

**DESIGN OF A MODERN CAR PARKING AT THE FACULTY OF ENGINEERING,
TECHNOLOGY APLIED DESIGN AND FINE ART**

BY

BYAMUKAMA SAMUEL

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SUPERVISOR: MR. MUHANGI BRUNO

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APPROVAL

this is to certify that byamukama samuel a second-year student of kabale university carried out a research project titled “design of a modern car parking at the faculty of engineering, technology, applied design and fine art” under my supervision and it is due ready for submission and examination with my approval.

Name.....

Signature:

Date:

DECLARATION

I, **BYAMUKAMA SAMUEL**, hereby declare that the work contained in this project report is solely mine, except where otherwise indicated, and has never been submitted for the award of any academic certificate in any academic institution or college. It is therefore original and duplication of this report is not allowed unless otherwise.

Signature.....

Date.....

ACKNOWLEDGEMENT

My profound gratitude goes to my supervisor, MR MUHANGI BRUNO of the Department of Civil Engineering, Kabale University for his guidance and invaluable contribution that ensured that this research work was properly undertaken. I remain greatly indebted to him. I'm also grateful to the Dean of Faculty of Engineering, Prof. Musaazi , and other lecturers of the Department of Civil Engineering, Kabale University for their support. I will forever remain grateful and indebted to my mother Mrs. Asiimwe Grace and the entire family for their moral support and encouragement that always inspire me to achieve heights. Finally, I wish to appreciate my colleagues and friends whose names have not been mentioned here, but have contributed one way or the other to the successful completion of this research.

DEDICATION

I dedicate this report to my mother **ASIIMWE GRACE** and Aunt **JANE NDAMATA**.

ABSTRACT

The ever-increasing use of the faculty green land as a parking lot for vehicles called for our group to research and designs a modern car ark. The investigated the most feasible solution of keeping in lace equal ratio of green land to buildings in the existence.

To achieve this, we designed a ground plan, model using arch cad and hand molded a prototype using mounting boards, novice glue, to show what we exactly designed using the software.

Chapter one about introduction explains the basis of the faculty, back ground of the project, problem statement, specific objective, main objectives .

Chapter two explains the basis of our research, study and source of the knowledge of our design.

Chapter three gives an overview of the employed methods that helped us to come find feasible solution to the problem statement. It includes bench marking, data collection, and design among the many

Lastly chapter four explains the future works, conclusions and recommendations.

LIST OF ABBREVIATIONS

CAD Computer Aided Design

3D three dimensions

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

Every car on the road needs a space to be parked in; it is a key issue in almost all urban centers. Unfortunately, I wonder why our campus of Nyabikoni just considers it as a minor issue. Compared to other faculties, the engineering faculty Nyabikoni campus exists to have no definite parking for motor vehicles. Since there is an expectation of development of the campus and the whole university at large in the nearby future, there is a need to construct an organized and a modern car parking area at Nyabikoni campus that will fit with the standards of the campus. This will help to curb on disorganization of motor vehicles around campus thus improving the aesthetic nature of the campus. Cars in urban centers take up space when they are moving but an average of twenty-three hours a day they are parked, and if at all they were used for all journeys they would require parking space at both ends of the trip hence need for more parking space required. Often cars in developing countries get more parking space than an average human. Parking is a very important aspect in the faculty sector since the availability of convenient, safe and secure parking spots determine how students and lecturers reach their destinations. In many developing cities, parking is still a major challenge in way that even the available off-street parking is cut off roads which is not in line with one of the good modules of go parking where Parking needs space which is not at any moment available to other road users. My project is a design of a modern car parking at the faculty of engineering, technology applied design and fine art to enable the lecturers, students, and nearby community conveniently lease a parking spot in the desired parking lot as it was indicated in the model. In a fast-growing university mainly Kabale university, there is increased numbers of motor vehicle with constant number of traffic regulation and management facilities hence high competition for the few ones and uncertainties in acquiring them. This parking will help users to eliminate uncertainties in finding a parking spot.

1.2 Background

Presently, Nyabikoni campus does not have a definite parking space to meet the increasing number of cars especially in the faculty of engineering thus the campus is in need of modern and advanced parking.

1.3 Problem statement

- There has been non-existence of demarcated parking space or lot for a long time, of course the huge enrollment this year and expecting more in the years to come, which will lead to congestion and disorganized compound in regards to retain an equal ratio between green land and concrete buildings. We've actually tried to find a physical solution to the problem other than simply having cars parked anywhere on Green.



