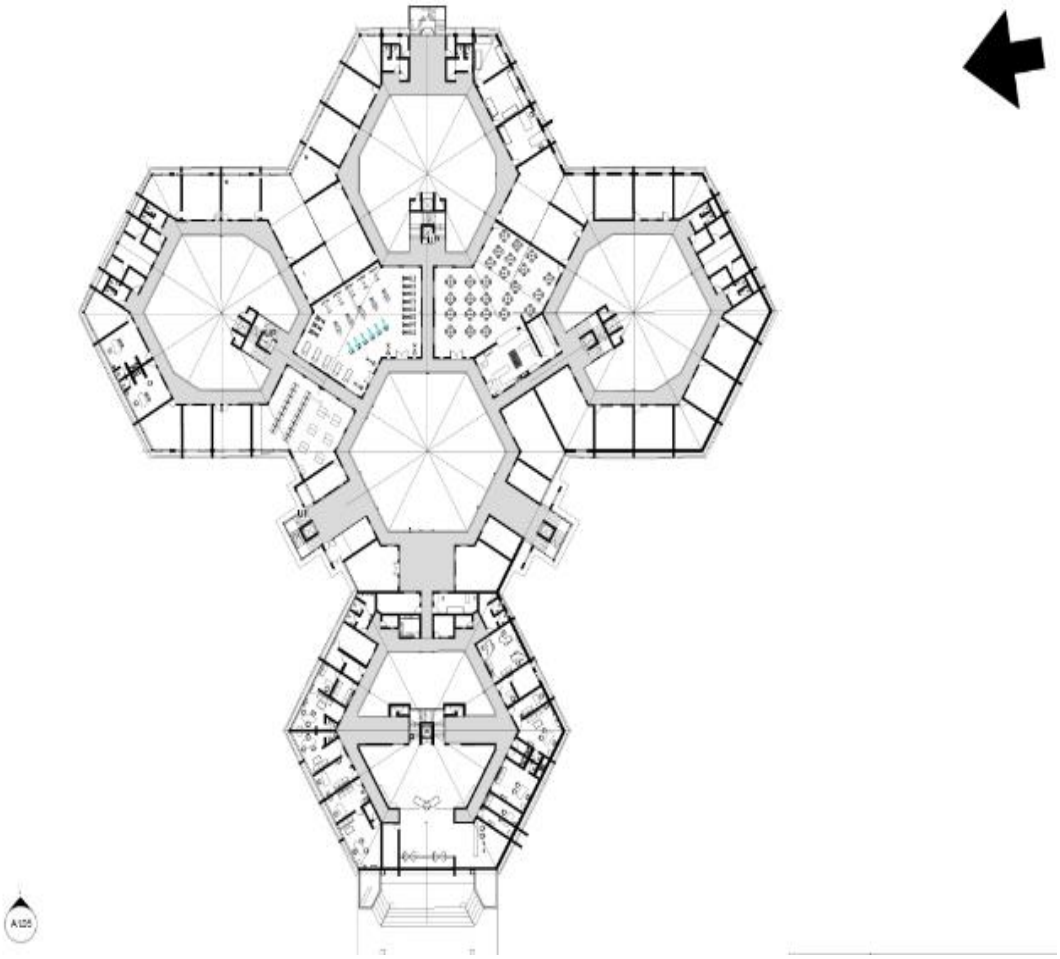


Figure 7.5: Ground floor plan

Source: Author, 2014.

7.6.1.2 First floor (operation, 'B', department)

On this floor are those offices under 'B' department (operations). This department gets the force's adrenaline pumping. It was placed on this floor because it involves force operations. Squads need easy access in order to respond to emergency calls. Offices under this department include; see fig. 7.6

- Surveillance monitoring unit 1 & 2
- Tele and Signalling Unit
- Map room
- Radio workshop
- Information room
- PABX office
- Security check
- Briefing room 1 & 2
- Class room 1-4
- Armoury
- Motor Traffic Division (MTD) office
- OC MTD
- Traffic Violation Bureau (TVB) office
- OC TVB
- Squad recall room
- Anti-fraud office
- Special operations
- DC Operations
- AC Operations
- Other offices.

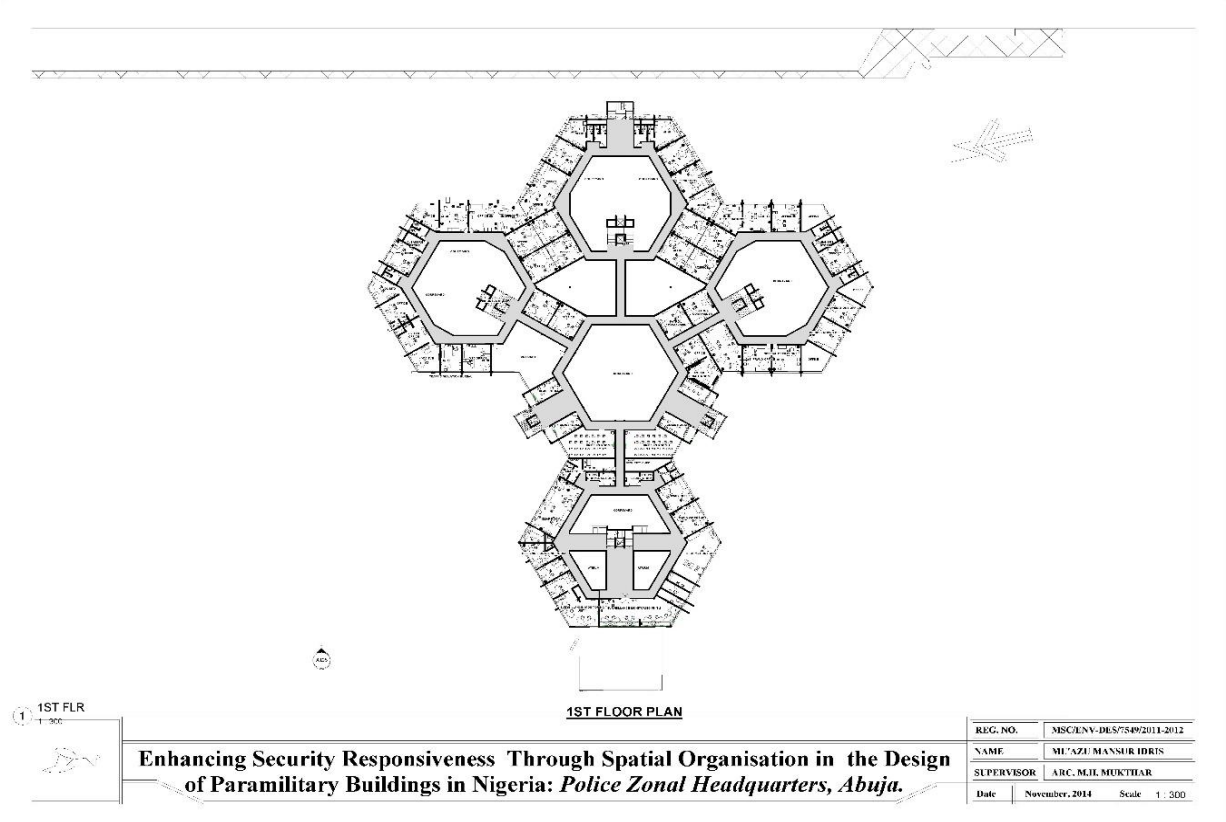


Figure 7.6: First floor plan

Source: Author, 2014.

