

**Proposed Academic Hub for the Federal College of Education Iwo Osun State, Nigeria.
(Architectural Design considerations for College Library)**

**Solomon Tunde ADEYI
(LCU/PG/002147)**

**Department of Architecture, Faculty of Environmental Design and Management,
School of Postgraduate Studies, Lead City University, Ibadan, Oyo State, Nigeria.**

**In Partial Fulfillment of the Requirement for the Award of the Master Degree (MSc) in
Architecture**

2022

Certification

This is to certify that Solomon Tunde ADEYI with matriculation number LCU/PG/002147 carried out this research work titled Architectural Design considerations for College Library in the Department of Architecture, Faculty of Environmental Design and Management, Lead City University, Ibadan, Oyo State for the award Master Degree (MSc) in Architecture under the supervision of:

.....
Arc David Oguntunde
Supervisor

.....
Date

.....
Dr. (Arc.) Funmilayo M. Adedire
Head of Department

.....
Date

DO NOT COPY. LEAD CITY UNIVERSITY, NIGERIA

Dedication

This research work is dedicated to God Almighty.

DO NOT COPY. LEAD CITY UNIVERSITY, NIGERIA

Acknowledgement

I express my profound gratitude and appreciation to God Almighty, who has been ceaselessly standing by me thus enabled me to attain this height of my academic pursuit.

My enormous regards and thanks goes to my supervisor, Arc. David Oguntunde, for dedicating so much time to thoroughly go through this work. I gratefully acknowledge the invaluable assistance of the Head of Department, Dr. (Arc.) Funmilayo Adedire and Postgraduate Coordinator, Dr. (Arc.) Oluwatosin Ayanleke. I also thankfully acknowledge the immeasurable contributions of Dr. Obaleye Oludare, Arc. David Oguntunde, Dr Adegoke Adedapo, Arc Ademola Adeola, Arc. Adenike Olugbesan, Arc. Jumoke Fasehun-Motesho, Arc. Martins Olaniyan, Arc. Babajide Aseyan and all the administrative staff of the College of Postgraduate Studies. To all my friends that I have not mentioned, who in one way or the other have contributed in making me a success, you are all important, thank you all.

Finally, to my heartthrob Ayomiposi, my lovely children and Uncle Kolawole Olaniyan, I say a very big thank you.

Above all, I am thankful to God Almighty for sparing my life and for His special assistance throughout the course.

Even though the above-mentioned institutions and persons have assisted in the process of this research work, I alone stand responsible for the errors, if any, found in the work.

Table of Contents

Title Page	
Certification	i
Dedication	ii
Acknowledgement	iii
Table of contents	iv
List of Figures	x
List of Plates	xiii
List of Tables	xiv
Abstract	
Chapter One	
1.0 Introduction	1
1.1 Background to the Study	1
1.2 Statement of the Research Problem	4
1.3 Aim and Objective	5
1.4 Research Questions	6
1.5 Significance of the Study	6
1.6 Scope of the Study	7
1.9 Operational Definition of Terms	7
Chapter Two	
2.0 Literature Review	9
2.1 Conceptual Review	9
2.1.1 Historical Evolution of Library	9
2.1.2 Evolution of Library in Africa	10

2.1.3	Evolution of Library in Nigeria	11
2.1.4	The National Library of Nigeria	12
2.1.5	Types of Library	12
2.1.6	Evolution of College and University Libraries	17
2.1.7	Evolution of College and University Libraries in Nigeria	18
2.1.8	Design Typology and Library Organisation	19
2.1.8.1	The Classical Plan Type	20
2.1.8.2	Medieval Plan	21
2.1.8.3	The Closed Book-Stacks Plan	23
2.1.8.4	The Open- Access Plan	25
2.1.8.5	The Development of Modern Library and Twentieth Century Planning Concept	27
2.1.9	Configured Space Utilitarian in Library Design	28
2.1.10	Approach to Space Configuration Using Analytical Tool	31
2.1.11	Flexible Nature of Library Activities and Function	36
2.2	Architectural Design Considerations for the Library	38
2.2.1	Physical Accessibility	39
2.2.1.1	Physical Accessibility Requirements in Buildings	39
2.2.1.2	General Principles of Accessible Design	39
2.2.1.3	Basic Measurements	40
2.2.1.4	Architectural element/features of accessibility	41
2.2.2	Thermal Comfort	59
2.2.3	Ventilation	60
2.2.4	Lighting	61
2.2.5	Orientation	62

2.2.6	Site and Location of Library Building	63
2.2.7	Library Interior Design	64
2.2.8	Roof	65
2.2.9	Landscape	66
2.2.10	Sustainability	66
2.2.11	Form/Shape	67
2.2.12	Cost/Budget	67
2.3	Empirical Review	68
2.3.1	Qualitative Factors for Library Building Design	68
2.3.2	Department and Sections in the University Library	71
2.3.2.1	The Administrative Section	71
2.3.2.2	Reader Services Section	72
2.3.2.3	Technical Services Section	73
2.3.2.4	The E-Library Section	75
2.3.2.5	The Research Services Section	75
2.3.3	Content of a Typical Academic Library	76
2.3.4	The Library Importance and Functions	77
2.3.5	Users' Satisfaction with Library Information Resources and Services	78
2.3.6	Architectural Solutions to Spatial Constraints	79
Chapter Three		
3.0	Methodology (Case Studies)	81
3.1	Introduction	81
3.2	Case Studies	81
3.3	Case Study One: Hezekiah Oluwasanmi Library, Obafemi Awolowo University,	

Ile Ife, Osun State	82
3.3.1 Brief History	82
3.3.2 Location	82
3.3.3 Description of the Building	83
3.3.4 Appraisal	90
3.4 Case Study Two: Timothy Olagbemi Library, Bowen University Iwo, Osun State	90
3.4.1 Brief History	90
3.4.2 Location	91
3.4.3 Description of the Building	91
3.4.4 Appraisal	99
3.5 Case Study Three: Gani Bello Library, Federal College of Education, Abeokuta, Ogun State	99
3.5.1 Brief History	99
3.5.2 Location	100
3.5.3 Description of the Building	100
3.5.4 Appraisal	105
3.6 Case Study Four: Macquarie University Library, Sydney, Australia	105
3.6.1 Brief History	105
3.6.2 Location	105
3.6.3 Description of the Building	105
3.6.4 Appraisal	109
3.7 Case Study Five: University of York Library, United Kingdom	109
3.7.1 Brief History	109
3.7.2 Description of the Building	110

3.7.3	Appraisal	116
3.8	Case Study Six: Birmingham Central Library	116
3.8.1	Brief History	116
3.8.2	Site Location	117
3.8.3	Description, Scope and Function	120
3.8.4.	Design Analysis	120
3.8.5	Circulation	121
3.8.6	Organization	122
3.8.4	Appraisal	122
3.9	Findings and Discussions	123
3.9.1	Deduction from the Case Studies	123
Chapter Four		
4.0	Site Analysis and Design Synthesis	124
4.1	Study Area	124
4.1.1	Site Location	124
4.1.2	Site Selection Criteria	125
4.2	Project analysis and design synthesis	126
4.2.1	Brief Analysis	127
4.2.2	Brief Development	128
4.2.3	Design Criteria	128
4.2.4	Conceptual Development	129
4.2.5	Functional Relationship	129
4.2.6	Space Allocation/ Schedule of Accommodation	130
4.2.7	Construction Methods and Materials	132

4.2.8 Building Services	136
Chapter Five	
Conclusion	140
5.1 Project Appraisal	140
5.1 Conclusion	140
5.3 Recommendation	141
References	143
Biodata	
Compliance	

DO NOT COPY. LEAD CITY UNIVERSITY, NIGERIA

List of Figures

Figure	Title	Page
1.	Classical Plan of Roman Library at Ephesus built in A.D. 107	20

2. Typical Medieval Library plan	21
3. Section through the reading room on the upper floors while the book-stacks are below	23
4. Plan of central reading rooms	23
5. Reading Rooms in Front surrounded by book-stack and book-stack behind	24
6. Columbia University Central Library, USA showing central book stacks surrounded by reading rooms	24
7. One Room Type with the Loan Table near the Entrance	26
8. Left Right Type	26
9. Refining the book	29
10. Various ramp configuration and slope	43
11. The maximum recommended slope of ramps	43
12. The inside of the elevator	48
13. Recommended nosing types	49
14. Stairs with tactile marking and continuous handrail	50
15. Handrails installed on both sides of the stairs and around the landing for gripping	50
16. Stairs of 3.00 m wide with one or more intermediate handrails	51
17. Railings and Handrails	52
18. Low curbs also act as wheel stop	53
19. Accessible entrance connected by accessible pathways	54
20. The minimum landing dimensions where the entrance door opens outward	54
21. The minimum landing dimensions where the entrance door opens inward	55
22. Type of sliding door	57
23. Type of swinging door	57
24. Revolving doors with an adjacent accessible swinging or sliding doors	57

25. Manual sliding and folding doors recommended for narrow spaces not heavily used by the public	57
26. The minimum door width of rest rooms	58
27. Double-leaf doors, with one leaf having a clear width of 0.80 metres	58
28. Concept of Form (Floor plan)	67
29. A Schematic Organogram of the Administrative Section of library of College of Education	72
30. Ground Floor Plan of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State	84
31. First Floor Plan of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State	84
32. Second Floor Plan of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State	85
33. Third Floor Plan of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State	85
34. Site Plan of Timothy Olagbemi Library, Bowen University Iwo, Osun State	93
35. Ground Floor Plan of Timothy Olagbemi Library, Bowen University Iwo, Osun State	93
36. First Floor Plan of Timothy Olagbemi Library, Bowen University Iwo, Osun State	94
37. Second Floor Plan of Timothy Olagbemi Library, Bowen University Iwo, Osun State	94
38. Site Plan of Gani Bello Library, Federal College of Education, Abeokuta, Ogun State	101
39. Ground Floor Plan Gani Bello Library, Federal College of Education, Abeokuta, Ogun State.	102
40. Ground Floor plan of Macquarie University library, Sydney, Australia.	106
41. First Floor plan of Macquarie University library, Sydney, Australia.	107

42.	Second Floor plan of Macquarie University library, Sydney, Australia.	107
43.	Third Floor plan of Macquarie University library, Sydney, Australia.	108
44.	Fourth Floor plan of Macquarie University library, Sydney, Australia.	108
45.	Ground Floor plan of Harry Fairhurst Library, University of York, United Kingdom.	111
46.	First Floor plan of Harry Fairhurst Library, University of York, United Kingdom.	111
47.	Second Floor plan of Harry Fairhurst Library, University of York, United Kingdom.	112
48.	Ground Floor plan of J. B. Morrell Library, University of York, United Kingdom.	112
49.	First floor plan of J. B. Morrell Library, University of York, United Kingdom.	113
50.	Second floor plan of J. B. Morrell Library, University of York, United Kingdom.	113
51.	Third Floor plan of J. B. Morrell Library, University of York, United Kingdom.	114
52.	Ground Floor plan of Raymond Burton Library, University of York, United Kingdom.	114
53.	First floor plan of Raymond Burton Library, University of York, United Kingdom.	115
54.	Second floor plan of Raymond Burton Library, University of York, United Kingdom.	115
55.	Site Plan of the neighbourhood in Birmingham where Central Library is located.	118
56.	Ground floor Plan, Birmingham Central Library.	118
57.	First floor Plan, Birmingham Central Library.	119
58.	Second floor Plan, Birmingham Central Library.	119
59.	Iwo Township within the context of Osun state.	124
60.	Site location maps.	125

List of Plates

Plate	Title	Page
-------	-------	------

1.	The interior of the Malatestian Library in Cesena, Italy.	22
2.	Typical library layout with movable furniture.	37
3.	Arranging space for function.	37
4.	Computer section of children library service.	38
5.	E- learning and internet application in the library hall.	80
6.	Entrance Gate of Obafemi Awolowo University.	83
7.	Satellite image showing site layout of Obafemi Awolowo University, Ile-Ife, Osun State.	83
8.	Approach view of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile-Ife, Osun State.	86
9.	Side view of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile-Ife, Osun State.	86
10.	Side view of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile-Ife, Osun State.	87
11.	Reading room of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile-Ife, Osun State.	87
12.	Circulation area of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile-Ife, Osun State.	88
13.	Catalogue area of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State.	88
14.	The interior view showing stair hall of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile-Ife, Osun State.	89
15.	Ramp at the entrance of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State .	89
16.	Main Entrance of Bowen University Iwo, Osun State.	92

17.	Satellite image showing site layout of Bowen University Iwo, Osun State.	92
18.	Approach View of Timothy Olagbemi Library, Bowen University Iwo, Osun State.	93
19.	Rear and Leftside Views of Timothy Olagbemi Library, Bowen University Iwo, Bowen University Iwo, Osun State.	93
20.	Aerial View of Timothy Olagbemi Library, Bowen University Iwo, Osun State.	96
21.	Circulation area of Timothy Olagbemi Library, Bowen University Iwo, Osun State.	96
22.	The interior ramp within Timothy Olagbemi Library, Bowen University Iwo, Osun State.	97
23.	Book shelves of Timothy Olagbemi Library, Bowen University Iwo, Osun State.	97
24.	Bookshelves and Furniture of Timothy Olagbemi Library, Bowen University Iwo, Osun State.	98
25.	Furniture of Timothy Olagbemi Library, Bowen University Iwo, Osun State.	98
26.	The Entrance Gate of Federal College of Education, Abeokuta, Ogun State.	100
27.	Satellite image showing site layout of the Federal College of Education, Abeokuta, Ogun State.	101
28.	Approach view of Gani Bello Library, Federal College of Education, Abeokuta, Ogun State	102
29.	Side view of Gani Bello Library, Federal College of Education, Abeokuta, Ogun State.	103
30.	The Library Extension, Federal College of Education, Abeokuta, Ogun State.	103
31.	Approach of the E Library, Federal College of Education, Abeokuta, Ogun State.	104
32.	Interior view of E Library section, Federal College of Education, Abeokuta, Ogun State.	104
33.	Satellite image showing site location, Macquarie University library, Sydney, Australia.	106
34.	Approach view of Macquarie University library, Sydney, Australia.	109
35.	Satellite image showing site layout, University of York, United Kingdom.	110
36.	Viewing showing University of York, United Kingdom.	116

37.	Birmingham Central Library	117
38.	The reference area on level two of Birmingham Central Library	120
39.	Birmingham Central Library's second-floor collection desk area	121

DO NOT COPY. LEAD CITY UNIVERSITY, NIGERIA

List of Tables

Table	Titles	Page
-------	--------	------

1.	List of Nigerian College of Education Libraries	19
2.	Schedule of Accommodation	130

DO NOT COPY. LEAD CITY UNIVERSITY, NIGERIA

Abstract

Essentially, a library is a public structure with amenities and services tailored to the various educational and social needs of a specific neighbourhood. Therefore, by definition, a public building is one that must provide access to everyone, regardless of anthropometric restrictions and age. As a result, creating for the majority also means designing for individuals in various categories. Thus, the aim of this project is to design a library that is accessible and comfortable to all users. Information for this study was garnered through the process of qualitative research and case studies. Therefore the methodology through which this study was carried out is based on primary and secondary sources of information. The primary is basically field investigation which includes oral interviews and observation of physical traces while the secondary has to do with search through encyclopedias, web sites, books and journals that are relevant to the study. Findings from case studies reveal that users at times battles with accessibility and comfortability thereby find it difficult to freely use many college buildings in Nigeria. Therefore, this thesis is efficient to have an in-depth assessment of the design considerations for the accessibility and comfortability of users in the library buildings. Insight on design considerations to alleviate this accessibility and comfortability of the users will be recommended and this should be considered at the early stage of the design.

In order to clarify the design process, this thesis discusses the relationship between libraries, accessibility, and comfortability. More crucially, it is founded on the variables that value the applicability of both accessibility and comfortability for the library's future demands. This is an advantage of space functionality, identification, recognition, accessibility, relationship and adaptability nature of the same proposed space to staff, student, researchers, professional and society at large. This forms a cordial idea or link between the library users, everyday life activities and traditional operation in the library arena.

Chapter One

Introduction

1.1 Background to the Study

Since they have existed throughout human history worldwide, libraries can be regarded as the greatest scientific and cultural centers to date. Studies on the history of libraries revealed that the major goal of libraries was to provide a location for the collection and storage of human knowledge as well as to give services to readers using these buildings (Pierce, A. D. (2019).

One of the prerequisites for the existence of libraries is the construction of libraries. The library is a living thing that is expanding. It expands in all service and resource spares, including personnel, collections, and buildings (Allen, F. R., & Moyer, M. (2021). A fundamental necessity is the amount of space, which is defined by the goal based mainly on the work to be done and the service to be rendered in the building.

Libraries similarly have different nature-public; academic, children, adult, research, business etc., different collection-reference, non-book material, photographic equipment's, different services-reference services, computer service, photographic service, lending service, interlibrary loan service etc., different readers-scientists, general public, research scholars, blinds, general students, labourers, children's, women etc., different staff technical staff, non-technical staff, semi-technical staff etc. (Demeter, M., et. al., 2018).. It is very difficult to estimate the space requirement from the point of one aspect, by users or readers, but decided from various points of views.

Libraries now have the duty to create the conditions and resources necessary to satisfy the informational requirements of every single member of society. Finding out what a college library needs can be viewed as a research project akin to one that will result in a postgraduate thesis. What matters more in this case is that there is a high likelihood that every component of the requirement report will be put into practice (Irvall and Nielsen, 2017).

The activities should start with a literature review, like they do in most research projects, as this will provide you with ideas for how to organize your college library. The opinions of shareholders should be sought out as well and there are two methods for doing that. First and foremost, it's critical to raise awareness, this can be done by using newsletters, public announcements, and the university or college website to provide information and solicit opinions on the construction of the library building. Secondly, even though these deadlines are not rigidly imposed in the local context, it is vital to notify faculty members by letter and request for requirements and other information from unions, including student unions.

Instead of making libraries obsolete, new technologies are enabling them to extend their services and turn into central, easily accessible hubs for academic institutions. Buildings for libraries can now be made out of glass, making them brighter and more inviting. Additionally, new book storage and internet access technologies provide areas for individual and group study as well as quiet reflection (Hynes, M. M., & Hynes, W. J. 2018). An automated system for storing and retrieving data is a technology that is becoming more and more common. Books and other goods are kept in this "robotic storage" system, where they are eventually found through an online catalog search and obtained from the issue desk a short while afterwards. The outcome is a secure location for the books, which are quickly accessed, and a significant amount of space saved that can subsequently be used to build an innovative, accessible library (Petrie and Bevan, 2018).

In addition to serving as the foundation for all academic activities, a college library is also a must for research, without which advances in knowledge cannot be accomplished (Abounaga, M. M. 2018). The fundamental tenet of a library is to promote learning, and it serves as both a venue for learning and a repository for and user of educational resources. The purpose of any library is to provide resources, opportunities for discussion, and services. Over the years, libraries have grown from storage and revival of information to audio and vision usage, non-book and paperless information in addition to its expanding contents. To fulfill the various demands of the populace, it

has also created a wide variety of libraries, from public to private, with each one's content chosen to suit the need of a particular user or set of users.

People frequently develop deep emotional connections with libraries in their life because library buildings are spaces for learning, gathering, and exploration (Gstalder, S. H. 2017). Library buildings also afford opportunities for students to become information literate, to develop the essential information and learning skills required for lifelong education and successful living in today's world. Library buildings provide opportunities for project work and independent learning using varied media and for integration of library resources across the curriculum. The requirements and purposes of library buildings have undoubtedly evolved over the past ten years, but the need for careful and thoughtful planning has not. Both usability and accessibility difficulties must be taken into consideration when designing the library. The question of who will use the library and how they will use it is one of many angles from which architects approach proposals for libraries. How are people going to access the library? What collections are going to be kept at the library? How much information about its upcoming collections is available? These share intriguing similarities with the design of software and hardware, from the most basic to the most sophisticated, in which usability and accessibility are significant obstacles. In other word, the purpose of the design considerations is to draw designers' attention to the need to apply the universal accessible design principles and specifications to structures and facilities. The purpose of these factors is to serve as a universal accessibility design guideline and planning tool. The substance of these concerns should be taken into account from the beginning of the design stage for all building projects and community facilities, especially those that are often used by the general public or are geared toward foreign tourists (Boyd, T., 2017).

Libraries currently serve as a dynamic gathering place for communities and businesses as well as an architectural hallmark for educational institutions. Because of their distinctive structural features,

they have evolved into the model for the community's personality. They serve more purposes now than just helping students study for exams or devoted readers check out the newest bestseller.

A library attracts people for a variety of reasons, and it has emerged as a key location for meeting, learning, exploring, imagining, informing, inspiring, and debating (Loh, C.E., 2017). In addition, modern technology has made it necessary to include electronic gadgets everywhere, which has transformed the design of the traditional library into a new, forward-thinking setting.

1.2 Statement of the Problem

A crucial element in fostering enthusiasm, traditions, and a culture of reading is the accessibility of reading spaces and resources as the support of useful and functional libraries is essential for the Colleges of Education to complete their jobs (Komariah, N., et. al., 2018). Therefore, in order to fulfill their academic goal, the National Commission for Colleges of Education required all colleges of education to maintain operational libraries. In order to help their colleges meet their goals of developing qualified teachers in their preferred disciplines, these libraries want to support their colleges by offering reading and learning resources. The school library which is part of the school system is established to achieve the educational objectives and complement curriculum implementation as stated in the National Policy on Education.

Due to the ideal modern academic library's flexibility, strategy, and proactivity, which makes it really user-oriented rather than librarian-oriented, academic libraries, are rapidly changing in both their structure and function. More reading space is made possible by new access and storage technologies, and the primary goal of the library is shifting from being a passive book warehouse to a bustling academic hub. Both are embraced by today's academic libraries, and occasionally changes are made as well (Berger, L., 2018). The present technological advancements make it possible for connecting academic libraries with a wide range of clients around the globe, including staff, students, and larger communities. Increasingly, in order to promote learning, creativity,

research, and experimentation, academic libraries are working with teaching and research faculty to establish collaborative learning centers that mix conventional learning spaces with modern technology. The library is frequently misunderstood as being nothing more than a repository for books and other materials. Instead of being merely repositories for the printed word, libraries in this context are desirable destinations. The idea of the library is among the most significant despite several difficulties in creating, enlarging, or renovating academic libraries to satisfy these new specifications. The dynamics of space are changing as a result of technology, making modern library architecture and design a dynamic field (Gardiner, J., et. al., 2021).

A lot of individuals still view libraries in the conventional fashion, primarily as a warehouse for books, including those who can afford to fund new library construction. In order to protect the books inside, these historic, older buildings have very strict regulations that make them difficult to visit. There is also the argument that since everything is now accessible online, libraries are obsolete and no longer necessary. Even though this is unquestionably not the case, it is crucial to discuss this notion at the early phases of new advances.

Lastly, the negligence of the design criteria for accessibility and others has resulted in inaccessibility and isolating some users thus holding them back from participation in social and economic activities. A concentrated effort needs to be made to incorporate specific design ideas into the interior and outside of buildings in order for all users to integrate and operate independently in any community. With this background in mind, this study aims to investigate architectural design considerations for College library vis-à-vis accessibility and comfortability.

1.3 Aim and Objectives

Aim

The aim of this study is to examine the design considerations/criteria that will thoroughly meet the needs of users in library of Federal College of Education, Iwo. The objectives are:

The objectives of this study are

- i. To analyze functional spaces for the users of a college library;
- ii. To identify the key architectural elements/features to a college library design;
- iii. To examine design considerations to achieve users' satisfaction in a college library;
- iv. To develop/design a programme enhancing both aesthetically pleasing and design effective.

1.4 Research Questions

- i. What are the required functional spaces of a college library?
- ii. What are the key architectural elements/features to a college library design?
- iii. What are the design considerations to achieve users' satisfaction in a College library?
- iv. What are the design considerations that will enhance aesthetic and design effectiveness?

1.5 Significance of the Study

One of the key components of national development is the advancement of education. Because it would be impossible to implement a deliberate development approach without a solidly established base. Since the end of colonialism in Nigeria, different regimes in the country have developed various educational programs, established primary and secondary schools as well as tertiary institutions with the aim of laying the groundwork for other fields of national development. This is due to the recognition of this important aspect of national development. Thus, the development of technical and vocational education in Nigeria would be greatly aided by the opening of more colleges of education in the nation.

Federal College of Education Iwo is a newly established College and the recent studies have revealed that Colleges of Education are among the fast growing institutions with reference to the students and staff populace. So, the importance of Library cannot be overemphasized in such an institution of learning as certain required facilities (buildings) needs to be designed and constructed.

Therefore, the need to have a standard and well equipped purpose built library that will serve the

needs of the students and staff and help the school at large is highly inevitable (Chen, K. W., & Norford, L., 2017).

Furthermore, this study will be of immense benefit to both researchers and non-researchers who intend to know more and build on their research work in order to contribute to their knowledge and serves as a guide for other studies. It study also promises to be a resourceful material to students as well as providing a range of theoretical and practical reflections that could be of use to the institutions which intend to have college Library in the nearest future.

1.6 Scope of the Study

Since no one library could possibly provide the knowledge that each possible user would want. Microsoft Encarta premium 2009 identify six major types of library to serve potential users as Public library, School library, College/University library, Research library, Special library and Government library.

The scope of this project will be limited to college library, attached to a higher institution to serves students and faculty in institution. It serves two complementary purposes of supporting the curriculum and faculty as well as the needs of advanced scholars thus contains a comprehensive compilation of information on one or more themes.

Thus, the scope will also involves the study of effective spatial integration and architectural design guidelines for college library building, considering the internal and external design as well as the surrounding/environment of college library. It will also cover the guiding principle during the construction of all the building elements from foundation to finishing

1.7 Operational Definition of Terms

Architectural: pertaining to the design and construction of structures as an art or activity.

Considerations: thoughts or facts taken into account when taken a decision.

College: an institution of higher learning that offers specialized professional or vocational training.

Accessibility: ability to reach a place from a particular dimension or by particular mean.

Library: It is a site where publications are kept and arranged for public use, including books, journals, microfilms, audio and video materials, computer data, and terminals for particular user groups in terms of culture, information, recreation, and education.

Design: a plan or picture created to depict the appearance and functionality of everything before it is built or made.

DO NOT COPY. LEAD CITY UNIVERSITY, NIGERIA

CHAPTER TWO

LITERATURE REVIEW

2.1 CONCEPTUAL REVIEW

2.1.1 Historical Evolution of Library

The history of library is nearly as old as the human civilization and development. The development of libraries passed through different era and cultures as well as every time social, political, and economic advancements made it possible for libraries to record and collect knowledge. Libraries were established in order to act as a vital conduit for information between the past, present, and future. Libraries make sure that the cultural record is preserved and made accessible for future use, whether it is in the form of books or electronic versions. Libraries provide people with access to the knowledge they need for work, leisure, learning, and governance. The invention of printing in the middle of the 15th century greatly encouraged the growth of library and radically alters their architecture 'by necessitating lager and better illuminating structures.

Ancient Greece was the first known culture to create libraries for both members of the governing class and the general populace. In the 500 B.C., both Pisistratus, the king of Athens, and Polycrates, the king of Samos, started building what might be referred to as public libraries. However, most people still could not read hence, these libraries served only a small percentage of the total population. The first truly extensive library in Greece was founded and arranged by Aristotle (384-322B.C). The Roman Empire amassed substantial literary collections from the Greek libraries dispersed around the area after capturing Macedonia in 146 B.C. As war loot, Roman officials frequently brought this literature back to their own villas. Romans thought that surrounding themselves with books was stylish and a sign of social distinction as the Roman Empire developed in power and luxury. Rich Roman households had built very sizable private libraries by 50 B.C. Rome's public library was built by Julius Caesar before he passed away in 44 B.C.

2.1.2 Evolution of Library in Africa

Library in Africa can be traced to Egypt in 1304 BC. The libraries were identifying with temples, and palaces of great rulers and kings. However, the development of library services in Africa started in the Arab States and South Africa. The first national library in Africa was in Cairo, the capital of Egypt. The library was founded in 1870 and was modelled after the great libraries of Europe. This was then followed by other national libraries in Algeria (Algiers 1883), Tunisia (Tunis 1883), South Africa (Cape Town 1918); Morocco (Rabat 1920) and Ethiopia (Addis Ababa 1944). Much later in Nigeria, the national library was established on November 6th, 1964 in Lagos.

After the Second World War (1939 to 1945), the pace of library development in Africa had increased considerably. Some of these developments were the increased agitation by many countries for political independence together with planned efforts towards economic and social developments in order to improve their living standards. In 1946, United Nations Educational, Scientific and Cultural Organization (UNESCO) were inaugurated thereby worked intensively with countries around the world to promote the development of libraries worldwide. Library development is an integral part of the missions of UNESCO. It was after the organization of libraries and development of the best educational methods to maintain, increase and make knowledge accessible, conserved and protect the world's inheritance of book treasures. For a long time, in the majority of African nations, the necessity for colleges and their libraries took precedence over the creation of national libraries. Arising from this, many college libraries perform the functions of national libraries. Most of the materials acquired by African Libraries are through gifts, exchanges with organizations and institutions around the world. Various universities have been chosen as the depositories for some international organizations. Thus, the University of Ibadan Library among other university libraries on the continent received certain documents from UNESCO and other organizations.

2.1.3 Evolution of Library in Nigeria

The development of library services in Nigeria began in the late 1920s when the Lagos Club was formed. Members of this club circulate books among themselves. A grant received by the club from the Carnegie Corporation of New York made it possible for the Lagos Library to be inaugurated in 1932. Books which were formerly owned by the Lagos Club formed the nucleus of the Lagos Library. Interest in books and libraries was developed by prominent Nigerian many of whom built up their personal libraries with books on numerous topics. Top among them was Henry Carr who had an appreciable collection of books about 18,000 volumes before his death in 1945. Later, the government of Nigeria purchased these volumes. Thus, Henry Carr collections formed the nucleus of the University Library of the University College, Ibadan which was established in 1948. An extensive collection of records, books, pamphlets, and other items were kept in Herbert Macaulay's library, a nationalist politician who was also interested in politics, history, and culture. Another notable Nigerian was Tom Jones, a very rich merchant who instructed the establishment of a library for Lagosians through his will and this led to Tom Jones Library. In 1943, the British Council Library was established as a resource for information during the war and to offer resources to encourage people to read. The council later established libraries in Kaduna, Enugu, Ibadan and Benin-City. The establishment of the University College, Ibadan in 1948 provided the nation with a library that could be look up to cater for its needs. The University College Library under John Harris began to perform some of the functions associated with the National Library in some countries. The Publications Ordinance was passed in 1950. The University College Library started the publication of Nigerian publications in 1953 which became the county's national bibliography. UNESCO in 1953, held and organized seminar at the University College, Ibadan which was tagged, "Development of Public Libraries in Africa", and the seminar sparked a quest to advance the nation's library system. Reorganizing the necessity to provide libraries in the country as well, particularly in the Eastern Region of the country, the Eastern Government instituted a regional pilot

project, based on the Ghana model in Enugu. In 1959, the new permanent Regional Central Library, now the Enugu State Central Library was officially opened. Thereafter, other notable libraries branches were established in Port Harcourt (2nd March, 1962), Ikot Ekpene (the 9th March, 1964), Owerri (1st May, 1965), Aba (5th September 1965), Calabar (10th December, 1965), Umuahia (7th May 1966), and Onitsha (26th November, 1966).

2.1.4 The National Library of Nigeria.

In 1958, the Federal Government appointed a Library Advisory Committee which comprised of government official and leaders of the library profession. The committee advised that the National Library should be established in Lagos to serve the Federal Government and to serve as a National Bibliographic Centre. The National Library Act was passed in 1964; this gave birth to the National Library in Lagos. The National Library of Nigeria serves as the coordinating centre for library activities within the country. It maintains a National Union Catalogue for books catalogued by it and five other participating libraries in the universities of Lagos, Ibadan, Ile Ife, Zaria and Nsukka. As from 1970, State branches of the National Library were established in the state capitals, first was Enugu (former Anambra State) in 1974, followed by Jos (Plateau State) in 1975, Bauchi, Bendel, Cross Rivers, Gongola, Imo, Kaduna, Kwara, Niger, Ogun, Ondo, the Federal Capital Territory, Abuja.

The National Library of Nigeria has statutory responsibility for the establishment and maintenance of minimum of a branch in each state of the Federation. So far it has, in addition to its headquarters at Abuja, established branches in the capital cities of some sixteen out of the thirty-six states in Nigeria.

2.1.5 Types of Library

A library is basically an organization whose facilities and services are meant to serve the varying educational and social needs of a particular community. The type of library and location in a

particular place is a function of the environmental needs and resources of that area. During the development of Libraries all over the world various types have evolved to serve the varying interests. Their characteristics and trails are distinguishable due to their history and development. Due to the fact that no single library could possibly contain the information needed by every potential user, there are various library kinds to meet various demands (Rahimi, F., 2021). There are six fundamental categories for libraries:

I. Public Library, usually funded from the Public Fund such as tax etc., it is a library which provide services to the general public as it is accessible to them;

The main characteristics of public libraries are that they are meant to serve the general public, they are financed with public funds and they offer free services (Meilleur, S., 2020). Examples are National, state, divisional or branch libraries and these libraries offer their collections and services to all members of the community. In Nigeria, we have Lagos Books Club, Lagos Library, Tom Jones Library, Henry Carr and Herbert Macaulay Private Libraries and the British Council Libraries. All these serve as precursor to the public libraries we find in some Nigerian towns and cities today;

II. School Library, situated within the school premises to provide for pupils up to and including high school; it is a library which is accessible to the students and staff. The importance of the school library cannot be overstated. It aids in directing the pupil in all aspects of their academic endeavors, impart the ideal reading culture to them before graduating from secondary school and provide suitable supplemental resources lecture room teaching. Becoming a part of school library networks helps most school libraries to improve their holdings in a better manner. Consequently, they can exchange materials with libraries at other schools. Meanwhile, the requirements and interests of students vary depending on their educational level. Accordingly, the schools Libraries serves different school levels thus, a diverse range of services are provided, as well as various collections are maintained (Merritt, K., 2021). It must be stated, however, that in many developing

countries there are very few school libraries. The information resources in those that exist are usually scanty so, Governments, educationists and teachers appreciate the importance of school libraries in every school setting.

III. Research Library which serves the needs of advanced scholars. This library contains an in-depth collection of material on one or several subjects.

Research libraries house collections of rare resources to meet the demands of highly specialized and advanced studies. These collections may contain major printings of literary works, rare manuscripts and books, scientific records, local histories, genealogy, original musical scores, and other special intellectual materials. These collections may contain numerous valuable and rare items; therefore usage is often restricted to the library buildings. Research libraries frequently put together displays of their most significant holdings, host lectures and colloquia, and publish academic examinations of the materials in their collections. The public can access the holdings of numerous notable research libraries in the United States, unlike certain research libraries that only allow selected scholars to access them.

IV. Special Library provides and delivers specialized information resources needed by the limited clientele. To meet the unique needs of their staff or members, several enterprises, private businesses, governmental organizations, museums, religious institutions, hospitals, associations, and different organizations keep their own libraries. The collections of these libraries, which are sometimes referred to as technical libraries, information centers, or special libraries are other names for these institutions rely on the particular requirements of the organizations they serve (Chen, G., et. al., 2017). Many special libraries have assumed position of prominence and have all provide the specialized needs of their patrons; the evaluation, packaging, and presentation of information by special libraries to users is done so as to boost output and contribute to the effectiveness of their parent organization. They accomplish these objectives by decreasing the amount of time staff

members spend looking for information and by supplying data that helps staff members make better decisions. Special libraries have become an invaluable part of the information resource centres in the country. They have been contributing to the industrial, technological, social and economic development of the country.