Figure 1; wing cars parked on the green land

1.4 Justification of the problem statement

A car parking on the green land deteriorates the green nature of the faculty environment. According to the local regulations the Greenland ratio to the existing buildings will be violated.

More to this it reduces the aesthetic nature of the faculty. Thus, it needs a feasible solution like a demarcated and designed parking lot for the vehicles.

1.5 Main objective

- To retain an equal ratio between the green land and the existing building thus improving the Aesthetic nature of the campus.



Figure 2; showing an equal ratio of green land.

1.6 Specific objectives

- Minimizing negative impacts to the natural environment such as unnecessarily removing mature vegetation or degrading soil stability
- To have aesthetically pleasing and functional parking areas that fulfill the needs and requirements of the users.
- Preserving and integrating existing mature trees in future parking
- Locating parking lot convenient to buildings.
- Preserving sight lines to entries and significant landscape in architectural features.
- Using topography and trees to mitigate negative visual impacts.

CHAPTER TWO: LITERATURE REVIEW

2.1 Analysis

The *Air force handbook, 32-11084, 31 & 32 ages*, provide criteria for parking associated with facility types. An excerpt of the handbook is provided in the appendix for the designer's convenience. Commanders and managers, who plan, program, review, certify, and approve Air force projects, thus a book for the basis of our study.

The analysis also included site study and determining where to situate the parking that is bench marking, site visit, data collection and reconnaissance.

2.2 Parking study

In determining the need for specific facility during the design from a comprehensive and detailed analysis. These studies helped us to determine the deficiencies in the total number of spaces and how long the spaces are going to be occupied. The parking study may be used as the basis for recommending additional spaces as well as altering configuration or circulation patterns. The parking included the following items:

- Inventory of total parking space within a specific area
- Analysis of specific problems such as poor location or deficiency of visitor or reserved parking areas and employee parking.
- Determination of parking duration and turnover rates
- Identifying access difficulties and poor pavement or plant material condition

The overall parking requirements were influenced based on the following:

- Collocation of compatible facilities to use common parking areas
- Reducing vehicle use through encouraging use of alternative transportation methods.
- Providing safe and attractively landscaped bike paths and walkways

(Car park Designers Hand book, J.D Hill, SECOND EDITION. 23&24

2.3 Physical requirements

The physical requirements considered while designing the car parking included the following: Siting, Miscellaneous, Parking area types, Geometry, Access, Maintenance

2.3.1 Siting

To most people, the ideal parking space is a few steps from their home or office door. We made use of a number of concerns to logically, efficiently, and economically site the parking area. Some of these include:

- a. Minimizing excessive grading operations and balancing cut and fill
- b. Integrating adequate parking spaces with surrounding facilities and existing circulation patterns
- c. Locating parking areas convenient to building entrances
- d. Using a topography and trees to mitigate negative visual impacts
- e. Separating customers and employee parking areas.
- f. Preserving sight lines to entries and significant landscape and architectural features
- g. Preserving and integrating existing mature trees in future parking

2.3.2 Orientation

To create safe and convenient parking areas, the orientation and configuration of the parking area must be considered early in the siting process.

- i. Align rows of parking spaces perpendicular to the facility minimizing the number of pedestrian aisle crossings
- ii. Provide access points and crosswalks from parking areas to facility entries.

2.3.4 Miscellaneous

The common parking area planning and design guidelines are:

- Use 36 square meters per vehicle (includes entry, circulation, and parking spaces) as atypical planning and cost estimating factor
- Minimizing parking area entrance and exit curb cuts
- Locate separate visitor and reserved parking at the front entry of the facility

- Eliminate dead end parking areas
- Locate entrances and exits away from busy intersection.
- Locate aisles and rows of parking parallel to the long dimension of the site with parking on each side of an aisle.
- Use rectangular parking area to minimize land areas requirement

2.3.5 Setbacks

I observed proper setbacks in designing parking area of the model by dimensioning.

Suggested parking area setbacks

From	To	Minimum Distance(meters)
Parking area curbing	Facility walls	6
Parking area entrance and exits	Roadway intersections	15-45
Parking area curbing	Perimeter screen walls	1.5
Parking area perimeter	Parallel roadway	6
Parking area curbing	Outside of edge of adjoining walkways	2

2.3.6 Grading and Drainage

Parking areas should be properly drained to take of runoff. The following minimums were used;

- Ideal slope for all parking area pavements is 20%
- Longitudinal pavement slope should be between 1%-5%
- Pavement cross slope should be between 1%-10%
- Storm water should be collected on the perimeter of parking areas with a minimum of 2% slope along concrete curb and gutter.