7.6.1.3 Second floor (logistics and suppply, 'C', department)

The second floor in the police headquarters design consists mainly of offices under the 'C' department (Logistics and supply, formerly known as works). This department is considered one of the busiest of all as it is a ground for private contractors and suppliers of police building accessories. Its area and offices partitioning is a replica of the It houses the following offices.

- AC works
- OC Works
- OC Maintenance
- Electrical room

- Laundry
- Clinic
- Quartermaster
- Procurement
- Maintenance
- Machine room

7.6.1.4 Third floor (criminal investigation department, 'D')

The third floor in this multi-storey building comprises offices under the Criminal Investigation Department. It houses staffs that are skilfully trained, as such any suspected intrusion can be easily detected and stopped. This likewise has a similar setting as the second floor. It consists of the following offices;

- AC CID
- OC CID (Zone)
- Interrogation room
- Evidence room
- Crime records room
- Photographing
- Photo dark room
- Line-up room
- CID records
- Detective's office
- Small room
- Interview room

- Exam room
- Print/ shakedown
- Police courtroom
- Attorney's office
- Clerk's office
- Cells 1-3
- Central Investigation Bureau (C.I.B.)

7.6.1.5 Fourth floor

This floor is likewise a replica of the preceding one. It houses the 'E' department; Training.

7.6.1.6 Fifth floor

This floor houses staffs of the police force under the 'F' department. It is charged with the responsibility of research and planning of the police force.

7.6.1.7 Sixth floor

The sixth floor has a relatively smaller area when compared to the lower ones. It consists of the 'G' department. As a newly introduced unit, it is not flooded with lots of staff due to little amount of tasks beforehand. It also has similar design areas as 'B', 'C' and 'D' departments as is seen in fig. 7.7.

7.6.1.8 Seventh floor

This floor has exactly the same area as the fifth. It houses the A.I.G.'s office and its supporting facilities. Senior officers having direct relationship with the have their offices on the floor for faster communication see fig.7.7

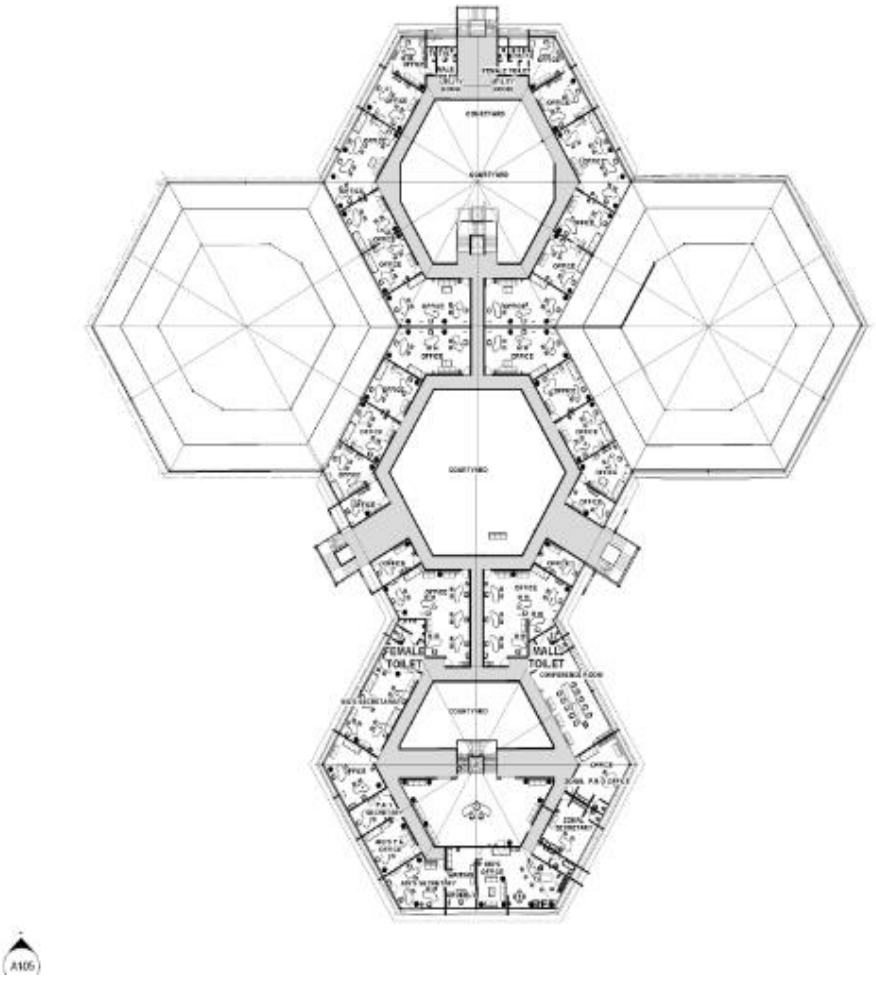


Figure 7.7: 5th and 6th floor design

Source: Author

7.6.2 Transport workshop

The transport workshop makes one of the auxiliary facilities in a typical police headquarters design. This one is no different from others as it is predesigned specifically to meet the requirements of a mechanic workshop. It contains the admin, O/c transport's office, spare parts store, sales room, oil room, workshop/ sub-assembly repairs, panel beating, spraying/ painting room as illustrated in fig. below;



Figure 7.8: Transport workshop floor plan

Source: Author, 2014.

7.6.3 C-workshop

C- Workshop means C department workshop also called works or logistics and supply department. It consists of functions as thus; O/c works' office, furniture store, assembly section, timber section, metal section, woodwork section, loading and offloading bay, tailor shop, and two no. toilets.

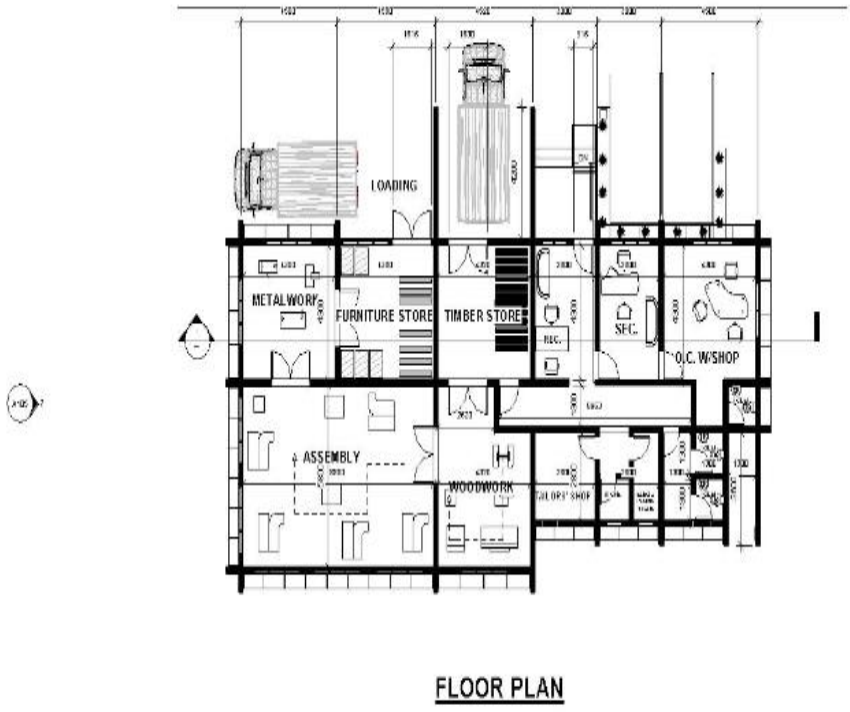


Figure 7.9: C-workshop floor plan

Source: Author, 2014.