V. Government Library is also called State or National library. It is established by the government to serve the governmental departments and agencies as well as the general public. The majority of international countries maintain libraries to meet the needs of their elected officials and their staff. Usually, the entire public can access these libraries as majority of countries retain both federal and state government libraries. At the federal, provincial, and territory levels, there are government libraries as well. Additionally, national archives, which compile and preserve historical records, including official records of lasting worth, are maintained by the majority of governments. A national library collects as many copies of locally produced books as it can in order to acquire, preserve, and promote its nation's published legacy. It is appropriate to point out that some national libraries, particularly in developing countries, assume wider responsibilities (Altay, A., & Dursun, B. 2019). Many national libraries in Africa go all out to provide services directly to the people by establishing satellite branches in different parts of the country. In some cases they also serve as the repository of government archives and sacrificial in an effort to provide services to educational and special libraries.

VI. College and University Libraries are attached to higher institution thus serves students and faculty in institution. They serve two complementary purposes of supporting the curriculum and faculty. It is also possible for a college/university to have more than one library. All College and Universities in the country have the libraries, as well as Faculty and Departmental libraries.

In college and university coursework, research is a crucial component for both students and Professors. College and university libraries are therefore often known as academic libraries, and

they are frequently regarded as the most crucial resource of a higher education establishment. Since instructors and students at colleges and universities may want to do research in any imaginable academic area, academic libraries' collections typically reflect a wide variety of interests and forms. Academic libraries differ in size from small liberal arts colleges' modest holdings to huge research universities' enormous collections. Some of the world's biggest libraries are housed in research universities. The majority of academic libraries are connected to other libraries through cooperative networks, allowing them to share scarce and rarely-used items needed for advanced research (Ban, J., et. al., 2020).

Many academic libraries allow public access to their collections; however, people not connected to the college and university may have fewer borrowing options. Within certain academic departments, schools, or colleges, large research universities may have distinct libraries. For instance, academic branch libraries may focus solely on collecting materials related to psychology, chemistry, engineering, agriculture, art, architecture, and other academic fields. Libraries at colleges may be divided into undergraduate and graduate sections. The majority of undergraduate libraries provide the fairly general resources required to facilitate study during a four- or five-year bachelor degree program. For more specialized research in pursuit of a graduate degree, graduate libraries offer resources. Rare books, handwritten manuscripts, maps, and other specialty collections are sometimes housed in distinct buildings in academic libraries. Academic libraries typically make a continuing effort to increase their holdings. However, in the 1990s, most university libraries saw a slowdown in the purchase of pricey printed resources as more money was spent on the purchase of new computers, telecommunications equipment for internet access, and online databases. Due to the complexity, breadth, and diversity of formats and material found in academic libraries, colleges and universities provide programs to orient new teachers and students to the library services available at the institution. These programs are made to show new users how to use various reference tools and library search techniques in an efficient manner.

2.1.6 Evolution of College and University Libraries

Since 1635, when the Québec library for the Collège des Jésuites was founded, library collections have been a part of higher education institutions north of Mexico. Despite the fact that Jesuit College is no longer in existence, some of its works currently belong to the library of Université Laval in Sainte-Foy, Québec. A budding institution in Cambridge, Massachusetts, received 300 books from English clergyman John Harvard in 1638. In honor of the college's patron, administrators later opted to rename the institution Harvard College (now Harvard University). The oldest secular university in the Middle East, Cairo University was established in Cairo, Egypt, in 1908. It features one of the largest academic libraries in the region. The private universities of the American University in Cairo, Al-Azhar University in Cairo, and the Egyptian National University, which was established in Giza in 1995, all have noteworthy academic library holdings. Iraq's universities and technical higher education institutions are served by almost 90 academic libraries. The University of Baghdad was established in 1957 and is the biggest university in the nation. Its library holds more than 800,000 books. Jordan's universities and other higher education institutions have more than 60 academic libraries. The University of Jordan in Amman, established in 1962, is the nation's founding institution of higher learning. More than 500,000 books are housed in its primary library. Other noteworthy academic institutions in the nation include Mu'tah University (established in 1984) in Al Karak and the Jordan University of Science and Technology (formed in 1986) in Irbid. The American University of Beirut, located in Lebanon, has one of the greatest academic library collections in the region. It is famous for having extensive holdings in the medical sciences. The libraries of the Universities of Tehrn in Iran and Ankara in Turkey are two other noteworthy institutions in the Middle East. At the Hebrew University of Jerusalem in Israel, the Jewish National and University Library have more than 4 million books, including 200 ancient manuscripts and works in more than 80 different languages. Israeli universities with sizable academic libraries include Tel Aviv University and the University of Haifa.

2.1.7 Evolution of College and University Libraries in Nigeria

The University of Ibadan and its library were founded in 1948, marking the beginning of Nigeria's development of college and university libraries (Ishola, B. C. (2020). Establishments of educational institutions at all levels, particularly in the tertiary sector, have increased steadily since the country gained independence in 1960 (Ishola, B. C. (2020). The government of Nigeria has consistently made significant investments in education. Realize that university and college libraries were created concurrently with their parent institutions because they were essential academic components of the universities. The number of college and university libraries is therefore equal to the number of these institutions. The University of Nigeria, Nsukka was founded in 1960. Others established in 1960s are the University of Lagos, Obafemi Awolowo University formerly known as University of Ife and Ahmadu Bello University. Federal College of Education, Kontagora 1958, Federal College of Education Kano 1961, Federal College of Education Zaria 1962, Alvan Ikoku College of Education 1963, Adeyemi College of Education 1964, Federal College of Education (Technical), Lagos State, 1967 and University of Benin 1970. Colleges and Universities were established by the Federal Government in Jos, Kano, Ilorin, Port- Harcourt, Calabar, Sokoto, Maiduguri, Pankishin, Okenne, Abeokuta, Oyo, and Gombe in the 1970s. Libraries were developed in these colleges and universities to support their academic programmes. More colleges and universities were also established by the states and these are River, Ogun, Anambra, Imo, Oyo and Benue State. Federal Universities of Technology, Agriculture at Akure, Bauchi, Owerri, Minna and Yola, Abeokuta and Makurdi were also established. The universities have set up their libraries to support teaching and research. The task of establishing colleges and universities was later extended to the private bodies.

Table 1: List of College Library in Nigeria

S/N	Status	Number
1	Federal	27

2	State	51
3	Private	122
4	Polytechnics offering NCE Programmes	09
5	Other NCE-Awarding Institutions	10

Source: National Commission for Colleges of Education (2021).

2.1.8 Design Typology and Library Organisation

Microsoft Encyclopedia, Premium (2008) described Typology as a classification of types or systematic classification of types. Design typology consists of the characteristics employed in certain types of architectural designs to show those common characteristics that have been in use over the years, and how they function, or how they affect functionality. Five significant influences have led to changes in library architecture over the years: the how information is stored, how people use libraries, and who reads them, the advancement of technology in the fields of architecture and librarianship, the accessibility of funding, and the acknowledgement of conventional architecture as a component of cultural heritage. Anthony Thomson in his book 'Library Buildings of Britain and Europe' London 1963 has identified that there are variety of library plan types namely:

- I. The classical plan type.
- II. Medieval Plan.
- III. The Closed Book-Stacks Plan.
- IV. The Open- Access Plan.
- V. Twentieth Century Planning Concept.

2.1.8.1 The Classical Plan Type

The classical plan originated in Rome and during this period, writings were done on parchment rolls rather than on a community centre where learned men could go to read and meet for discussions. It

consists of a large singular hall which contained the books, readers and the staff. Figure 1 shows the Roman Library at Ephesus built in about 107AD which is an example of this type of library. The monumental nature of the Classical plan is related to the monumental nature of library buildings. This was traced back to the importance attached to the library buildings as the central body of information and knowledge in the universities (Bailin, K., et. al, 2018)). However, two reasons for the failure of the classical plan are;

- I. It generates noise as a result of echo from the large hall.
- II. Due to space shortage and difficulty in organizing other functional spaces.

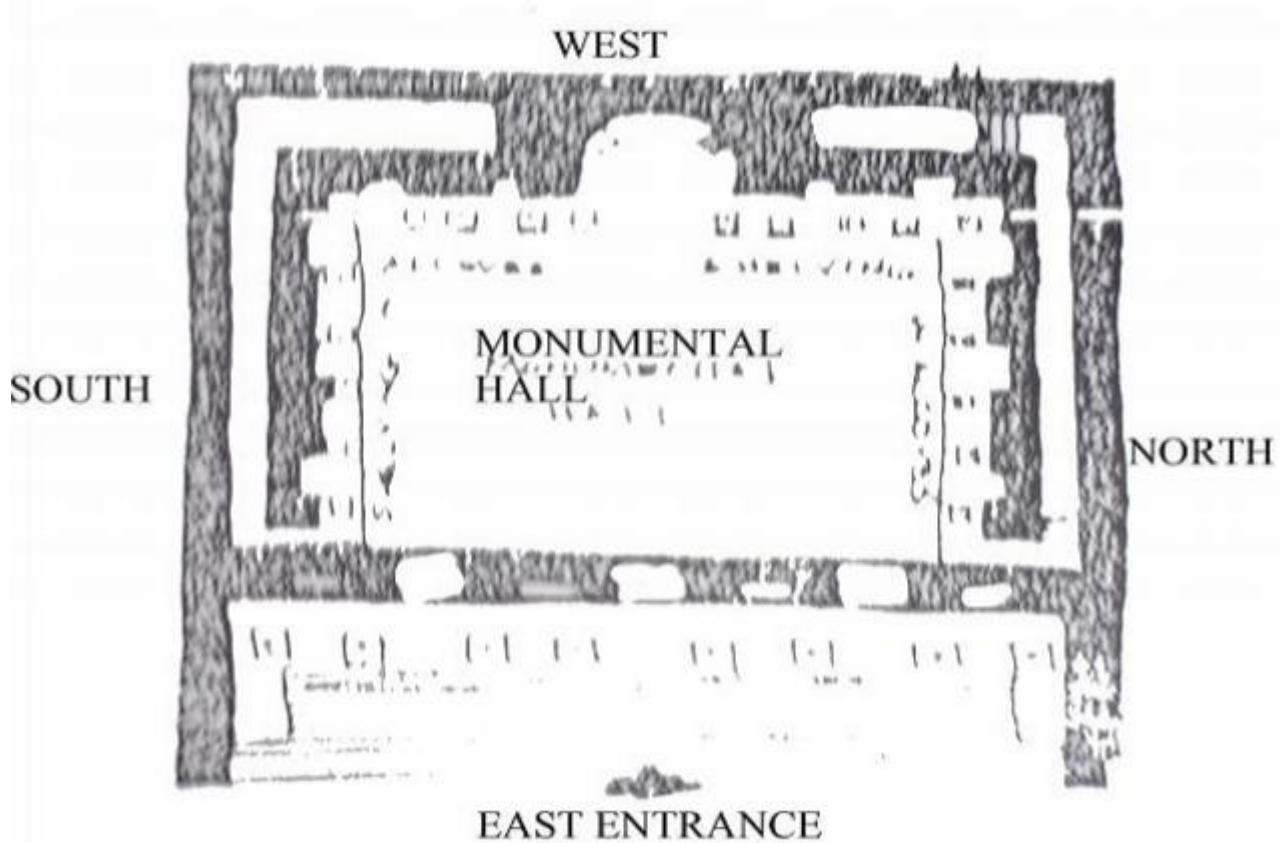


Figure 1: Classical Plan of Roman Library at Ephesus built in A.D. 107.

Source: Fere, (1994).

2.1.8.2 Medieval Plan

This is an improvement on the classical type. The buildings were of single rooms lit by windows along either side with bays formed by book cases along the walls. This plan was used usually in

monasteries, cathedrals and colleges. Figure 2 show a typical type of medieval library plan. The development stages of a library during the medieval period include:

I. The church pews system, as shown in plate 1. The interior of the Malatestian Library in Cesena, Italy is one of the best-preserved examples of a medieval library. It was built between 1447 and 1452.

II. The double lectern system or book desk system.

III. The stall system.

IV. Alcoves system

The prototype was the library of Trinity College, Cambridge. The plan was good for a small libraries, special collections and rooms within larger libraries.

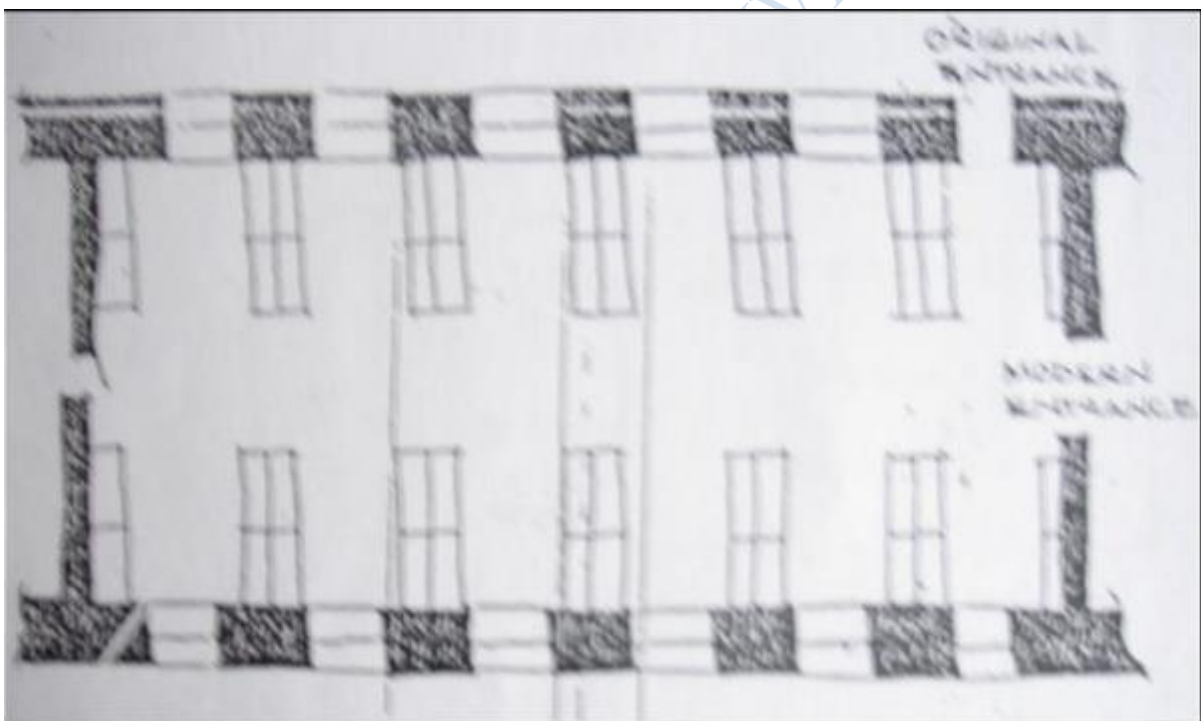


Figure 2: Typical Medieval Library plan.

Source: Fere, (1994.)



Plate 1: The interior of the Malatestian Library in Cesena, Italy

Source: Microsoft student Encarta Encyclopedia, (2008).

2.1.8.3 The Closed Book-Stacks Plan

This plan came into practice in the 19th century when there was need to supply readers with more books as much as possible and this need will then see the increase in book production. Thus, the following arrangements were available;

- i. The reading room on the upper floors while the book-stacks were below; this arrangement gave room for reading areas to enjoy daylight from above as shown in figure 3
- ii. The plan could also be in form of central reading rooms surrounded by book stacks as shown in figure 4
- iii. The reading room in front and the book stacks behind with the librarian in between, for instance the Harvard University Central Library, USA as shown in figure 5
- iv. A central book stacks surrounded by reading rooms. This was developed when the discovery that daylight for book stacks was essential. A typical example is the Columbia University Central Library, USA as shown in figure 6.

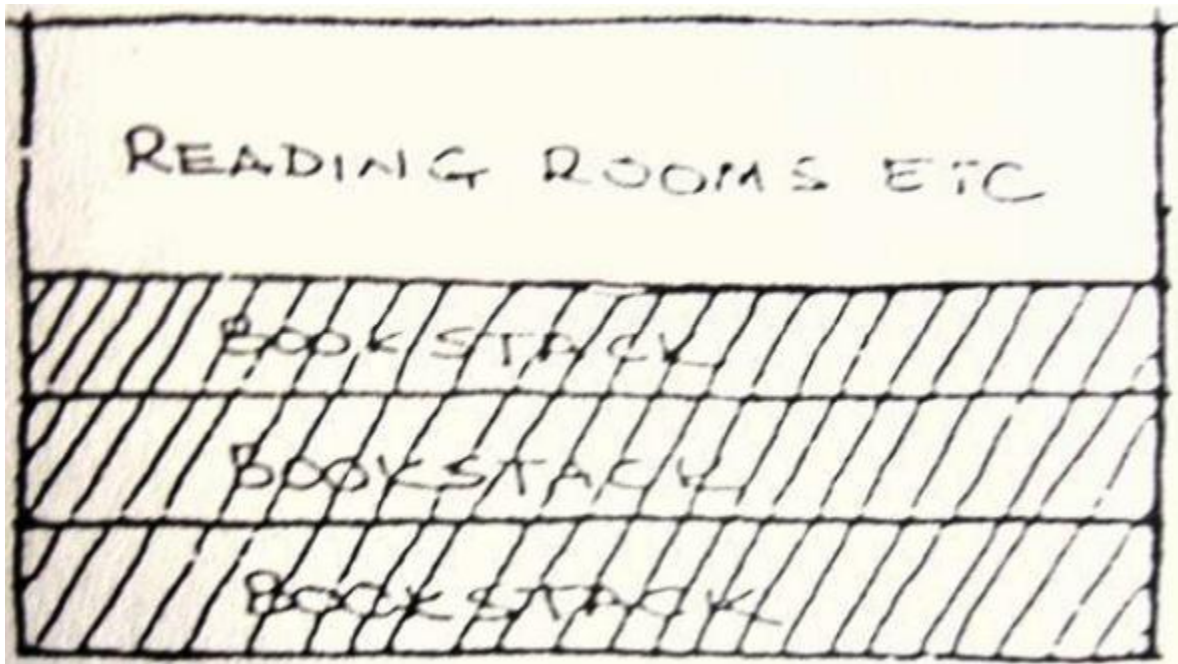


Figure 3: Section through the reading room on the upper floors while the book-stacks are below.
Source: Fere, (1994.)

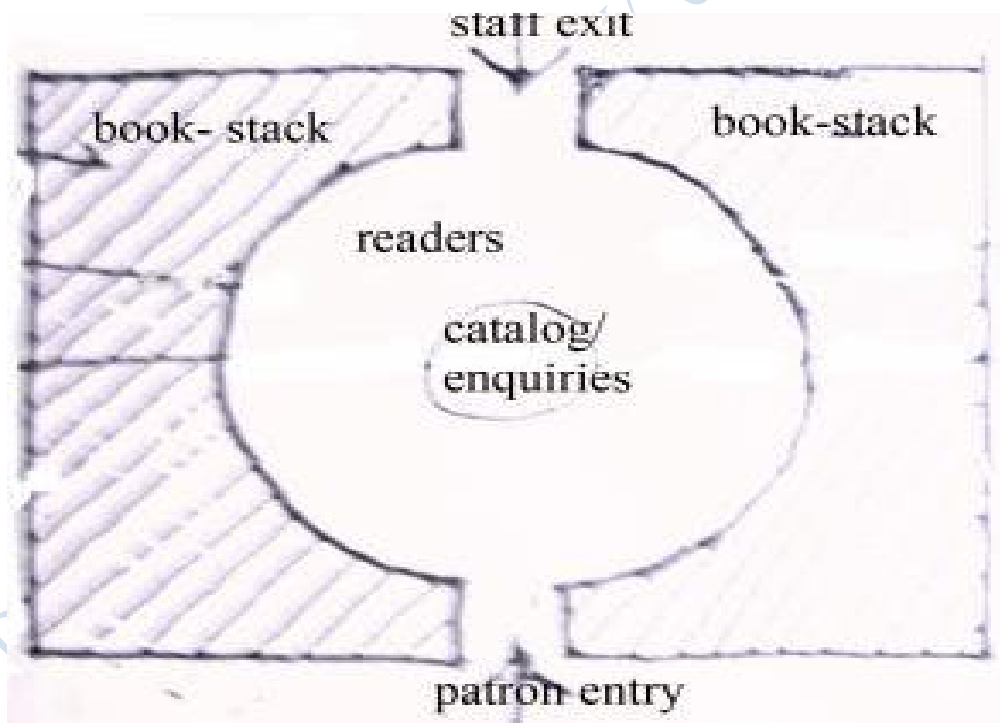


Figure 4: Plan of central reading rooms.
Source: Fere, (1994.)

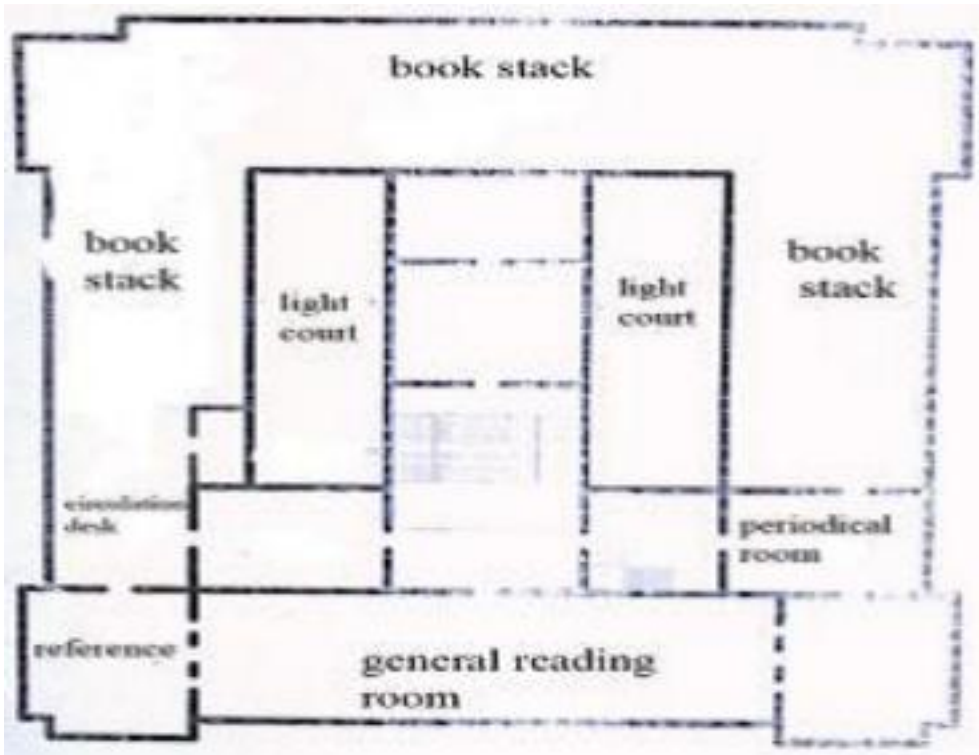


Figure 5: Reading Rooms in Front surrounded by book-stack and book-stack behind
 Source: Fere, (1994.)

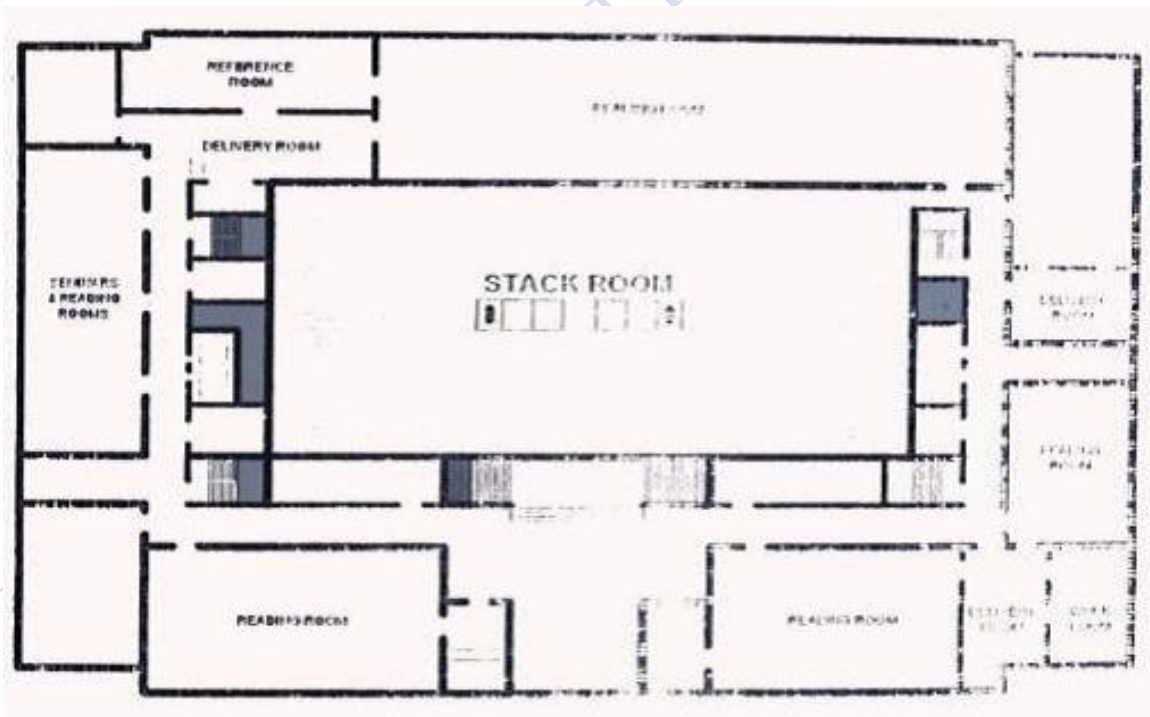


Figure 6: Central book stacks surrounded by reading rooms.at Columbia University Central Library, USA
 Source: Fere, (1994.)

2.1.8.4 The Open- Access Plan

A later development in library design during the medieval period was the provision of open access to stacks and subject division within the library. They are classified as;

i. One room type: this is meant for small libraries with both books and readers in the same room. The readers have free access to the books without any hindrance. Here, an informal loan desk is nearer to the entrance in the center of the larger side as shown in Figure 7

ii. Left-right type: In this type of arrangement, the one room is divided into sections. The plan is mostly rectangular with a large room on either sides of the loan desk and entrance. A small room could be located immediately behind the loan desk for either reference collection or for the staff. This type is commonly used for small libraries. Large ones that were based on this principle had to be divided laterally, depending on the nuisance levels of various activities as shown in Figure 8.

iii. One storey type: the development in building technology and educational advancement became necessary for the library to grow. The reference section was located on the quiet upper floor while books were kept on the ground floor for the convenience of the borrowers. This type of plan resulted in compact and economical building. An example is the British Public Library.

iv. Plan for large libraries: this type of plan is made up of flexible open plan for readers in such a way that movable partitions between the departments allow for change of subject area or use. For noise control, the arrangement which separated the different departments by book shelves was replaced with full height glazed partitions between the different departments. An example of this is the America Memorial Library, West Berlin (Tronchin, L., & Fabbri, K. 2017).

v. The Scandinavian type: this type consists of a large space for with an attractive lending department on the ground level supplemented by a gallery. The provision for a separate reference library is also made. An example is Frederiksberg Public Library, Denmark.

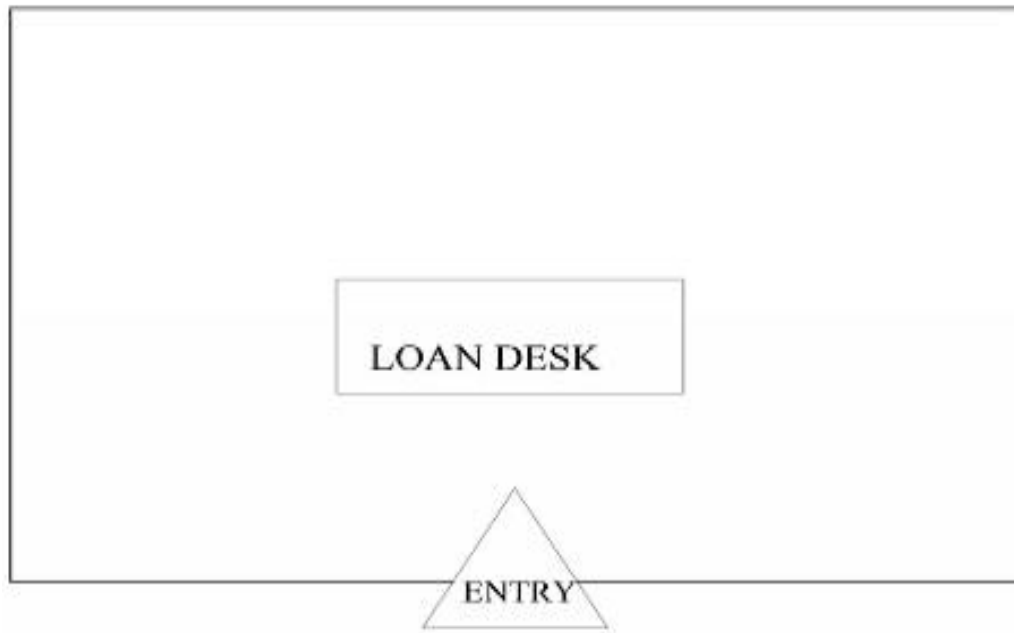


Figure 7: One Room Type with the Loan Table near the Entrance.

Source: Ezekwe, (2009.)

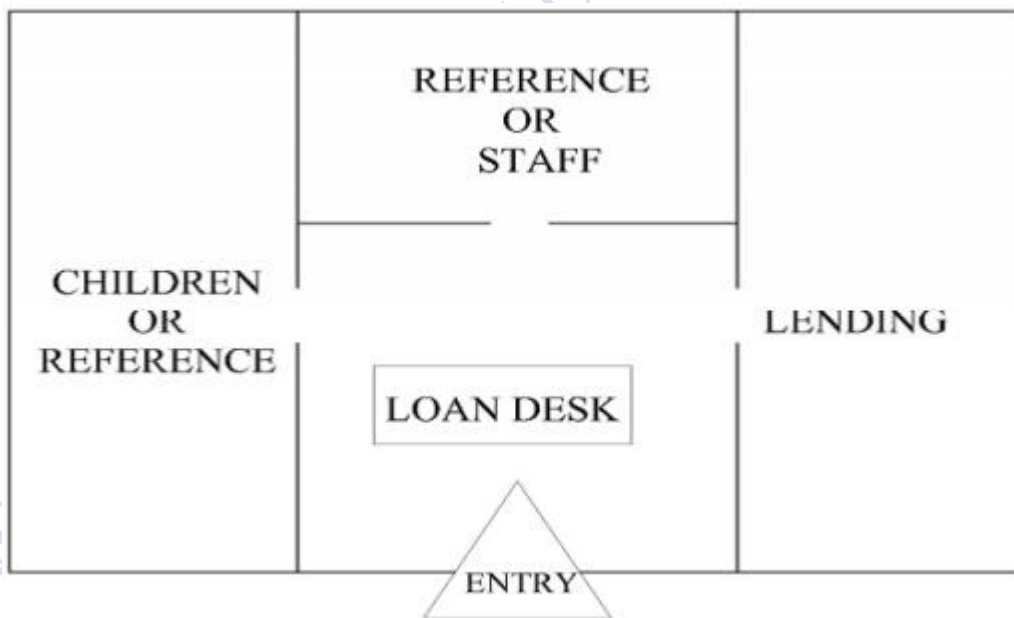


Figure 8: Left Right Type.

Source: Ezekwe, (2009)

2.1.8.5 The Development of Modern Library and Twentieth Century Planning Concept

Great library holdings fluctuated with the outcomes of war and politics. In Europe, College and University libraries grew in popularity at this time especially in the Scandinavia, central and Eastern Europe, Italy, Spain and Portugal. Before the late 18th century, there was no such thing as a college or university library that served as a useful resource for research. In the 19th century, German universities served as models for most of the world's universities. In contrast to many other college libraries of the 18th and 19th centuries, which remained antiquarian, older universities reorganized their existing consolidated collections to support the new type of research scholar. These collections contained few scholarly books and were primarily haphazard unsystematic gentlemen's libraries. As concept of educations change, so also do the concept of library service within educational institutions and indeed, the architecture.

Apart from books, this concept took up new forms such as photographic materials into the stock of the libraries. The emphasis was access to stack and to increase the services to users. This planning also witnesses the modular system of construction with columns forming the main vertical supports. Lower ceiling height became prominent as a result of improved changes in ventilation and lighting system.

In its functional adaptive condition, a project to build college and university libraries will start with this kind of study. Library service needs, demographics of the service region, and other related statistics are forecasted and converted into the need for library space. The various possibilities are then analyzed, and a strategy is decided. Following the establishment of a library building program, the choice of architects, and a building's design that has been selected, this paradigm discusses libraries as facilities, how library facilities change as a result of changes in their surroundings, how those changes sometimes affect library organization, and how library organization changes affect library space. This framework must be completely itemized and simplified in order to balance the usefulness of configuring a space for adaptability of purpose and functions in many aspects of

library design. To accomplish this, multiple types of space formation and integration inside the cores and centers of libraries must be set to justify and satisfy the needs of the public in their usage of the library. The following factors are identified by the technique used to explore this theoretical framework:

- An existing and projected gross square foot requirement.
- Locally defined library design criteria.
- Functional operation of the facility.
- User accessibility and ease of access.
- Capacity for shelving, seating and staff requirements.
- Provision and equipment for future technology.
- Expansion potential, present and future.
- Library Building Program Space Summary.

2.1.9 CONFIGURED SPACE UTILITARIAN IN THE LIBRARY DESIGN

The utility of these structured spaces must be enumerated in order to determine the seamless operation of a specific area in the present and sophisticated library design. Access Services, Reader, Book, Roaming, Services cape, and Way seeking are among the space's inhabitants.

I. Access Services: Circulation, interlibrary loans, reserve and current periodical reading rooms, listening, viewing, and microform workstations, computer workstations, document delivery, outreach and home delivery, management of meeting and study rooms, reader's assistance, and stack maintenance are a few examples of library-related activities that are concerned with directly giving users access to library materials and services, whether physically or electronically. Many academic libraries have developed a cohesive department responsible for the whole spectrum of access services over the last two decades, and the approach is also relevant to special, school, and public libraries.

II. Book: The physical or electronic components of a library collection. These units manifest in a number of configurations, with the context, arrangement, and so on defining the flow of the function. The nature and function of the books collection area can be changed. As a result of its portability, book stacking should be flexible for simple movement between and replacement of different activities within the provided configuration. In an open library hall, there is space for comfort and to emphasize the concept of space; the portable nature of book stacking allows for easy substitution for different activities within the predetermined set space and easy circulation. All library items, regardless of format, are collectively referred to as books in this context. Text is a similar phrase that describes the unit's intellectual and emotional substance.

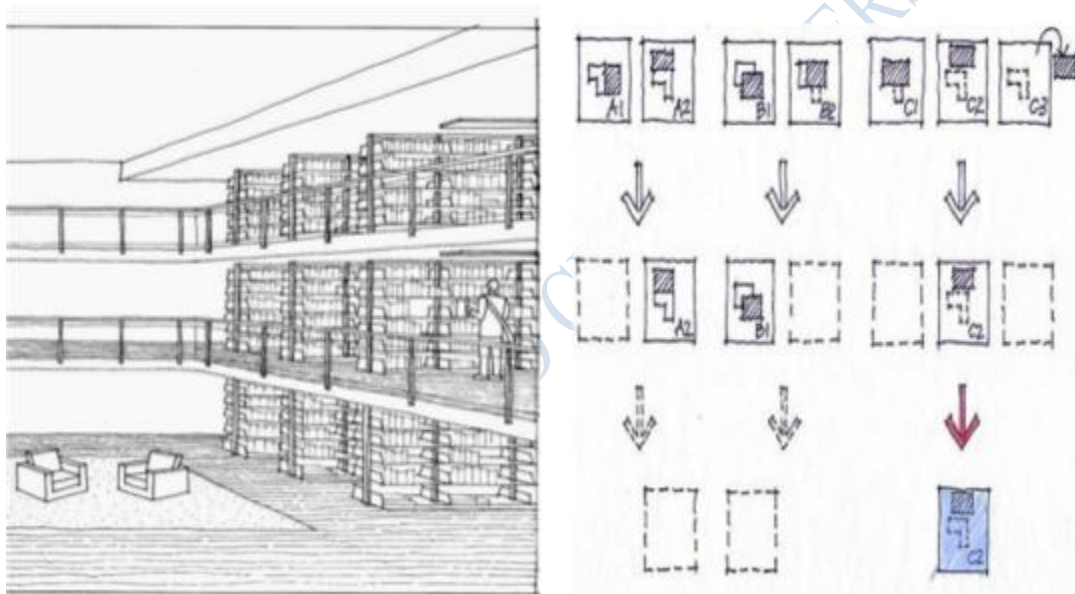


Figure 9: refining the book stacking

Source: Researcher fieldwork, (2022).