2.3.7 Curve radii

The radius of our parking area entry or exit curb return was 4 meters. When significant use by buses is expected, the radius is increased to 13 meters. Interior radii for perimeter curbing and islands are reduced to 2 meters. We took Care to provide an inside turning radius of at least 4 meters on all internal vehicle circulation aisles. Thus, why we increased it by 13 meters because the university has buses and in future the university is going to have truck.

2.3.8 Maintenance

Regular maintenance can greatly prolong the life and utility of parking area pavements. They should be regularly policed for litter and plant material debris. Parking spaces should be restriped as required.

Removal of debris and snow are special considerations for the designer. Elements such as islands and curbs can interfere with expediency of these activities thus should be avoided.

During the design, consideration of ample and well-located snow piling areas where frequent and significant snow accumulation is expected. Like in the faculty, there is a lot of frost during night, which can affect the design of a car parking in the faculty.

2.3.8 Geometry

Parking areas take on many configurations. Parking spaces may be parallel, perpendicular, or angled (30, 45, or 60 degree) to the driving lane, or aisle. A common factor among these various parking layouts is the size of the parking space. The minimum standard automobile parking space should be 6 meters long and 2.75 meters wide. Aisle widths vary based on the angle chosen and if they are one- or two-way. Two-way aisles should be a minimum of 7 meters wide.

The area required by each parking configuration will vary. As a general rule of thumb, the closer to perpendicular, the more vehicles can be parked per linear meter. Perpendicular, or 90-degree parking, accommodates 82 vehicles per 100 linear meters versus just less than 40 vehicles for 30 degree.

Summary of the dimensions and attributes of the parking area configurations is provided in the Appendix. Some of the advantages and disadvantages of the various parking configurations are addressed in the following paragraphs.

2.4 Parking Area Type

2.4.1 Off-street parking

Off-street parking is the most common and accepted method of satisfying facility parking needs. In many cases, these areas are developed as one large mass parking area. When we were siting off-street parking areas, we tried to should consider

- Creating multiple smaller parking areas rather than one large mass
- Integrating planted islands to increase aesthetics
- Minimize extensive grading operations by designing to the topography
- Ensuring a distance of at least 15 meters is provided from proposed parking area entrances and exits to intersections

Minimizing the number of entrances and exits

2.4.2 Geometry

Parking areas take on many configurations. Parking spaces may be parallel, perpendicular, or angled (30, 45, or 60 degree) to the driving lane, or aisle. A common factor among these various parking layouts is the size of the parking space. The minimum standard automobile parking space should be 6 meters long and 2.75 meters wide. Aisle widths vary based on the angle chosen and if they are one- or two-way. Two-way aisles should be a minimum of 7 meters wide. Now our car parking design is at angle of 90%

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Summary of the dimensions and attributes of the parking area configurations is provided in the Appendix. Some of the advantages and disadvantages of the various parking configurations are addressed in the following paragraphs.

2.4.2 Parallel

For the designer, the parallel parking configuration can be used where suitable off-street parking cannot be accommodated or is not practical. For the driver, parallel parking requires experience, confidence, and patience.

Parking spaces should be a minimum of 7.5 meters long and at least 2.75 meters wide. On-street parallel parking spaces should be 3.35 meters wide.

Advantages

- Works well in extremely narrow, linear spaces
- Requires minimum pavement area

Disadvantages

- Difficult maneuvering for most drivers
- Less than ideal visibility of adjacent traffic
- Inefficient use of on-street space

2.2.3 Perpendicular

Especially effective in low turnover rate or long-term parking areas, the perpendicular, or 90-degree parking configuration is the most efficient and economical since it accommodates the most vehicles per linear meter. *Source The architecture of parking, Simon Henley, Car park Designers' Handbook, J.D Hill, SECONDEDITION*

2.5 Results and Discussions from the study

- Find a feasible solution to the problem statement, as a group we evaluated the works of some scholars on parking.
- Use of internet to get more of developed car parking designs currently available.
- More books like Air Force Handbook, 32-1084 which explains about the alignment of the cars in the parking lot for references on car alignment and design.
- Pavement design for concrete parking lots N SACHDEVA, which gave us an overview of which material we can use for pavement

- The architecture of parking, Simon Henley, Car park Designers' Handbook, J.D Hill, SECOND EDITION, which explains on the basics and standards of parking dimensions.
- This research finding from the above sources, create safe and convenient parking areas, the orientation and configuration of the parking area must be considered early in the siting process, in consideration of the environmental impacts.
- Align rows of parking spaces in perpendicular type of parking for vehicles 6 meters long and 2.75 meters wide standard according to Air Force Handbook 32-1084

CHAPTER THREE: METHODOLOGY

3.1 Introduction

Methodology is the philosophical framework within which the research is conducted or the foundation upon which the research is based (Brown, 2006).