7.7 Roof Plan

7.7.1 Main Building

A substantial part of the main building's roof area is decked. This provides a comfortable platform for security guards, snipers to be more specific, to carry out their assigned duties of aerial surveillance from the structure's roof top. All courtyards are covered with a suspended Perspex roofing material depicting the tortoise shell concept in shape and strength. This allows light to pass through the material. The suspension is to allow warm air find its way out of the courtyards thereby improving ventilation. Fig below is a representation of the roof plan.

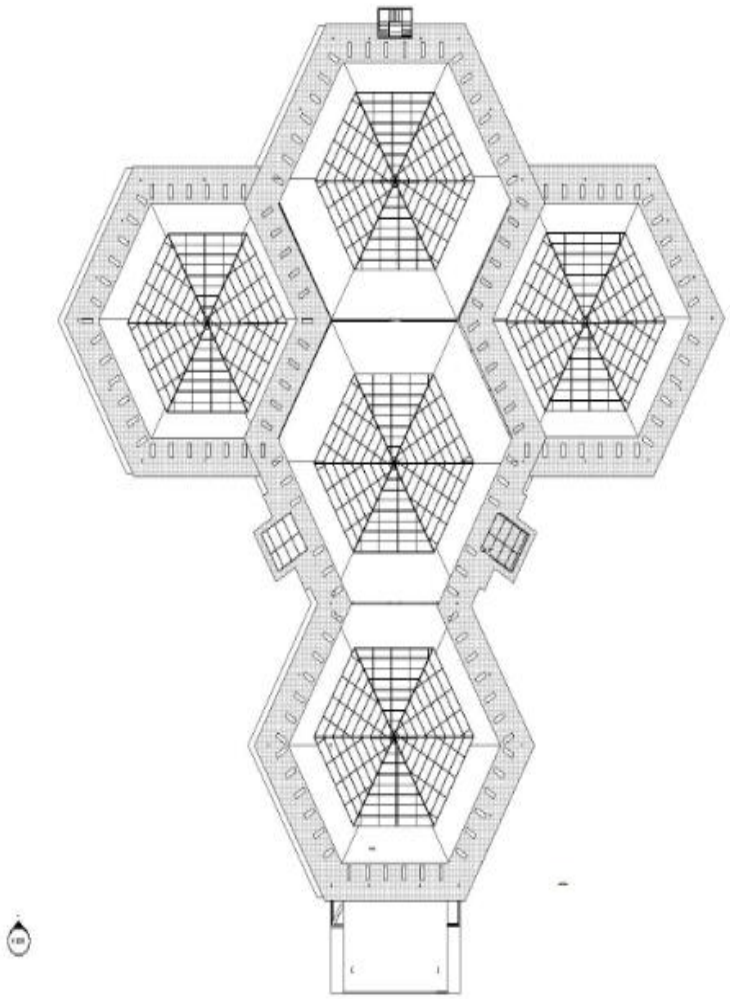


Figure 7.10: Main building roof plan

Source: Author, 2014.

7.7.2 Transport workshop

This structure is covered with a conventional aluminium roofing sheet.

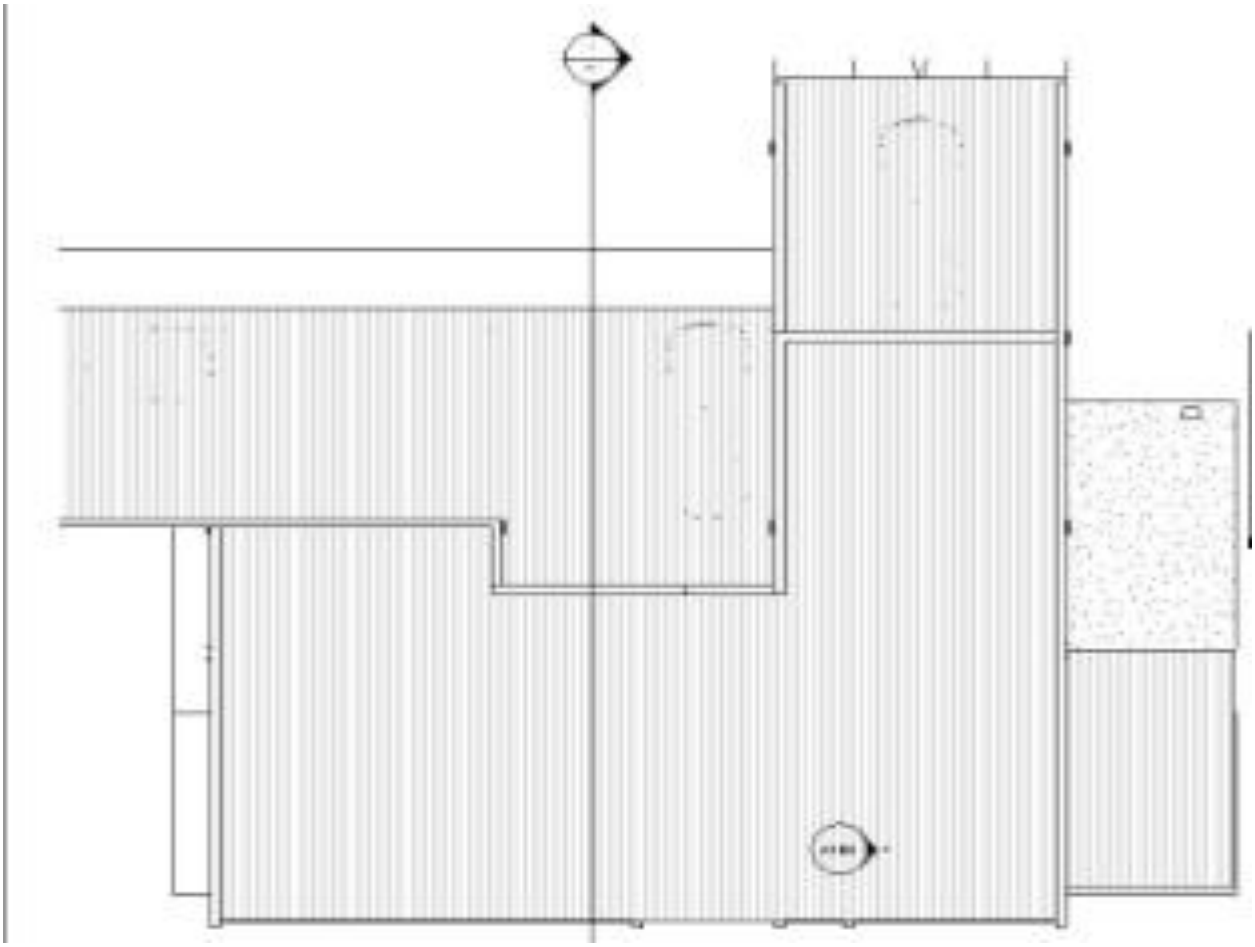


Figure 7.11: Transport workshop roof plan.