III. Reader: Identifying and positioning the reader in the ideal setting with appropriate comforts available in libraries may cause his reading boundaries to burst, and even compare the requirement for creating flexible space. A user of a library's resources and offerings must be provided with configured spatial satisfactions. These elements promote spatial interactions with a common interest in the user, patron, borrower, consumer, or reader, making the library's essential public function and

the way people perceive it more evocative. The word is used to refer to writings found in libraries that viewers or listeners can also experience. All books, regardless of format, have a transforming effect on individuals who read them, and it is because of this educational opportunity that those who use physical or virtual libraries are considered readers.

IV. Roaming: This could involve accompanying readers searching the stacks for a book or topic; scheduling routine walks through the stack, study, and lounge spaces; identifying readers who require assistance with using the OPAC or the Internet, and contacting those who appear lost or bewildered and offering support. Instead of posting staff to a service desk where they will wait for reader-initiated requests for help, the active practice of roaming is an option. Because patrons will begin to anticipate assistance from library employees at the time of encounter as a result of roaming, all staff members should be prepared to provide basic assistance without referring to a specific desk or service

The simulation space was built using a space created to gather spatial attribute data.

- Programming, the use of location data and attribute data to write a program into a pedestrian and create patterns of pedestrian movement..
- Program testing and ongoing way seeking model modification.

V. Wayfinding: the act of moving from one location to another inside a defined space, usually in a physical context such as a city or a building. The process of finding your way involves orienting yourself to your surroundings, choosing a path, monitoring your progress along the way, and identifying your destination (Kuliga, S. F., et. al., 2019). The system that helps readers find their way in the library servicescapk layout is aided by lighting, architectural details, and signage. Access services employees frequently aid readers with navigation and cope with faults in a library's wayfinding system.

2.1.10 APPROACHES TO SPACE CONFIGURATION USING ANALYTICAL TOOL

Qualitative spatial representation is an analytical technique used for space evaluation and the magnitude of its configurative. Within the Qualitative Spatial Representation (QSP), a space analysis tool, there are numerous techniques. This tool attempted to detect multiple modes, dimensions, grids, transformational demands, and structured space formation. The tool is said to further demonstrate how its usability may be customized and developed in order to create a condition in which the configured area is easily adaptable to current and future changes in the Public Library. As a result, it is critical at this point to examine some of the space determinants and representation. Topology, orientation, shape, size, and distance are all addressed in Qualitative Spatial Representations (QSR).

I. Topology: The most basic element of space is topology. Because it can only create qualitative differences, topology must be a key part of spatial judgment of a high quality. Topology has garnered a lot of attention in the literature on mathematics. But much of it is too abstract to be helpful for people who want to formalize intuitive spatial understanding. Although mathematical topology has inspired different qualitative spatial theories, there are several factors that make such wholesale imports undesirable in general (Lee, G. J. 2017). In addition, we have interests beyond only representation but also in qualitative spatial thinking, which has not gotten much attention in mathematics.

II. Mereotopology: Mereotopology is philosophy of parts and whole. The academic fields of mereology and topology are combined to form the field of mereotopology. A thorough examination of the nuanced relationships between mereology and topology was unfolded. It was observed that, while mereology is insufficient on its own, there are ideas in the literature that propose combining topology and mereology. Connection, a key topological concept for qualitatively describing space, cannot be described solely in terms of the mereological part-to-whole relationship (Jin, R., 2019).

To establish an acceptable qualitative account of space, topological ideas must be introduced to mereology. There are three basic integration strategies:

- Generalize mereology by adding a topological primitive.
- Mereology is a sub-theory of topology, which is fundamental.
- Topology is an advanced, domain-specific branch of mereology.

III. Orientation: Orientation relations define how things are positioned in reference to one another. Orientation is defined by three fundamental ideas: the primary object, the reference object, and the frame of reference. Certain qualitative orientations calculi in the literature include relying on an extrinsic frame of reference without explicitly establishing a triadic link. Points serve as the fundamental spatial elements that the bulk of qualitative approaches to dealing with direction are founded on. The direction a point faces when facing away from a geographic reference point in the cardinal direction is expressed as north, east, south, and west can be described in a variety of ways (Scharnhorst, P., et. al., 2021). Orientation is also defined as the path from a located point to a reference point by starting at a perspective point (Arndt, D., et. al., 2021). Three axes are utilized in this approach: the perspective point and the reference point, which determine the other two, are orthogonal to the first while the first is defined by both.

IV. Distance and Size: The most crucial features of space include distance. An absolute scale or a relative measurement is used to qualitatively depict distance. One of the first category's statements is "A is near B", the second group makes the claim that "but A is nearer B than C."

Another technique for identifying the relative sizes of two objects involves translating portions that are supposedly shape- and size-invariant and then using topological correlations. Orientation and distance are closely related ideas; for instance, distances cannot be summed unless they are in the same direction. It follows that the existence of numerous calculi based on positional information is not surprising: a basic that incorporates location and orientation data (Bradley, J., et. al., 2018).

Factors influencing the Position of Distance and Size in a Configured Space

A. Person: This space determinant appears in unusual settings (elevator, crowd). In a predetermined setting, four key distances are to be kept in mind as they are applied in user interactions. Additionally, regarding the type of engagement that is permitted, each distance has a certain importance and these meanings are determined by the constructed space culture. It also demonstrates how distance restricts the kinds of interactions that are most likely to take place in configured space in a public library by expressing how interactions between actors are characterized, configured space, and what they do to participants and spectators. Distance measurements reveal a crucial aspect of face-to-face communication.

As the distance between two people grows, there is a likelihood that they will communicate in an organization reduces (After the first 30 meters of actual desk spacing, it quickly gets smaller).

Physical adaptability is translated into social interactions in a variety of diverse contexts. Social distance occurs in both virtual and real worlds thus, social positioning is conveyed by avatar positioning. In the real world of a library, people keep a proper usable distance. As a result, the physical body can be somewhat identified with the visual image. Han, B. and colleagues (2020) examined graphical chat log files and discovered that spatial management occurred in a manner that was strikingly comparable to how real space is controlled taking proximity and orientation into account. Participants, for example, maintained personal space (as in a traditional library setting layout) and appeared to stand near and look at individuals whose function is specified by the platform offered for their interaction. Because people congregate there, the graphical aspect of this virtual environment is essential in the same way that they would in face-to-face encounters.

B. Person/Workstation: Another issue addressed in the literature concerning space organization and adaptation relates to the connections between people and workstations positioned near the participants in a social engagement. When a group of library customers meet in a shared location

known as a referential environment. In order to identify the idea in his thoughts, the speaker uses a referring term. Mutual belief that the addressee(s) has correctly identified a referent depends on the establishment of a referential identity. Closeness, salience, and permanence are common spatial features utilized to choose frame references and sources in this context (Hagman, J. 2018).

Since everyone is literally a part of the same environment as we all know and to facilitate reciprocal spatial orienting, this spatial knowledge can be used. It should be remembered the idea that each person has a unique viewpoint about the world. As a result, in order to understand the reference, speakers must adopt the perspective of their addressee. This is known as perspective-taking or mutual modeling: one person's ability to sympathize because of another person's situation. The spatial arrangements of the individuals and artifacts vary depending on the viewpoint. Different approaches of describing spatial places can be distinguished egocentrically (using the phrase "in front of me" or "in front of you"), from the standpoint of the recipient (such as "in front of you"), or from a shared or "neutral" perspective ("between us").

C. Person/Place: Another topic raised by the literature is about the intricate links that exist between people and the location/center of activity. The influence of geography on human behavior is a sometimes overlooked area of environmental psychology (Deme Belafi, Z., et. al. 2019).

The physical setting, in especially the interior library, is a special place where offices, rooms, and a feeling of spatial and group identity can be found. It is believed that how group identification and other factors interact (the sense of belonging to a broader human group) and spatial identity (based on experience and understanding of the surroundings) is extremely important. One of the most noteworthy features is how little attention was paid to the issue of territoriality in adaptable space across the entire library building. In anthropology, place is defined as having acquired meaning as a result of human endeavour.

Our sense of location provides a behavioral framework that directs our actions in specific circumstances. Aside from a precise layout and physical structure, every place has a social meaning and a cultural knowledge of the purpose, nature, and role it plays. These characteristics are undeniably visible in the actual world. This suggests a deep connection to physical world, followed by its intuitive character.

D. Space and Artifacts: There are no voids in the real world or the virtual world. As a result of occupying our spaces, things and objects have states and locations that can be modified. Thus, any object in the environment could influence how people interact with one another either directly or indirectly. We may therefore create a variety of functions thanks to the connections between artifacts and space.

Recognizing that you have access to the same tools because you are in the same space is the first step. As stated by the distributed cognition theory, when used together in the same physical space, tools form a single cognitive system and can cooperate.

E. Shape: Shape is a crucial aspect of an object that is especially challenging to qualitatively describe. Both constructive and restrictive techniques can be used with qualitative formalisms for describing shape. Structured arrangements of basic components can be used to describe complex shapes in the constructive description of qualitative shape. Topology must be followed by the introduction of primitives in terms of shapes while maintaining a qualitative representation. Approaches that describe an object's border including those that categorize the succession of several boundary segment type's diagrams that outline the arrangement of various curvature extreme along its contour.

A purely topological theory can only make extremely limited statements about the geometry of a region, no matter if it is one piece or not, if there are holes or cavities inside, or any other factors.

The bounding box and convex hull are two examples of shape abstraction primitives that the 9-intersection model has briefly studied.

F. Diversity and Uniformity of Shape: The structure is well defined and regular in shape, with a deep interest in every intersection, decision point, and road segment. Large metro poles frequently have a mesh or grid pattern. Although architects must follow to broad principles, they are granted more leeway in constructing necessary space, particularly in library structures.

Depending on the intended function of the constructed space or rooms, they can vary significantly in size, number of connections to adjacent rooms, or shape. Floor layouts can include a variety of room shapes. Large rooms, in particular, can be distinctive due to their uneven shape and plethora of connections. As a result, systematic management of indoor environments is challenging. This framework identifies the numerous techniques by which space can be structured within a given design, while also creating rooms for varied demands.

2.1.11 FLEXIBLE NATURE OF LIBRARY ACTIVITIES AND FUNCTION

Both a building and a location are considered to be a library. The difference between location and space is analogous to the distinction between house and home. Dimension, shape, utility, and so on can all be used to describe how space is configured.

The architecture of the library buildings and the organization of internal areas represent the steadiness and sobriety of this institution meant to preserve humanity's memory (Luo, L., & Liang, J., 2019). It is a place of stillness because reading and studying places are prevalent in libraries; the solitude of intellectual endeavor undertaken in community identifies the print culture reader.

Libraries have begun to expand their offerings in cyberspace as information technology has grown and communication networks have expanded.



Plate 2: Typical library layout with movable furniture.

Source: Researcher's fieldwork (2022).



Plate 3: Arranging space for function

Source: Researcher's fieldwork, 2022.

P

The Internet's ability to provide remote availability of library services and resources gave rise to the concept of a "library without walls." The user's view of the library, as well as the library's perception of itself, has shifted. Changes in library perception had an impact on spaces as well. Library spaces should adapt not only to the changing information landscape, but also to changes in research and study methods, and implicitly, to changes in user information behavior. Today, they are imbued with new values and serve new functions in comparison to traditional library rooms.



Plate 4: Computer section of children library service

Source: Researcher's fieldwork, (2022).

2.2 ARCHITECTURAL DESIGN CONSIDERATIONS FOR THE LIBRARY

Design considerations have been created to assist designers in implementing the universal accessibility and flexibility design ideas and standards to structures and facilities. These guidelines and planning tools are intended to promote comfortability and accessibility for all people. For

added assurance that the project conforms to all relevant laws and regulations, the designer should also refer to pertinent Ordinances and Design Manuals.

2.2.1 Physical Accessibility

2.2.1.1 Physical Accessibility Requirements in Buildings

All structures must adhere to accessibility standards for all types of individuals. These include all public structures, governmental institutions, office buildings, residential complexes, commercial complexes, medical facilities, educational institutions, dining establishments, recreational and sporting venues, religious structures, and all other structures typically occupied by the general public.

For an accessible public building, the following must be observed:

- i. The accessibility requirements for all buildings must be met by all entities. For brand-new buildings, the main entrance(s) meant for the general public should be the accessible entrance(s).
- ii. There should be accessibility anywhere that the general public can use amenities such waiting areas, coffee shops, exhibition spaces, merchandising departments, service areas, ticket desks, refreshment stands, etc.
- iii. There should be at least one wheelchair-accessible cubicle in every public restroom.

2.2.1.2 General Principles of Accessible Design of Library

We don't have to fight for the right to use libraries (Belousov, B. et al, 2019). We have access to a huge information base through libraries, where one can find books, periodicals, newspapers, journals, etc. Thus, it becomes imperative that design criteria for enhancing accessibility is given due consideration in design. Collections are now kept in digital formats and made available via computers thanks to the development of digital libraries; both real and digital libraries should be accessible to all users. Therefore, it is crucial to guarantee that the library's facilities are physically accessible. If one uses the term "physical access," they imply that everyone, regardless of physical

restrictions, can enter and utilize all areas of the library without assistance and do so in a secure and comfortable manner (United Nations Enable, 2003).

The following fundamental accessibility standards should be met by constructions and buildings:

I. *Functionality*: Everyone who uses the building should be able to utilize it in the same way and with the same level of comfort or convenience as a legitimate person, in order to provide the fundamental functioning anticipated of it.

II. *Autonomy*: No user should seek the help of anybody in order to use the structure.

III. *Safety*: Use of the building by the users should not negate their safety. Generally speaking, anything made for human use need to offer a significantly higher level of safety. To ensure safety, all hazards which exist in and surrounding buildings should be identified and eliminated. For instance:

- i. Find and remove all pointless hurdles and obstructions and where such obstacles are inevitable then, it should either be clearly identified or cordoned off.
- ii. It is important to take extra ensuring there aren't any cords or trailing wires that could become tangled and cause an accident.
- iii. Ascertain that any potential passageways have been cleaned of any dangers.
- iv. The flooring surface must be non-skid in nature. Whenever carpets or any other type of floor covering are employed, care should be taken to ensure that it is non-woven, to prevent torn threads from becoming twisted on the users' way or equipment.
- v. Make sure the paths are free of any soft or slushy sections and open pits (such as open manholes, trapdoors, etc.). Such traps ought to have a distinct perimeter.

2.2.1.3 Basic Measurements for Accessibility

Before planning any structure for accessibility, an understanding of the maximum size for safety and comfort is important.

Any standing position requires a minimum movement space of 0.9 m. In every location where the person is expected to move or travel, there should not be any obstructions smaller than this distance. Things ought to be kept up to 1.60 meters in height or less so that he can reach them while standing. For items like bookcases, cabinets, wardrobes, and so on, this is especially true. To move around, turn, and navigate, a person in a wheelchair requires unfettered clearances. And for reaching out to items, they should be positioned such that they are neither higher than 1.30 meters nor lower than 0.70 meters above the ground (Neufert, E 2000). For some users namely, those who are physically challenged, the structure become exceedingly inconvenient if these dimensions constraints are not observed.

2.2.1.4 Architectural Element/Features of Accessibility

I. Ramps

Wherever steps prevent pedestrians from moving freely, ramps should be available. Ramps should be placed outside wherever possible. Due to their significant space requirements, indoor ramps are not advised. In a perfect world, a ramp's entrance would be right next to a set of stairs. (United Nations Enable, 2003).

Ramps are particularly crucial for improving building accessibility, so they must be carefully planned. Consequently, the following items deserve attention:

- i. when there is a level disparity that cannot be avoided (such as at door frames and thresholds), it should be kept to a maximum of 300 mm. A ramp must be available any time there is a change in level that is greater than 300 mm.
- ii. Adequate landing space must be kept each ramp's beginning and ending.
- iii. A strong, rough, and non-skid substance must be used to create the ramp's surface. Carpets should also be avoided.

iv. The ramp's ideal dimensions are no longer than three meters and no steeper than 6%. If it is not feasible to build a single ramp that complies with the length and slope restrictions, it is possible to construct a ramp with multiple runs.

v. The ramp should be divided into ramps with many runs if it is longer than three meters. The length of each run should not exceed three meters.

vi. Make sure the landing areas at the ends of each run of the ramp are sufficient. This area must be used as a landing spot in case the person needs to relax, turn around, and make a partial return, or slow down to avoid traveling too quickly (United Nations Enable, 2003).

vii. There must be enough room to open a door if the user needs to do so.

viii. A hand rail for the balustrade is necessary for any ramp that is longer than one meter. To prevent falling off the ramp, the balustrade hand rail is very helpful as a safety barrier. (United Nations Enable, 2003).

ix. Every ten meters should attract change of direction with an inclusion of landing. Each landing should be at least one and a half meters long and one ramp's width wide. (United Nation Enable, 2003).

x. All ramps must have a safety handrail that is at least 0.40 meters high.

xi. On ramps broader than three meters, a central railing may be installed (fig. 16).

xii. When holding is performed using both sides, there should be a space between the railings of 0.90 to 1.40 meters (fig. 16) (United Nations Enable, 2003).

xiii. For the benefit of those who are blind, the ramp's top and bottom should each have a colorful, tactile indicator. A minimum 0.60 m marking strip width is required (United Nations Enable, 2003).

Ramp Configuration:

These several arrangements for ramps are possible:

- i. Straight run (fig. 9A)
- ii. 90 turn (fig. 9B)

iii. Switch back or 180 turn (fig 9C).

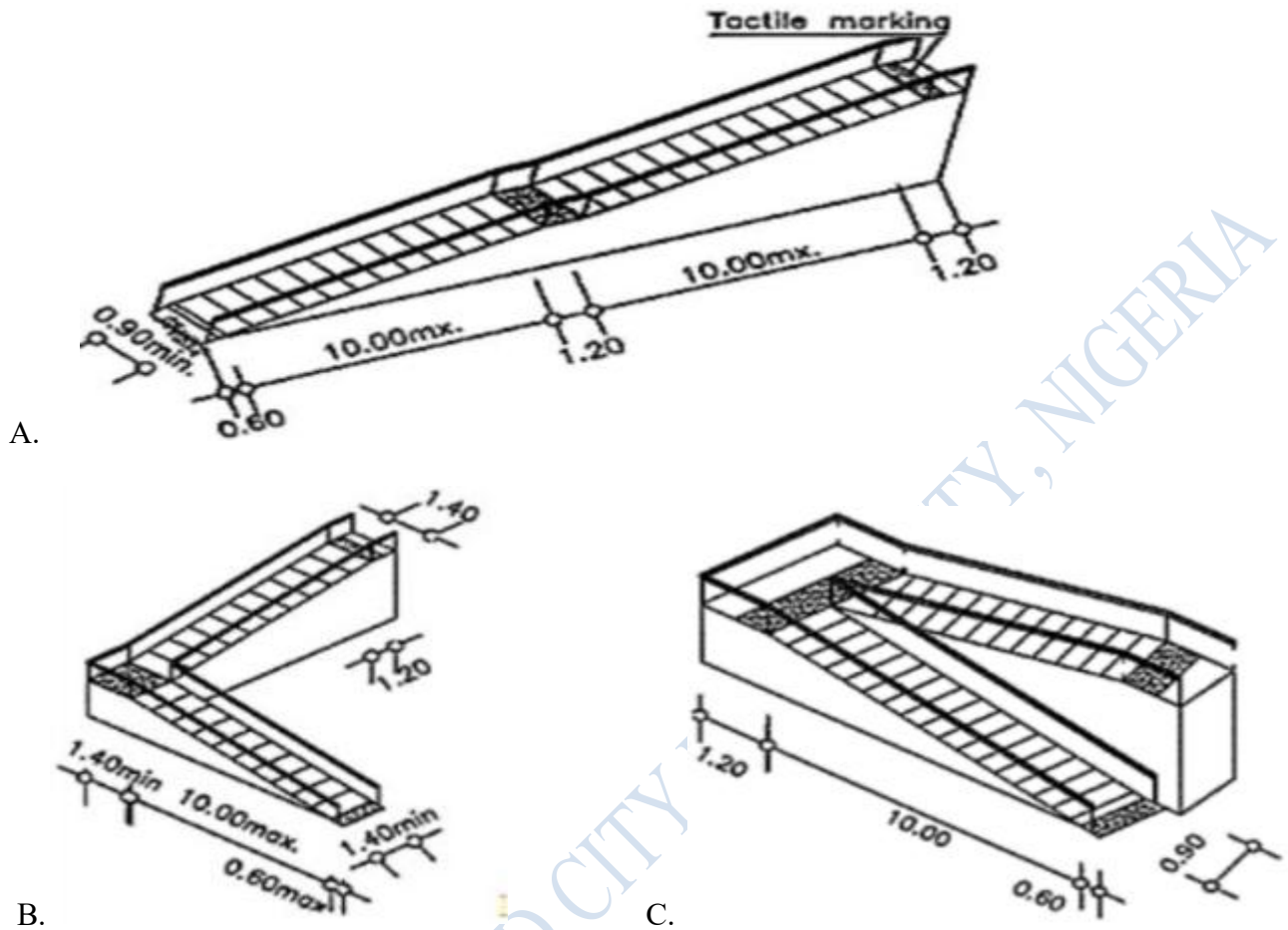


Figure 10: Various ramp configuration and slope.

Source: United Nations Enable, 2003.

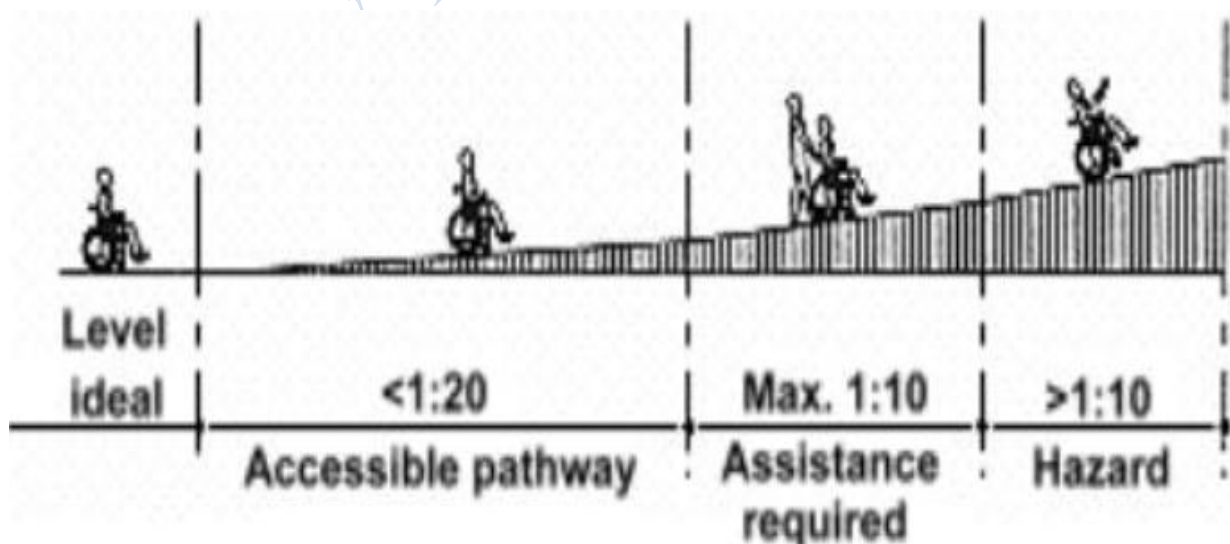


Figure 11: The maximum recommended slope of ramps.

Source: United Nations Enable, 2003.

Width: Using, configuring, and sloping all affect width. A 0.90 metre minimum width is required.

Slope: Ramps work well when the slope is no greater than 1:20. Steeper slopes could be permissible in some situations, depending on the distance to be covered (fig. 11) (United Nations Enable, 2003).

II. Rest rooms/Toilets

The significance that restrooms play in our lives is crucial and essential. How difficult it is to live without one can be realized if one tries to resist entering it when the urge comes. However, we frequently fail to provide this bare minimal amenity in a way that is appropriate for the building's users. Restrooms should have enough easily accessible space, with all fixtures and fittings in a convenient location. Thus the following points are noteworthy:

- i. The door must be able to open outward so that someone can comfortably close it from within the toilet after thoroughly utilizing it.
- ii. Give the door enough room in front of it so that it may be opened easily.
- iii. The floor covering needs to be non-slip.
- iv. The toilet needs to be big/wide enough for all types of users to enter, turn around, and shut the door.
- v. The door latch, Wash hand basins, taps, mirrors, handrails and other gadgets ought to be accessible to all users.
- vi. Signposts and markers should be used to visibly display the presence and location of restrooms for the physically challenged users.
- vii. The universal accessibility sign should be used to identify accessible restrooms. It is not necessary to indicate sign should the restrooms are accessible
- viii. The physically challenged person shall be able to enter at least one compartment for each sex on each floor of any public restroom.

ix. Special restroom layouts and sizes should meet the basic standards (United Nations Enable, 2003).

x. In designated restrooms, a toilet and a water closet should be available.

III. Water Closets

i. The toilet paper dispenser and flushing mechanisms ought to be positioned within reach at a height of 0.50 m to 1.20 m, respectively, and the height of the toilet seat ought to be between 0.45 m and 0.50 m from the finished floor level (United Nations Enable, 2003).

ii. If a grasp bar is present, the toilet seat's center line should be 0.45 to 0.50 meters away from the neighbouring wall.

iii. When using a tankless toilet, grab bars should be installed on the wall behind the toilet and between 0.85 and 0.95 meters above the floor on the side wall nearest to the toilet. They can also be installed on the floor at the seat's edge if the toilet is on a side wall.

iv. It is suggested that easily accessible hand-operated flushing controls be placed on the toilet's open side. It is advised to use wall-mounted restrooms (United Nations Enable, 2003).

V. Parking Space

There must be enough parking lots for any public structure. Care must be exercised to guarantee that the parking place can be reached without encountering any barriers, and no other vehicles can obstruct the approach.. In addition, the following should be noted:

i. In order for a physically challenged person to enter and exit their vehicle, the parking area must be at least 3 meters wide. There should be sufficient room to maneuver about using a wheelchair.

ii. No slope may be present in the parking place.

iii. There should be reserved space for parking of vehicles by handicapped persons and should be prominently marked.

VI. Counters, Table tops, Door handles, Taps, and Control

- i. In public spaces, counters and table tops that are intended for human use must be made with the bare minimum of measurements in mind.
- ii. These fundamental measurements also apply to any control device that requires manual operation, including computer keyboards, telephones, audio/video equipment, culinary ovens, post boxes, window latches, doorknobs, door handles, and electrical switches, taps, and valves.
- iii. It is important to make sure that all users, including those who are disabled, have clear access to these equipment and objects. These gadgets need not only be placed properly; they also need to be simple to use and safe.
- iii. On accessible doors, all handles, pulls, latches, locks, and other operating mechanisms must be simple to hold and operate with one hand. They shouldn't need to be operated with a wrist twist, a tight grasp, or a hard pinch.

VII. Furniture and Equipment

Designing furniture that is suited to demands requires special consideration of every user including the physically challenged people.

Furniture should be placed such that the movement of all users is not restricted.

- i. Avoid at all costs purchasing and or fabrication of any furniture with pointed edges or attachments.
- ii. In order to prevent users from slipping away, furniture may be suitably hefty or covered by non-skid feet (or even fastened to the ground or wall) when in usage as they might frequently lean against or prop themselves up against furniture.
- iii. Sofas and seating furniture may be armless for easy usage especially by the handicapped.
- iv. Computer furniture must be specially designed such that they can directly use them. Accessories like printing paper, diskettes etc. should be easily accessible to all users.

VIII. Lifts

It is strongly advised to have a lift available when the building has more than one storey. Moving books between floors without a ramp is incredibly unpleasant and exhausting. Care should be exercised while choosing a lift to make sure that:

- i. The lift door should be broad enough to comfortably allow all users.
- ii. The lift cabin is large enough for carriage of books.
- iii. On the landing as well as within the cabin, the lift controls are positioned at a practical height.
- iv. To ensure safety, the cabin has a sturdy guardrail.

IX. Elevators

The main principle here is to provide well-dimensioned elevators that every category of users can use conveniently. To achieve this, the following considerations must be given:

- i. A railing set at 0.80 to 0.85 meters from the floor should be present inside the elevator on three of its sides (fig. 12).
- ii. All floors typically used by the general public should be accessible by elevator.
- iii. In order to be easily accessible, the control panel should be positioned 1.20 to 1.90 meters above the ground. It can be mounted in one of the alternate locations (fig. 19).
- iv. Control buttons must be easily reachable and lit. They should have a 20 mm maximum diameter.
- v. To simultaneously inform passengers who are blind or deaf, the elevator should feature an arrival signal on each floor that consists of a bell and a light.

vi. On each floor, there should be a low-pile fixed carpet or a non-skid resilient surface in the space in front of the elevator.

vii. In order for all users to clearly notice it, the elevator door's color ought to be different from the surrounding area (United Nations Enable, 2003).

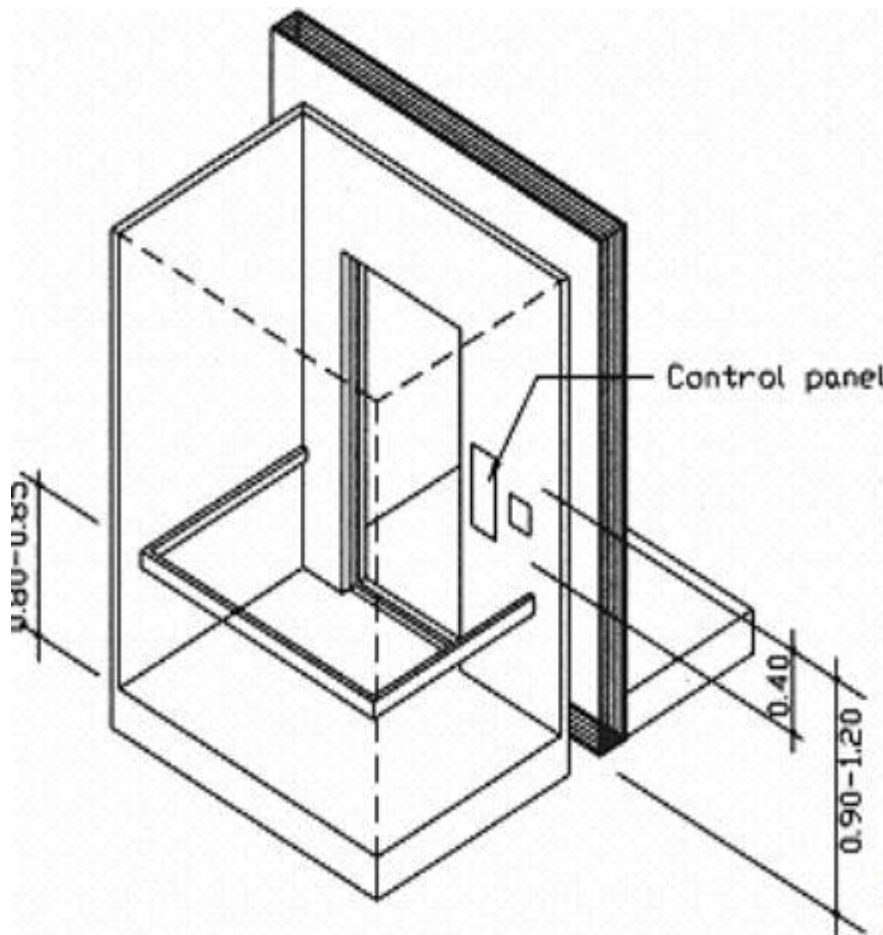


Figure 12: The inside of the elevator

Source: United Nations Enable, (2003.)

X. Stairs

To ensure everyone's comfort, safe, properly sized staircases must be provided. To achieve this, the following considerations must be given:

- i. Each step should be the same.
- ii. In order to ensure that every user is comfortable, level differences should be highlighted or kept to a minimum.

- iii. Steps on an otherwise accessible way should be accompanied by a supplementary ramped route, elevator, or lift.
- iv. Avoid using spiral staircases and landings with steps in a public building rather use other types (fig. 14).
- v. For one-way traffic, stairways must be at least 0.90 meters wide, and for two-way traffic, they must be at least 1.50 meters wide.
- vi. Open risers are not recommended.
- vii. The riser and tread distances for indoor stairs should be 0.12 m and 0.18 m, respectively. A maximum riser of 0.15 meters and a minimum tread of 0.30 meters should be used for outdoor stairs.
- viii. Every time the steps have a 2.50 m or greater level difference, there needs to be an intermediate landing.
- ix. At least 1.20 meters (m) of the landing's length shall stretch the entire width of the stairs.

Recommended Types of Nosing

- i. Treads shouldn't have projecting or sharp edges.
- ii. The nose shouldn't stick out more than 40 mm and should be either flat against the surface or rounded.

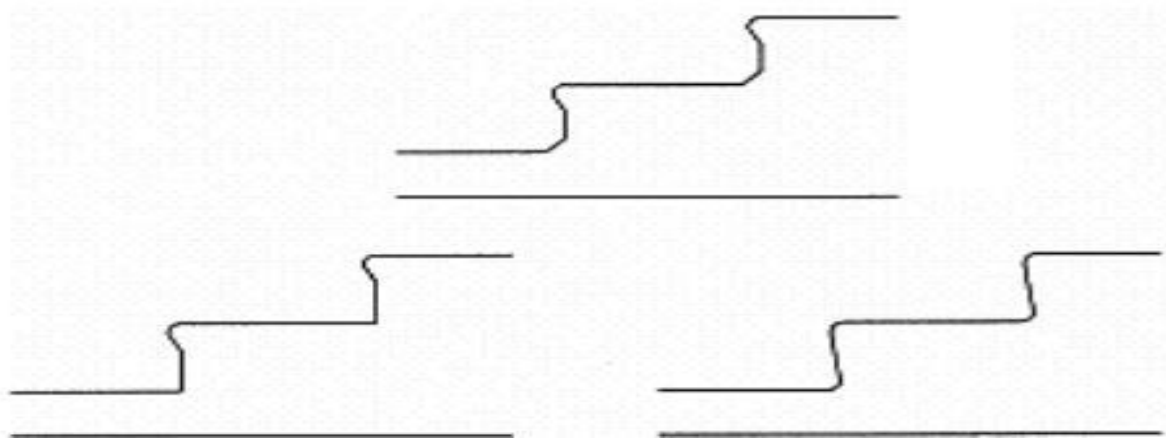


Figure 13: Recommended nosing types.

Source: United Nations enable, (2003.)