This section describes the methodology that was used to completion of the design of a modern car parking at the faculty of engineering, technology applied design and fine art. It comprises of a description of the tools, instruments, approaches, techniques. This is a detailed description of selected methodology i.e., step-by-step methods of how one intends to achieve the objectives of the study of the project. This section comprises of project design, which describes the tools, instruments, approaches, processes and techniques, data collection, analysis, synthesis, interior design others.

This chapter describes the methods and approaches to be done aimed at achieving the set objectives. The approaches are described in the table below;

3.2 Methods and approaches

Activity	Method
Obtaining preliminary information	<ul style="list-style-type: none">▪ Bench Marking▪ Literature review▪ Site reconnaissance
Data collection	<ul style="list-style-type: none">▪ Making research findings from books
Drawing of a plan and modeling a prototype	<ul style="list-style-type: none">▪ Use arch cad 20 to generate the impressive 3D model as shown▪ Modeling a prototype

This section describes the methodology that was used to completion of the design of a modern car parking at the faculty of engineering, technology applied design and fine art. It comprises of a description of the tools, instruments, approaches, techniques. This is a detailed description of selected methodology i.e. step-by-step methods of how one intends to achieve

the objectives of the study of the project. This section comprises of project design, which describes the tools, instruments, approaches, processes and techniques, data collection, analysis, synthesis, interior design others.

3.3 Bench Marking; determining the site where our design can be stipulated in case of its construction by visiting the site ground to cater for the green land ratio, the available buildings, taking measurements to have a clear scale for scripting and architectural design.

3.4 Data collection; by visiting the site and taking necessary measurements. Also making research findings from books and mostly the research by ***“THE ABINGTON HONORS 102H”***, Use of internet to get more of developed car parking designs currently available. More books like Air Force Handbook, 32-1084, Pavement design for concrete parking lots N SACHDEVA, The architecture of parking, Simon Henley, Car park Designers’ Handbook, J.D Hill, SECOND EDITION were used which gave design knowledge on how to design an aesthetically pleasing and functional parking.

First, I critically identified the information I needed to gather in order to complete the task. This is through development of the fact-finding plan which involves from where am going to collect the information, why that site, how am I going to collect it from that chosen place, when am I going to collect it and where.

3.5 Observation Method; the data collection technic required us to go to the field and observe how vehicle users look for parking spots and areas around their parking places. We also observed how the different parking companies manage and allocate their parking slots around town. We also observed which parking lot has facilitation for the physically handicapped and which does not.

Description	Dimension
Parking space width	3 meters
Parking space length	6 meters

3.6 Design using Architecture

The project plan was designed to allow efficient and effective implementation during the construction. The architectural plan was used primarily to show the interactions between the objects from the front end to the back. In a given order, a car parking design, examples and a 3D architectural BIM model were looked at as an interesting example of parking design project with DWG cad drawing ready.

3.6.1 Arch CAD

This was a pioneer in BIM, a tool that has now become a standard not only in terms of design and construction, but also for the lifecycle of the parking. Its pricing program has made it affordable for new practices.

With its capacity to change into 3D, it is liked by most architects due to its convenience.

I had a chance of going through the process of making a plan of our parking using software and I was able to come out with the 3D presentation of it.