Source: Author, 2014.

7.7.3 C-workshop

Like the transport workshop, the C-workshop is roofed with a corrugated aluminium roofing sheet except for the entrance porch which is decked. Divide by a 1m high parapet, it is a flat roof that slopes in to directions; the north-east and south west. This is due to the fact that the structure houses no major security asset within it. Since it contains carpentry, tailoring and wood workshop, natural lighting is an important factor that was considered as seen in fig. below. As such roof light were used at strategic intervals to enhance visibility thereby boosting productivity.

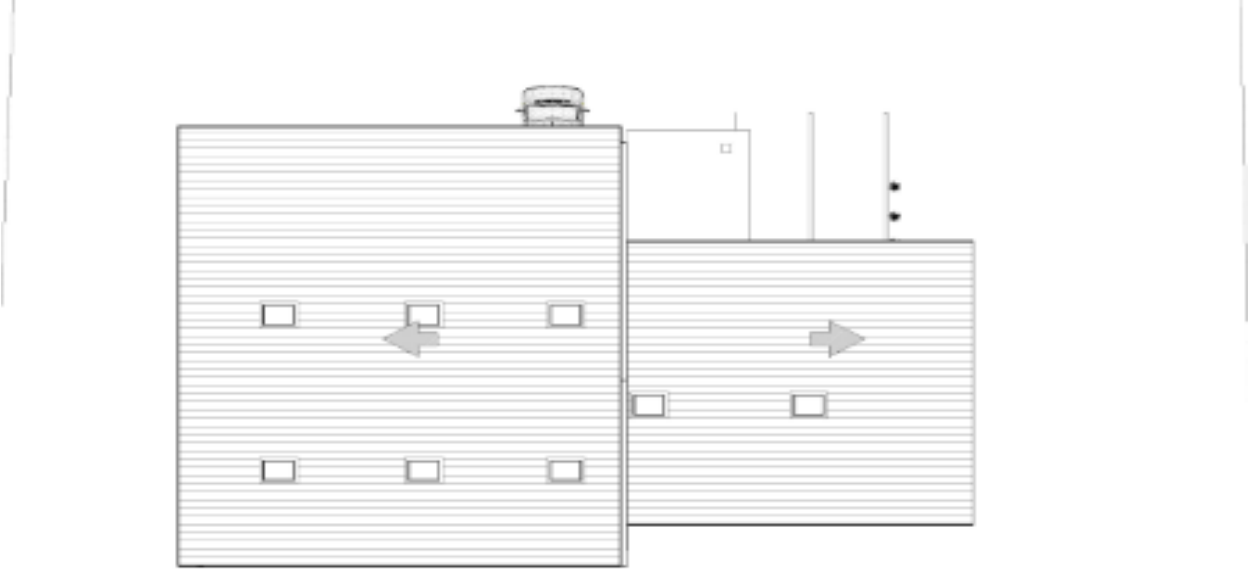


Figure 7.12: C-workshop roof plan

Source: Author

7.8 Elevations.

All elevations in the building of the building are designated with strong bulletproof materials

7.8.1 Main building.

The approach elevation of the main building is viewed through a perfect symmetry from the main entrance to the site. The building's robust and massive nature portrays power and dominance, sending hands-off messages to would be offenders. On its façade is a material serving as its external protective envelope. The massive glazing is to boost up natural surveillance. A one way tinted glass was used all over the building's façade. This way, intruders are given the notion that they are been watched from the inside. Also, their bullet proof nature secures the building's inhabitants to a great extent by delaying intrusion in the course of any attack on the building. The above materials can be seen in figs. 7.13-7.14.

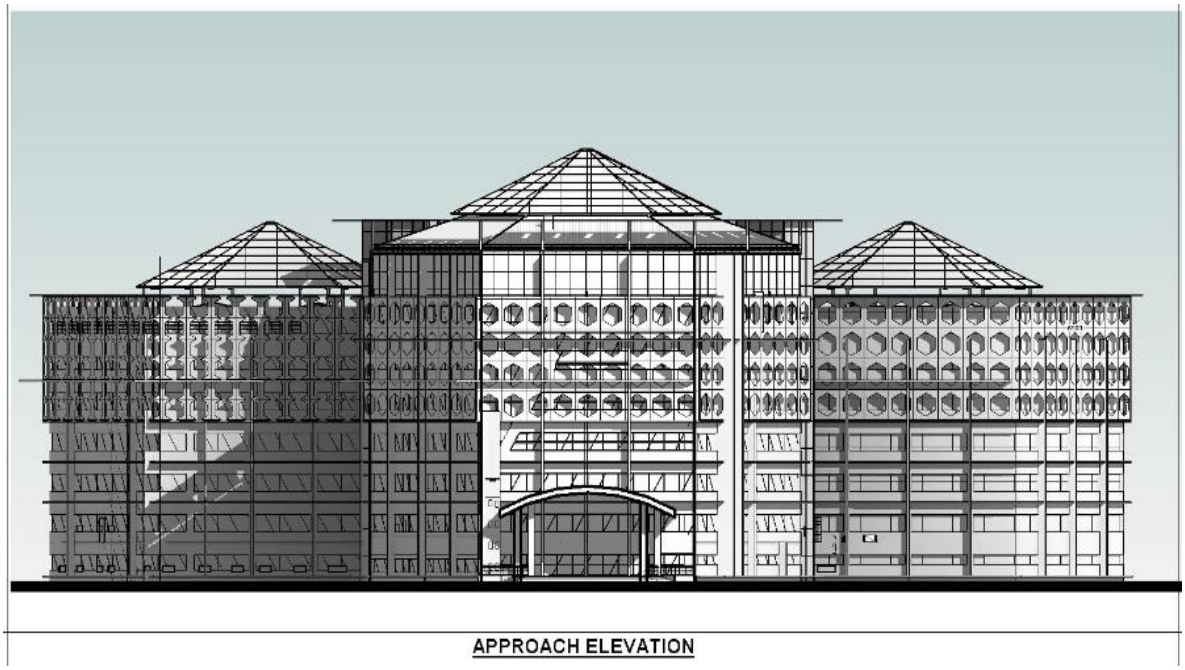


Figure 7.13: Main building approach elevation.

Source: Author, 2014.