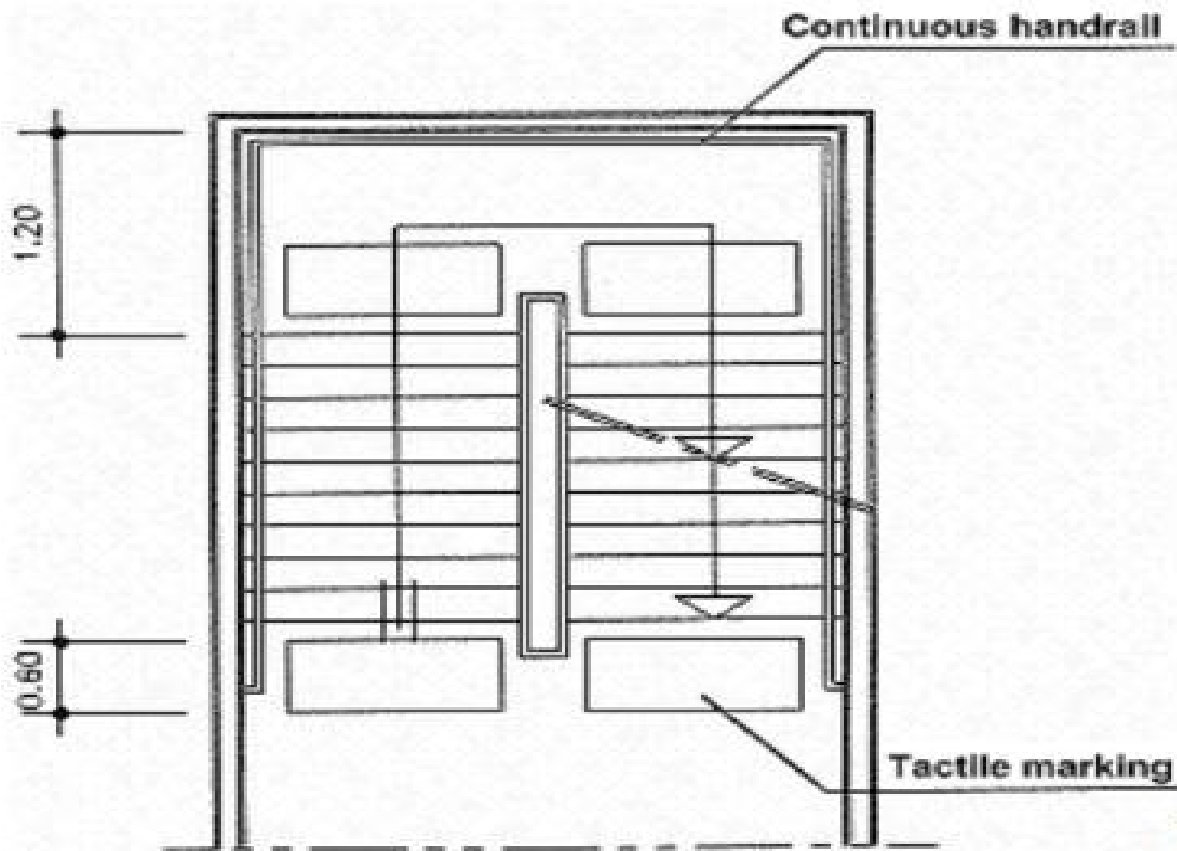


Figure 14: Stairs with tactile marking and continuous handrail.

Source: United Nations Enable, (2003.)

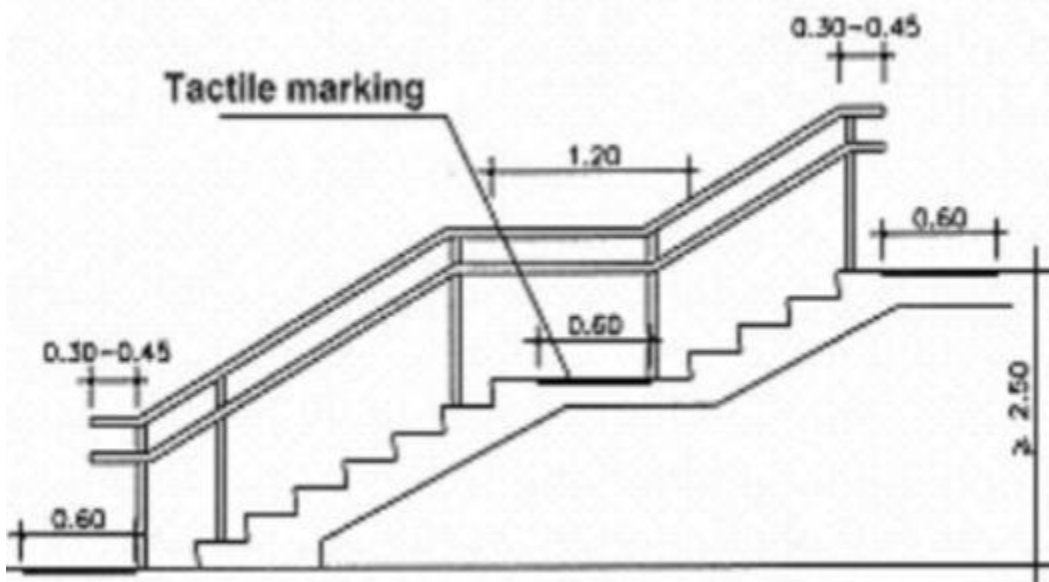


Figure 15: Handrails installed on both sides of the stairs and around the landing for gripping.

Source: United Nations Enable, (2003.)

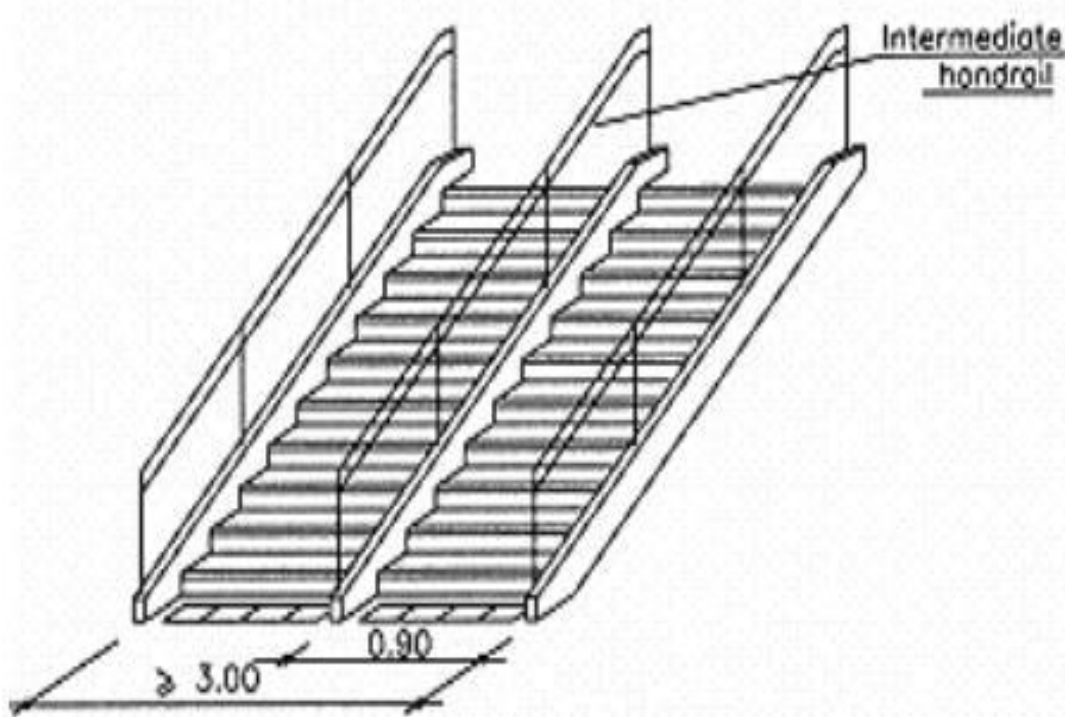


Figure 16: Stairs of 3.00 m wide with one or more intermediate handrails.

Source: United Nations Enable, (2003.)

XI. Railings and Handrails

Adequate railing must be installed wherever necessary for everyone's convenience and safety.

It is advisable to add safety guards or rails around dangerous locations, staircases, ramps, accessible roofs, mezzanines, galleries, balconies, and raised platforms that are higher than 0.40 metre.

i. Both stairways' sides, as well as the landing, must have handrails built for support. (fig. 16).

(United Nations Enable, 2003).

ii. One or more intermediate handrails could be installed on stairs that are wider than three meters.

(fig. 16). (United Nations Enable, 2003).

iii. When holding is performed using both sides, there should be a space between the railings of

0.90 to 1.40 meters (fig. 16) (United Nations Enable, 2003).

- iv. To help people in the restrooms, handrails ought to be put in.
- v. Railings should be installed on stairway windows that are less than one meter from the landing.
- vi. When descending and ascending the steps, handrails shall reach 0.30 to 0.45 meters.
- vii. To ensure that kids are safe, there should be little room between the vertical and horizontal railing bars.
- viii. The travel path should not be obstructed by handrails.
- ix. For wheelchair users, handrails should be erected between 0.70 and 0.75 meters above completed floor level, and for physically challenged and elderly people, between 0.85 and 0.95 meters above finished floor level.
- x. A third handrail can be put at 0.60 m in height to make it easier for kids and short persons to utilize.

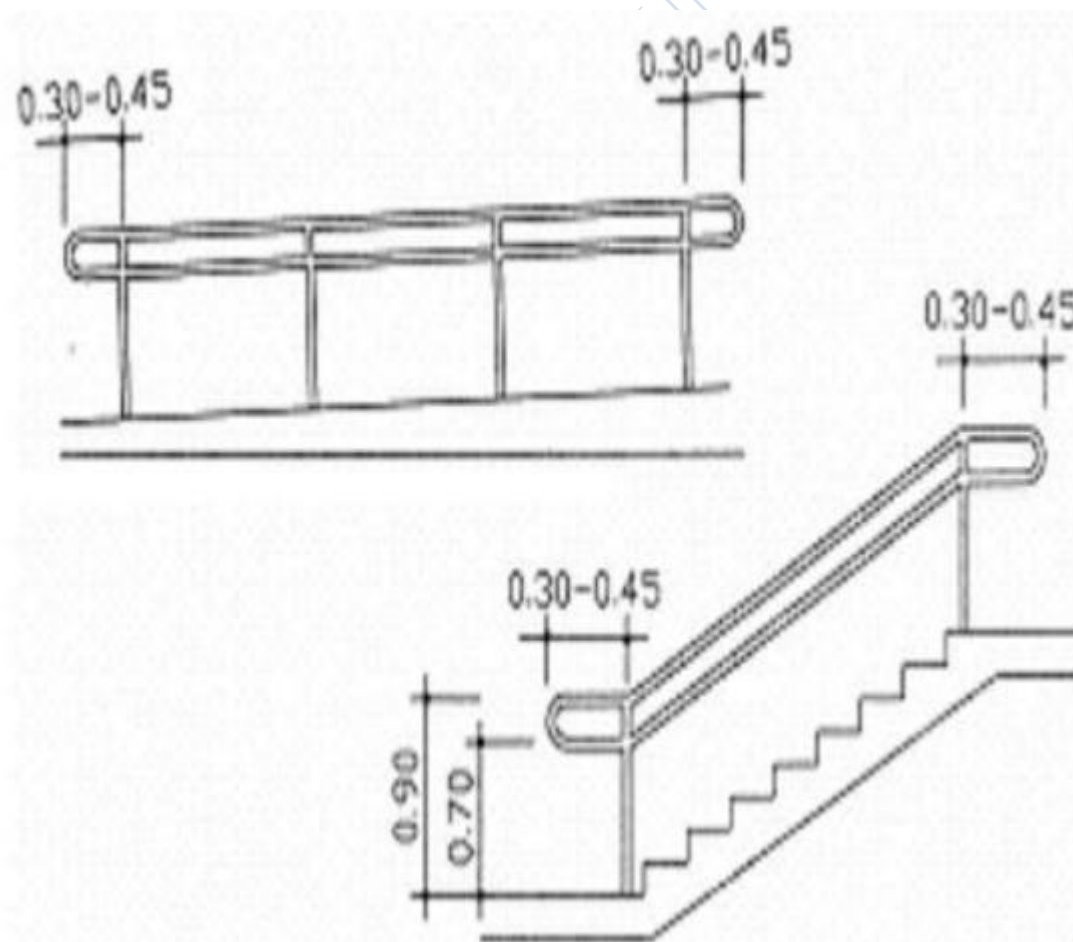


Figure 17: Railings and Handrails.

Source: United Nations Enable, (2003.)

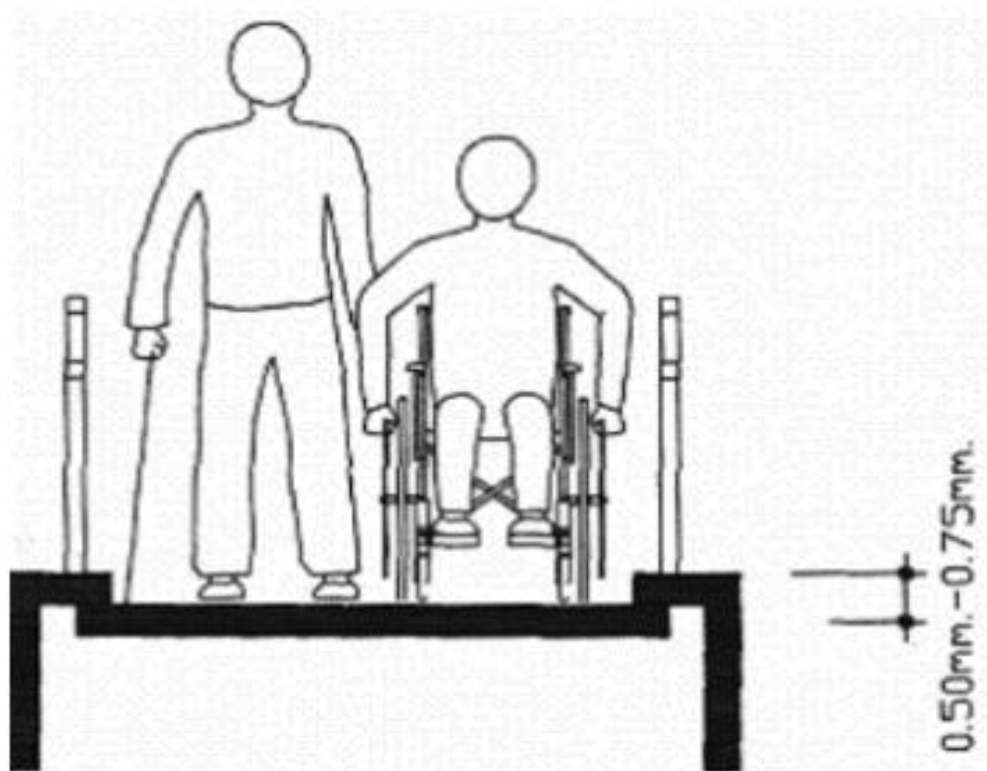


Figure 18: Low curbs also act as wheel stop.

Source: United Nations Enable, (2003.)

XII. Entrances

It's important to have entrances to buildings that are both accessible and obvious. Hence, the following factors must be considered in order to achieve this:

- i. All main entrances of the newly constructed accessible public buildings should be accessible by all users.
- ii. Every institution should have at least one wheelchair-accessible entrance. In brand-new structures, the primary entry(s) intended for public use must be the accessible entrance (s) (United Nations Enable, 2003).
- iii. There should be accessible paths connecting each accessible entry to accessible parking spaces, local public transit connections, and drop-off locations. (Fig. 19)

- iv. An easily accessible elevator or lift should be available from the accessible entry in multi-storey structures. (United Nations Enable, 2003).
- v. Although the surface quality should be non-slip, the landing's surface should have a two percent water drain.
- vi. The worldwide accessibility sign should be used to identify accessible entrances, as well as alternative entrance sites.
- vii. The minimum landing dimensions for entrance doors that open outward must meet up with figure 20 whereas the minimum landing dimensions must also adhere to figure 21 when the entrance door opens inward. (United Nations Enable, 2003).
- viii. Avoid using doormats made of jute. However, when used, the mat's upper surface should be parallel to the floor finish. It is best to land in protected areas. (United Nations Enable, 2003).

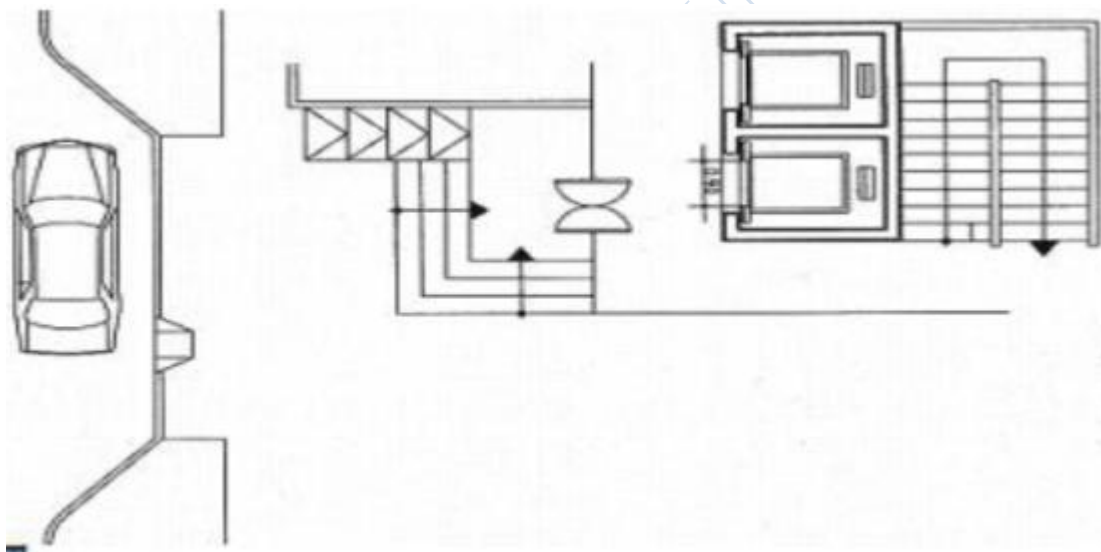


Figure 19: Accessible entrance connected by accessible pathways

Source: United Nations Enable, (2003.)

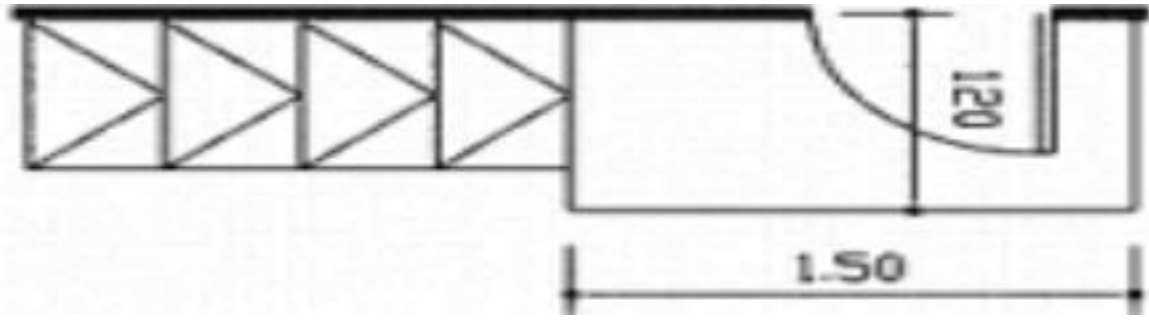


Figure 20: The minimum landing dimensions where the entrance door opens outward.

Source: United Nations Enable, (2003.)

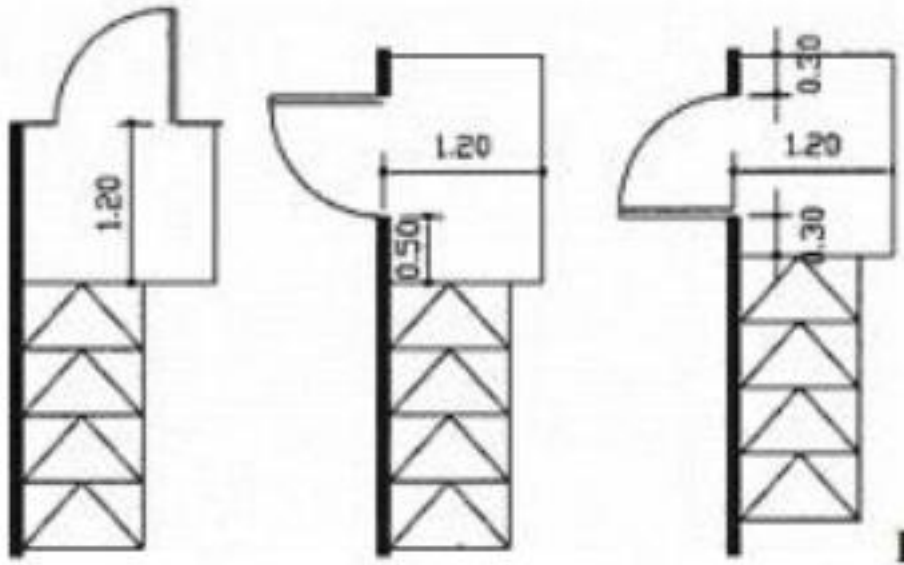


Figure 21: The minimum landing dimensions where the entrance door opens inward.

Source: United Nations Enable, (2003.)

XIII. Doors

All users should be able to pass through doors with ease if they are broad enough.

- i. Accessible doors should be made so that one person can open them with just a single motion and little effort.
- ii. For people with physical disabilities, power-operated doors are ideal.
- iii. The activator mechanism ought to be automatic or conveniently located.
- iv. An accessible door must have a kick plate, glazing, a handle for the door, an auxiliary pull handle, and a sign. (United Nations Enable, 2003).

v. Alleys, doors, and corridors must all be sufficiently broad, well-lit, and situated on level ground without any inclines.

vi. To make it comfortable to open the door, there must be enough room in front of it.

Door types:

(a) Automatic doors: - both sliding and swinging types are possible.

Swinging doors are typically outweighed by sliding doors (fig. 22) (fig. 23).

Automatic doors are practical in congested areas.

Automatic doors need to open and close frequently enough. Double-swinging doors can have guardrails erected nearby to mark the region where the door opens and shield passersby from being struck by it (United Nations Enable, 2003).

(b) Revolving Doors: - Physically challenged individuals should not utilize revolving doors.

Revolving doors should always be accompanied by a nearby, easily opened swinging or sliding door (fig. 24). Additional gates should come after the turnstiles. (fig. 24).

(c) Pivoted Doors: - Pivoting doors ought to open away from the direction of traffic whenever it's practical.

(d) Sliding and Folding Doors: - For small areas with less public traffic, manual sliding and folding doors are advised (fig. 25).

Door Opening:

i. In the open position, exterior doors must have a minimum opening of 0.90 metre.

ii. When an inside door is open, the minimal opening is 0.80 meters.

iii. Toilet doors should have 0.75 metre wide minimum doors.

iv. The minimal door opening can be 0.75 meters if the entrance is straight and the door can stay open by itself.

v. A minimum 0.90 metre clear door opening is required for doors installed in openings deeper than 0.60 metre. (fig. 25).

- vi. An appropriate clear width for a double-leaf door is 0.80 meters (fig. 27).
- vii. The minimum clear width for double-leaf doors is 0.80 meters on each side.

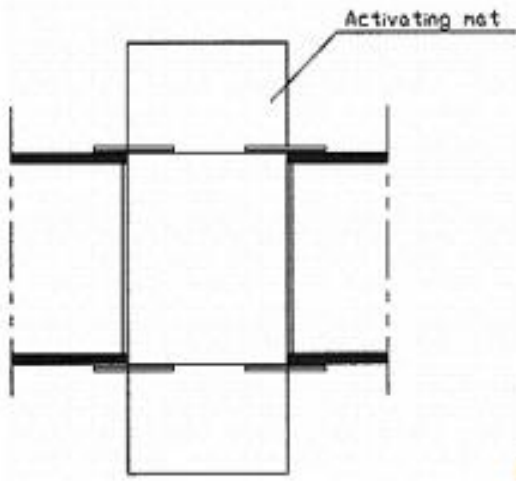


Figure 22: Showing sliding door type.
Source: United Nations Enable, (2003.)

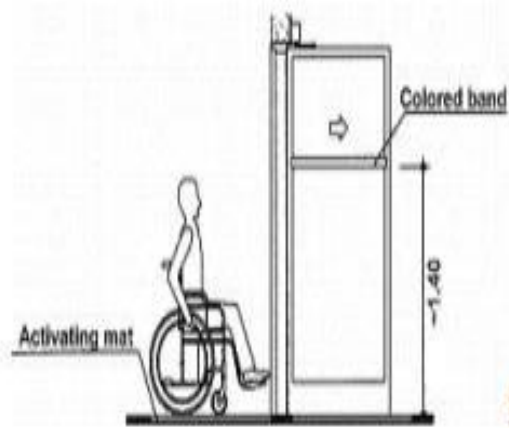


Figure 23: Showing swinging door type.
Source: United Nations Enable, (2003.)

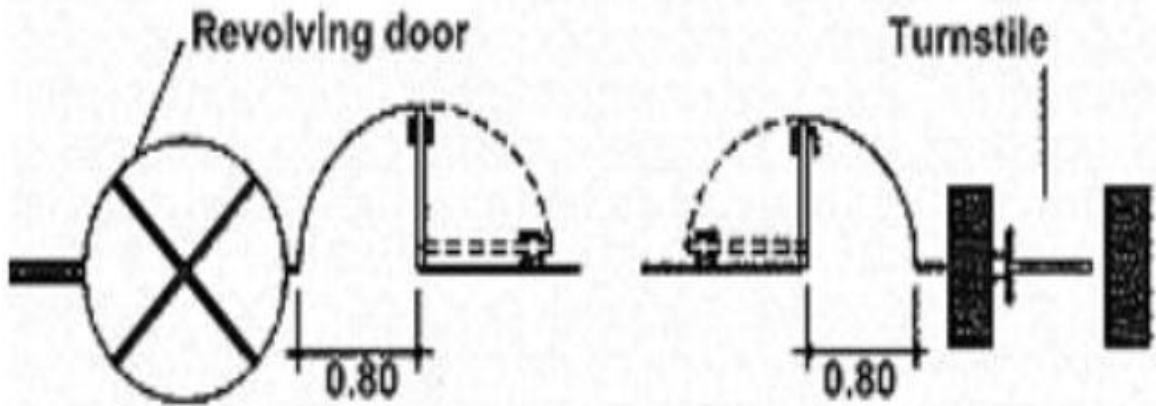


Figure 24: Showing revolving doors with an adjacent accessible swinging or sliding doors.
Source: United Nations Enable, 2003.



Figure 25: Manual sliding and folding doors recommended for narrow spaces not heavily used by the public.

Source: United Nations Enable, 2003.

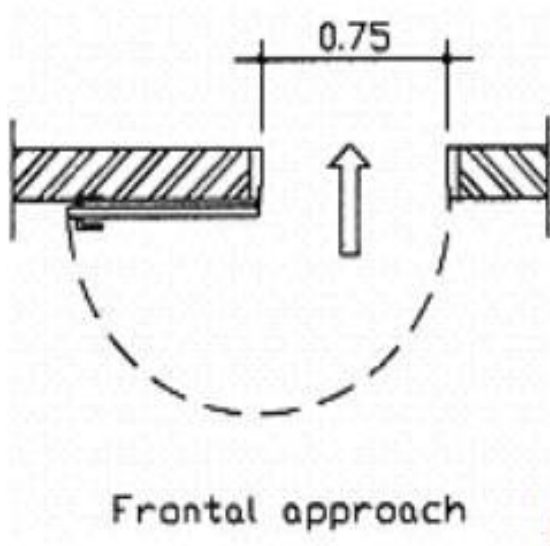


Fig 26

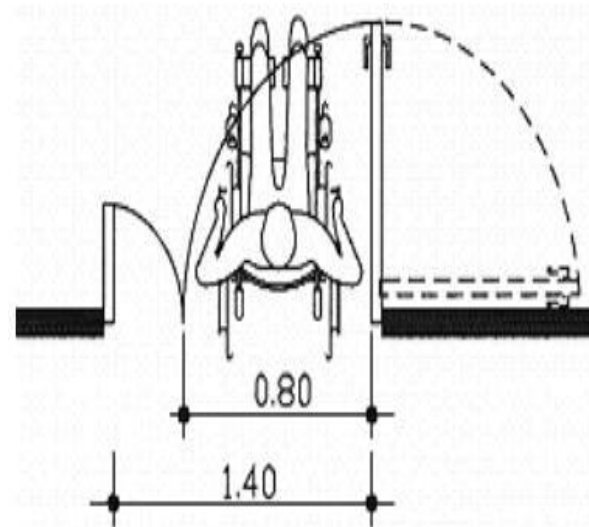


Fig 27

Figure 26: The minimum door width of rest rooms.

Figure 27: Double-leaf doors, with one leaf having a clear width of 0.80 m.

Source: United Nations Enable, (2003.)

XIV. Exit doors Landing

There should not be a 20 mm or greater difference between the exit landing and finished floor level.

Glazing and glazed doors:

- i. Outward swinging doors and doors in public passageways ought to have small windows so that people may see incoming cars. The bottom border of the window shouldn't extend higher than 1 metre than the final floor level (United Nations Enable, 2003).
- ii. In structures where people with visual impairments visit, completely glazed doors have to be avoided (United Nations Enable, 2003).

iii. For the advantage of all users, glazed doors should be prominently marked with a colored band or mark that is positioned between 1.40 metre and 1.60 metre in height (United Nations Enable, 2003).

XV. Corridors/Lobbies and Doorways

Corridors should be well-dimensioned to facilitate the passage and manoeuvring by all users. To achieve this, the following considerations must be given:

- i. A low-traffic corridor should have an unobstructed width of at least 0.90 metre in order to enable flexibility for 90-degree turns.
- ii. A public corridor must have a minimum unobstructed width of 1.50 metre. The suggested width is 1.80 meters at the moment.
- iii. The bare minimum circulation area should look like figure 23 in order to allow for maneuverability in 180 degree turns.
- iv. The doors positioned throughout the length of the hallway should be accessible due to the corridor's breadth (fig. 22) (United Nations Enable, 2003).

2.2.2 Thermal Comfort

1. Thermal Comfort: It's crucial to maintain the room's temperature and relative humidity within the comfort zone because reading rooms are "stay spaces" where individuals sit still for extended periods of time.

2. Visual Comfort: This can be achieved through; *a. Visual interest:* It helps to have something to look at or allow the eyes wander over when reflecting when spending a lot of time in one area. Reading is a visually dull process that requires a counterbalance to prevent brain tiredness.

b. Visual Relief: Avoiding distracting or upsetting aspects, such as glare or abrupt, extreme changes in the visual field, is vital. In addition, reading calls for the chance to unwind the eyes by focusing on distant objects.

3. Acoustic Quality: A sound environment that promotes peace and introspection when reading is one that is free of distracting background noises and has a certain sound quality.

4. Zoning: The practical layout of the plan should be such that persons entering, departing, or even passing through the space shouldn't excessively bother the readers. Multiple entrances have been found to occasionally cause some distraction in any library.

5. "Genius Loci": A reading space should have some reference to its geographic location and be connected to the context of the area through information like shifting sunshine, the sound of rain, and other seasonal indicators, even though this is a term that is typically employed on a more profane level. This distinguishes the areas and creates a sense of location.

It is important to note that although these guidelines might be used to the design of a variety of spaces, we explicitly view a reading room as a "stay space"—a place for solitary work and peaceful study and that is how the criteria should be interpreted.

2.2.3 Ventilation

The circulation of air inside a building and between the inside and outside of the building is the simplest definition of ventilation. The ventilation strategies can be generally categorized into stack-ventilation type, cross ventilation type, and single-sided ventilation type. The cause or motive forces for ventilation are wind (dynamic) convection induced by a temperature difference between indoors and outdoors (thermal) (Li, Y., & He, J., 2021). The stack-ventilation strategy relies on thermal forces, caused by temperature differences between the indoor and outdoor air. Therefore, a higher shaft will ultimately result in a larger cross-sectional area with a greater temperature difference that means more air movement will be available with a greater motive force. Stack

ventilation is effective in deeper plan spaces by making use of the central lobby to draw air from the outside and up through the center of the building (Jackson, 2021).

Cross Ventilation

In a cross-ventilation scheme, inlets and outlets are provided typically of windows to promote the flow of air through a building. Lack of cross ventilation refuses an effective air movement through a building since there is an absence of an outlet opening. Li, Y., & He, J.,(2021) noted that to guarantee adequate ventilation flow, there must be a sizable differential in wind pressure between the inputs and exhaust ports and little internal flow resistance.

In terms of efficiency, (Jackson, 2021) stated that cross ventilation is the most effective means of natural ventilation for buildings with not more than 12–15-meter depth where the air is allowed to pass from one side of the building to the other. Also mentioned was the need for windows to be easy for building occupants to operate and to allow for controlled ventilation without creating draughts. According to (El-nafaty, et al., 2018), the maintenance and upkeep of the shafts also has a special relevance. The ventilation techniques, which include the aforementioned types of ventilation, are important for the entire ventilation system in a library building.

2.2.4 Lighting

The use of natural light, or daylighting, has long been recognized as an attractive architectural feature and a sign of outstanding design. When properly included, daylight fosters a sense of calm reflection and aesthetic comfort while also psychologically connecting the current library user to the pre-technological past (Sun, C., et, al., 2020).

Understanding the physical properties of daylight is the first step in designing for it. Understanding this energy medium that is entering the building is necessary for controlling and modifying it for usage in a library. The fact that sunlight is what it is means that its intensity must be carefully controlled and managed to prevent issues with glare or heat buildup. The main objective of library

lighting is to offer adequate illumination for a visual activity, such as reading. In the case of daylight, this entails adjusting the aperture designs to reduce solar heat gain while yet achieving the foot-candle levels necessary for optical clarity (Sultana, S. et. al 2019).

The second condition is that there shouldn't be too much contrast or brightness in the surrounding area so that the library user may easily observe the task and avoid getting tired of looking at it after a while. In daylight design, glare situations (i.e., when the brightness ratios of surfaces exceed visual comfort standards) are avoided through aperture design, exterior sun control features, and the arrangement of surrounding surfaces to balance the nearby surface brightness levels. To prevent glare from windows or roof monitors and to balance the brightness distribution in the space, electric light fixtures are frequently turned on during the day in libraries with rather poor daylighting design. Its fluctuation is another quality of daylight. Sun movement throughout a normal day and seasonal changes in the sun's prominent position in the sky cause variations in the amount of daylight and its direction at a building's windows or roof. Additional variety is present based on the sky's circumstances. Cloudy days still have varied daytime directions, but the light is diffuser than on a clear day. On days with clouds, the brightness of the day remains consistent from dawn to sunset but varies little in absolute terms.

A library's overall lighting plan includes a daylighting scheme. To achieve an integrated solution to all lighting design-related issues, the building architect, heating/cooling engineer, and professional lighting designer must work closely together. This will increase visual comfort for library patrons and daylight utilization. The most significant outcome of the technical and artistic skills of an art designer is a functional lighting plan for a library. When designing a library building, it should include provisions for both natural and artificial lighting systems. Users will spend more time in the library and visit it more often if the lighting is good. It is acknowledged in contemporary library designs that adjusting the lighting intensity can help define the activity zones and that the quality of lighting has a significant impact on the visual comfort of both readers and library employees.

2.2.5 Orientation

An object's orientation is determined by where it is situated in relation to seasonal changes in the sun's path and current wind patterns. An energy-efficient library can be better oriented, increasing its comfort for users and lowering maintenance costs especially from energy consumption point of view. Building orientation is the practice of rotating a structure to take use of particular qualities of its surroundings, such as street appeal, a picturesque vantage point, and drainage considerations.

Building orientation refers to how a house is constructed in relation to the direction of the sun. The orientation can be used to describe a certain space or, more crucially, the entire facade. Building orientation, which is simply where a structure is placed in relation to the sun, is often done to maximize solar gain at the appropriate time of year when necessary in cold climates and to decrease solar gain in hot areas (Van Duinkerken, W., 2018). When creating a library, the direction of the building is crucial.

In order to determine an efficient ventilation strategy and the effect of thermal comfort in a building, the shape of a building is an important aspect that regulates the areas that are exposed to the exterior climate through walls and ceilings. As far as the orientation and geometry of the library building is concerned (Ariff, A. A. A. et al. 2019) highlighted an importance locations of air inlet which is an essential factor to archive the he desired functional performance. A favorable orientation of a building to allow maximum inlet of external air is also an important consideration that is required from the planning stage.

