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The Architectural Plausibility of an Urban Parking Facility Project: A Jos City Centre Scenario

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Abstract
This paper is aimed at addressing the car park shortage problem of the Central Business District, CBD, of Jos, the Plateau State capital, Nigeria, West Africa. The car park dilemma has become a blot in the landscape in the city centre as a result of its gross inadequacy. A study of the city centre's car park problem revealed a continuing, incremental trend whose magnitude cannot be easily quantified. The purpose of this paper is to put forward a plausible, sustainable solution which would address the parking problem such that it is contained as the need arises irrespective of the developmental stride of the city centre. This was achieved by undertaking a field investigation and an Outline Architectural Design of a prototype car park facility in the form of add – on – module to address the exigencies of sustainability and adaptability to address the unpredictable but surely increasing future car park needs. Through this means emerges a blueprint for means of addressing the present car park problems and also the future requirements within the framework of socio - economic, environmental and sustainability angles.
Keywords: Architectural Design, Car Park, Central Business District (CBD), Planning, Sustainability

1. INTRODUCTION

1.1 Background

Jos is a town that its background and growth dates back to the early 19th century and also its commercial and cosmopolitan ascendency is as a result of the mining activities in Tin and Columbite in its general area. All these have also led to its importance in the following geo – political era in Nigeria:

i. The four – region structure of the late 1950 to early sixties,
ii. The 12 - state structure of 1967 - 1975,
iii. The 19, 21 and 30 state structures
iv. The present 36 state structure.

During the four – region era of Nigeria, Jos was the 3rd most important town in Northern Nigeria, after only Kaduna and Kano. In the 12, 19, 21, 30 and 36 – state structures, Jos retained the position of headquarters of the old, new and the present Plateau state. The town is also a terminal for railway line. At the outskirt, is an international airport, the Yakubu Gowon International Airport at Haipang. Through all these periods there have been steady and continuous increase in human population, businesses, buildings and other paraphernalia of urbanization including cars busses, trucks and articulated vehicle as major means of transportation within the city.

Consequently, traffic congestion and car park shortage became major problems in the city especially from about 2004. This was mainly as a result of increase in the volume of activities in the Nigerian economy and the enhancement of workers' salaries by the introduction of the Eighteen thousand naira (N18,000.00) minimum wage by the Chief Olusegun Obasanjo administration of 1999 – 2007 which was in turn, facilitated by the appreciation of the global oil price. The visible effects of these developments were the explosion in the number of cars on roads of Nigerian cities including Jos with severe burden of traffic congestion and acute parking space shortage especially within the city centres. These problems were aggravated by the fact that there was neither provision of commensurate Road networks nor parking spaces to address this increase in number of vehicles in the cityscape.

1.2 The Problem Statement

With plenty vehicles in the CBD of Jos, several of the streets are always clogged with cars as a result of dearth of good Road network and parking spaces. It is only a few banks and commercial premises that have designated very limited car parking spaces which have become grossly inadequate as result of this vehicular explosion. Even at that, with the advent of the danger of vehicular bomb blasts and suicide bombs as a result of the ongoing Boko Haram insurgency in Northern Nigeria the use of almost all designated parking spaces in most institutions have been denied.

In order to secure a parking space a driver would have to maneuver for an unreasonable length of time with the attendant loss of man hour and patience. Sometimes after several attempts and securing no parking space some drivers (out of desperation and frustration) leave their cars with a good part of it blocking a portion of the road or blocking other cars. This shortage of parking spaces also compel car owners to engage in "double" parking which leads to the nuisance of traffic congestion. Even if space were secured, parking is usually done in haphazard manner as a car may be placed awkwardly in a position that could accommodate two cars. This problem is usually as a result of absence of order and direction in the parking process and location. These difficulties usually compel vehicle owners to park their cars at locations remote from where they intend to transact businesses, leading to

some of them falling victim to car part pilferers, car thieves and burglars.

There is currently a situation in Jos town (as of 2014) whereby young boys and girls are engaged by the state government to go about collecting fees from car owners who park at some locations (especially, Ahmadu Bello Way, Beach road and Rwang Pam streets) in the CBD in the name of parking charges. In as much as this study neither undermines nor criticizes the Internal Revenue Generation (IGR) efforts of the State Government, there appears to be great moral deficit in the practice, in that nothing whatsoever is being done by the government or its agency collecting this revenue to add value to the space that the cars are parked. The spaces in which these cars are parked are neither kept clean nor designated for that function and despite the fact that revenue is being collected, cars are parked at *owners' risks*. With this type of anomaly in mind, Fadamiro and Fadairo (2000), had found that interventions of the government in urban management and administration has been fragmentary and uncoordinated creating overlaps and conflicts, thereby hindering the successful management of the urban growth.

The value of land is very high in the Central Business District (CBD) of Jos. This factor usually constrains developers to use up their land leaving little or nothing for parking spaces. Although many architects are aware of their duty and the requirement to provide commensurate and adequate parking spaces for designed facilities, they are usually encumbered by the land value factor (coupled with pressure from clients), making them acquiesce to schemes that short change the provision of adequate car park spaces.