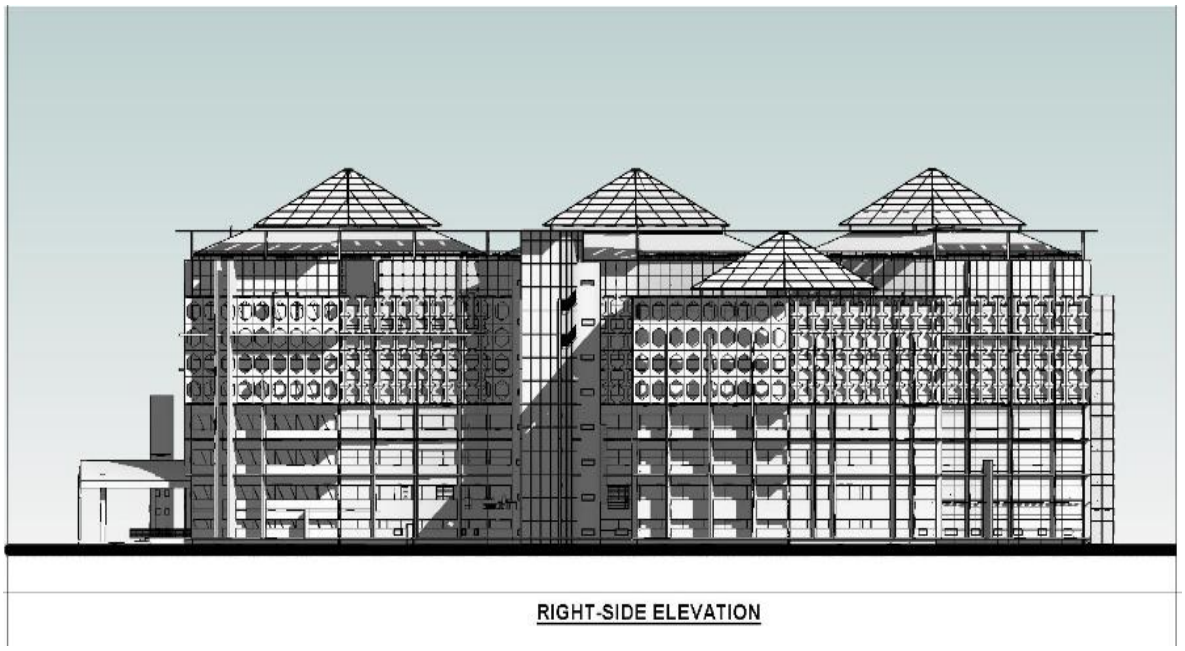


Figure 7.14: Main building Right-side elevation

Source: Author, 2014.

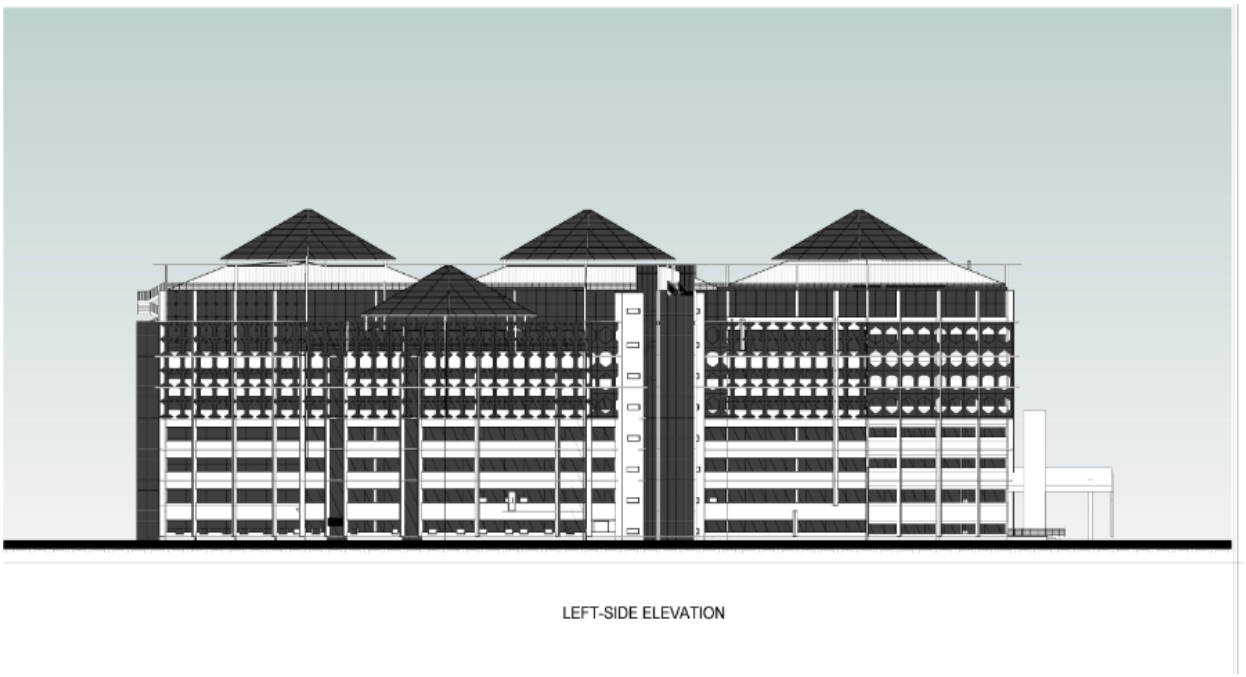


Figure 7.15: Main building left-side elevation

Source: Author, 2014.

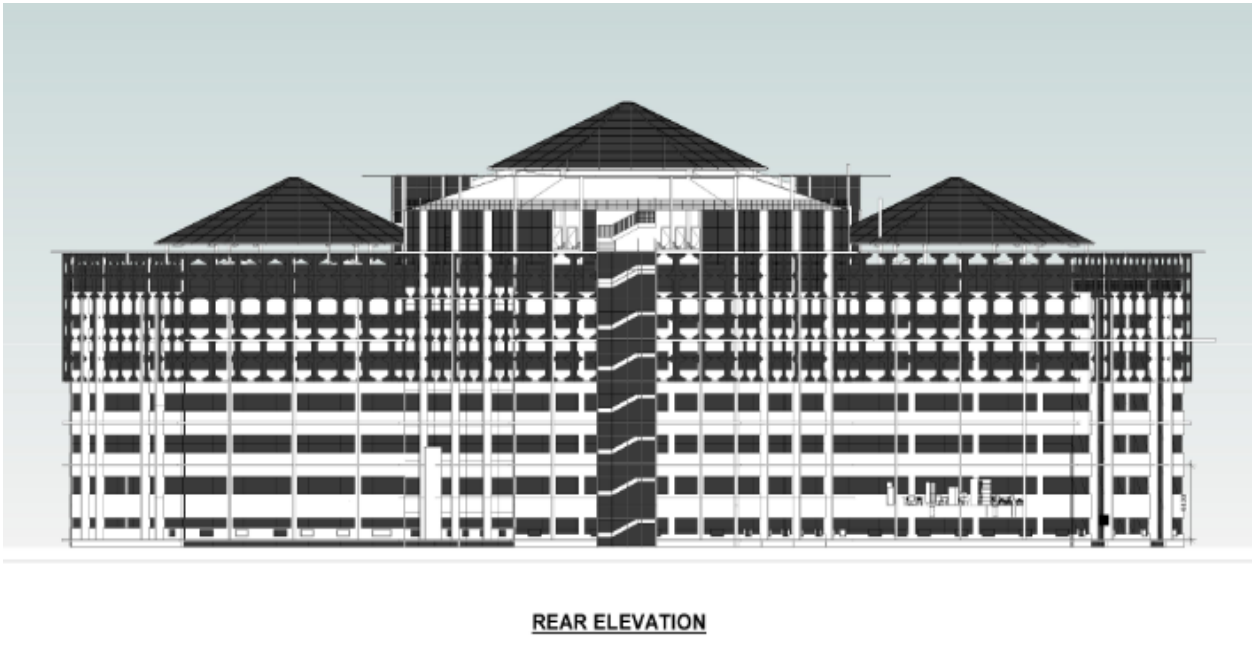


Figure 7.16: Main building's rear elevation

Source: Author

7.8.2 Transport workshop.

The transport workshop portrays a simple design of a typical workshop. As explained above, materials used for the façade include reinforced concrete, prestressed steel, and bullet proof glazing as illustrated in fig. 7.17 below.