2.2.6 Site and Location of Library Building

One of the essential organizing tasks is designing and establishing a library. It necessitates a solid comprehension of both the needs of the end users and the goals and activities of a library. Planning ahead before constructing a library should be in accordance with the type of work that will be done

and the community that will be served. The constructing of a library building plan should be carefully examined in light of this, and a few general planning concepts should be taken into consideration (Handa, T. S. 2021). Therefore, there are numerous crucial considerations to be made while thinking about developing a library.

Location: Making a good location decision for the building's planning and construction is one of the most crucial issues that need to be addressed right at the start of the building design process. Any library facility's ability to be successful will be greatly influenced by its surroundings. The site ought to be convenient for library patrons. The center placement is seen to be good for academic libraries, such as those at universities, colleges, or schools.

Site Capacity: The location ought to be big enough to accommodate the construction of a sizable building. The building ought to be capable of expanding both horizontally and vertically. On the site, in addition to building construction, there should be space for user parking, setbacks for emergencies, landscaping, etc.

Provision should be made for adequate sufficient parking spaces to meet institutional and local parking codes for staff as well as users during all service hours and be convenient to the library's entrances. Handicapped parking spaces should meet international regulations in both number and specifications. Large cars and trucks moving materials in and out must be well considered and must be well identified and lighted at all times.

Neighbourhood Compatibility: For a public library, the neighborhood's fit with the institution's vision and objectives will be more important. The phrase "neighbourhood compatibility" refers to a number of factors, including how well the library will blend into its surroundings, if there will be enough room for future additions, and whether or not the neighborhood has already been established as a site for human habitation (Mehaffy, M.W., 2019).

2.2.7 Library Interior Design

The inside of the library should be very flexible with a minimal amount of load-bearing internal walls and columns to facilitate periodic reorganization over the building's lifespan (Wallance, D. 2022). Selecting building supplies, machinery, shelves, and furniture should be done in accordance with a comprehensive interior design strategy. The following are some crucial features of library interior design that are covered:

General Aesthetics: The design decisions made for the library's physical space should convey a specific message about the overall experiences patrons can expect. The style of the library should be determined upon before anything else, whether it is more formal and conventional, more modern and open, or a combination of both. The interior of the structure should also reflect local culture in order to pique local residents' attention as well as that of faraway art enthusiasts.

Colour Selection: In order to use more fashionable colors in the future, choosing a colour scheme is essential when planning the inside of a library building. The most suitable colour scheme will impact how users interact with the library. The "hot" colours are necessary for vibrant interaction spaces, whilst the "cool" colours are suitable for designing a calm, introspective study space.

Furniture and Fixtures: The furniture's and finishes' most constrained lifespans should be taken into account in order to facilitate simple replacement and renovation. Broadloom carpet should be replaced with a modular carpet system to allow for future renovations and space flexibility.

Meanwhile, net should be used to cover the windows.

2.2.8 Roof

The drainage systems on the roof should be adequate to carry off water from heavy downpours or melted snow. The roof and eaves area should be well insulated to allow for maximum energy efficiency.

The roof serves as a weatherproof barrier for the building. Snow and wind loads require a robust roof to sustain them. So, the Roof must meet the following operational requirements: Weather

Resistance Strength and Stability, Heat Protection, Sound Insulation, Fire Resistance, Day Lighting. Every roof's primary purpose is to shield occupants and their belongings from the elements. Also, roofs can act as insulators, holding heat in the winter or cool air in the summer.

2.2.9 Landscape

An infrastructure installation's effects are reduced by intelligent landscape design, which can also improve the location. It is an essential feature of better quality design. It needs to be created concurrently with the proposal that is, to be considered early in the planning and design stage. The landscape enhances the overall design of the building thus complement and enhance the site and adjoining neighborhood of the building (Dino, I. G., & Üçoluk, G., 2017). The landscaping design visually satisfying and inviting and in harmony with the climatic zone of the library as the plants selected provide pleasing colors and textures throughout all seasons of the year. The plants selected appropriate to the amount of sun and/or shade the building will receive thus enhances the building's energy and water conservation efforts.

2.2.10 Sustainability

Sustainability concerns are increasingly significant in contemporary libraries. An efficient design that follows best practices in terms of waste reduction, material quality enhancement, and energy usage reduction. In addition, social, economic, and environmental factors are crucial factors to take into account when designing and building. Sustainability needs to be incorporated into the design from the start. Sustainability is changing typological presumptions as well as specific architectural techniques, resulting in libraries that provide greater user happiness and are therefore superior spaces for reading, meeting friends, or studying (Cacabelos, A., et. al., 2017).

It promotes the preservation of natural outdoor environment and healthful indoor habitat thus adopting resources and techniques that reduce pollution and waste and do not permanently harm the

ground so, it is possible to prevent having a detrimental influence on the air, land, and water. The use of passive and natural heating, cooling, ventilation, and lighting is also maximized.

2.2.11 Form/Shape

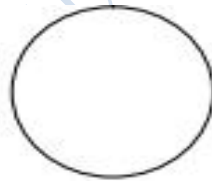
The form a building takes represents the imagery of the design which is usually created by biased or wrong interpretation (Chen, Y., et. al., 2018). The accessible library will have a form that is a medley of irregular shapes. The general form of the plan will be rectangular. A rectangular and square floor plan provides more seating capacity for persons than a circular or hexagonal floor plan of the same are. Result from comparative study of seating capacity using a typical floor plan of 100m^2 of various shapes shown below.



Square

Area 100m^2

Seating Capacity 36persons



Circle

Radius 3.0m

Area 100m^2

Seating Capacity 31persons



Rectangle

Area 100m^2

Seating Capacity 34persons



Hexagon

Area 100m^2

Seating Capacity 23persons

Figure 28: Concept of Form (Floor plan)

Source: Researcher's fieldwork, (2022)

2.2.12 Cost/Budget

The layout should be such that the library can be operated with the least amount of personnel and resources possible.

2.3 Empirical Review

2.3.1 Qualitative Factors for Library Building Design

When designing a new library, it's important to consider how the physical space will serve the educational institutions' goals for learning, teaching, and research, both now and in the future. The library building must reflect strong vision and mission of the institution which it serves. The 'ten commandments' of organizing libraries were developed by renowned British architect Harry Faulkner-Brown, who was in charge of creating numerous library structures around the globe (Naweed, N. A., & Turakulov, A. E. (2021). The construction of libraries is a valuable and expensive resource so; planning a new library requires systematic approach. The idea is that a good library environment includes a number of crucial characteristics, including Functional, Adaptable, Accessible, Varied, Interactive, Conducive, Environmentally Suitable, Safe and secures, Efficient, Suitable for information technology, and have 'oomph' (McDonald, 2006).

Functional: When a library building recognizes the critical value of people, books, and information technology, as well as their dynamic relationship and intricate interactions, it best serves its purpose and makes it easier to give high-quality services. The demands of the research, teaching, and learning communities should be balanced. The service needs to be able to meet the evolving demands of the academic community, thus the new facility must support this.

Adaptable: Possibility to develop and maintain a great degree of adaptability in the structure, allowing for easy and less disruptive changes in the way that space is used by simply rearrangement of the furniture, storage, and equipment.

Accessible: The library serves as the colleges or universities primary academic emphasis and is integral to the institution's procedures for learning, teaching, and research. It needs to be as reachable as feasible, enticing users to take full use of the services it offers. In addition to traditional and electronic delivery methods, it must accommodate the users' expanding demand as well as their varied learning and study styles. Access should be as simple and uncomplicated as feasible, with an obvious layout that encourages individual study.

Varied: To accommodate the expanding diversity of its users and their various learning and discovery styles, libraries should offer a range of study spaces. Users should be encouraged to learn at their own rate and on their own schedule, with accommodations for quiet study and solitary learning as well as, increasingly, group work and interactive learning. The availability of social and collaborative places where users can engage with one another is a significant development. Of course, the "hybrid library" must offer access to both analog and digital resources, and more area is being set aside for lecture rooms, IT services (including wired and wireless provision), and technical assistance.

Interactive: The library's building needs to strike the right mix between areas for readers, services, collections, and information technology. In addition to making the best use of the available space, a well-organized library also stimulates interaction among users and the use of its services. In today's libraries, essential venues for interaction include the main desk, information stations, group study areas, and information skills rooms.

Conducive: As the center of learning for the college, the library needs to exude a sense of excellence, worth, and "place." The environment should stimulate and inspire its users while also being favorable to academic work and reflection. Numerous readers who study for extended periods of time and in growing numbers should feel secure and comfortable.

Environmentally suitable: Creating a supportive environment is essential for computers to operate well and for library items to be preserved, in addition to providing comfort for readers. Ideal conditions call for regulation of temperature, humidity, dust, and pollution. Natural or passive ventilation, which is becoming typical in new construction, offers a cost-effective, environmentally friendly, and humane option. Any structure or energy management system installed ought to be constructed with the lowest possible common denominator in mind, and it ought to be ecologically friendly.

Safe and secures: A special focus should be placed on workstations' ergonomically designed layout, protecting IT equipment, and operating throughout a non-standard working period in order for the design to comply with current health and safety requirements.

Building bye-laws' current health and safety standards must be followed in the design of the building. Security threats related to the facility, its occupants, collections, and data technology shouldn't be compromised in any way.

Efficient: When it comes to space management, resource use, efficiency, and life cycle costs, the building project should show that it is worth the money being spent. The strategy needs to have low operating and maintenance costs over extended durations that is, library must run as well and cost-effectively as they can with the least amount of upkeep.

Suitable for information technology: The design of libraries must enable patrons to fully take advantage of the rapid advancements in ICT.

Information technology has made digitization more necessary than ever before, the new location must guarantee that both the library and its patrons will fully benefit from the IT infrastructure. Wireless access should be available so that users can convert any area of the library into an IT place.

Oomph: The most indefinable quality in library design is best characterized as having "oomph" or "wow" factor. It is the skill and professional ability of the Architect to develop fascinating structures with captivating architectural elements and pleasant interior spaces that catch the thoughts of users and the spirit of the college by striking a balance between all these aspects.

2.3.2 Department and Sections in the College Library

To effectively and efficiently perform its function and objectives, the academic libraries are often divided into various department and section. More often, academic libraries are often classified into three sections

- i. The Administrative Section
- ii. The Reader Services Section
- iii. The Technical Services Section

However, during the library research, the following additional section were recently found in most library due to the increases in information technology (E-Library) and constant quest to increase knowledge.

- i. The E-Library Section
- ii. The Research Section
- iii. The Non-Print/Audio-Visual Section

2.3.2.1 The Administrative Section

The library, as the fulcrum of any institution; enjoy the prestige of being equated to an academic faculty. The administrative branch of the library oversees the daily operations of the facility under

the direction of the college librarian. The College librarian is concerned with everything that pertains to the institutional functions and management. The administrative section deals with the challenge such as budgeting, recruiting and maintaining of staff, maintenance of library materials and long term planning of the library. In order to carry out these functions, the library administration is further divided in managerial units, which formed a unified system.

Below is the schematic organogram of the administrative section.

ADMINISTRATIVE SECTION ORANOGRAM

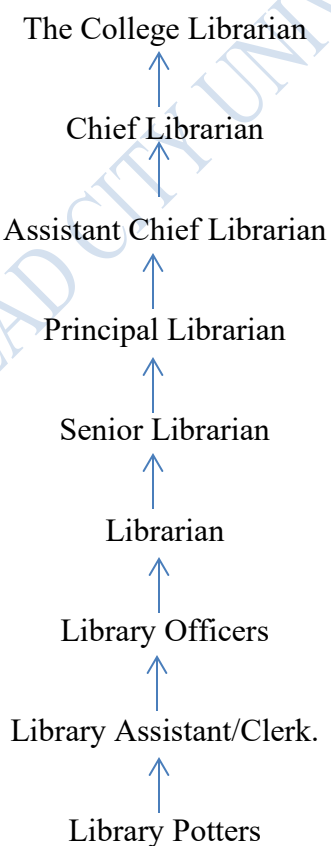


Figure 29: A Schematic Organogram of the Administrative Section of library of College of Education.

Source: Researcher's Field work, (2022).

2.3.2.2 Reader Services Section

The readers' service section is divided into different department which includes the following:

1. Circulation: This is a crucial unit to library operations for its most active services. It is responsible for the loaning and returning of books and other materials. The circulation desk provides many other important services besides loans and returns. There include putting of books on reserve, collection of fines and fees, registration of new users, renewal of books etc.

The circulation area is designed in such a way as to accommodate terminals for an automated circulation system, which is fast replacing the traditional method. The use of computer at circulation has improved the trustworthiness of loan records. With the advent of encoded labels on books and readers identity cards that can be read and recorded by optical scanners, the conventional cards found inside a book for lending are being replaced.

2. References: One of the professional services provided by a librarian is reference work, which involves assisting users in finding information and a wide general knowledge. Reference libraries in educational institutions provide classes on research methods, library use, and bibliographic teaching. Reference librarians have found themselves aiding users with these technologies more frequently as the library catalogues' formats have changed due to computers.

3. General Reading Area: The general reading area are places where seating arrangement are made for library users to seat for the sole purpose of reading or research. It is usually the largest in any library. Often, books are also stacked in the reading area for easy accessibility.

4. Reserved books: This type of service area is typically found in college libraries, where study resources that are hard to come by yet are in high demand are stored for in-house use.

5. Carrel: This is a single person enclosed reading space meant for research student and staff.

6. Conservation and Group Discussion Room: Students sometimes have to do their assignment in the libraries and hence discuss, also some student like to read where there is no absolute silent.

Thus, these discussions usually distract other library users who like to read in absolute silent environment, it is an attempt to prevent such distraction that has led to the provision of conversation rooms where student can discuss without disturbing other library users.

2.3.2.3 Technical Services Section

This is the section of the library that handle all the materials (book, journals, etc.) acquired by the university before there are placed on the shelves for users. The technical service section's activity is primarily administrative in nature. The clerks are capable of maintaining records, impacting ledgers, typing, creating, and shelving. The function of the technical services of a library includes:

1. Acquisition: Transfers from local, state, federal and foreign governments or organizations; donations; purchases; and deposits of copyright are some of the ways that libraries acquire new materials. The majority of the library's holdings are obtained through copyright deposits, especially in the divisions of maps, music, movies, prints, and pictures (Microsoft Encarta premium, 2009).

2. Cataloguing and Classification: After the acquisition of materials, materials are given to the department in charge of cataloguing them, and they decide how to characterize them and where to put them in the collection. Following that, the catalogue description is created, and the materials are labeled with the library's name and identification code. Pocket card labels are attached to the leading material. An indication acquired items are placed in its proper location. The catalogue process is a highly skilled operation for professionally trained librarians. Due to the incompleteness of the data included, online public access catalogues, which aim to efficiently access the library's resources while greatly limiting users' ability to conduct traditional searches are still somewhat constrained. These systems can exchange information about the resources owned by other libraries and utilize the computer to request a variety of materials through interlibrary loan from numerous other libraries.

3. Binding and Preservation: Technical Services Section is tasked with not only acquiring and cataloging library resources but also physically preparing and preserving them. The issue of paper and book deterioration has come to the attention of librarians more and more since World War II. The library must determine which materials need special management and care to extend their useful lives. The next step is to choose binding's packaging, storage strategy, and heating and lighting system to help preserve these components. To preserve highly delicate importation materials on microfilm, microfiche, or in electronic form, libraries may take pictures of their contents.

4. Collection Development: The primary goals of this is to help develop the collection of the library by making recommendation for the purchase of books and journal and to be acquainted with the mode and problems involved in acquiring books/journals for the library. Libraries obtain current books from publisher in forms of donation, purchase etc.

2.3.2.4 The E-Library Section

An electronic library is one where collections are kept in digital formats (rather than print, microform, or other media) and are accessed by computers. The storage and remote access of digital content are both possible so; information retrieval systems include digital libraries (Bainbridge, D. 2020).

The information retrieval system type includes digital libraries. The goal of the e-library is to offer resources and information services that can satisfy the staff and students' demands for research, instruction, and learning. The e-library is undoubtedly viewed by academic researchers as a research center and a source of intelligent drive where knowledge, concepts, and directions are produced to further the university's research objectives (Sams, A., & Leither, L. (2021).

2.3.2.5 The Research Services Section

This is the section of the library that deals with special material meant for researchers and scholars.

It includes the following units:

i. Serial Units: This unit takes up publication issues at periodic intervals. It could be daily, weekly, bi-weekly, monthly, and quarterly or any other materials published periodically. Current magazines, journal or newspaper usually housed only current issues on a single alphabetical display hall. The last six editions are usually placed on shelves beneath the current display issue. Since the current issues are usually in high demand, large spaces should be designed to spread out the front covers to these periodicals and adequate space provided for readers.

ii. Exhibition/Theses/Student Project Unit: This is the units where past works of staff and students are kept for consultation. Such works are arranged on departmental bases for use by library users.

iii. Maps and Manuscripts: Maps and other manuscripts are acquired, processed, and preserved in this part because they are essential to research.

iv. Document Section: This area contains important government publications; federal, states and other governmental agencies' publication. Likewise, publications from international organizations are gathered here, analyzed, saved, and used to meet readers' informational needs.

v. Non-Print/Audio-Visual Section: Reproductions of works of art, movies, recordings of sound and vision, photos, microfiches, CD-ROMs, flash drives, diskettes, computer software, online databases, and other media are among them.

2.3.3 Content of a Typical Academic Library

Any typical academic library should contain the following among other things:

1. The General Reading Collection: This is the main collection of books and pamphlets on open access to readers and usually housed in big hall that serves as the general reading/stack area, usually close to the circulation desk. This collection covers all the subject taught in the institution and

should largely satisfy all the course requirement of the student. All books and monographs contain in the general reading area are usually available for borrowing on completion of loan slips and surrender of borrower's ticket.

2. The Reference Collection: This collection is made up of items for consultation only are, therefore, not available for home reading vis-à-vis lending. They usually include among other things encyclopedias, dictionaries, handbooks atlases, manual, bibliographies, and indexes, etc.

3. Serial Collection: These consist of current and bound journals, annual report, periodicals, magazines etc.

4. Reserve collection: Most academic library maintain a separate collection of textbooks, journal and other reading materials include newspapers, articles which are in great demand and/or recommended by lecturer for compulsory reading. Also in this collection are past examination question papers, which student find useful for revision purposes, such collections are usually close to the circulation desk and are available for use on hourly basis or request.

5. Research and Rare materials: This include scholarly publications, potent, special scientific report, manuscripts, bibliography, maps and prints staff publication, document and publication of government and international organization. All material within the research area is accessible directly to teaching staff and final year student only. Other will have to request specially from the reference librarian who will arrange to fetch the material for the reader.

6. Microforms and audio-visual materials: These consist of microfilms, microfiches, micro cards, tapes, cassettes, slides, films, diskettes etc. these materials are usually kept in educational technology centre where they can be auditioned and viewed by individuals and group users. Readers are allowed to use these materials with the library for educational purpose.

2.3.4 The Importance and Functions of Library

Metacalf, 1986, the doyen of library consultants, identified the following statement as purpose of library:

1. Safeguarding books and other record collections from the elements, an unclean atmosphere, and improper treatment;
2. Containing a variety of catalogs and related bibliographic tools that allow readers to view pertinent resources in nearby collections and supplemental holdings in other institutions;
3. Housing of books and other collections in various spaces for accessibility;
4. The provision of collections and services to readers and other users who want rapid or regular access;
5. A team to choose from, acquire, arrange, maintain, and service the collections, as well as to assist readers with their informative needs;
6. A place where resources/services can be promoted through exhibits, lectures, publications, etc.;
7. Avenue for supplementary activities including photocopying, bibliographies, instruction, creating audio-visual materials, and computer support services, etc;
8. A place for the library's administrative and business offices, including those in charge of staffing, finances, fundraising, publications, signs graphics, building operation, security, supplies, mail and delivery service, etc;
9. Quarter for students, teachers, and visiting academics to conduct research;
10. A place where resources/services can be promoted through exhibits, lectures, publications, etc;
11. A building that will serve as a monument to a person or an institution's academic life in the service of academic accomplishment.

These physical provisions are made to accommodate the current needs of libraries, but they must also be set up to allow for future adjustments to unavoidable shifts in institutional or governmental policy, differences in educational practices, societal trends, and unpredictably evolving technology.

2.3.5 Users` Satisfaction with Library Information Resources and Services

Because the library can stand alone, whereas the college cannot, it is thought of as the center of the institution. Libraries, teachers'/classrooms, and laboratories make up the three main infrastructure components of college. These three areas each contain a wealth of information resources, including tools for supporting teaching, learning, and research activities (Oliehoek, et.al, 2017). This is why Hasler, M. (2019) referred to the library as the hub of a learning environment and a location where information is made available to all users, regardless of their ages, political and ethical backgrounds, religion, sex, etc. It is clear that the mission of universities cannot be fulfilled without a library that is appropriately stocked with printed books, information and communication technology and its accompanying facilities, well-trained employees, and a high level of user services that will meet their information demands.

Users' satisfaction is the method through which they judge whether a good or service meets their requirements and expectations. It is expected that they will be dissatisfied with the goods or services if they fall short of their demands or expectations. In a similar vein and according to Zhang, Z. (2019), users evaluate the adequacy of the resources and services provided to them as well as if their expectations are met by how satisfied they are with the library's information resources and services. The level of patron satisfaction with the library's information resources and services can be inferred from their reactions to them and from their propensity to utilize the facility again in the future. Zhang, Z. (2019) also claim that patrons' happiness with the services provided to them and the information resources that are available to them determines how much they will utilize the library.

2.3.6 Architectural Solutions to Spatial Constraints

Communities and architects have given numerous inventive ideas that respond to space constraints in their desire to accommodate the variety of dimensions of the library and its patrons. Most

libraries relocate volumes to high-density storage facilities and then convert the former cataloguing workroom into an appealing current periodicals reading room.

Many other institutions are reconsidering the need to locate all employees near public spaces.

One alternative to total separation is to create a hoteling area in a central location where employees can reserve temporary offices and business services for a few hours or days. Divestment is a more radical approach to dealing with overpopulation, although some libraries have chosen to contract out functions such as cataloguing, resulting in staff space savings.

Library Spaces in the Internet Age

Information technology has quickly infiltrated a library that was almost entirely based on the reality of print culture. Inevitably, the rate of technological innovation and change outpaced the capacity of library facilities to adapt to the new reality. The dramatic changes brought about by online access to information made it difficult to modify traditional library buildings. Neither are newly constructed library facilities any better: the time between the design of a new facility and its opening may take 4-5 years, during which time information technology and user information behavior are likely to change dramatically. These continual changes in all activity categories necessitated the construction of some buildings with interiors that are flexible and modular, allowing for easy adaptation to new functions.



Plate 5: E- learning and internet application in the library hall

Source: Researcher's fieldwork, 2022.

CHAPTER THREE

RESEARCH METHODOLOGY (CASE STUDIES)

3.1 Introduction

To put it simply, research is the act of gathering, analyzing, and applying knowledge in a planned and methodical way to problems in order to advance knowledge and help people relate to their environment, achieve their goals, and settle conflicts. The many techniques, protocols, steps, and

tools used to protect, specify, collect, compile, process, and analyze data could also be referred to as research methodology (Wikipedia, 2018).

The major aim of case studies is to assess existing structures vis-a-vis their functionality thus unravel the associated setbacks and how it can be improved through careful design and planning.

Consequent upon this several case studies were under taken to find out the problems associated with the accessibility for mobility impaired persons in libraries.

3.2 Case Studies

For the purpose of this research, six case studies are carried out on some existing Library Complex in three different Nigerian's higher institutions and three foreign higher institutions. The case studies carried out are to serve as existing example or as a guide towards achieving a realistic design and also to learn through their analysis, merits and demerits of their designs so that the proposed design can inculcate some of these merits and then improve on the demerits especially in attaining a unique designed form that will provide easy accessibility to the users.

Therefore, Case studies were carried out on the Library of the following higher institutions;

- i. Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State.
- ii. Timothy Olagbemi Library, Bowen University, Iwo, Osun State.
- iii. Gani Bello Library, Federal College of Education, Abeokuta, Ogun State.
- iv. Macquarie University Library, Sydney, Australia.
- v. University of York Library, United Kingdom.
- vi. Birmingham Central Library

3.3 Case Study One: Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile-Ife, Osun State.

3.3.1 Brief History

The Obafemi Awolowo University Ile-Ife (formerly University of Ife) was established in 1962. The University commences academic activities at Ibadan the capital of the old western region where it inherited building and other infrastructure from the Ibadan campus, it was imperative for the University library to commence the immediate operation based on the collection of books and library building. In order to facilitate simple accessibility, the library relocated to a more advantageous permanent site building in the university master plan in October 1969.

The four-story structure, which had a total floor size of 42,000 square feet, was intended to hold 250,000 books and provide seating for 800 readers. Due to the significant growth in student enrollment, the building's capacity had been reached by 1980, necessitating a further enlargement with a 500,000-volume capacity. In August 1983, the additional addition was put into service, increasing the library's capacity to 2,500 people; the library was named after prof. Hezekiah Oluwasanmi (Vice Chancellor, 1966 - 1975) in honour of his effort to the growth of the library.

3.3.2 Location

The library complex is located at the core academic environment, directly facing the access road to the University bounded to the right by the University senate building and the department of English language, also the left by lecture (amphitheatre) and the rear by the faculty of administration, the law and social sciences, also the library building is easily accessible from other area of the campus such as the hostel, over all the building is easily accessible by any prospective users.

3.3.3 Description of the Building

Architect: James Cubitt A. O. A. Associates



PI

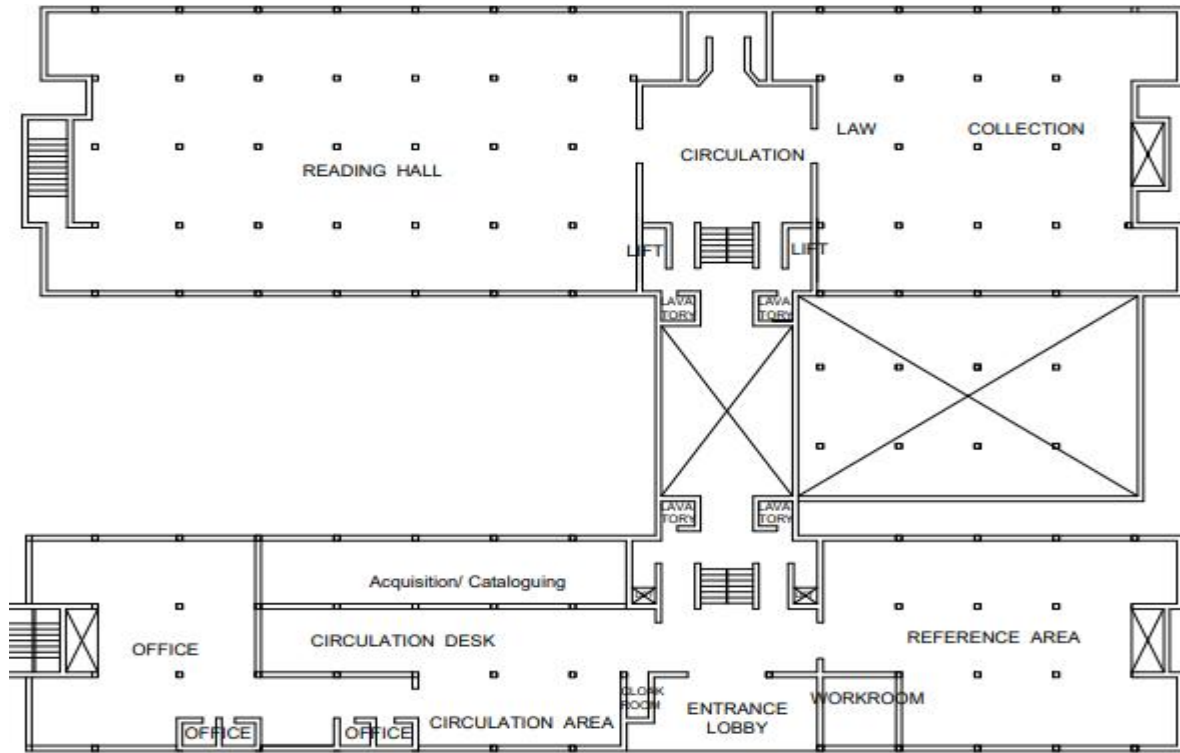
Plate 6: Entrance Gate of Obafemi Awolowo University

Source: Researcher's Field Work, (2022).



Plate 7: Satellite image showing site layout of Obafemi Awolowo University, Ile-Ife, Osun State.

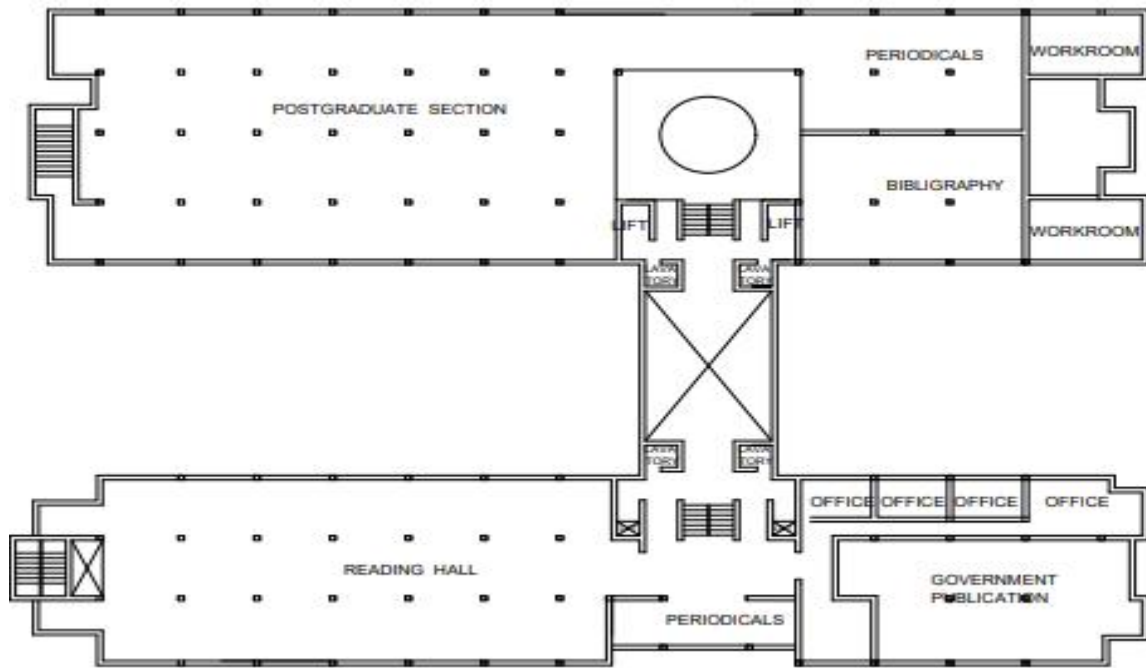
Source: Goggle Earth, (2019).



GROUND FLOOR PLAN

Figure 30: Ground Floor Plan of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State.

Source: Researcher's Field Work, (2022).



FIRST FLOOR PLAN

Figure 31: First Floor Plan of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State.

Source: Researcher's Field Work, (2022).

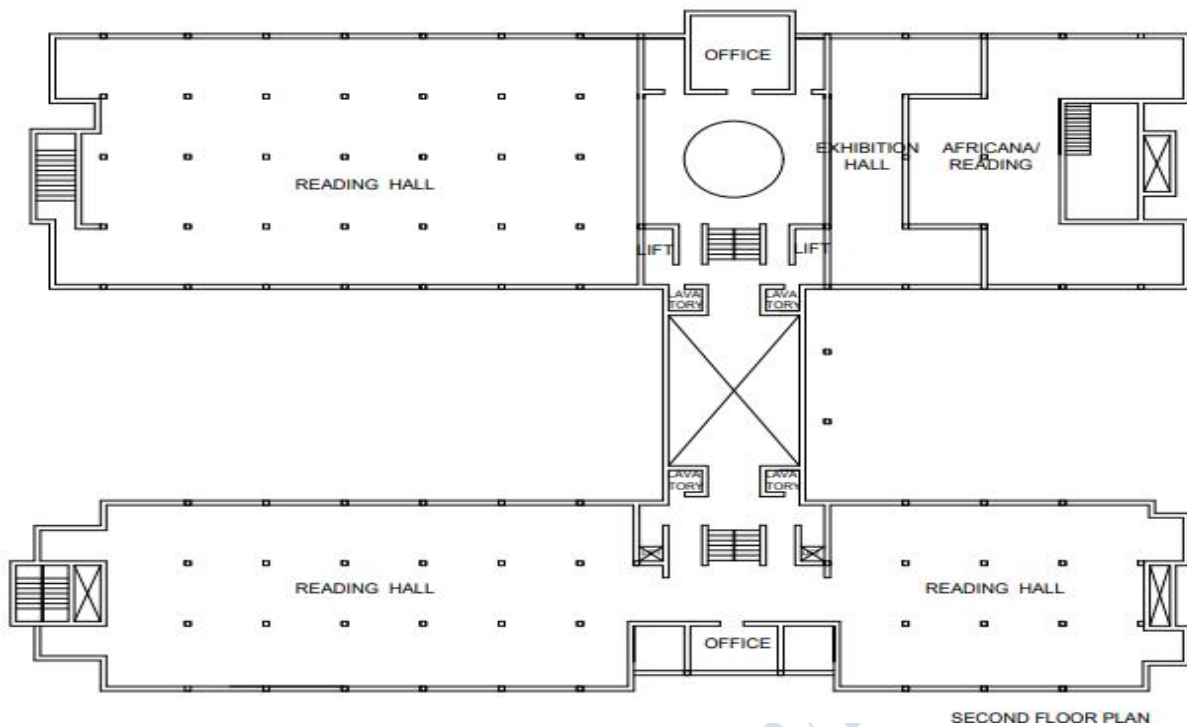


Figure 32: Second Floor Plan of Hezekiah Oluwasanmi Library,
Obafemi Awolowo University, Ile Ife, Osun State.

Source: Researcher's Field Work, (2022).

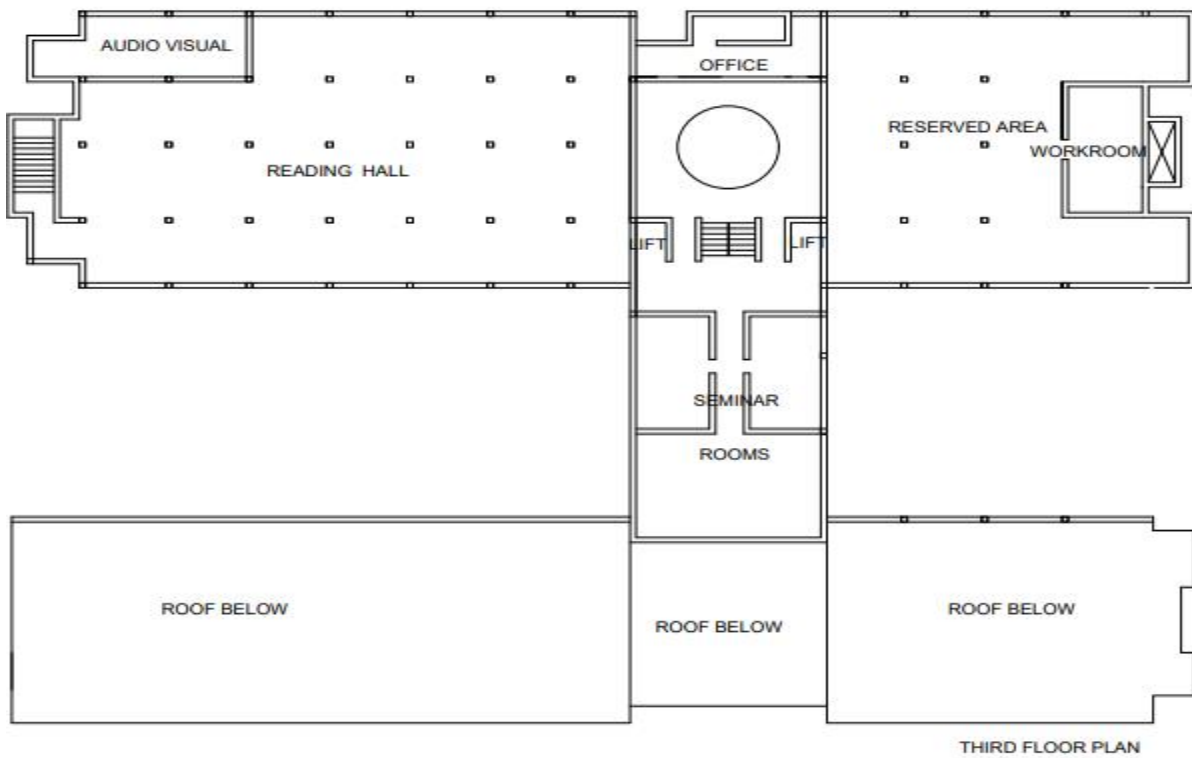


Figure 33: Third Floor Plan of Hezekiah Oluwasanmi Library,
Obafemi Awolowo University, Ile Ife, Osun State.