The development regulatory agency for the metropolis, the Jos Metropolitan Development Board, (JMDB) does not seem to be alive enough to its responsibility of enforcing statutory parking space provision requirement for old, on – going or new projects. It is very common to see commercial buildings whereby 70% to 90% of the spaces are built – up and making no provision for parking, thereby compelling cars to park along the roads.

The situation whereby cars litter every available space does not only constitute eyesore in the cityscape, it is also an aesthetical slur on the environmental quality, thereby jeopardizing the government's effort of making tourism a major item in its political and developmental agenda. All these factors necessitate the need for a proposal to resolve the acute shortage of parking spaces in Jos, the plateau state capital.

To compound the hazard of the haphazard parking habit in Jos , is the contemporary danger of insurgents using bomb laden cars as vehicle to achieve their nefarious activities. In a recent incident on the 20th may 2014, twin car bombs went off within 10 minutes of each other claiming the lives of about 120 people. All these instances necessitate the provision of dedicated prototype car park facility in the form of add on module as is being enunciated by this paper.

1.3 Aim and Objective

The aim of this study is to propose the resolution of parking space problem by providing through architectural and planning precepts the plausibility of prototype commercial parking facilities for the CBD of Jos.

In order to achieve this, the following objectives were considered:

(i) To determine and quantify the average parking time or turnover of vehicles per parking space within the Jos city centre.
(ii) To categorize parking spaces and users based on parking duration.
(iii) To provide outline architectural design of a suitable prototypical, modular parking facility.

This study therefore focused on parking space shortage and how it could be ameliorated within the Jos city centre by developing a justifiable and plausible facility from the design, planning and economic angles. Alluding to this approach to resolution of social and environmental challenges, Fadairo and Ogunduyile (2010) maintained that to the planner and architect, the urban land is a resource to be used to achieve coherence and conforming land use pattern, hence they allocate land for efficient, harmonious and integrated usage.

In the field survey process, to actually determine the number of vehicles so that the figure could be used for planning is a bit difficult in that the number varies greatly from day to day as a result of variation in days of the week, municipal nature of Jos, in which events / celebrations (national or religious) could greatly influence the influx of cars into the city. This makes it necessary to use average figures as estimates and even at that, the future number of cars that would visit the city centre still remains largely unpredictable. In order to overcome this unpredictability, the proposal by this research is in the form of prototypical and modular design in which, based on the arising needs, parking facility units could be added on to sustainably meet unfolding parking exigencies.

1.4 The Study Area

The CBD of the city is taken to be the general area, demarcated or circumscribed by the following roads and land marks: Mango Street, Enugu road, up to the Polo Field, Joseph Gomwalk Road, Standard Building, Masallachi Juma Road, Tafawa Balewa Way, West of Mines Junction, Zoo Area, Central Bank/ Bank Street Area, Sharia Court of Appeal, Constitution Hill Road, Murtala Mohammed Way, Gangere Road, through Yam/ Potatoe Market, Dilimi Road, Nasarawa Road, turning left to cross Bauchi Road at Zololo Junction, and back to Mango Street. The following roads, areas and land marks, included in the CBD:

1. The Masallachi Juma Street

2. Old Bukuru Park
3. Tafawa Balewa Way
4. Rwang Pam Township Stadium
5. West of Mines Junction
6. Rwang Pam Street
7. Langtang street
8. Shendam street
9. Panyam street
10. Church street
11. Ahmadu Bello way - beach road
12. Murtala Mohammed Way
13. Old Jos University Teaching Hospital
14. The Jos Main Market and Precincts
15. Bauchi road, from terminus rotary interchange to Zololo junction.
16. Constitution hill road up to *British America insurance* junction

In this area there are 31 banks including the Central Bank, Jos, a total of 65 commercial buildings of over two storeys, over 30,000 stalls, stores, shops of small and big time traders and merchants, dealing on sundry items like building materials, clothes, books/ stationery, computers, accessories and repairs, restaurants, household items, mobile traders and hawkers. It is the existence and patronage of these businesses that are responsible for the influx of cars and persons into the Jos city centre that in turn cause the car park problem.

1.5 Justification

The provision of a dedicated commercial parking facility apart from solving the chaotic urban parking problem ensures the provision of reasonable security as the cars are parked under the care and watchful eyes of security guards. Ameh and Oko (2001), citing Becker and Sims (1992), elucidate that managing and using space has become a major pre occupation of many organizations in major metropolitan areas such as New York, London and Tokyo. Additionally, the provision of such facility contributes to urban aesthetics and harmony. Alluding to this fact, Fadairo and Ogunduyile (2010) pointed out that the objects produced by the architect are relevant to more than one of the senses – the senses of sight, touch (feeling), or movement since the architect creates boundaries in space. They further opined that in architecture, there is the need to walk through a building or the space created or even touch some of the materials to be able to fully appreciate them.

A purposefully designed car park facility project, if properly executed and managed does not only generate money for the entrepreneur (thereby attracting investors) it also solves the socio – economic and environmental problem by generation of employment and presentation of an aesthetically pleasing and orderly environment. A situation whereby most cars in the urban centre are neatly parked in such facilities would help to promote the image of Plateau State of Nigeria as a tourism destination. By imbibing the idea of sustainability as espoused by this research there is the potential of expanding car park facilities as and when the need arises thereby ensuring that no matter how the CBD develops or expands, viable commercial parking facilities such as this would easily be added on from the smallest or single module to sustain the orderliness engendered by the facility. This would be a sustainable, continuous and continuing solution to present and future parking problems. Figure 1 shows that parking spaces in property and designated areas constitute only about 30% as at 2008. At the time of this study (March 2015), it was discovered that parking spaces are less than 10% even at that, parking spaces in property like banks are greatly reduced since cars are no longer allowed to park in such premises for security reasons.