Figure 7.17: Transport workshop elevations.

Source: Author, 2014.

7.8.3 C-workshop.

Workshops in any case are designed to be mechanical. Their need to serve their principal purpose, allows for less consideration for aesthetics. This designed relays the same information to any viewer. The C-workshop is designed to be as simple as possible using the same materials as used in the transport workshop. See figs. 7.18 and 7.19 for illustrations.

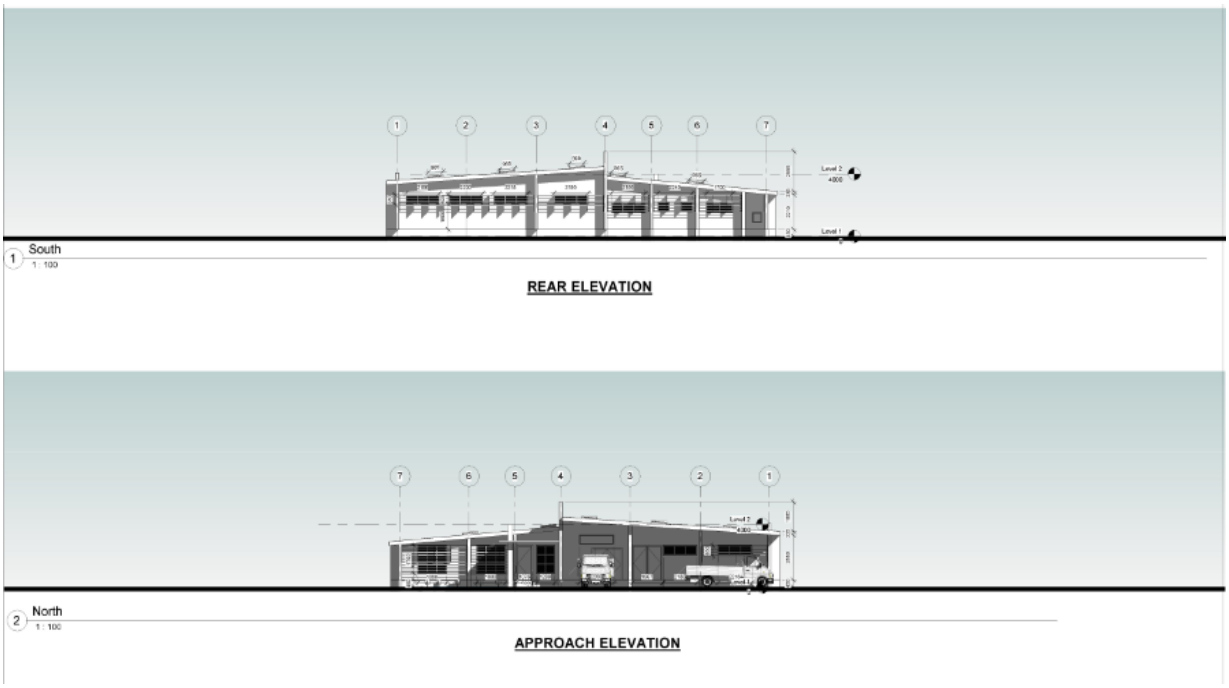


Figure 7.18: C-workshop approach and rear elevations

Source: Author

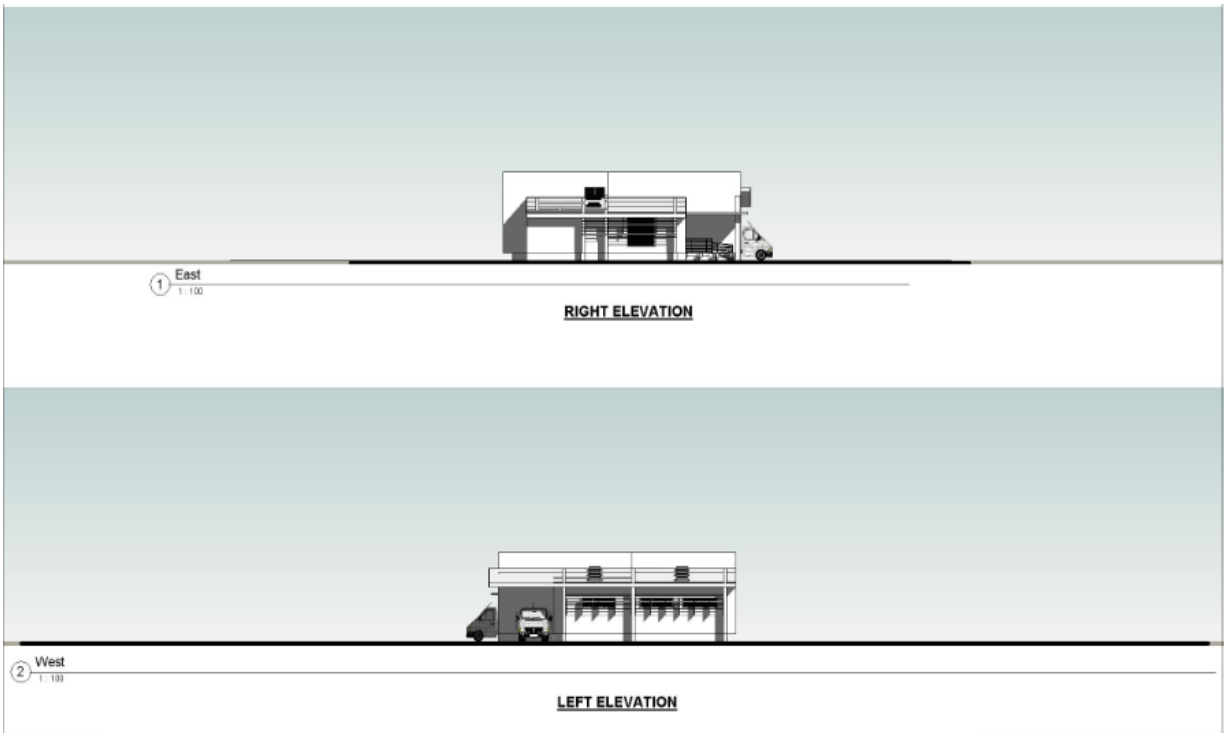


Figure 7.19: C-workshop right and left side elevations.