Source: Researcher's Field Work, (2022).



Plate 8: The Approach view of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State.

Source: Researcher's Field Work, (2022).



Plate 9: Side view of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State.

Source: Researcher's Field Work, (2022).



Plate 10: Side view of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State.

Source: Researcher's Field Work, (2022).



Plate

11: Reading room of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State.

Source: Researcher's Field Work, (2022).



Plate 12: Circulation area of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State.

Source: Researcher's Field Work, (2022).



PI

Plate 13: Catalogue area of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State.

Source: Researcher's Field Work, (2022).



Plate 14: The interior view showing stairhall of Hezekiah Oluwasanmi Library Obafemi Awolowo University, Ile Ife, Osun State.

Source: Researcher's Field Work, (2022).



Plate 15: Ramp at the entrance of Hezekiah Oluwasanmi Library, Obafemi Awolowo University, Ile Ife, Osun State.

Source: Researcher's Field Work, (2022).

3.3.4 Appraisal

Merits

1. Good orientation of the building
2. Aesthetically pleasing
3. Well defined entrance and Provision of ramp at the main entrance to the library complex, to ease movement of the users.
4. Effective location to enable easy access of the prospective users.
5. The library has spacious and comfortable reading spaces.
6. Provision of vertical movement of the users and books through lift.
7. The accessibility to the various units of the library is good enough.
8. Effective use of shading devices to protect direct penetration of sun and to control glare.
9. Regular modules were used thereby creating rooms for flexibility of space.

Demerits

1. Poor lighting of the interior in some circulation area in the library.
2. Circulation routes are not wide enough for easy movement by some users.
3. Shelves are not reachable for some users especially the physically challenge users.
4. Lack of an accessible exit strategy from the building in the event of a crisis for some people.

3.4 Case Study Two: Timothy Olagbemi Library, Bowen University, Iwo, Osun State.

3.4.1 Brief History

The Bowen University, Iwo, Osun State was established in 2001. The University commences academic activities at Iwo where it inherited buildings and some infrastructure from the defunct Baptist College Iwo. Since library is an essential facility thus the University library commenced the immediate operation based on the collection of books using the existing library building of former Baptist College. In January 2012, the library moved to a more benefitting and purpose designed building that was located at the permanent site of the University for Convenience.

The two storey building which covered a total area of 9,000 sq. Mt. is the first phase of the University Library and it was built to hold 65,000 books and provide seating for 1000 readers. Unless otherwise decided, the proposed second phase is a replica of the present first phase. The opening hour is 8.00a.m – 9.00 p. m., Monday to Saturdays and Sundays is 3.00p.m – 9.00 p.m. However, other libraries in the institution includes Law library for College of Law and Medical Library for Medical and paramedical students of College of Health Sciences at the University Teaching Hospital situated at Ogbomoso in Oyo State. The library was named after Prof. Timothy Olagbemi (Vice Chancellor, 2003 - 2013) in honour of his relentless efforts to the growth of the library.

3.4.2 Location

The library complex is located at the core academic environment, directly facing the University Worship Centre bounded to the right by the spaces for the faculty buildings, the left by the Sport ground and the rear by the proposed University printing press and existing Parent forum building. Furthermore, the library building is easily accessible from other area of the campus including the hostels.

3.4.3 Description of the Building

Architect: Mobolaji Adeniyi Associate

Year: 2011



Plate 16: Main Entrance of Bowen University Iwo, Osun State.

Source: Researcher's Field Work, (2022).

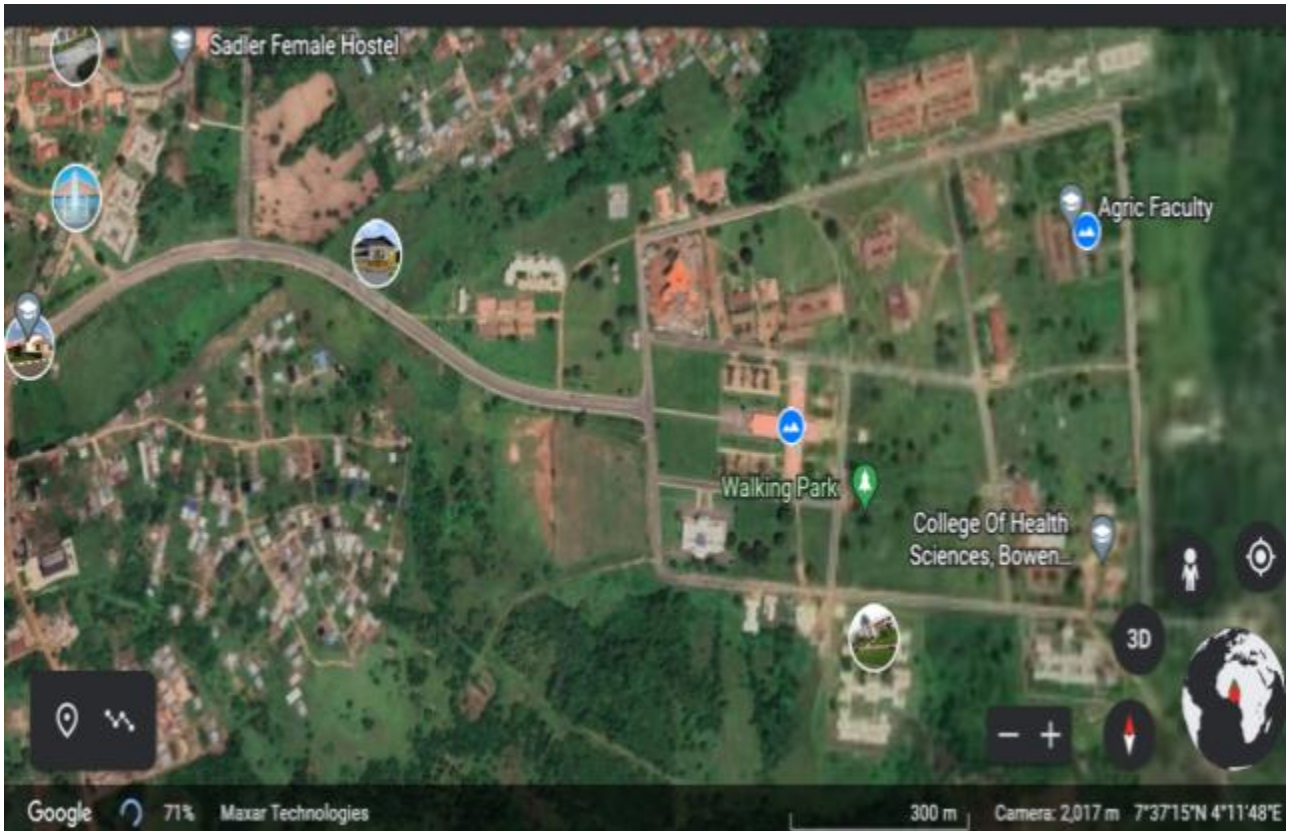


Plate 17: Satellite image showing site layout of Bowen University Iwo, Osun State.

Source: Source: Google Earth, (2019).

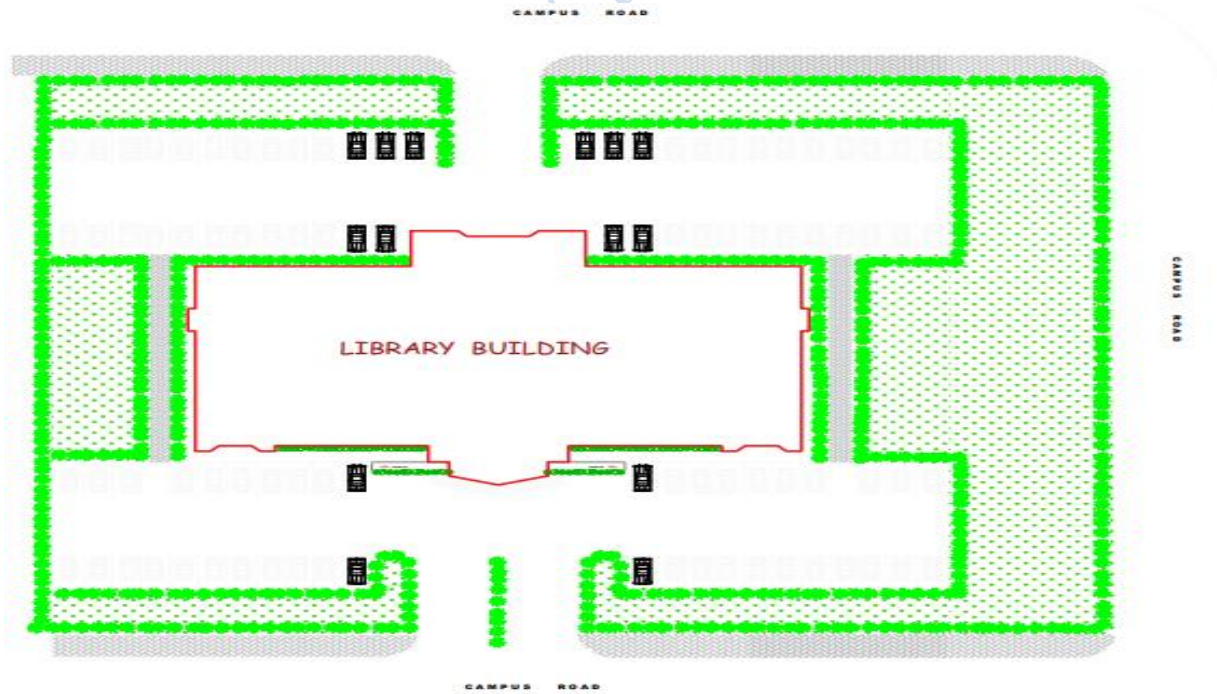


Figure 34: Site Plan of Timothy Olagbemi Library, Bowen University Iwo, Osun State.

Source: Researcher's Field Work, (2022).

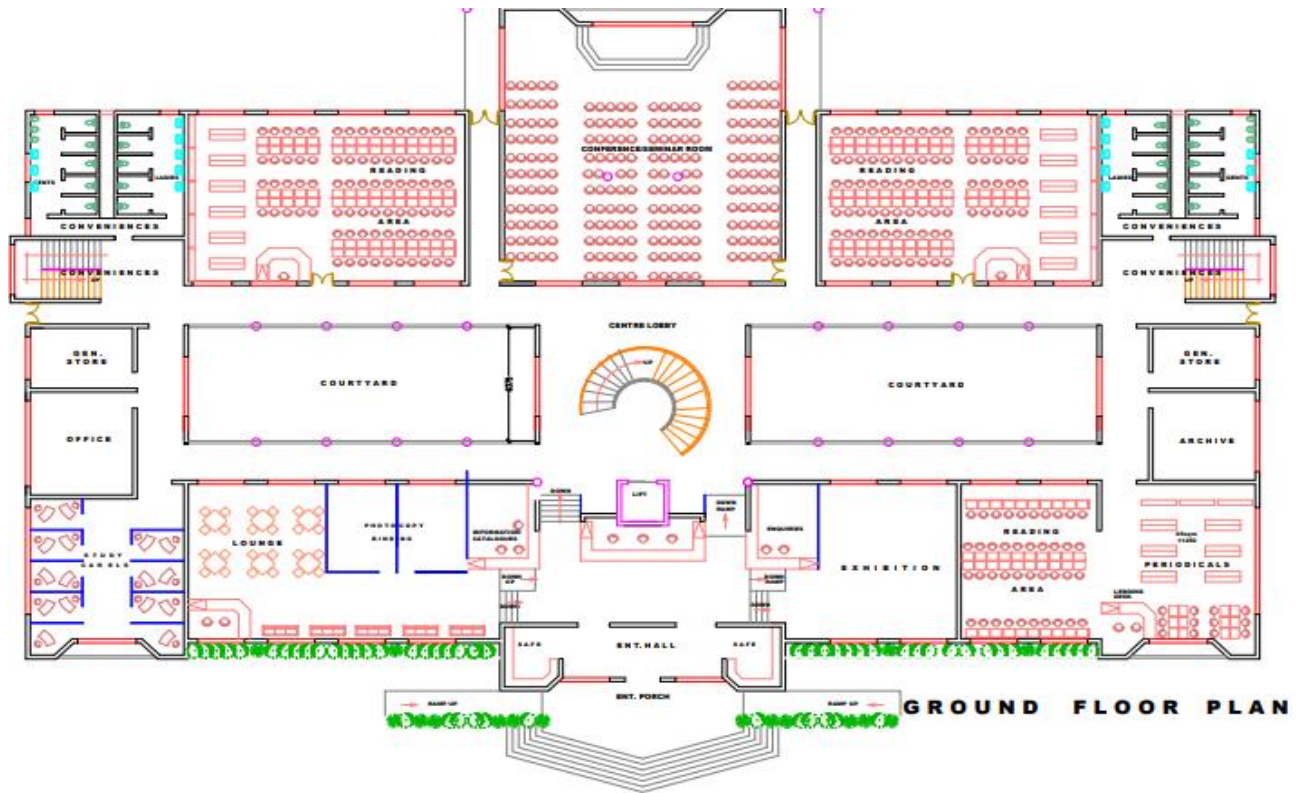


Figure 35: Ground Floor Plan of Timothy Olagbemi Library, Bowen University Iwo, Osun State.
Source: Researcher’s Field Work, (2022).

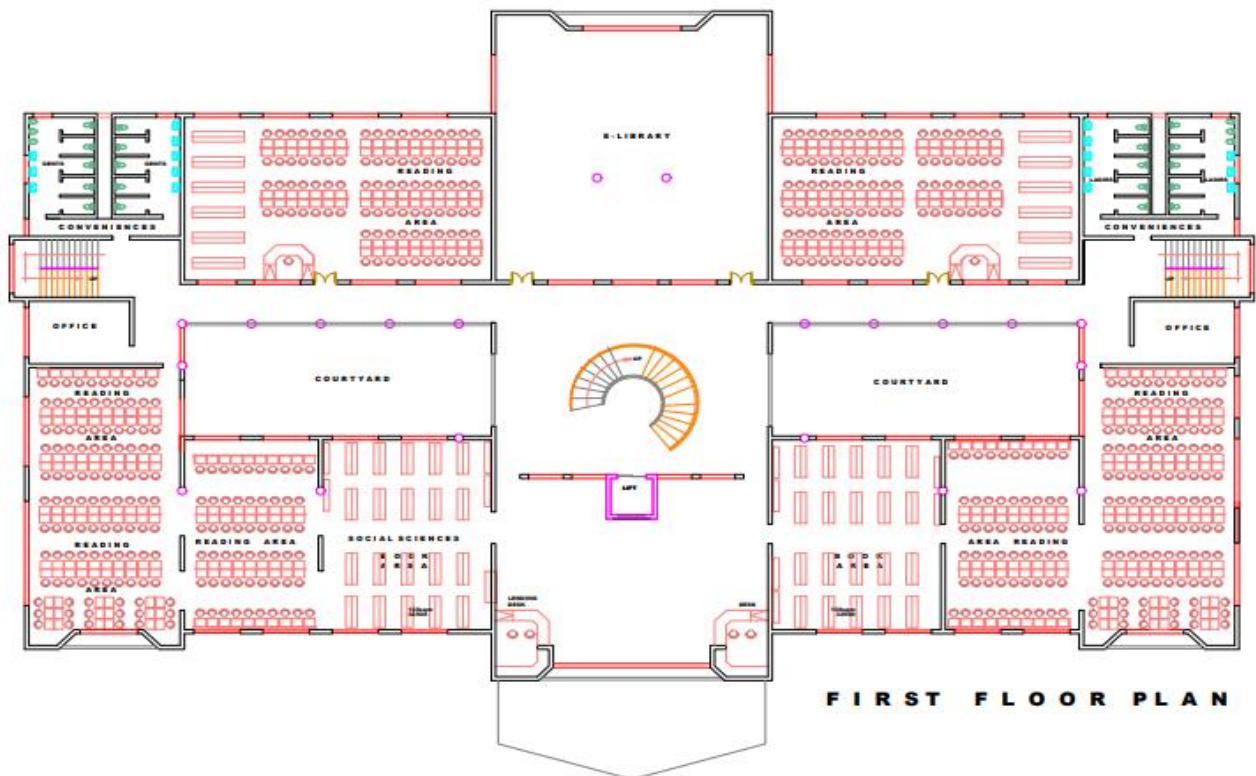


Figure 36: First Floor Plan of Timothy Olagbemi Library, Bowen University Iwo, Osun State.

Source: Researcher's Field Work, (2022).



Figure 37: Second Floor Plan of Timothy Olagbemi Library, Bowen University Iwo, Osun State.

Source: Researcher's Field Work, (2022).

DO NOT COPY. LEAD CITY C



PI

Plate 18: Approach View of Timothy Olagbemi Library, Bowen University Iwo, Osun State.

Source: Researcher's Field Work, (2022).



Plate 19: Rear and Leftside Views of Timothy Olagbemi Library, Bowen University Iwo, State.

Source: Researcher's Field Work, (2022).



Plate 20: Aerial View of Timothy Olagbemi Library, Bowen University Iwo, Osun State.

Source: Researcher's Field Work, (2022).



Plate 21: Circulation area of Timothy Olagbemi Library, Bowen University Iwo, Osun State.

Source: Researcher's Field Work, (2022).



Plate 22: The interior ramp in Timothy Olagbemi Library, Bowen University Iwo, Osun State.

Source: Researcher's Field Work, (2022).



Plate 23: Book shelves of Timothy Olagbemi Library, Bowen University Iwo, Osun State.

Source: Researcher's Field Work, (2022).



Plate 24: Bookshelves and Furniture of Timothy Olagbemi Library, Bowen University Iwo, Osun State.

Source: Researcher's Field Work, (2022).



Plate 25: Furniture of Timothy Olagbemi Library, Bowen University Iwo, Osun State.

Source: Researcher's Field Work, (2022).

3.4.4 APPRAISAL

Merits

1. Effective location that enable easy access of prospective users.
2. Provision of vertical movement of the users and books through lift.
3. Effective design flow and allocation of space.
4. Well defined entrance to the library complex.
5. The use of linoleum in the reading room to reduce noise.
6. The accessibility to the various units of the library is good enough.
7. Aesthetically pleasing design.
8. Good orientation of the building.
9. Usage of regular modules thereby creating rooms for flexibility of space.

Demerits

1. Conference/Seminar room is located inward.
2. It is not centrally located

3.5 Case Study Five: Gani Bello Library, Federal College of Education, Abeokuta, Ogun State.

3.5.1 Brief History

The Library started functioning the same year the Federal College of Education was established in 1977 at Isale Igbein Abeokuta and moved to its permanent site at Osiele in 1983. The building of Gani Belo Library was originally the dining hall of the Catering services. It was remodeled into library building when the Federal Government abolished the Catering services of all Federal Institutions thus the Library started occupying it in 1989.

3.5.2 Location.

The main library complex is located within the academic core area of the university and it can be easily accessible from any part of the university.

3.5.3 Description of the Building

Architect: The building was redesigned by Federal Ministry of Works and Housing, Abeokuta.

Year: 1983.

The main Library is a one floor building and contains reading rooms, circulation, special collection (student projects), Reprographic (photocopy and bindery). Two numbers of one storey buildings were built as extensions. The first extension accommodates system room, staff reading room, reference, workroom and offices while the second extension is purposely for the provision of electronics services and support of e-learning.



Plate 26: The Entrance Gate of Federal College of Education, Abeokuta, Ogun State

Source: Researcher's Field Work, (2022).



Plate 27: Satellite image showing site layout of the Federal College of Education, Abeokuta, Ogun State.

Source: Google Earth, (2019).

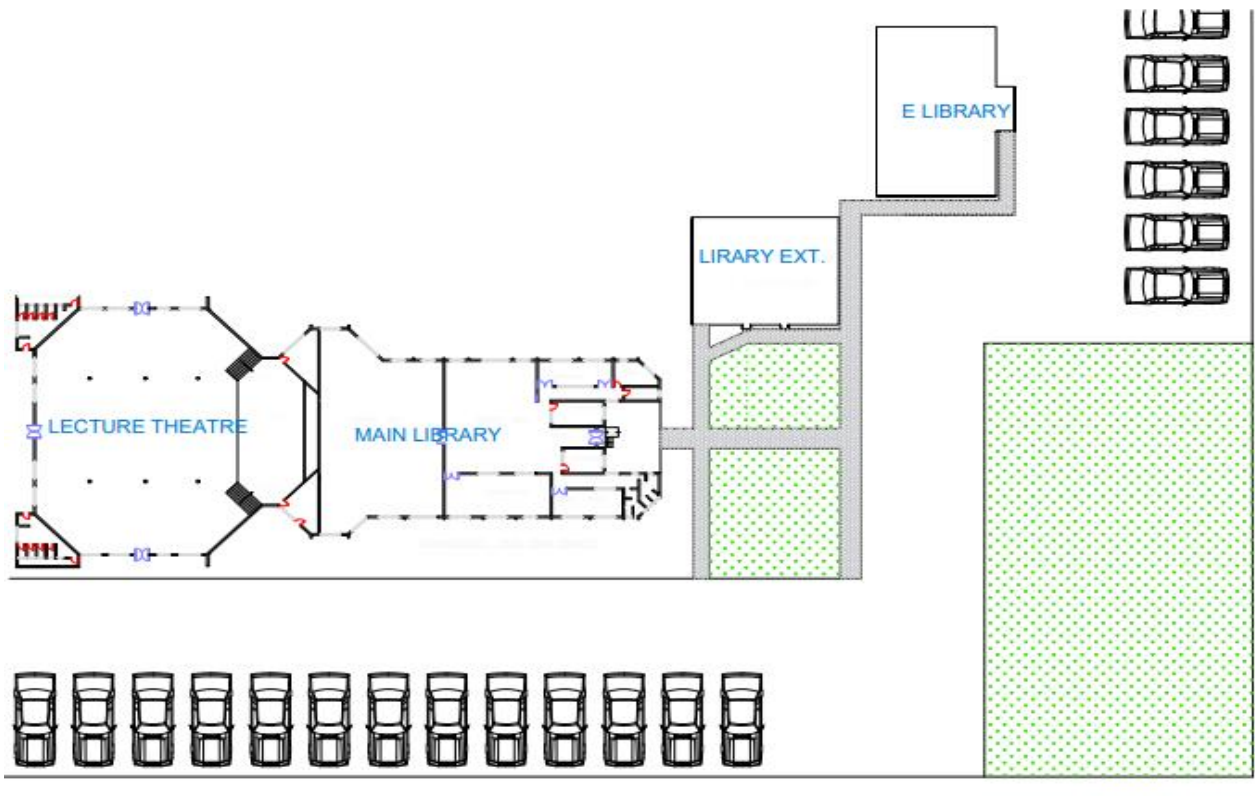


Figure 38: Site Plan of Gani Bello Library, Federal College of Education, Abeokuta, Ogun State.

Source: Researcher’s Field Work, (2022).

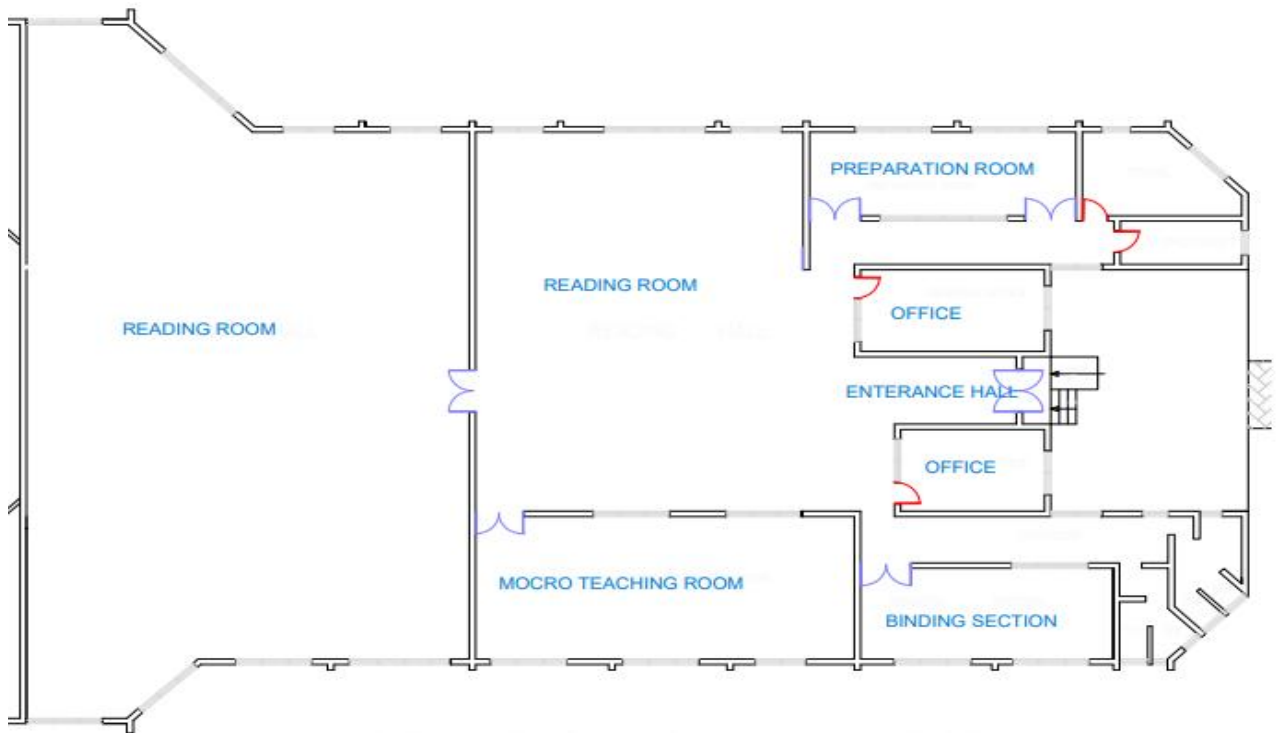


Figure 39: Ground Floor Plan Gani Bello Library, Federal College of Education, Abeokuta, Ogun State.

Source: Researcher's Field Work, (2022.)



Plate 28: Approach view of Gani Bello Library, Federal College of Education, Abeokuta, Ogun State.

Source: Researcher's Field Work, (2022.)



Plate 29: Side view of Gani Bello Library, Federal College of Education, Abeokuta, Ogun State.

Source: Researcher's Field Work, (2022.)



Plate 30: The Library Extension, Federal College of Education, Abeokuta, Ogun State.

Source: Researcher's Field Work, (2022.)



Plate 31: Approach of the E Library, Federal College of Education, Abeokuta, Ogun State.

Source: Researcher's Field Work, (2022.)



Plate 32: Interior view of E Library section, Federal College of Education, Abeokuta, Ogun State.

Source: Researcher's Field Work, (2022.)

3.5.4 Appraisal

Merits

1. Accessible to all users as ramp is provided at the entrance for the physically challenged.
2. Aesthetically pleasing.
3. Well landscaped.
4. Extended eave serves as shading devices to reduce the impact of sun ray into the reading room.

Demerits

1. Not effectively planned.
2. Poor ventilation of the interior of the library.
3. Poor lighting of the interior of the library.

3.6 Case Study Four: Macquarie University Library, Sydney, Australia.

3.6.1 Brief History

Macquarie University Library which has a collection of more than 1.8 million books is the largest university library in northern Sydney. It is dedicated to delivering services with innovation, excellence, flexibility, and professional ethics. Its mission is to become Macquarie University one of Australia's top eight research universities and one of the top 200 universities worldwide by becoming a global leader in the delivery of information services.

3.6.2 Location

The library complex is located at the core academic environment.

3.6.3 Description of the Building

The University's goals to transform the library building into a crucial campus facility and a 21st-century learning environment had the best chance of success at this point. The subsequent principles represent these goals: The primary architectural ideas for the structure are

1. Light and connection.

2. Strong sense of place

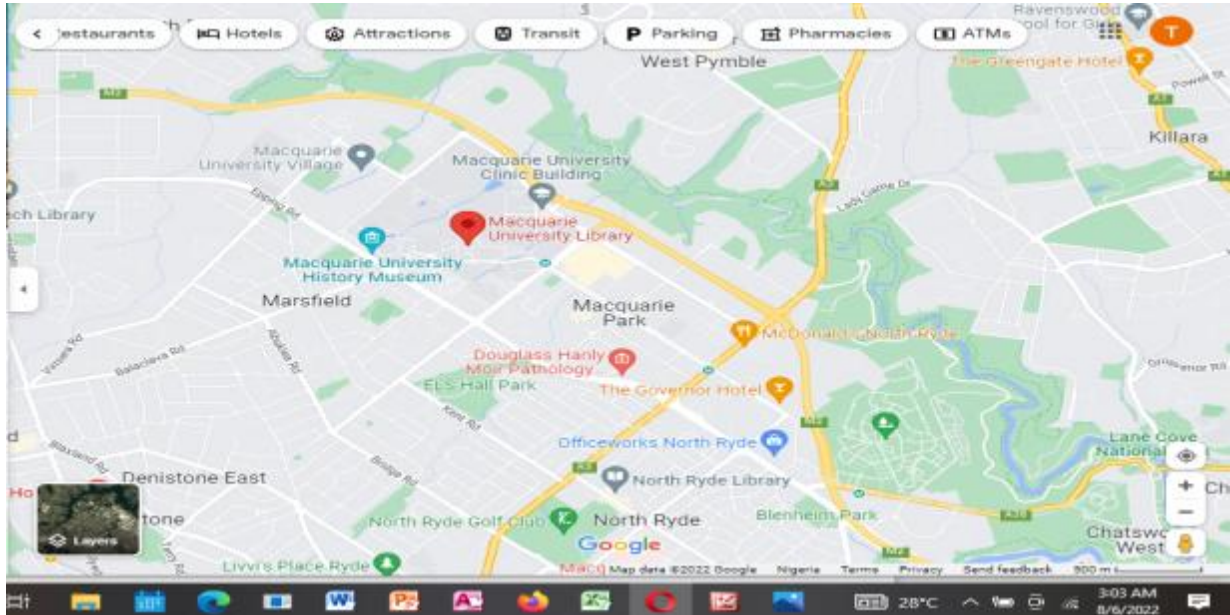


Plate 33: Satellite image showing site location of Macquarie University library, Sydney, Australia.

Source: Goggle Earth, (2021.)



Figure 40: Ground Floor Plan of Macquarie University library, Sydney, Australia.

Source: Researcher's Field Work, (2022)

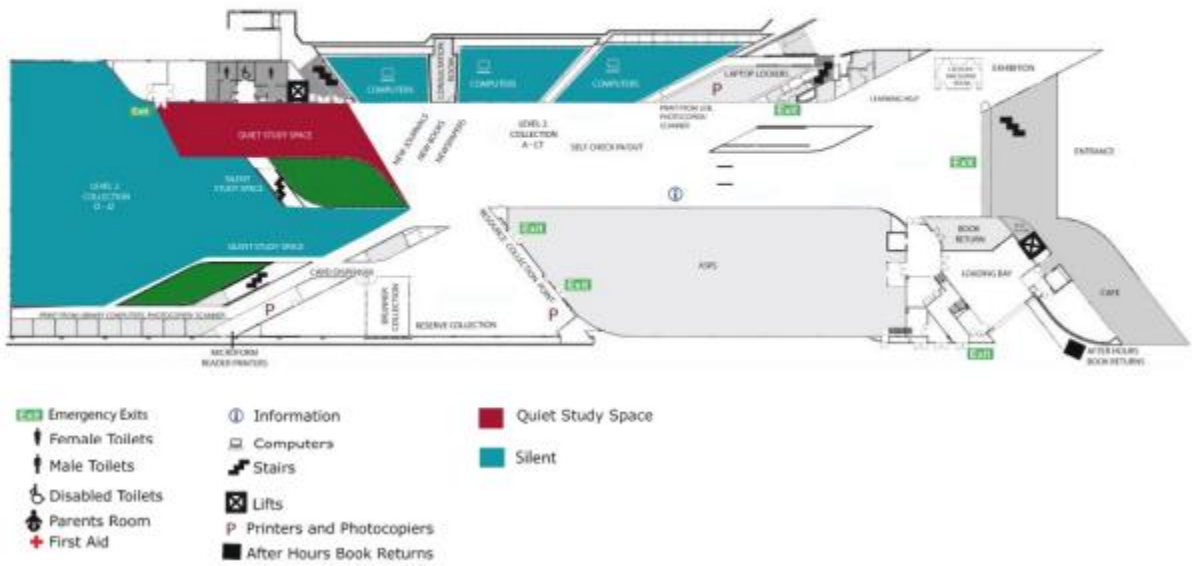


Figure 41

Figure 41: First Floor Plan of Macquarie University library, Sydney, Australia.

Source: Researcher’s Field Work, (2022)

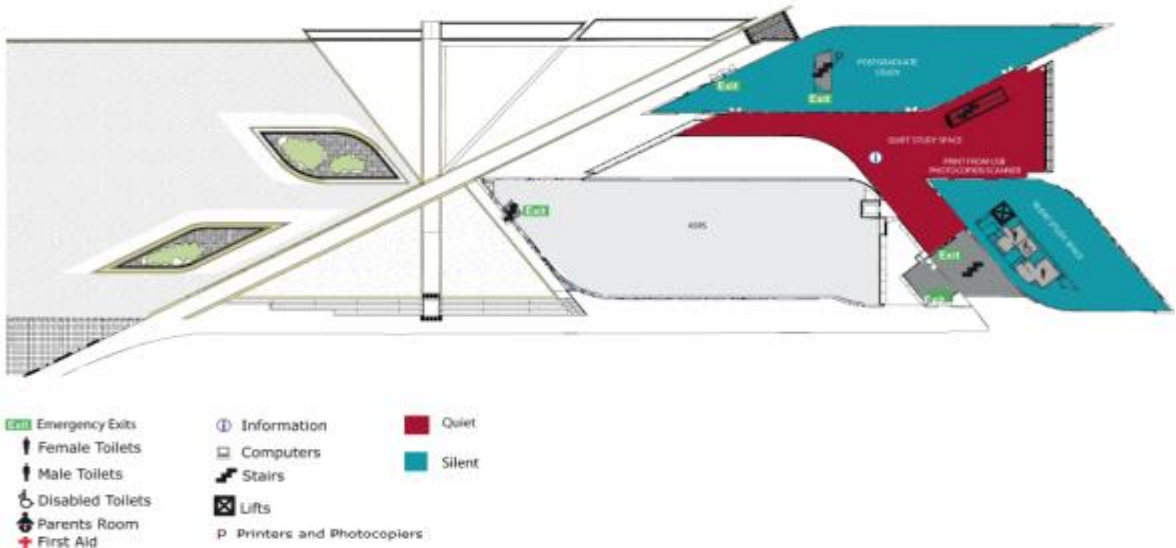


Figure 42: Second Floor Plan of Macquarie University library, Sydney, Australia.