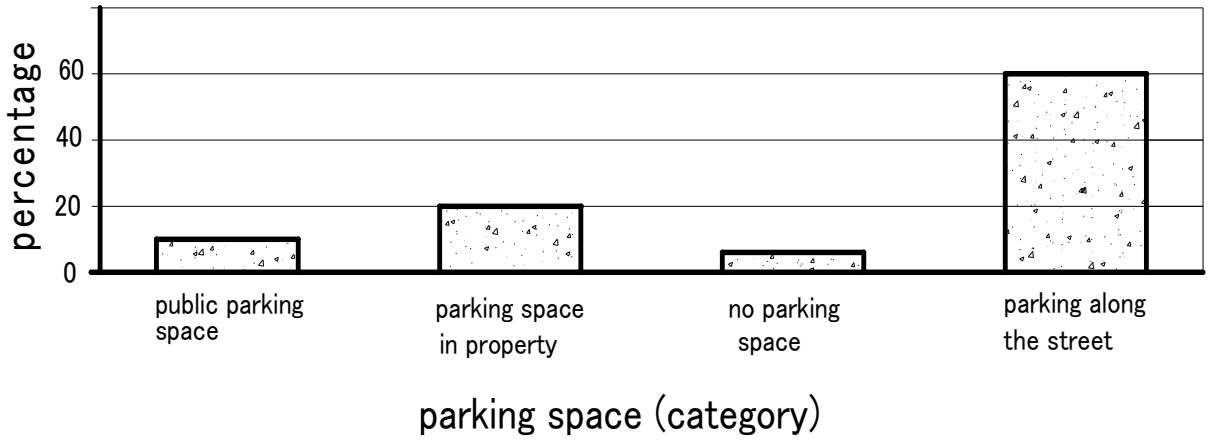

Figure 1: Parking Facilities Distribution in Central Area of Jos
Source: Socio-Economic Survey, Greater Jos Master Plan, February, 2008.

2. MATERIALS AND METHODS

2.1 The Research Design

This study used a combination of field survey and Descriptive research to obtain information concerning the current status of problems and also to describe "what exists" with respect to the conditions in particular situations. Supporting this approach to problem solving, Awotunde and Ugodulunwa (2004) averred that this type of study makes descriptive assertions about some population after discovering the distribution of certain traits or problems. In this research, the problems and purpose are described and then the proposed solutions are proffered in descriptive form (and Outline Architectural Design, which is a product of research in its own right).

2.2 Procedure

Trained enumerators were used to obtain information like duration and categorization of parked cars. The process involved the use of eight trained enumerators to note the parking duration of the vehicles at different locations of the CBD of Jos city. Their locations were: Rwang Pam street, Ahmadu Bello Way, Beach Road and Murtala Mohammed way, part of Bauchi road and Tafawa Balewa Way with two enumerators respectively. Each of the eight enumerators was in the same location for two days and later moved to other locations. This was done unobtrusively as the vehicle owners did not know that they were being watched and logged.

Architectural design precepts of car park facilities were appraised to be able to propose such a facility for the study area. Some of the precepts appraised were such parameters an cars turning radiuses, suitable parking space dimensions, orientation, configuration and relevant facilities for standard city parking facility.

3. RESULTS

The work of the enumerators revealed following:

A. The prevalence of car clogged streets, near absence of parking spaces, double parking, haphazard parking of cars, remote location of parking openings, theft of /from parked cars, unkempt places used as car parks, the non provision of commensurate parking spaces in facilities in operation or those being developed and the absence of watch over parked cars. These observations were all pervading in the CBD of Jos.

B. Three distinct types of parking duration users were observed:

(i) Those that park for a very short duration - dash to a shop, pick up an item or two, return to their car and leave all within five minutes.

(ii) Those that go for shopping that take from about 30 minutes to three hours.

(iii) Those that leave their cars for the whole day, say from about 8am to 5pm.

Those in group (3) are traders or officers who as they are in their shops or offices, leave their cars until they are about to go on break, or finally go home at the end of the day. Groups 1 and 2 make for quick turn over of parking spaces.

C. The Necessity for the Provision of *Outline Architectural Design* of a Prototype Parking Facility. From this angle, if the proposed facility is to be undertaken as a life project, following the *Outline Architectural Design,* any qualified Architect, could easily produce the comprehensive Working Drawings that would bring the project to reality.

4. DISCUSSION

4.1 The Functional Analysis and Architectural Design of the Car Park Facility.

A car park facility is a project designed and constructed to cater for the parking of cars while the car owners go about their businesses. Emmitt and Gorse, (2010), indicated that the functions of such a facility include providing: Shelter, security, safety, ease of use and operation, ease of maintenance upgrading, adaptability and durability.