showing a 3D model from Arch CAD



Figure 3; showing ground floor plan of the parking



Figure 4; 3D parking view

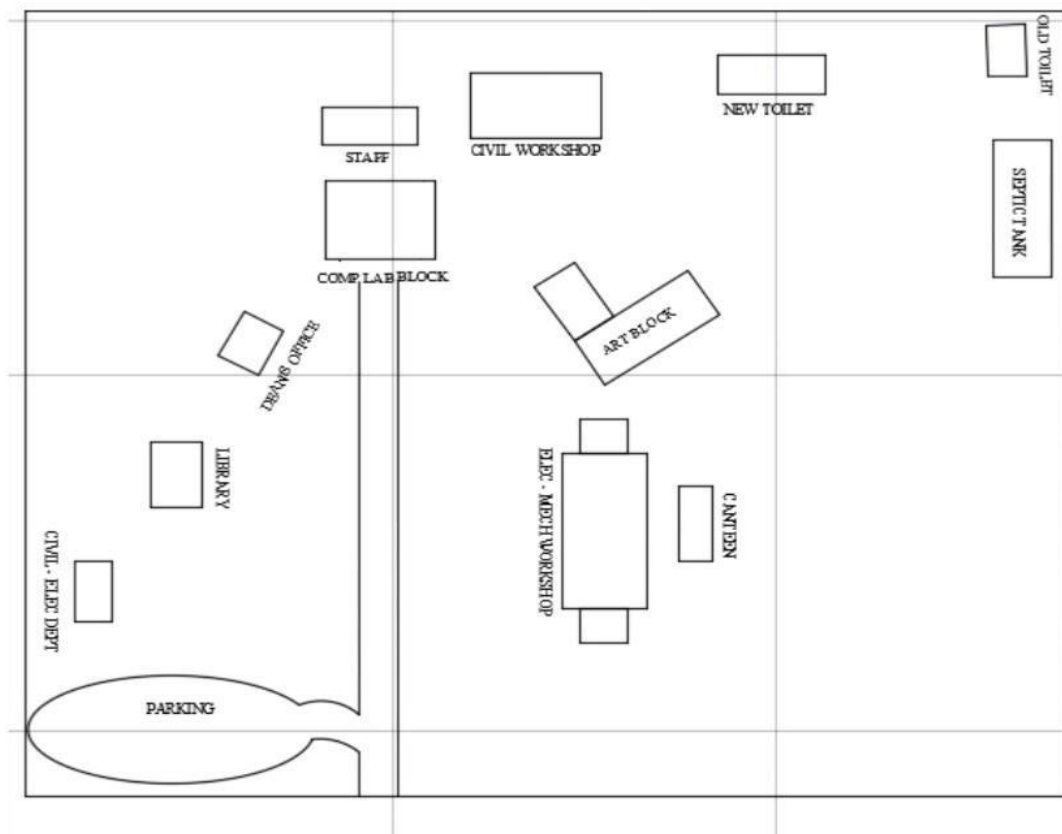


Figure 5; showing the faculty lay out showing where the parking can be located

CHAPTER FOUR: OUTCOMES, CHALLENGES, FUTURE AND PROSPECTIVE WORKS

4.1 Skills acquired

During my project plan design, I was able to;

- Apply the knowledge that I acquired in Drawing and CADs unit like dimensioning, making plans and generally appreciate and understand the practical application of my academic programme.

Present critical and innovative opinions with confidence, as well as capable of resolving problems professionally. This has encouraged me to be job-ready thus increasing my employment prospects

- Demonstrate excellent ethics and integrity in the work conducts and work as team player efficiently. In addition, I learnt to work with my professional mentors and to begin to build networks within my profession.
- I was able to realize the importance of working together to achieve the same goal.

4.2 Challenges faced during the project plan design.

During my project plan design, I faced some challenges such as;

- Over spending when buying the materials to makeup a model like novic glue,
- Power off and on when I was typing my report where all my work was removed from the computer, which hindered the progress of my work and at times forced me to stop working.
- Covid19 which hindered the progress of the work and we were not able to meet our supervisors since we were in doors.
- Expensive materials which we had to first wait to get from the central like mounting boards.

4.3 Recommendations

- Project plan design is of great importance in a student's career since the skills acquired can be used in the future as one is pursuing his/her job. This standard therefore should be done consistently to every finalist as a proof that she/ he understood what he studied in his course.
- Thus, such design projects should be encouraged.

- The university should also ensure the implementation of the project to have the parking in place for use.
- We recommend a new legislation to moderate the Metropolitan Parking Scheme. A line needs to be drawn for proper demarcation of parking slots for off-street parking to avoid the disorganization of the compound and the green land. Legislation should also help to control the parking user exploitation from the parking lot operators and put a known penalty for the offence.
- There should be parking policies put in place for new developments in the campus example they should consider parking spaces for the physically handicapped people.

4.4 Conclusion

- Project planning is a very significant aspect in civil engineering it determines the suitability and application of the technical skills acquired from the site as per standards and specifications.
- As car ownership grows, so demand for parking will also grow and therefore, faculty of engineering will have to deal with many of the issues that have been outlined in this report. It is possible to develop a car parking policy that will manage the negative impacts of faculty car use. It should be a carefully calculated act for Kabale University.

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