Source: Researcher's Field Work, (2022)

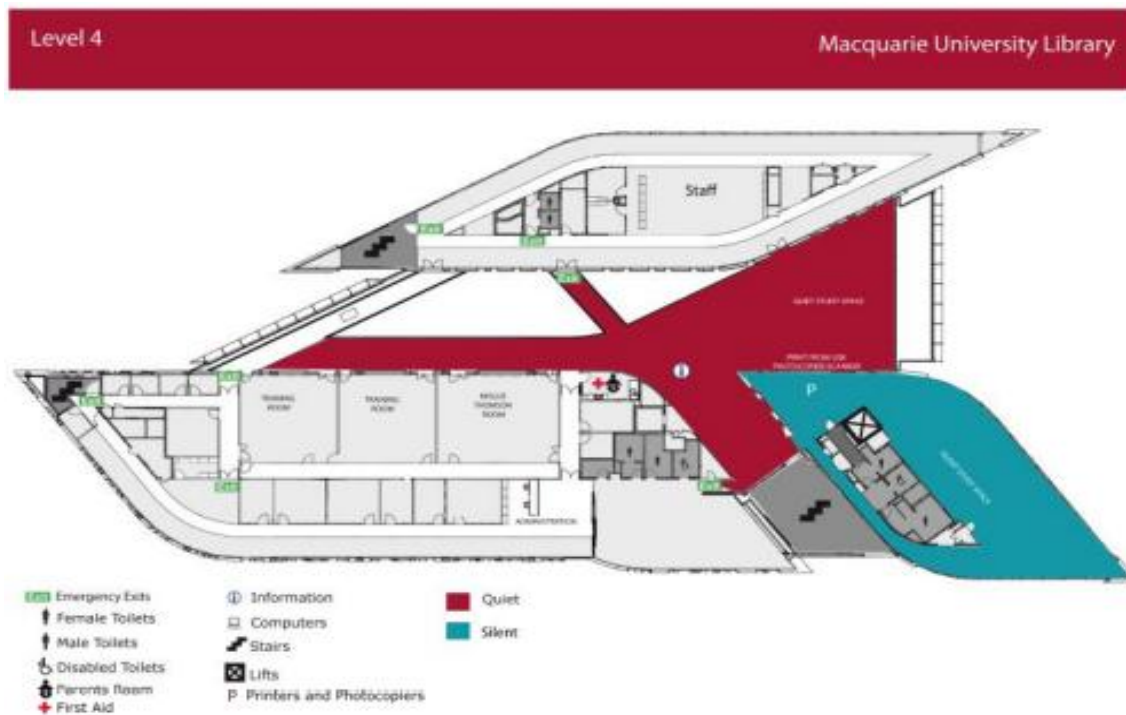


Figure 43: Third Floor Plan of Macquarie University library, Sydney, Australia.

Source: Researcher's Field Work, (2022)

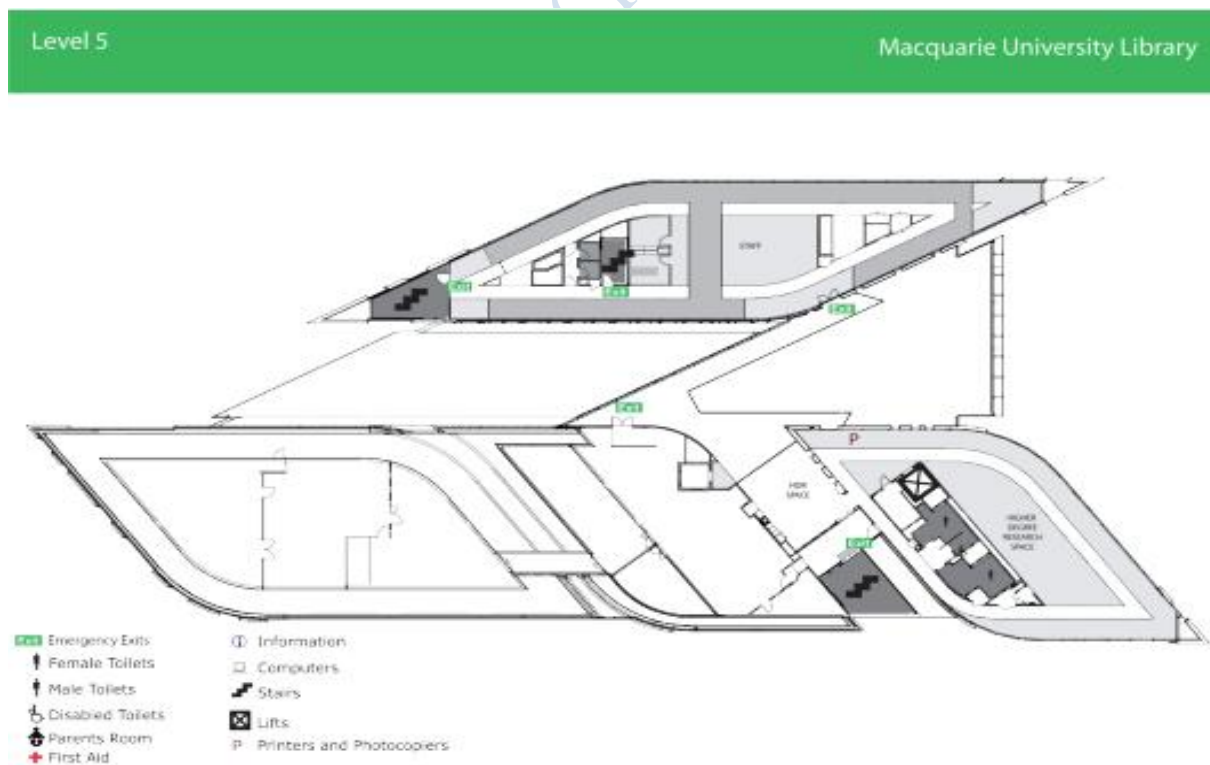


Figure 44: Forth Floor Plan of Macquarie University library, Sydney, Australia.

Source: Researcher's Field Work, (2022)



Plate 34: Approach view of Macquarie University library, Sydney, Australia.

Source: Researcher's Field Work, (2022.)

3.6.4 Appraisal

Merits

1. Provision of vertical movement of books through lift.
2. Provision of lift for vertical movement of physically challenged users.
3. Provision of toilet facilities for the physically challenged.

3.7 Case Study Five: University of York Library, United Kingdom.

3.7.1 Brief History

One of the most varied archive collection in UK. There are over 1,300 study spaces across the University's buildings, offering group, single and collaborative work areas. There is also easy access to power socket, and Wi-Fi throughout.

The resources available at this university are extensive and facilitate studying and research in all fields of study. The University collections include:

1. Around one million print books
2. More than 7,000 print and electronic journals
3. Over 7,000 audio-visual items.
4. Music, score, map, these and other specialist resources
5. Rare and valuable items in the University's special collections

3.7.2 Description of the Building

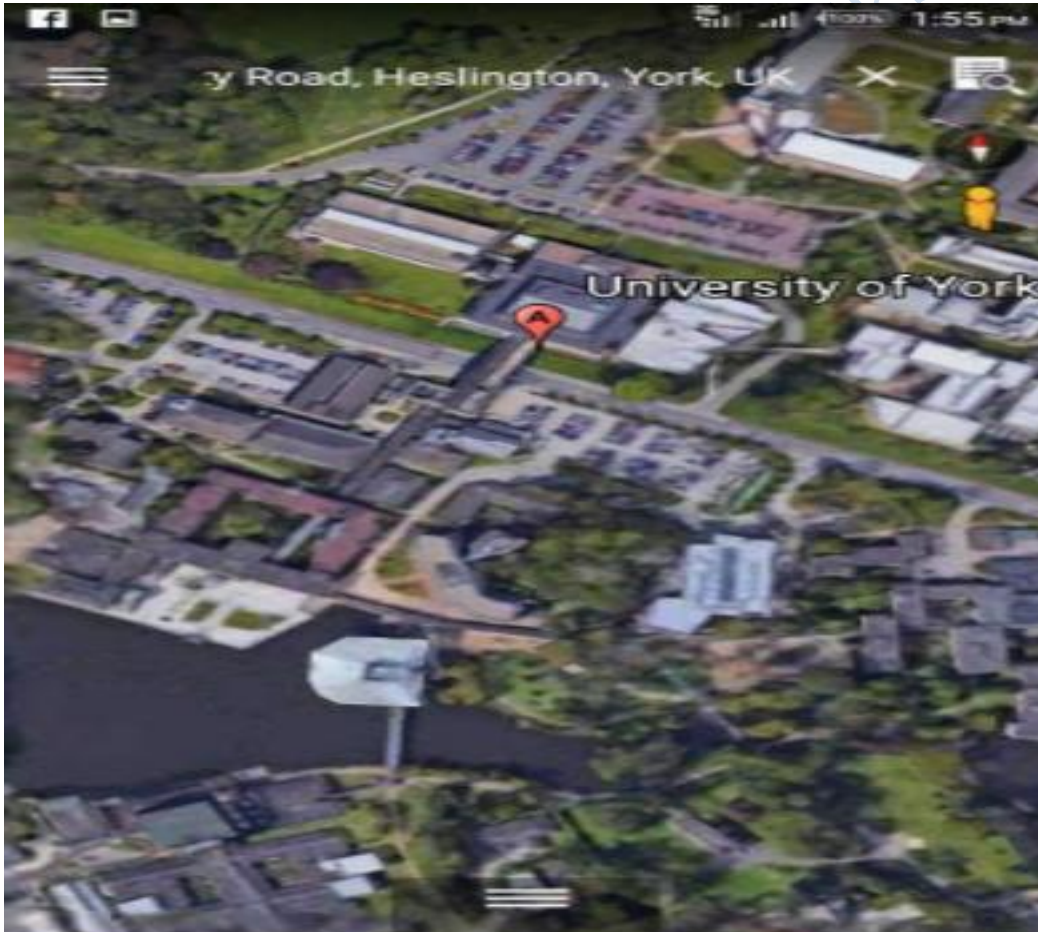


Plate 35: Satellite image showing site layout, University of York, United Kingdom.

Source: Goggle Earth, (2022.)

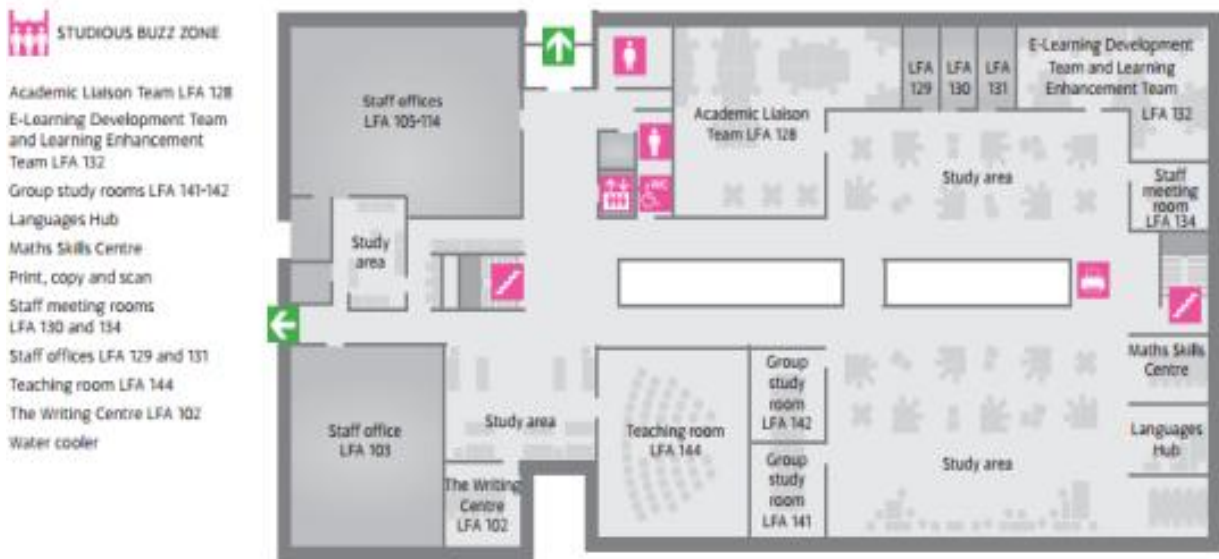
FAIRHURST Floor 0



Figure 45: Ground Floor Plan of Harry Fairhurst Library, University of York, United Kingdom.

Source: Researcher's Field Work, (2022.)

FAIRHURST Floor 1



Figure

Figure 46: First Floor plan of Harry Fairhurst Library, University of York, United Kingdom.

Source: Researcher's Field Work, (2022.)

FAIRHURST Floor 2

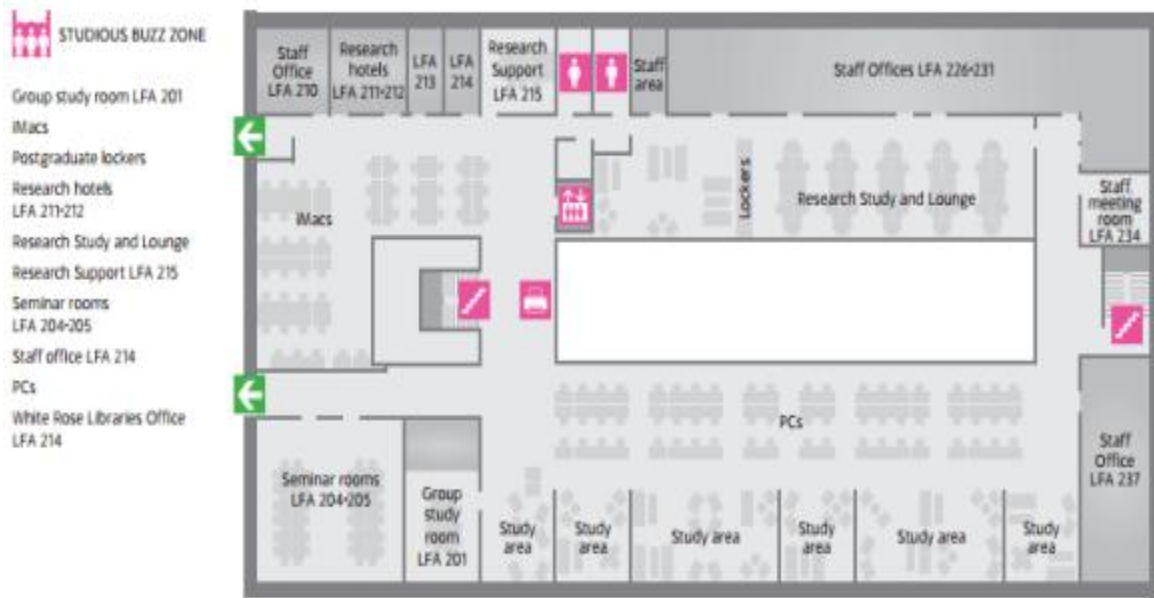


Figure 47: Second Floor plan of Harry Fairhurst Library, University of York, United Kingdom.

Source: Researcher's Field Work, (2022.)

MORRELL Floor 0

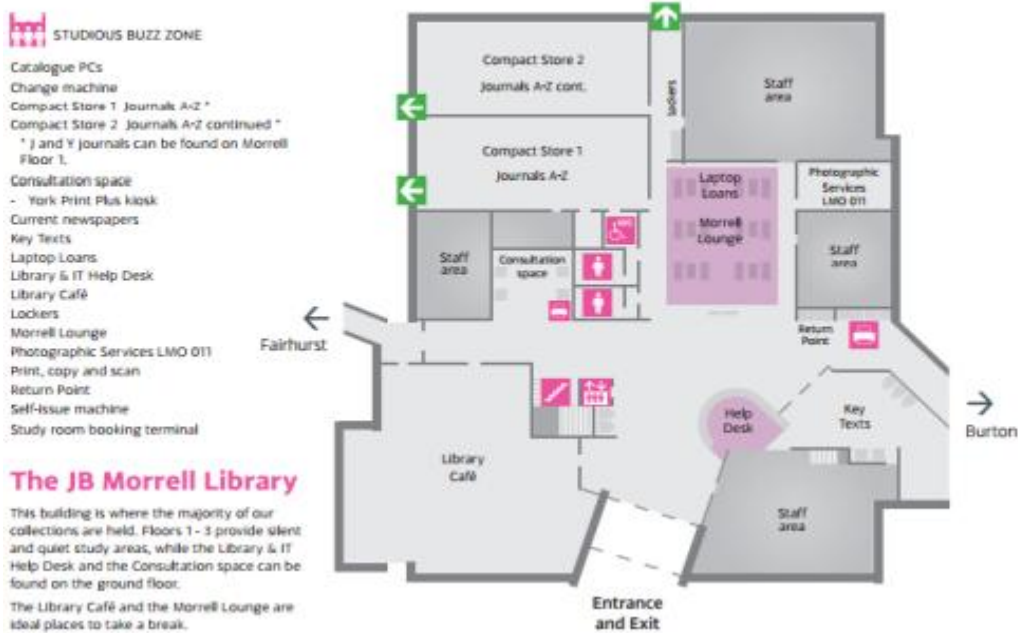


Figure 48: Ground Floor Plan of J. B. Morrell Library, University of York, United Kingdom.

Source: Researcher's Field Work, (2022.)

MORRELL Floor 1



Figure 49: First Floor Plan of J. B. Morrell Library, University of York, United Kingdom.

Source: Researcher's Field Work, (2022.)

MORRELL Floor 2



Figure 50: Second Floor Plan of J. B. Morrell Library, University of York, United Kingdom.

Source: Researcher's Field Work, (2022.)

MORRELL Floor 3



Figure 51: Third floor plan of J. B. Morrell Library, University of York, United Kingdom.

Source: Researcher's Field Work, (2022.)

BURTON Floor 0

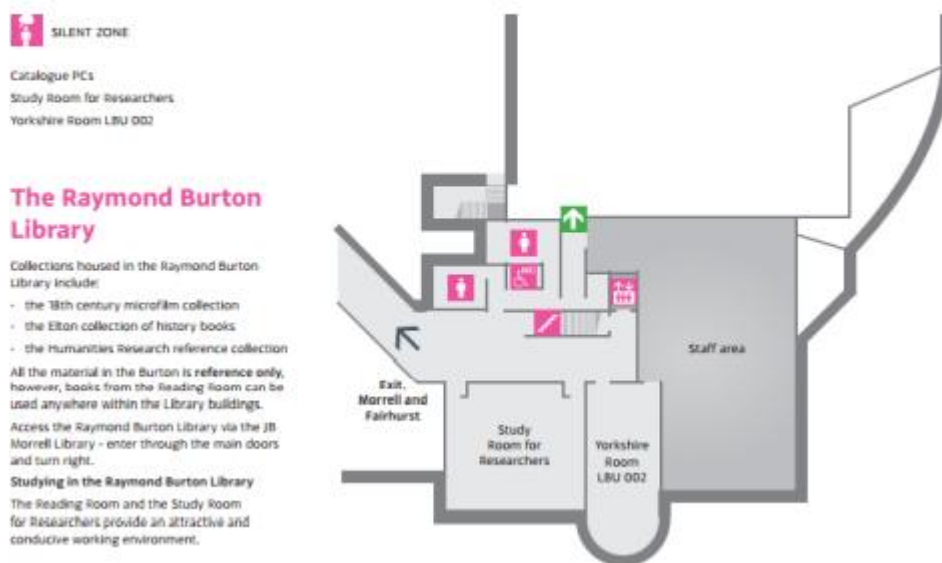


Figure 52: Ground Floor Plan of Raymond Burton Library, University of York, United Kingdom.

Source: Researcher's Field Work, (2022.)

BURTON Floor 1

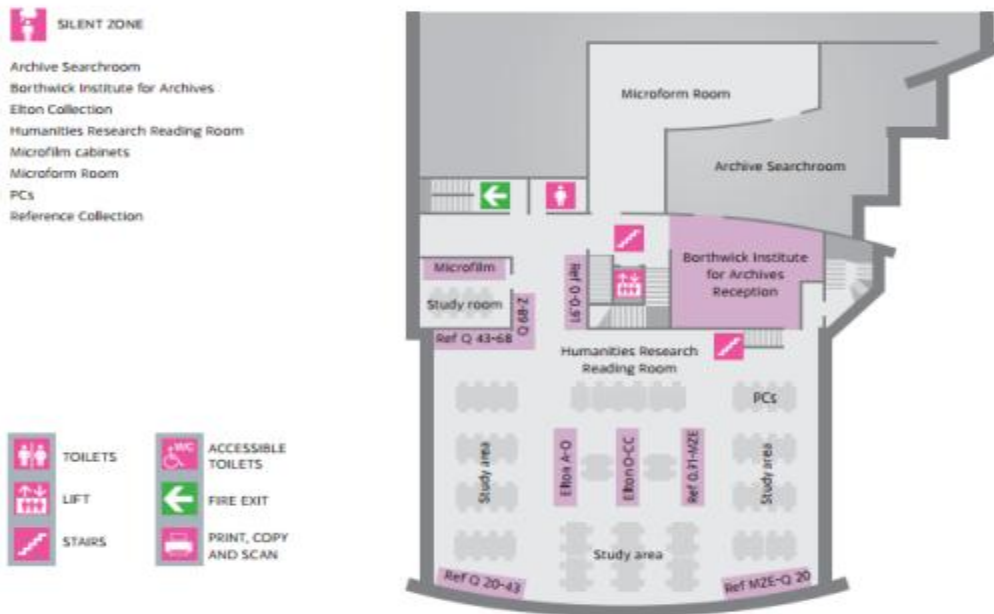


Figure 53: First Floor Plan of Raymond Burton Library, University of York, United Kingdom.

Source: Researcher's Field Work, (2022.)

BURTON Floor 2

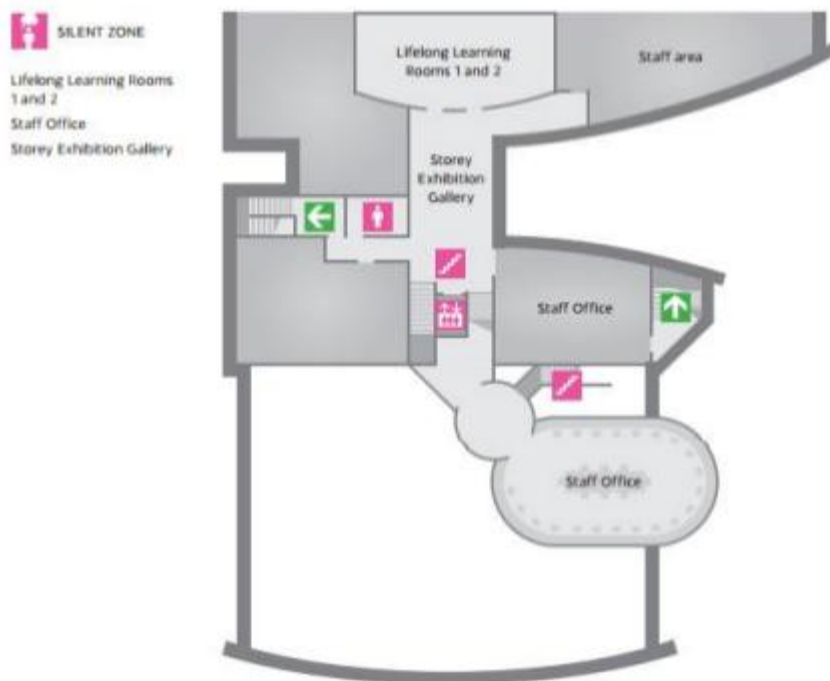


Figure 54: Second Floor Plan of Raymond Burton Library, University of York, United Kingdom.

Source: Researcher's Field Work, (2022.)

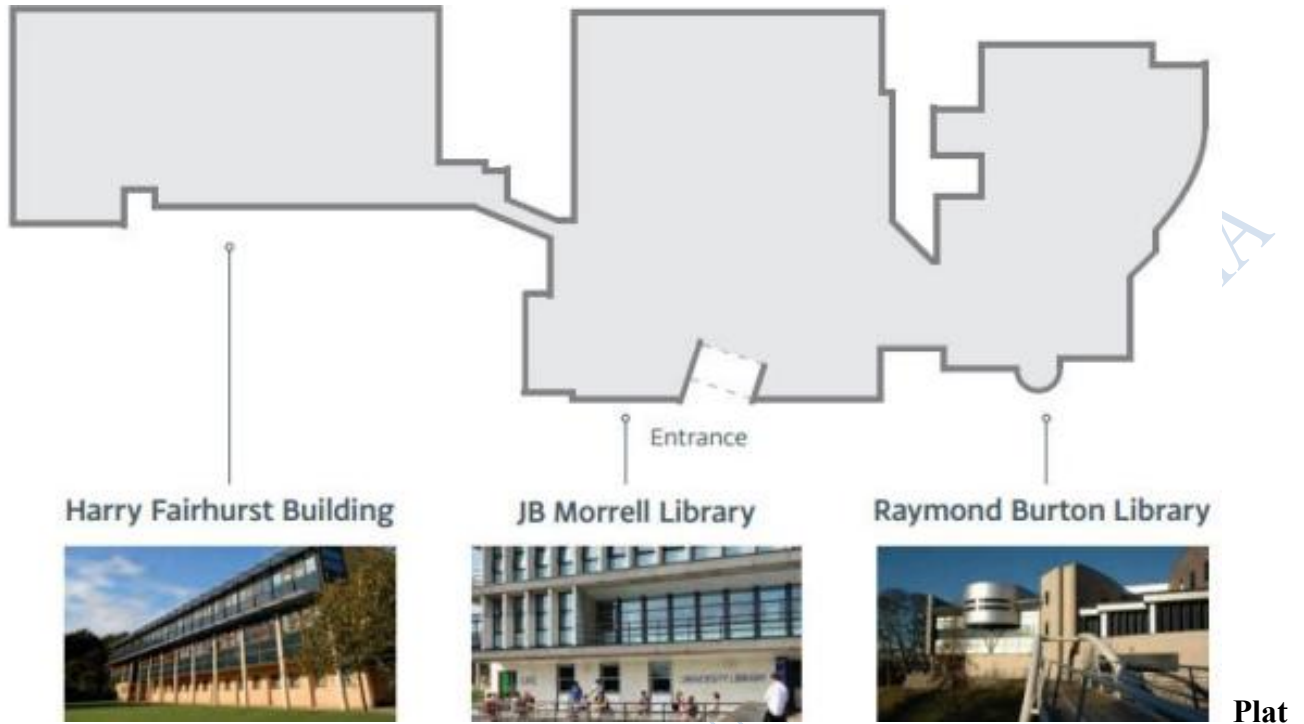


Figure 36: Viewing showing University of York, United Kingdom.

Source: Researcher's Field Work, (2022.)

3.7.3 Appraisal

Merits

1. Provision of vertical movement of books through lift.
2. Provision of lift for vertical movement of physically challenged users.
3. Provision of toilet facilities for the wheelchair users

3.8 Case Study Six: Birmingham Central Library

3.8.1 Brief History

Architects: John Madin Design Group

Client: Birmingham District Council

Capacity: 1,123,050 Volumes.

Total Floor Area: 21,368m²

This edifice houses the biggest public library in all of Europe.

There are 1,260 reader chairs and one million books spread across more than 30 miles of shelving, with room for expansion.

In June 1973, the public was allowed access to the central library in Birmingham, which was designed to serve the area's estimated 1,084,000 residents.



Plate 37: Birmingham Central Library.

Source: Researcher's fieldwork, 2022

3.8.2. Site Location

The library is situated on a bridge over a portion of the inner ring road in the city's core, next to a civic building. The location is close to Victoria Square, which is surrounded by five Victorian civic buildings.

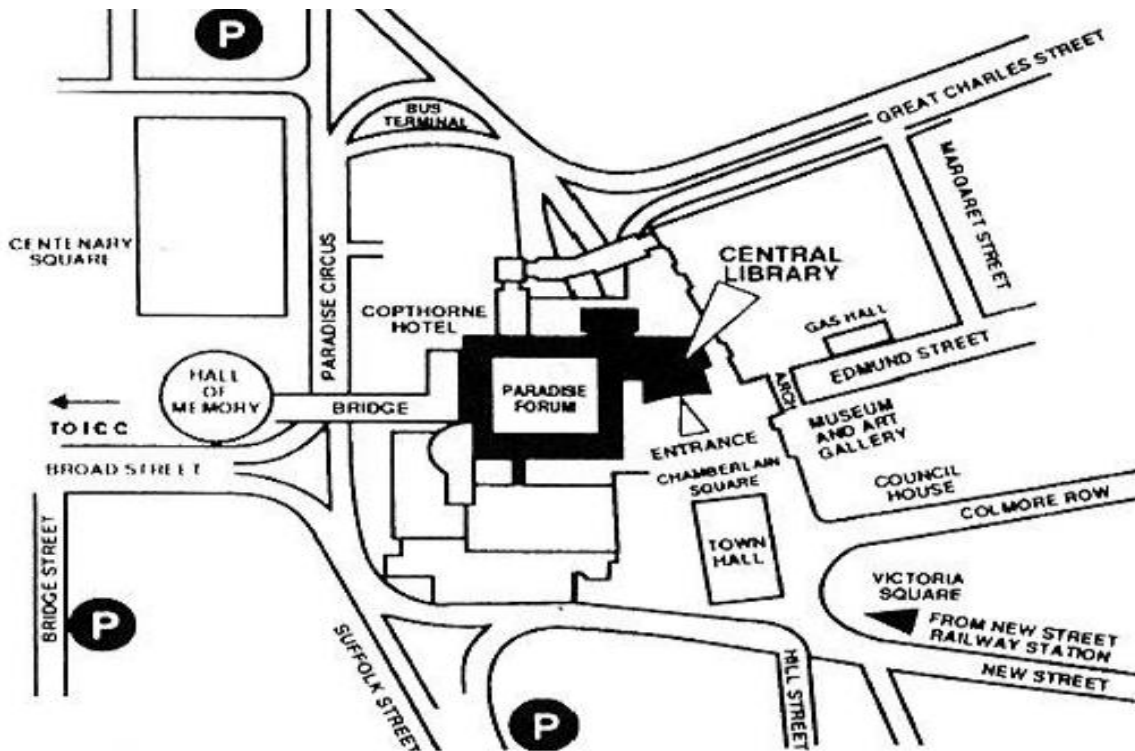


Figure 55: Site Plan of the neighbourhood in Birmingham where the Central Library is located

Source: Birmingham district planning Authority 2010



Figure 56: Ground floor Plan

Source: Birmingham district planning Authority (2010)

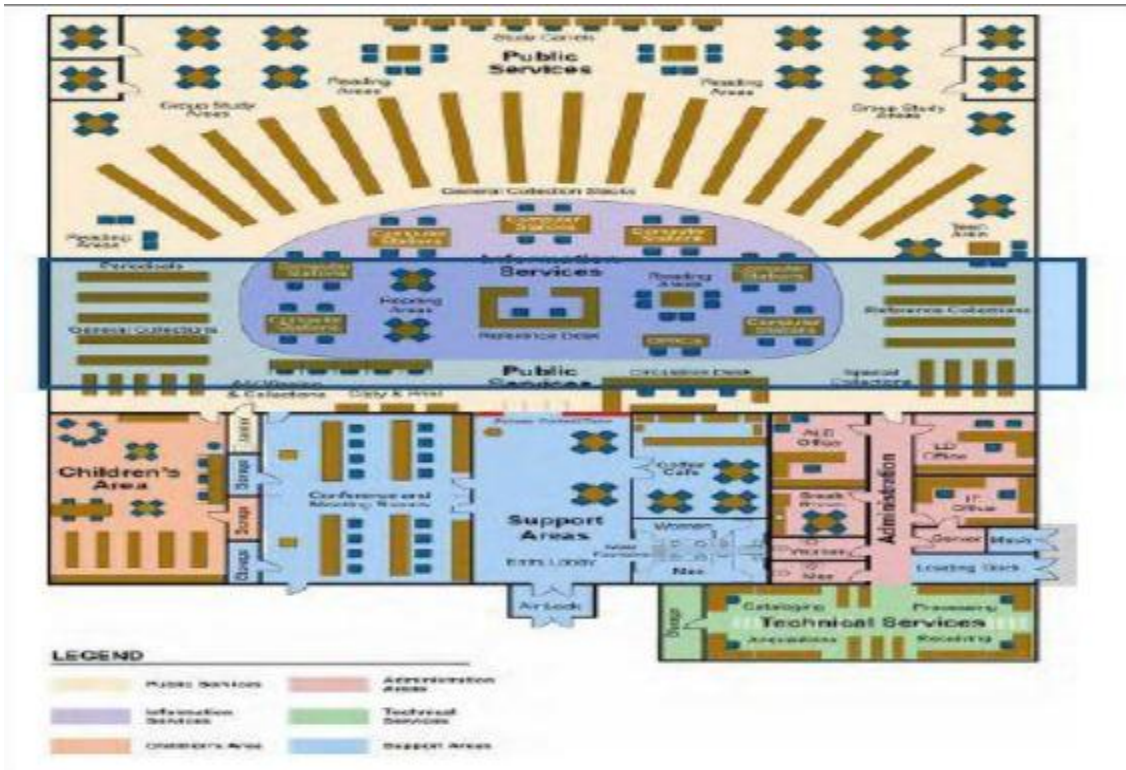


Figure 57: First floor Plan

Source: Birmingham district planning Authority (2010)

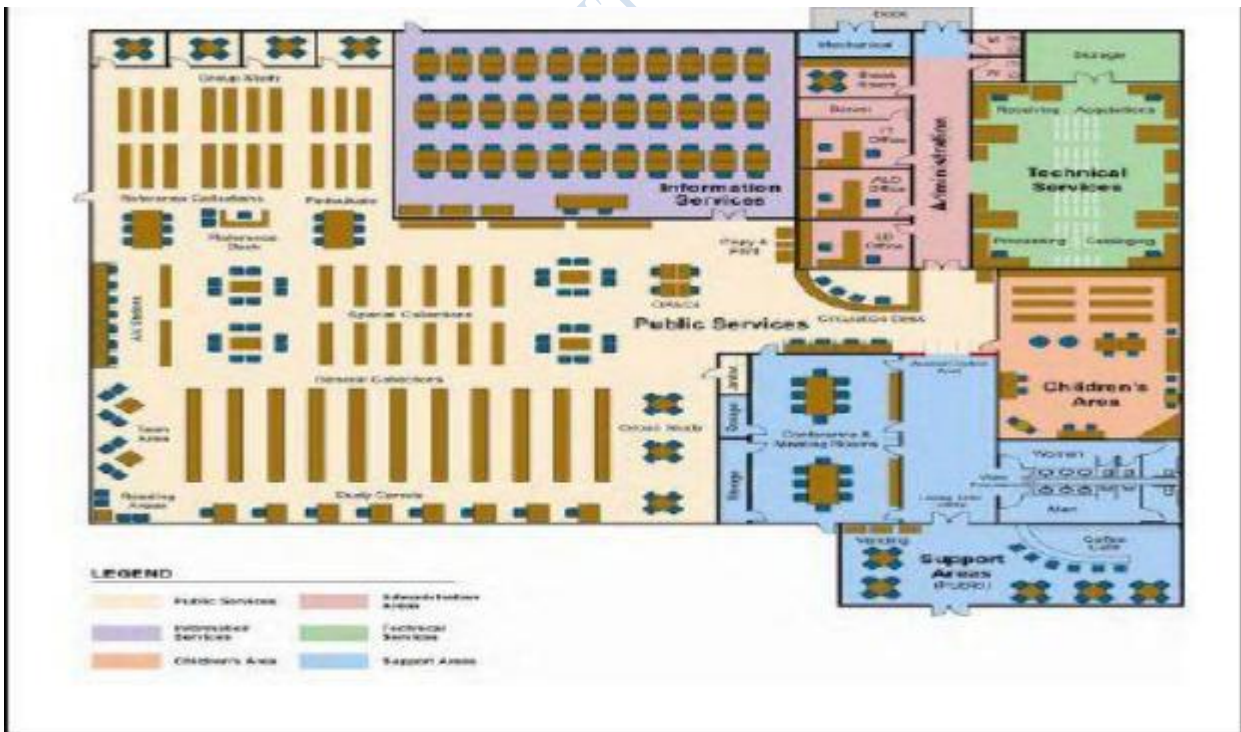


Figure 58: Second floor Plan

Source: Birmingham district planning Authority (2010)

3.8.3 Description, Scope and Function

The Birmingham library was planned in such a way that the principal aspects of library services which require different treatment and atmosphere were separated. First the central lending library which had to cater for large numbers of readers visiting the library for short period to borrow books with exceptionally heavy pressure at lunch time daily had to be separated from the reference library which was divided into nine subject departments providing for a very wide range of readers. This renowned public library was regarded as a cultural center with a variety of activities, including exhibitions, lectures, movies, conferences, meeting spaces, etc., when it was providing its excellent services.