In order to achieve success in such a venture, it is necessary to diligently work out the constructional requirements so that there would be no room for ambiguity in costing. Reasoning along that line, Okpala, 2000, opined that financial risk (including cost overrun) is directly related to the ability of the client to fashion out and execute an adequate financial plan. This financial plan can only be obtained from the costing of a fairly detailed Architectural Design and Details.

4.2 Necessity for the Automatic Number Plate Recognition (ANPR) Technology.

For security reasons, the (ANPR) would be attractive and is hereby recommended for application in such a facility. Ching, (2011) asserted that it is ideal for facilities with high capacity car parks as it is fully automated and operates 24/7, 365 days a year. This technology could capture the plate number of any car that comes into the facility and as the need arises, could relate it to other relevant information in car registration Data Base.

4.3 Outsourcing the Management of the Facility

In order to achieve successful and smooth operation of this facility, it is recommended that the facility is provided by the State Government and its management outsourced to specialized outfits. Shika, Abdulsalami and Sagada, (2010) citing Behara et al, (1995) elucidate that outsourcing (also called third party contracting) concentrates an organization's resources on its core competences allowing the organization to achieve a definable preeminence and provide a unique value for customers. This is more poignant when viewed against the backdrop of antecedents of mismanagement and failure of Governments (State and Federal) to properly run and maintain facilities.

4.4 Ingress/egress, elevated security post and ATM points

The parking facility as designed is to have one point of ingress and one for egress. This is for security reason as they would ease monitoring of vehicles and also make for better and neater circulation. There are eight automated teller machines ATM to ease accessibility to cash for shoppers. It is also proposed that they are sublet to eight different banks – four each at the points of ingress and egress. There are two security posts, the inlet post being where payments are made and receipts issued for parking fees. At this point also, the car type, registration number, arrival time and date are noted and a security plastic tally issued. This is to enhance the security of the car as the tally is produced at exit point. This is in addition to the use of the ANPR technology.

4.5 Parking Space for Single Module of 172 Car Capacity

The parking spaces are for a wide range of conventional cars. Chiara and Callender, (1987) have instructed that Parking spaces should be built to accommodate the larger cars frequently used, although not necessarily the very largest. They further pointed out that Planning in hopes of just medium and small size cars would be used, invites difficulties, consequently, the parking lot size is uniform - 5000mm x 2500mm of rectangular orientation. The parking spaces proposed in this facility are not for articulated vehicles, Lorries, tippers or busses. Upon alighting from the vehicle, there are 100 mm thick concrete kerbs that bound pedestrian walkways, separating the vehicular from the pedestrian traffic – for safety and protection of pedestrians. This therefore leaves a strip of 1200 mm for pedestrian movement upon alighting from the car (see figures 2 - 5).

4.6 Drainage

The drainage of water in the facility is in the form of open channel running at the four perimeters of the site. The object of this is to direct all surface water away from the vehicular and pedestrian paths depending on the topographical disposition of the site. The open channel nature of the drainage ensures easy, periodic clearing and cleaning. The dimensions of the channel on the is 500mm X 600mm and average of 600mm depth. The fence and the kerb continue from the drainage channel walls (figure 11).

4.7 Hard Surfaces for Cars and Pedestrians. The hard surface for cars and pedestrians is made of durable inter locking tiles of 50mm thick precast concrete on a 100mm dry bed of stone base and stone dust. The interlocking tiles are bounded at the edges by precast concrete kerbs of 100mm thick x 500mm long x 300mm high. The width of the walkway is 1200mm to permit simultaneous movement of two persons abreast.

4.8 The fence. Fence which is provided for demarcation and security is made up of 225 mm sandcrete blocks of 1500mm height at all four sides and takes on a design a design at the street approach elevation for reasons of greater visibility, aesthetics and security. On top of the fence on all sides are secured helical, inter twined barbed

wires for enhanced security.

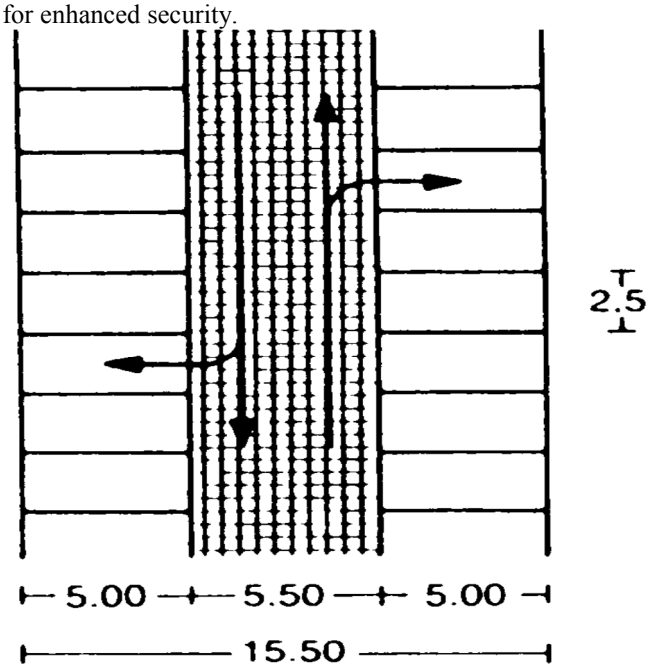

Figure 2: 90^{O} Exit/Entry, Two – Way Traffic Parking Space 2.5 m Wide - The Adopted Format.
Source: Neufert, E. & P. Architects Data (1987)