Source: Author, 2014.

The figures below showcase sections through the main building, transport workshop and C-workshop as can be viewed in figs. 7.20 & 7.21, 7.22, and 7.23 respectively.

7.9 Section

7.9.1 Main building.

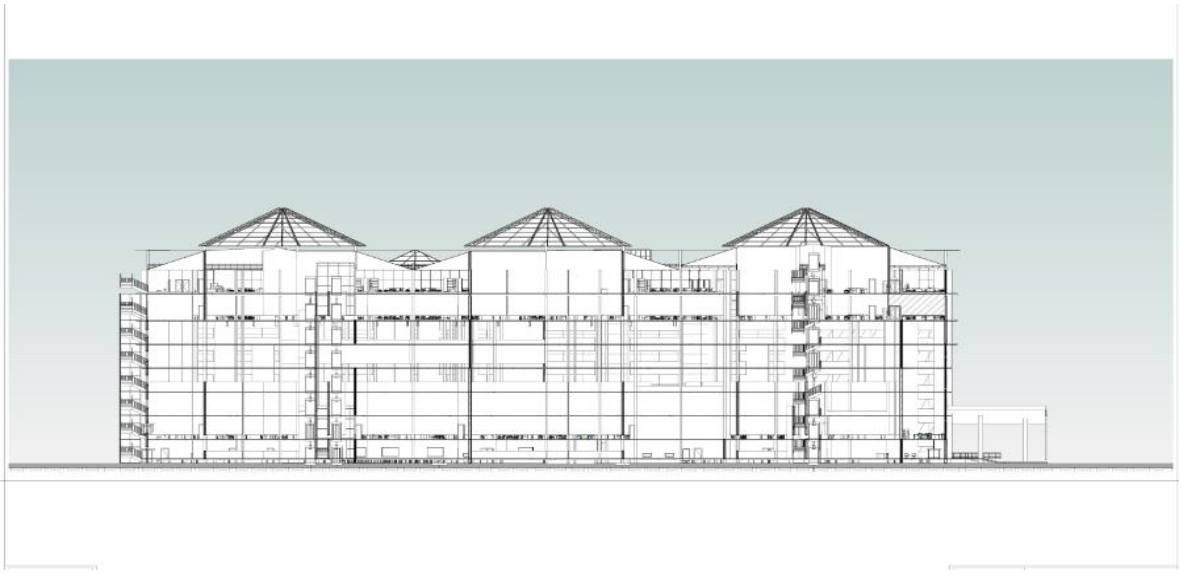


Figure 7.20: Main building section A-A.

Source: Author, 2014.

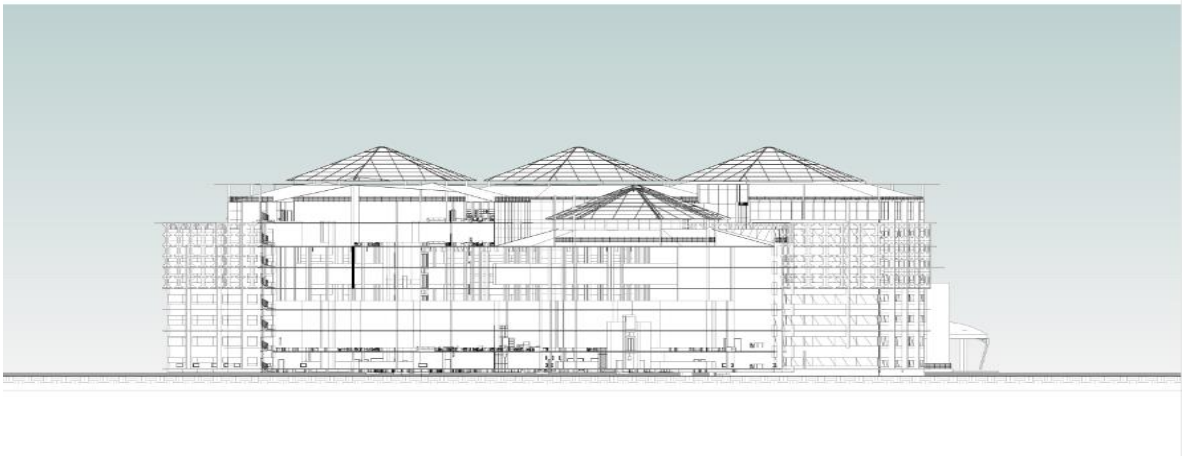


Figure 7.21: Main building section B-B.

Source: Author, 2014.

7.9.2 Transport workshop



Figure 7.22: Transport workshop section A-A

Source: Author

7.9.3 C-workshop

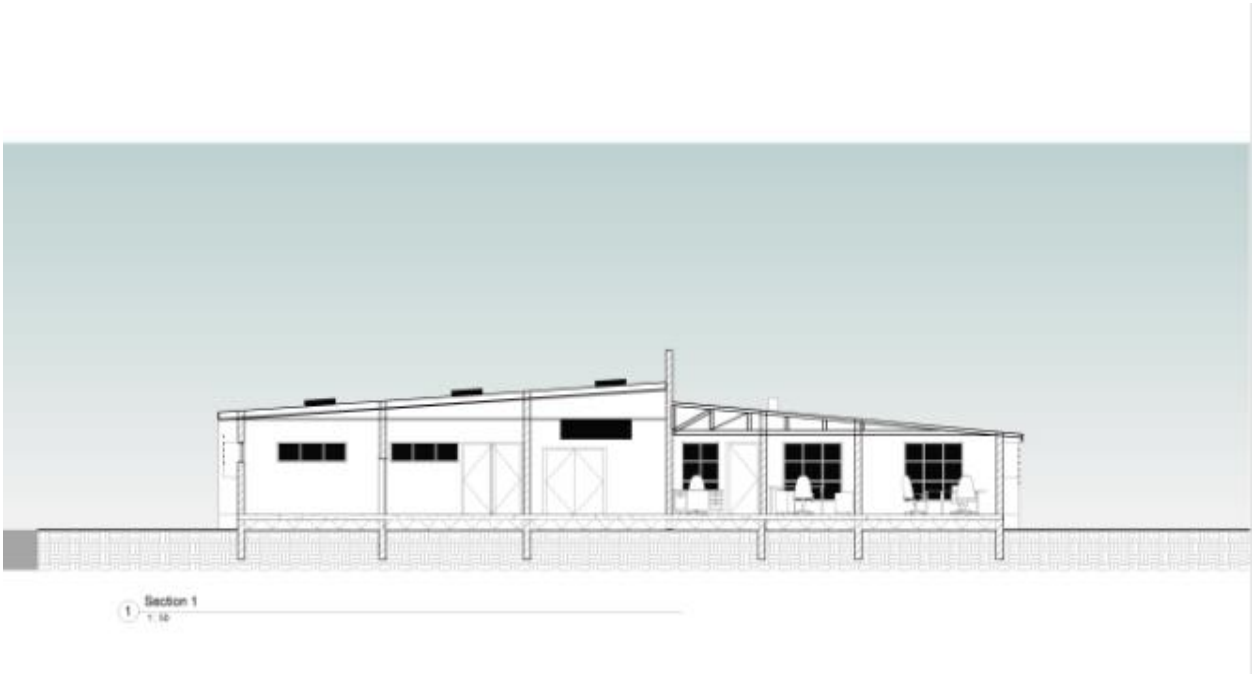


Figure 7.23: C-workshop section A-A.