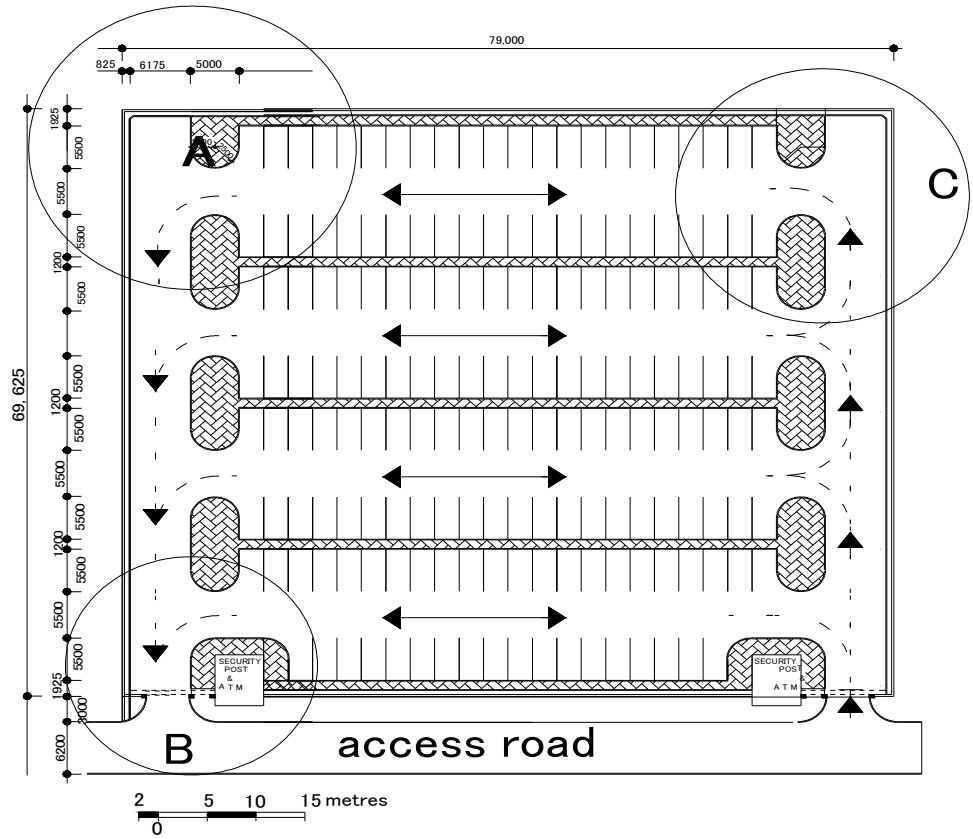

Figure 3: The vehicular and pedestrian Circulation Plan - (single or basic module – for 172 car capacity). Source: author's design

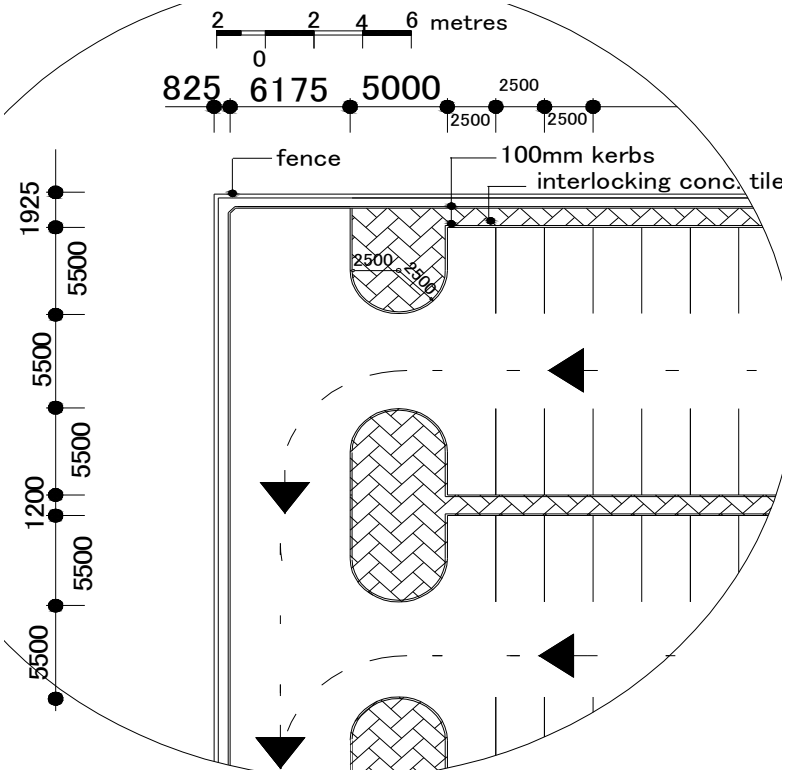

Figure 4: Infrastructural Detail at A. PLAN.
Source: author's design

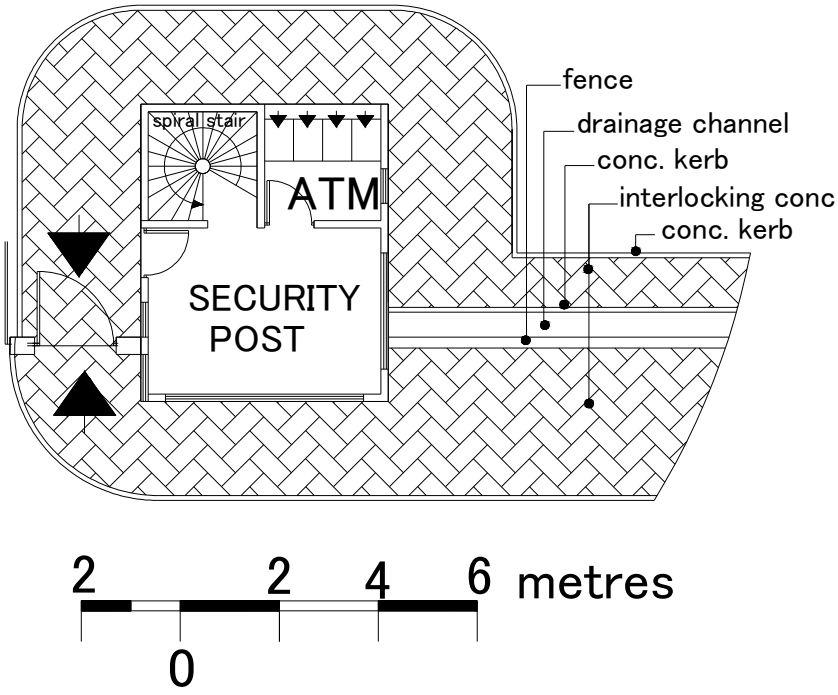

Figure 8: Ground Floor plan at security post showing the Surrounding setup.
Source: author's design

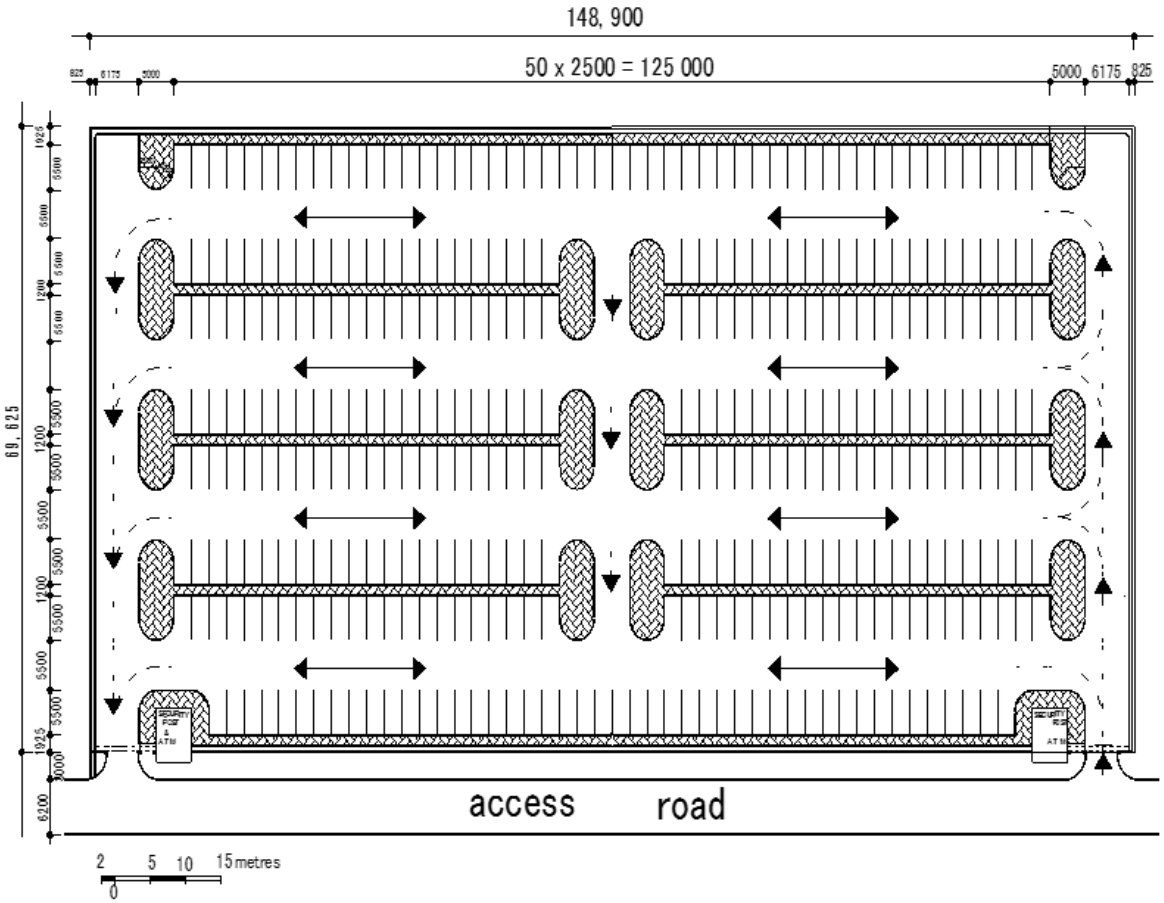

Figure 5: The vehicular and pedestrian Circulation Plan - (double module - 358 car capacity). Source: author's design