Source: Author.

8.0 CONCLUSION AND RECOMMENDATIONS

8.1 Contribution to Knowledge

In contribution to knowledge, this research has outlined various drawbacks associated with paramilitary headquarters' design and has proffered to them, possible solutions that have been showcased in the archetype design of a police zonal headquarters linked to this research.

The study has brought on a breakthrough to security awareness in that things that were believed to be security elements now are merely causes of untidy environments

It has being discovered that the use of physical security measures alone doesn't deter crime

8.2 Recommendations

I recommend that the ministry of police affairs in conjunction with the ministry of finance and interior ministry as well as all stakeholders should as a matter of urgency adopt the aforementioned findings as a tool for standardizing all future paramilitary headquarters designs.

Also the federal government (the Presidency) should stand steadfast and support the afore mentioned ministries in realizing security responsive buildings

I also recommend that a team consisting of group of professionals belonging to the construction industry be formed and giving the task to inspect any paramilitary facility to be built in the future. This way the nation will not only keep producing security responsive paramilitary buildings, but also other governmental facilities. Defiant will be frequently brought to order.

A further suggestion is that need be for advertisement of physical security principles on media. This way every citizen will be potentially sensitive to criminals within

Finally, I recommend that research and planning departments should be formed as the police have done recently. The institution should employ staffs that have the potential excellence in the area of research. Criminals could be interviewed and given a chance to work for the force after serving some jail terms. This way much will be extracted from them about crime and criminal behaviour.

8.3 Areas of Further Study

This study could be further explored by carrying out a similar research on residential paramilitary buildings. Also to expand the frontiers of knowledge, one can move some steps further by studying military personnel and their facilities and proffer befitting solutions to their wanting designs. It will be very much astonishing to see days of architectural designs relying too much on gadgets and information and communication technology to deter and control crime come to an end. Architecture should produce a substantial amount on security then ICT complements it. A good suggestion also is to see how security responsiveness could be enhanced through building forms.

With these suggestions, building behaviour will in the near future eliminate terrorism and attacks on security buildings.

8.4 Conclusion

In conclusion, this research has talked a lot about a lot of issues under the topic "*Enhancing Security Responsiveness through Spatial Organisation in the Design of Paramilitary Headquarters in Nigeria".* The research analytical components here are 'Security

Responsiveness', 'Spatial Organisation', and 'Paramilitary Headquarters'. A critical study was carried out on these three key words producing a literature review through which a corresponding methodology was adopted. Data were collected, from some randomly selected paramilitary institutions and their corresponding consultants. These collated data were carefully analysed and the aforementioned findings were discovered. It is believed that after this study, a conceptual framework for designing paramilitary headquarters is now available as a guide for future designers. This way the heightened occurrence of crime, bomb attacks unnecessary killings of staff working under such institutions will be greatly curtailed if not brought to an end.

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APPENDICES

Appendix A: Interview Questions

The following questions are a product of the researcher's study which attempts to extend the frontiers of knowledge under the M.Sc. (thesis) research in architecture, titled **"ENHANCING SECCURITY RESPONSIVENESS THROUGH SPATIAL ORGANISATION IN PARAMILITARY BUILDINGS IN NIGERIA".** This questionnaire is strictly prepared for academic purpose and will be treated with utmost confidentiality. The researcher wishes to provide a copy of the research findings to the respondent if he/she desires.

- What are the spatial features of a security responsive environment?
- How can the spatial features of security responsive environment be assessed?
- What are the spatial preventive measures adopted to hinder the ingress of criminals in paramilitary buildings?
- How can these preventive measures be enhanced?
- What are the spatial characteristics of paramilitary premises?
- How can security responsiveness through spatial organisation be achieved in paramilitary complexes?

SECTION A: RESEARCH QUESTION 1

1. Request for the building's working drawings
2. Request for taking snap shots

3. What motivated the building design?
4. How can you assess the level of security adequacy in this building?
5. Are there security standards in paramilitary buildings?
6. What are the unique security features/standards a paramilitary building should have?
7. Was the building designed to be security responsive?
8. What are the elements/measures of security responsiveness in this building?
9. Why were they adopted?

SECTION B: RESEARCH QUESTION 2

10. What/where are the probable targets (assets) in the building?
11. Are there threats around the building?
12. What are the nature of threats usually posed to the building?
13. What are the threats anticipated from parking areas?
14. Have there been any cases of external aggression in the building?
15. Do any of the neighboring buildings prove an external threat to the premises?
16. What are the security challenges usually experienced?

SECTION C: RESEARCH QUESTION 3

17. How does the authority tackle criminal ingress (intrusion) and egress into the premises?
18. How do you get surveillance records?

19. What are the strategic positions that demand major surveillance and enhancement?

SECTION D: RESEARCH QUESTION 4

20. Do you think the security can be enhanced?
21. As an expert in the field, in what way do you personally think security responsiveness can be improved?

Appendix B: Informants Profile

S/N	Employer	Position	Years In Service	Years In Current Position	Specialized Area Of Education	Highest Level Of Education
1	NPF					
2	NPF					
3	NPF					
4	Tomoro Architects					

Appendix C: Standoff Distance Check List for High and Low Occupancy Buildings

Location	Applicable Level of Protection	Minimum Stand Off Distance (High Occupancy)	Applied Standoff Distance	Minimum Stand Off Distance(Low Occupancy)	Applied Standoff Distance
Parking					
Trash Can					
Perimeter Fence					

Appendix D: Checklist for asset categories and potential aggressor types.

Variable/asset categories	Criminal			Protestants	Terrorists	Subverives (spies/saboteur
	Casual	Career	Highly org.			
Information						
Vehicles						
Mission critical personnel						
Arms, Ammunition, and Explosives						
Military/ Civilian personnel						
Building						

Appendix E: Asset category and security system ingress/ egress denial.

Asset Category	Security System	
	Ingress Denial	Egress Denial
Information		
Vehicles • Military critical • Other		
Mission Critical Personnel • Assassination • Kidnapping • Hostage		
Arms, Ammunition and Explosives (AA&E)		
Military/ Civilian Personnel • Kidnapping • Hostage		
Building • Military • Other		

Appendix F: Interview analysis table

Concepts	Variables	Remark		
		Satisfactory	Average	Unsatisfactory
Natural surveillance	Architectural design			
	Lighting			
	Visual connection (clear sightlines)			
	Security system elements			
	Site security control			
	Building materials			
	Offsite vantage points due to orientation			
	Offsite landscaping			
Natural Access Control	Unobstructed space (Visual barrier)			
	Access control points (Physical barrier)			
Territorial Reinforcement	Landscape			
	Spatial control			
	Doors and Gates			
	Perimeter control			
	Standoff distance			
Traffic control techniques				
Parking				
Landuse compatibility				
Building siting and control				