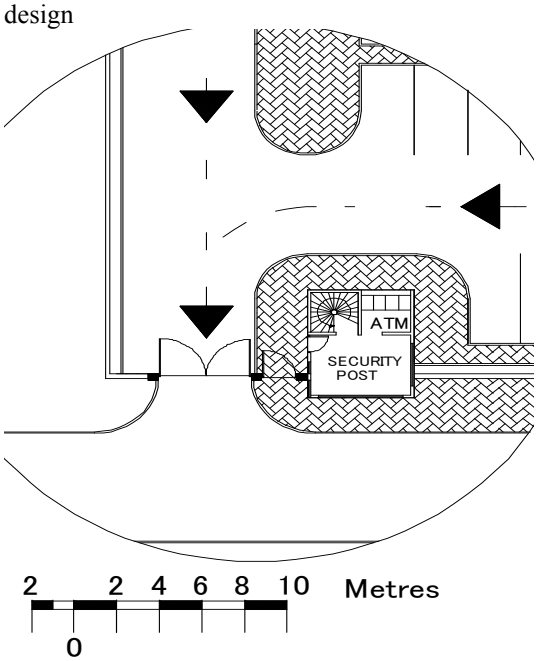

Figure 6: infrastructural Detail at B (PLAN). Source: author's design

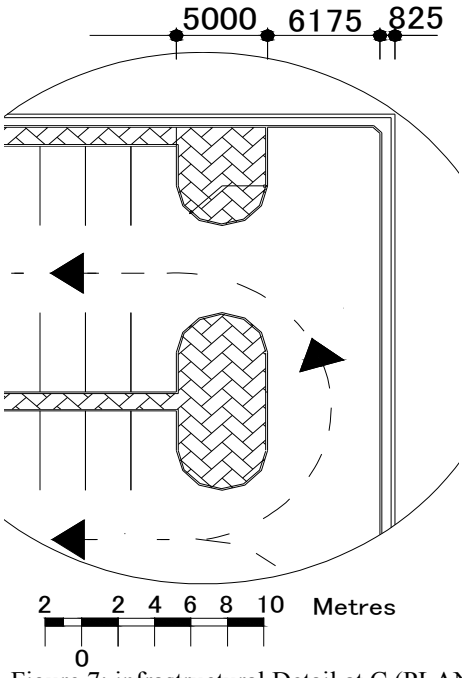

Figure 7: infrastructural Detail at C (PLAN). Source: author's design

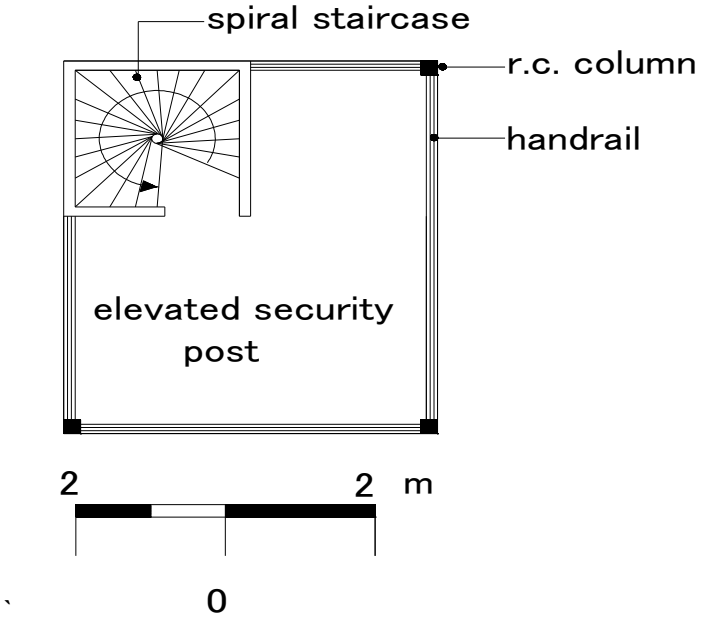

Figure 9: Upper Floor Plan of Elevated Security monitoring Post.
Source: author's design

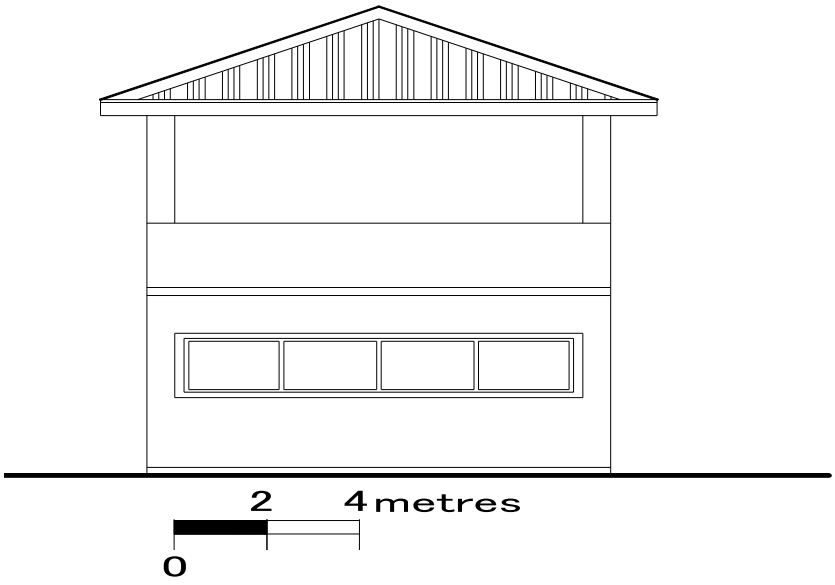

Figure 10: Approach View of the Security post with Elevated Monitoring Post.
Source: author's design

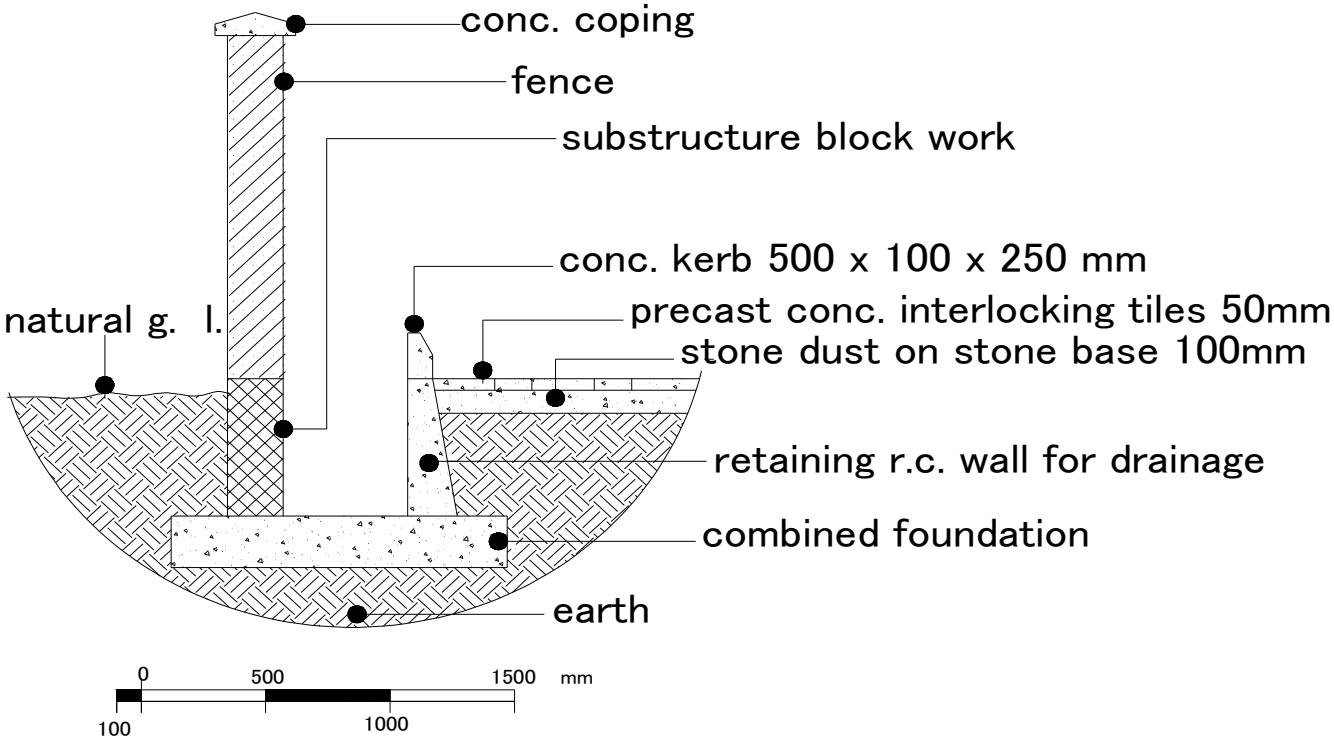

Figure 11: Section through the Combined Foundation base, Fence, Drainage Channel and retaining wall Source: author's design.

4.9 Lighting for Security and Aesthetics. There are provided lighting points from all the two security posts and on the fence walls. The wall mounted fittings are at horizontal intervals of 6000 mm and at a height of 1200mm from the ground on the interior of sides, front, and rear walls. The street side fence has wall mounted fittings at the exterior side.

4.10 CCTV for security. In order to guard against theft, pilfering from cars, mugging and general security, closed circuit television cameras and monitors are provided. The cameras are located at the fascias of the two elevated

security posts. A total of six closed circuit television cameras, (CCTV) or video cameras are provided for security.

4.11 Vehicular Turning Radius. In order to effect smooth and convenient navigation and circulation an outermost turning radius of 7.5m was used. Neufert and Neufert (1987) gives the minimum range as between 5.3m and 6.5m for short and long cars respectively.

4.12 Automatic Number Plate Recognition (ANPR) is a fixed camera controlled system designed to detect parking abuse such as unauthorized use of parking areas, or to enforce limited waiting regimes. There is the need to provide this gadget in different parts of the CBD and especially within the parking facility.

5.0 Recommendations and Conclusion

For effectiveness and sustainability, the eed that the recommendations of this study be strictly adhered to unless there emerge other extenuating circumstances beyond the purview of this study. The concept of modular incremental parking space based on exigency is a sustainable socially, economically and environmentally relevant solution to the car park quagmire in the CBD of Jos, the plateau state capital of Nigeria.

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