Plate 38: The reference area on level two of Birmingham Central Library

Source: Birmingham district planning Authority (2010)

3.8.4. Design Analysis

Because there are actually two buildings connecting at a corner, the plan clearly reflects the fact that the structure is referred to as "the central libraries," in the plural. The three-story lending library's top floor is level with the lowest floor of the seven-story reference library, which is shaped like an inverted Ziggurat and erected around a sizable open courtyard. It is elevated high above the

pedestrian walkway. Should the necessity arise, the structure's design is completely reversible, with enough floor loads that takes into consideration even rolling stack requirements. The fundamental design choice was to forego the three primary tasks of reference, lending, and administration, leaving meeting accommodations as an outside-the-box consideration. The reference library, which contains a million books, was required to give a mass-significant visual shape and piercing image, which is accomplished by its inverted Ziggurat.



Plate 39: Birmingham Central Library's second-floor collection desk area

Source: Birmingham district planning Authority (2010)

3.8.5. Circulation

With the depth of the enormous structure, the use of escalators for vertical movement rather than lifts or stairs gives the sense that one room flows into the next, from the lively activity of the lending library to the quiet serenity of the study spaces. The escalators also give you a chance to mentally acclimate to the building's magnitude before conducting business there.

In addition to the advantages of peacefulness and convenience of vertical movement in the tall structure, its capacity to carry a big number of passengers at once is undoubtedly an advantage. In order to determine the design strategy, it was necessary to build vertically rather than laterally.

3.8.6 Organization

Even though there are escalators inside the building that make moving vertically easier and more convenient, most people still choose to be on the ground floor. With the exception of children who truly needed to be on the ground floor, length of stay therefore showed to be the best indicator of departmental placement. A day or longer may be spent studying at any of the higher reference departments. Thus with a proper time be of a day a succession in atmosphere is followed.

There is a noticeable shift in consciousness when the escalator moves in two steps to reach the first reference level; it is divided in half by a station for the distribution of date-stamped admission cards from a column, has a low, heavily covered ceiling, and has significantly less natural sunlight.

Because double height balconies are frequently used over most of the departments, the proportion is ample and solid without being oppressive. These voids are all unique despite varying in size and mood, similar to how the building's many floors do.

As a result of the inverted ziggurat, the floor widths are continually expanding, adding flexibility and enhancing the appeal of the entire structure by making each floor distinct from the others. As a result, the four large levels from one continuous whole changed continuously as floor areas, lighting, column placement, void placement, and colors changed.

3.8.7 Appraisal

1. Open access of the library generally encourages users to explore stacks.
2. The floor structure loading permits complete interchange of book storage and reader space if required.
3. The library has full height glazing on all sides and each floor projects beyond the face of the window to form a continuous balcony.
4. The structure is faced with precast units with a Portland stone finish.

3.9 Findings and Discussions

3.9.1 Deduction from the Case Studies

1. The choice of location of library should be at the core academic area of the campus and it should be along the route for easy access.
2. Library building is basically of regular shapes mostly combination of rectangles.
3. Functional circulations routes and barrier free that allows easy movement for all users.
4. The structure should be built on a modular design that can be quickly expanded or adjusted to match changes in the format of the collection and user requirements.
5. Provision of lift and escalator for vertical movement of books and accessibility for all users.
6. Provision should be made for handrail for ramps and stairs.
7. Consideration in the design and height of the chairs and desks for reading as well as book shelves at the reading rooms.
8. Every user should be able to access the library without having to go far, so parking lots should be built accordingly.
9. Adequate and functional toilets facilities for all users.
10. Adequate consideration should be given to the design of stairs, risers, threads, and landing to accommodate people with physical disabilities.
11. Wide enough passageways and doors should be provided for wheelchair users.
12. The use of sky light system is suitable for our climate.

CHAPTER FOUR

SITE ANALYSIS AND DESIGN SYNTHETIC

4.1. Study Area



Figure 59: Iwo Township within the context of Osun state.

Source: Researcher's Field Work, (2022.).

The study area is in Iwo township of Osun State in the South Western zone of the Nigeria. It lies between Latitudes $7^{\circ} 33'$ and $7^{\circ} 40'$ North of the Equator and between Longitudes $4^{\circ} 9'$ and $4^{\circ} 13'$ East of the Greenwich Meridian. It is also revealed that the centre of the town lies on Latitude 07.634130 N and Longitude 004.180690 E. (Iwo Land Urban Renewal, 2012 unpublished).

4.1.1 Site Location

Site location is within the permanent at Elere area of Iwo along Iwo/Oyo road. The selection of the appropriate site for this has become easy but there are basic criteria for adopting the proposed site.

The proposed master plan of Federal College of Education Iwo has area earmarked for the Academic and it spanned from beside the Administrative area towards the back of the

Administrative area which also faces the student hostel. The physical planning unit of the college and the college authority has a task of maintaining the master plan, even though there may be need for alterations as occasion arises.

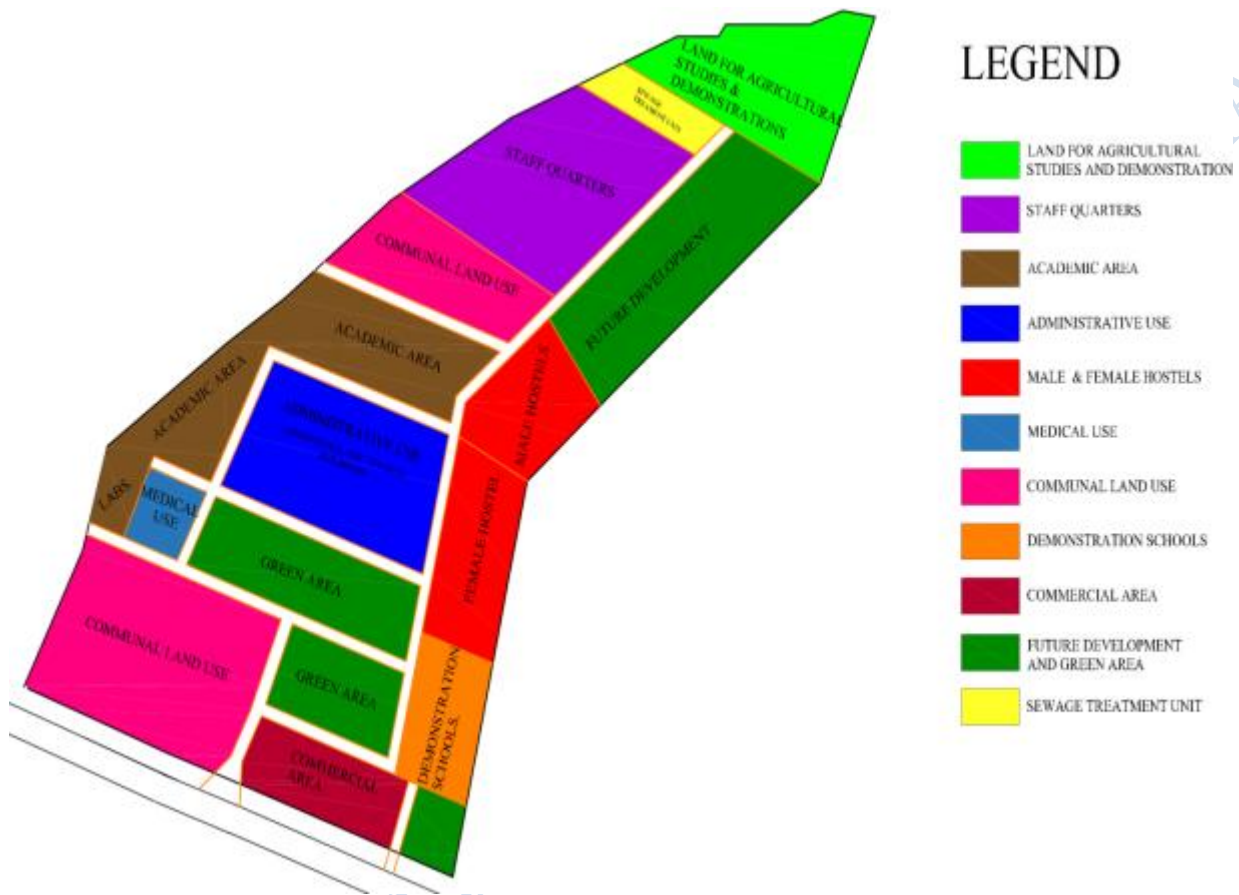


Figure 60 site location maps

Source: Researcher’s Field Work, (2022.)

4.1.2 Site Selection Criteria

The fact that library is an avenue for the promotion of academic, research and unity in the campus facilitates the site selection of the proposed Library closed to the academic and faculty buildings the region. The proposed Library is bounded by the proposed roads and proposed faculty buildings at the North, South, east and west sides respectively.

The location of the site also has the following considerations;

- A great advantage of proximity between the academic and administrative.

- The serenity is guaranteed.
- The site can easily be accessed by foot or vehicles.
- The site is sizable enough to accommodate the proposed buildings and vehicular parking in addition to the proposed faculty buildings.
- The location of the site provides it with a good view.
- The site has a gentle slope which is characterized by good drainage system.
- The central location of the site makes it easily accessible for the faculties' staff and students.
- The location provides a high level of security to the building both day and night.
- The site is free from heavy vegetation, hence little clearing is required.

4.2 Project Analysis and Design Synthesis

College Library is a public building. Therefore, by definition, a public building is one that must provide access to everyone, regardless of age or physical restrictions.

In the design of a this library project, in order to ensure complete organization and usage of space, the users' comfort, and other factors, several considerations must be made, population and the effectiveness of the environment as a whole in addressing their social, physiological, and educational demands. The limiting control guidelines impose restrictions on the design of site. The properly located building achieved harmony, increased functional efficiency and minimized drainage problem. The comfort level that is attained and the cost are influenced by the direction, the plan layout, the building's design, and the materials utilized.

The Physical access to buildings should be particularly evident in public buildings by every user as the biggest achievement encountered in using libraries (McNulty 2006). So is the case of this library project

Thus, every category of library must be fully integrated in the educational society and emphasis must be placed on physically accessible libraries.

4.2.1 Brief Analysis

- a) Entrance porch
- b) Reception
- c) Sentry (security post)
- d) Locker room
- e) Circulation area
- f) Acquisition unit
- g) Catalogue unit Reading rooms
- h) 24 hour reading area
- i) E-Library
- j) Multimedia (audio visual) unit
- k) Delivery bay
- l) Lounge
- m) Archive
- n) Exhibition hall
- o) Bindery department
- p) Reading rooms
- q) Reference/bibliography
- r) Serial Unit
- s) College Librarian
- t) Principal Officers
- u) Secretaries office
- v) Kitchenette
- w) Board room
- x) Conveniences

4.2.2 Brief Development

In the design of a library project, in order to ensure that the users' population is comfortable and that the environment as a whole functions to suit their educational, physiological, protective, and social needs, a specific factor must be taken into consideration while organizing and using space.. The limiting control guidelines impose restrictions on the design of site. A properly located building achieved harmony, increased functional efficiency and minimized drainage problem. The level of comfort attained and the reduction of costs can be influenced by the building's orientation, plan organization, design, and materials.

4.2.3 Design Criteria

To create an accessible building design, a number of technical factors and design guidelines should be considered when making plans for the built environment. The vertical and horizontal access requirements for all building types are covered in the following graphic illustrations. It covers the technical and architectural facets of putting these measures in place.

Designing a functional and comprehensive library requires several design considerations to be considered with respect to their impact on the overall building. They include

- a) Site selection
- b) Space requirements
- c) Structure- Economical structural spans and spacing modules
- d) Ventilation (natural means)
- e) Air temperature (passive cooling)
- f) Lighting - daylight, bright lit walls with energy efficient technology (solar panel)
- g) Acoustic- Sound absorptive materials
- h) High performance features (green Architecture)
- i) School population and accommodation schedule

4.2.4 Conceptual Development

The proposed Academic Hub library for the College will be an inquisition to learning and other academic activities. It will provide the minimum required standards for a functional library in Nigeria. The facilities to make up the hub are library, conference/seminar hall and bookstore. Hence in conforming to a set standard, spaces to be provided include;

Libraries requires unbroken flow of space, this is to allow for flexible configuration and a free line of sight. Hence large open areas are to be provided to serve as general reading rooms, while enclosed spaces will serve specific services like Audio Visual rooms, etc.

Since the College is proposing seven schools, cataloguing for easy detection of books will be based on the eight different colleges. While Conference/seminar rooms will serve the purpose of seminar, conference and general meetings that require spacious in order to provide more spacious and suitable environment. However, to further improve the quality of quietness and acoustic of the Library, both the conference/seminar hall and bookstore are separately designed.

4.2.5 Functional Relationship

The functional relationship chart shows the degree of relationships among the various spaces in the facility. It helps the designer to see at a glance which spaces are or not related to one another. This helps the designer to locate related spaces within easy proximity of each other and isolate those which are not related. It also aids zoning of spaces and functionality of the design.

1. Separation of the various traffics from one another i.e. vehicular, pedestrian, Staff, students etc.
2. Orientation of buildings to create maximum thermal comfort and convenience.
3. Orderliness, functionality, aesthetics, unity.
4. Green areas with soft and hard landscaping.
5. Ample parking spaces
6. Separation of conference/seminar hall and bookstore.

4.2.6 Space Allocation/ Schedule of Accommodation

Space allocation and schedule is a result of the functional requirements of spaces. It is also determined by a hierarchical property as well as its relationship to other proposed spaces. A library, as a public building, should therefore be devoid of obstructions to movement. It should be able to incorporate the free flow of users, equipment's, materials as well as services. This will reduced traffic builds up, prevent accidents, and increase efficiency of services and ultimately user satisfaction. Activities in a library revolve around studying; the library should therefore provide accommodation for the library collection, provide accommodation for the administrative elements and finally accommodate the readers. Therefore, services can be broadly classified into three (3). They are the Administrative, primary and supporting services.

Table 3: Schedule of Accommodation

S/N	Functional Areas	Dimension M	Area M ²	Number	Total areaM ²
1.	College Librarian			1	
2.	Principal Officers			12	
3.	Conveniences			85	
4.	Store				
5.	Acquisition Unit			1	
6.	Cataloguing Unit			1	
7.	Circulation Unit	13.300m x 20.475m		1	
8.	Cloakroom/locker(M)			1	
9.	Cloakroom/locker (F)			1	
10.	Bindery Unit			1	
11.	Sentry			3	
12.	Reading Hall	13.300m x 20.475m	599.025	10	5990.25625

13.	E-Library			1	
14.	Multimedia Room			1	
15.	Archive			1	
16.	Study Carrel	2.625mx1.8m	4.725	48	226.8
17.	Group Discussion			2	
18.	Exhibition Hall			1	
19.	Reference	13.300m x 20.475m		1	
20.	Government Publication			1	
21.	Entrance Porch	13.300m x 20.475m		1	
22.	Chief Librarian	11.925m x 11.925m	142.205625	2	284.41125
23.	Assistant Chief Librarian	11.925m x 11.925m	142.205625	2	284.41125
24.	Principal Librarian	9.90m x 11.925m	118.0575	2	236.115
25.	Senior Librarian	9.90m x 11.925m	118.0575	3	236.115
26.	Office	8.925m x 11.925m	106.430625	2	212.86125
27.	Secretary Office	5.85m x 11.925m	69.76125	2	139.5225
28.	Store	4.275m x 4.425	18.91685	2	37.8337

Source: Researcher's fieldwork, (2022).

Spaces for the Study services are to be specific to the schools education curriculum. Hence 10 groups of cataloguing are proposed based on the 7 aforementioned faculties and additional 3 for future expansion.

1. Conference/Seminar hall (detached)
2. E-library
3. Multimedia unit (Audio Visual)

4. 24-hours reading spaces

5. Scholar reading halls.

4.2.7 Construction Methods and Materials

Both the building method and material selection will be influenced by the facility's location. Library building being a facility that accommodate large vast of activities and people, It is anticipated that strong, contemporary building materials would be used. A professional structural engineer registered with COREN shall manage all structural work and configurations as designs for columns, beams, reinforcements, and other elements will be necessary. A number of analyses will also be needed to determine the facility's safe bearing capability for the soil and the impact of the wind. The primary structural materials in the design must be reinforced concrete and steel. When picking finishes, various factors like as thermal insulation, acoustic design, and others will be taken into account. Each interior space's intended usage will dictate the finishes that are used.

A. Pre-Construction Operations

The contractor and other pertinent organizations conduct pre-construction operations. The tasks entail determining the health and safety concerns with the project, offering on-site documentation, and assuring facility access and security (Salingaros, N.A., 2015). There should be a pre-construction meeting scheduled to make sure that everyone involved is aware of the procedures for contractor submittals, sampling and testing, construction surveys, outside agency inspections, payment requests, claims and disputes, unexpected job conditions, and change order requests.

B. Substructure

Most of the building's substructure is comprised of the foundation. The soil within the site is firm, well compacted, with good load bearing capacity and has the presence of rock boulders running underneath the soil layer. Normal strip foundation would be employed in this case because of the

favourite characteristics of the soil. The quality of the foundation materials will offer resistance to chemical and pose adequate compressive strength; this will aid in conveying the weight of the building without any form of differential settlement. In the substructure stage, the following operations are primarily carried out:

i. Site Clearing: All obstacles on the area where the structures will be located must be taken out to make way for subsequent operations. There must be no trees or other vegetation on the construction site.

ii. Site Hoarding: It involves building a barrier around the site's perimeter to increase security and safeguard contents and equipment. Corrugated galvanized zinc sheets will be utilized for the hoarding and will be affixed to timber framework.

iii. Removal of Topsoil: The topsoil being removed from the area of the land where the buildings are located. However, it is best to keep the top soil from the other areas so that it can be planted in the landscape. 150 mm is the typical depth at which top soil is removed.

iv. Setting Out: Getting measurements from building designs to the actual site is a process known as "setting out." The existing road that serves as the buildings' reference point must be taken into consideration while laying out the buildings. The use of Theodolite is required for the laying out in order to attain a better level of accuracy than can be accomplished with other techniques.

v. Excavation to Trenches: Upon the completion of the setting out and certification by the consultants. Excavators are required to dig the trenches to the structural engineer's prescribed depth. The trenches must be examined and approved before installing the blinding,

vi. Casting of Blinding, Foundation Footing and Column Bases: Deep concrete piles will be drilled into the water's surface, and each pile will have a pile cap. Laying the foundation footing requires taking into account the site's slope. The locations and specifications set forth by the structural engineer for the reinforcement of the column bases.

vii. Laying of Foundation Blockwall: The foundation block walls must be constructed using 230mm stretcher-bonded sandcrete blocks and must have concrete poured into them completely. The foundation block wall's durability (strength) will be increased by the concrete.

viii. Hardcore filling: A 300mm thick layer of weathered rock should make up the hard core. It ought to be even and tightly packed.

ix. Damp proofing: The area of the foundation should be covered with three plies of bituminous felt to act as damp proofing. It is done to prevent water from capillarizing up to the floor slab.

x. Casting of in-situ ground floor slab: The structural engineer's suggested thickness must be followed when building the ground floor slab. The floor slab has to be strengthened (reinforced). Prior to beginning work, it must be reviewed and approved by a structural engineer.

C. Superstructure

The building will be concrete framed structure. Reinforcement concrete will be used for columns, beams, and slabs. Sand Crete and non-flammable light partition for walls. It will have fire-rated doors and a ceiling. The floors will be finished generally in linoleum, vitrified floor tiles that are not slippery with different materials and textured in different places. Fire resistant finishes will be used. Mechanized anti-fire equipment will however complement the anti-fire efforts. The superstructure is made up of five fundamental parts, including; floors, walls, doors & windows, ceiling and roof.

i. Floors: The floor shall adhere to the appropriate specifications in accordance with the structural specification. It ought to be strong enough to bear pressure and keep moisture out. Heat and sound absorption, fire resistance, and ease of maintenance, aesthetic appealing, comfort, safety, cleanliness etc. are all desirable. The flooring are made of reinforced concrete floor slabs, and PVC tiles, marble tiles, vitrified tiles, ceramic tiles, and cement screed are used to finish them.

ii. Walls: The majority of the building's visual components, including walls, are responsible for its appearance. It should be made with appropriate aesthetics, wind, dust, and animal protection in mind. In addition to resistance to moisture, thermal and acoustic insulation, and fire resistance, strength and stability are of utmost importance. Sandcrete hollow blocks measuring 225 mm will be used for the interior and exterior walls. Some of the restroom walls will be built from hollow 150mm sandcrete bricks. To serve as fire protection and make it easier and safer for people to leave the building in the event of a fire, stair walls should be made of thick concrete.

iii. Doors and Windows: The height of both internal and external doors will be 2100mm while the corresponding widths will be 750mm, 900mm, 1200mm, 1500mm, and 1800mm.

iv. Ceiling: Modern times have seen the development of different ceiling materials, from dry to wet ones. Suspended ceiling will be used in most spaces to help in housing major light fittings and for acoustic considerations; the ceiling materials used is 600x600mm cellulose ceiling boards. Also, the architect's recommended pattern for installing the boards must be followed.

v. Roof: The following conditions must be satisfied by a roof in order for it to function: strength and stability, durability, fire resistance and occasionally, sound insulation, lighting, ventilation. The type of construction utilized in each unit will depend on its span and character. The roof is a space frame structure, supported by steel and reinforced concrete columns, with 60mm thick aluminium insulated roof panel covering. The dominant roof design is a mono slope shed-type with 600mm roof gutter to serve as roof drainage.

4.2.8 Building Services

For the building to be used as efficiently as possible, utility services must be offered. Important among these are, circulation, ventilation, lighting, water supply, electricity supply, and sewage disposal and fire protection.

i. Circulation

This shows the flow of visitors around the construction site. There are entry points for both automotive and pedestrian circulation in the proposed project. In a library building, movement vertically and horizontally is irresistible. In this design, provisions were made for movement of people and equipment between the floors.

Circulation is an important factor to consider in library design; as a result, this library has enough of room for employees and students to walk around freely and easily.

ii. Ventilation

Ventilation generally may be natural or artificial/mechanical. For air to travel naturally during ventilation there must be a significant temperature difference or breeze, while the practice of treating the air in an enclosed space to create and maintain the necessary levels of temperature, humidity, and air movement is known as artificial ventilation. The library building will be ventilated and cooled by both natural and artificial means of ventilation. Artificial ventilation is through a combination of central air-conditioning system and extractor fans.

iv. Water Supply

A direct water supply system will be deployed by connecting through the available water mains from the designated water reservoirs built to service the College Community as a whole. To ensure that the buildings always have access to water, a borehole and an electricity-operated pump shall be provided. For various distributions, storage cisterns must be placed where they are needed.

iii. Lighting

In the design of a library, lighting is an important factor to consider because of its physiological and psychological effect on people. The sense of wellbeing associated with day lighting and the orientation brought about by contact with the outside. This library is designed to have access to the natural daylight.

v. Electrical Systems

The electricity lines of Ibadan Electricity Distribution Company (IBEDC) from the town shall serve the buildings. To give each level and space on the property with the necessary power, a distribution network must be installed. The wiring system must be constructed, carefully planned, and wired in accordance with all electrical engineer and services engineer criteria.

There shall be strong conductivity and good resistance in the type of wire cable used. Additionally, If there is a power outage, a backup power source (generator) will be available to supply the necessary power. As soon as there is power failure from IBEDC, the generator immediately kicks in.

vi. Fire Protection

A library building needs to be well protected from fire outbreak because of the large number of people and materials it accommodates. The goal of fire protection is to stop the ignition and spread of a fire, control the spread of smoke, and make it easier for people to flee or be rescued. Active and passive precautions will be taken to effectively put out fires in the event of an outbreak. Active safety measures are devices that automatically go into action in the event of a fire and they include installation of heat-activated sprinklers that contain a fire at its source by releasing small amounts of water only enough to put out a fire. Having a clear and accessible exit, heat and smoke detectors, and smoke and fire alarm systems are all crucial fire safety precautions. Construction solutions for the structure and its components are passive safeguards that will help in reducing the spread of fire. These include minimum structural sections, casings and coatings, building supporting floors, installing fire doors and windows, etc.

vii. Sewage Disposal

Access is given to facilities for the handling, storing, and collection of trash in order to facilitate frequent collection. The buildings are conveniently situated, have good ventilation, and adhere to all fire safety and public health regulations. The users must be educated on proper trash disposal

techniques and the garbage must be disposed of in an appropriate manner. Additionally, waste must be collected individually on each floor in a big container and brought to a collection station on the main floor. Every floor has a garbage chute, and the ground floor serves as the collecting location. There are other incinerators on the property.

viii. Acoustic

Good acoustic is one the most important consideration for library design. Room acoustics initially establishes the fundamental dimensions, shapes, and finish materials of a specific area, as well as the placement and layout of surfaces that reflect and absorb sound (Hansen, C. H., & Hansen, K. L., 2021). Depending on the intended purpose and occupancy of the room, these specifications may change.

Acoustic consideration at the reading rooms of the proposed library will be controlled by the use of absorptive materials like fibrous materials, volume resonators, foam, acoustic tile on wall and ceiling (Whittington, W., 2021). While acoustics at the other places in the library would be achieved through the application of curved surfaces made from hard building materials like concrete, gypsum board, wood, glass, and masonry.

ix. External Works:

When the external scaffold and the good hoist have been completely removed, the tower cranes dismantled and floors at crane position closed in, the external works such as sewage treatment plant, kerbs, soft and trend landscaping will commence.

a. Plant: Plant designs include lawns, trees, shrubs, ground cover and seasonal planting. In order to improve the environment and contribute in the fight to control and eradicate harmful pathogens and pests, planting should be done as much as possible.

Grass and tree planting around the building is an effective way of controlling heat gain into the building. The grasses and leaves absorb solar radiation in the external environment thus resulting in a marked reduction. Their environmental processes cool the air temperature thus encouraging air movement. In addition to providing comfortable shade to the building, it provides a serene reticent surrounding resulting in good aesthetic outlook. It also reduces air – borne noise, catch dust and filter the air, it reduces sun glare and provides visual privacy.

b. Side Walk and Road–ways: The project shall normally include new pavement for the roadways, curbs, and street walkways, consultation with physical planning department will be done in this regard.

c. Parking: All parking lots should be paved unless otherwise required in the specific requirement or task order. Porous pavements are desirable when budget and site condition allows.

d. Street Tree: The site shall provide for new street trees. Appropriate tree pits and grates are required.

e. Drainage: All surface runoff must be gathered on site and drained underground. Drainage away from buildings shall be accommodated for in the graded area. By reducing paved and other impermeable surfaces, runoff can be reduced.

CHAPTER FIVE

CONCLUSION

5.1 Project Appraisal

Each project is unique implement program which encourages the inclusion of physically challenged people. By separating the Seminar/Conference enhance the noise protection of the Library thus in turn help in fulfilling the purpose/essence of project.

'Everyone' here refers to all individuals who will use the library without any distinctions being made by the environment.

'Independent' refers the ability to take action without requiring assistance is referred to as independence. Hence the extent of independence is felt throughout the library design.

The word "natural" emphasizes how important it is to the definition. It suggests that the accessibility and comfortability features included in library design are seen as standard and are not intended to help certain racial or ethnic groups.

By using this strategy, the library is set up in a way that allows everyone access and comfortable in the most autonomous and natural possible way.

5.2 Conclusion

Embarking on an accessible design project would help in ensuring that all users have the legal right to use the entire built environment and it will result in significant improvements to their comfort and safety. The essence of integrated accessibility and comfortability may be summed up in three words: everyone, independent, and natural.

There is a huge need now for many libraries in all colleges to ensure proper space fits both current needs and future requirements. As the world of digital technology, processing, management, usability, and functionality changes constantly, college libraries should be readily adaptable, accommodating, variable, compliant, open, acquiescent, tractable, receptive, flexible, and prone to

change. Both library services and structure have been reorganized as a result of the introduction of contemporary information technology to the profession. Utilizing the modular planning approach, which allows for flexible usage of interior design; this explicitly demands and explains the need for the present and the future. If necessary, the design should enable the library spaces to be converted to other uses. When creating library buildings that will undoubtedly withstand the test and trials of unknowable future, adequate floor grids and conduits for different types of buildings should be taken into consideration.

Furthermore, College library's stakeholders must accept criteria for contemporary architectural designs since they cannot afford to proceed with the construction of College library building in the same antiquated manner. It's time to think about updating our traditional collection based book libraries into libraries of the 21st century and designing and building College libraries that are focused on the future. In order to do this, a thorough examination of the current and long-term environments in which the College library will need to operate is required.

5.3 Recommendation

Until now the subject of accessibility and comfortability in designing and building has not been given due attention in public attention and legislation in Nigeria. This is due in part to the fact that this issue is fraught with complexity, funding issues, and other problems that make it hard for intervention. It is crucial that the Nigerian government set an example by prioritizing accessibility and comfortability in public buildings and by passing legislation that requires both. The subject of accessibility and comfortability is the goal of "barrier-free" design but may take some time to achieve because it will require adjustments to established design elements and preconceived notions. As a result of the demand for accessibility and comfortability as well as the perspective on the idea of space, it is clear that nothing short of a policy of legislation for accessible and comfortability building design will suffice. Such policy should integrate the needs of all users and improvement of

the quality and convenience of housing and providing general public with building services. The top priority should be that all people should be able to access and feel comfortable in any new buildings. This should be viewed as a long-term investment because it will improve facility comfort for all users. After all, what is worth doing is worth doing well.

DO NOT COPY. LEAD CITY UNIVERSITY, NIGERIA

REFERENCE

- Aboulnaga, M. M.** (2018). Sustainability Measures of Public Buildings in Seaside Cities: The New Library of Alexandria (New Bibliotheca Alexandrina), Egypt. In *Seaside Building Design: Principles and Practice* (pp. 65-111). Springer, Cham.
- Allen, F. R., & Moyer, M.** (2021). A library seating census: Gathering seating occupancy data in an academic library to reveal furniture preferences and inform future planning. *The Journal of Academic Librarianship*, 47(5), 102427.
- Altay, A., & Dursun, B.** (2019). Determination of hybrid renewable energy systems for project type public library building.
- Ariff, A. A. A., Ahmad, S. S., & Hussin, M. A.** (2019). Green envelope as an architectural strategy for energy efficiency in a library building. In *MATEC Web of Conferences* (Vol. 266, p. 01004). EDP Sciences.
- Arndt, D., Bangerth, W., Davydov, D., Heister, T., Heltai, L., Kronbichler, M., & Wells, D.** (2021). The deal. II finite element library: Design, features, and insights. *Computers & Mathematics with Applications*, 81, 407-422.
- Ban, J., Lee, S., & Panarelli, L.** (2020). Interior Design Elements of Public Library Space Planning for social infrastructure-Focusing on Korean and International Major Design Guidelines of Public Library Building. *Proceedings of the Korean Institute of Interior Design*, 22(1), 132-137.
- Bailin, K., Jahre, B., & Morris, S. (Eds.).** (2018). *Planning Academic Library Orientations: Case Studies from Around the World*. Chandos Publishing.
- Bainbridge, D.** (2020, August). Building digital library collections with greenstone 3 tutorial. In *Proceedings of the ACM/IEEE Joint Conference on Digital Libraries in 2020* (pp. 571-572).
- Belousov, B., Sadybakasov, A., Wibranek, B., Veiga, F., Tessmann, O., & Peters, J.** (2019, October). Building a library of tactile skills based on fingervision. In *2019 IEEE-RAS 19th International Conference on Humanoid Robots (Humanoids)* (pp. 717-722). IEEE.

- Berger, L.** (2018). The building that disappeared: the Viipuri Library by Alvar Aalto. Aalto University.
- Boyd, T., Mitchell, S. G., Gabb, D., Long, D. L., Song, Y. F., & Cronin, L.** (2017). POMzites: a family of zeolitic polyoxometalate frameworks from a minimal building block library. *Journal of the American Chemical Society*, 139(16), 5930-5938.
- Bradley, J., Tomlin, P., & Mathews, B.** (2018). Building intelligent infrastructures: steps toward designing IoT-enabled library facilities. *Library Technology Reports*, 54(1), 23-27.
- Cacabelos, A., Eguía, P., Febrero, L., & Granada, E.** (2017). Development of a new multi-stage building energy model calibration methodology and validation in a public library. *Energy and Buildings*, 146, 182-199.
- Chen, G., Walmsley, S., Cheung, G. C., Chen, L., Cheng, C. Y., Beuerman, R. W. & Choi, H.** (2017). Customized consensus spectral library building for untargeted quantitative metabolomics analysis with data independent acquisition mass spectrometry and MetaboDIA workflow. *Analytical chemistry*, 89(9), 4897-4906.
- Chen, K. W., & Norford, L.** (2017). Developing an Open Python Library for Urban Design Optimisation-Pyliburo in Building Simulation (Vol. 2017, pp. 486-493).
- Chen, Y., Gai, T., Su, X., Wei, Y., Su, Y., & Ye, T.** (2018, March). Hybrid hotspot library building based on optical and geometry analysis at early stage for new node development. In *Design-Process-Technology Co-optimization for Manufacturability XII* (Vol. 10588, pp. 300-306). SPIE.
- Dino, I. G., & Üçoluk, G.** (2017). Multiobjective design optimization of building space layout, energy, and daylighting performance. *Journal of Computing in Civil Engineering*, 31(5), 04017025.
- Deme Belafi, Z., Hong, T., & Reith, A.** (2019). A library of building occupant behaviour models represented in a standardised schema. *Energy Efficiency*, 12(3), 637-651.

- Demeter, M., Besara, R., Colvin, G., & Birmingham, B.** (2018). Send in the crowds: Planning and benefiting from large-scale academic library events. *Marketing Libraries Journal*, 86-95.
- El-nafaty, A. S., Ahmad, M. H. & Hamid, M.,** 2018. Perspectives on Naturally Ventilated Library (NVL) Buildings in Nigeria. *Journal of Computational and Theoretical Nanoscience*.
- Everest, F. A. & Pohlmann, K. C.** (2022). *Master handbook of acoustics*. McGraw-Hill Education.
- Gardiner, J., Das Chowdhury, P., Halsey, J., Tahaei, M., Elahi, T., & Rashid, A.** (2021, October). Building a privacy testbed: Use cases and design considerations. In *European Symposium on Research in Computer Security* (pp. 185-193). Springer, Cham.
- Gstalder, S. H.** (2017). *Understanding library space planning* (Doctoral dissertation, University of Pennsylvania).
- Hagman, J.** (2018). *Welcome to the Library: Building a Social Orientation Campaign*. In *Planning Library Orientations* (pp. 87-93). Chandos Publishing.
- Han, B., Chen, S., & Liang, J.** (2020). 2D dynamic structure-soil-structure interaction: A case study of Millikan Library Building. *Engineering Analysis with Boundary Elements*, 113, 346-358.
- Handa, T. S.** *Innovative Library Services through Aesthetic Library Design and Space Planning*.
- Hansen, C. H., & Hansen, K. L.** (2021). *Noise control: from concept to application*. CRC Press.
- Pierce, A. D.** (2019). *Acoustics: an introduction to its physical principles and applications*. Springer.
- Hasler, M.** (2019). Book Review: *Collaborative Library Design: From Planning to Impact*. *Reference & User Services Quarterly*, 58(3), 188-189.
- Hynes, M. M., & Hynes, W. J.** (2018). If you build it, will they come? Student preferences for Makerspace environments in higher education. *International Journal of Technology and Design Education*, 28(3), 867-883.

- Ilako, C., Maceviciute, E., & Bukirwa, J. M.** (2020). Relevance of the spatial triad theory in (re) designing and planning of academic library spaces. *Qualitative and Quantitative Methods in Libraries*, 9(1), 65-75.
- Ishola, B. C.** (2020). Library building: My experience. *Library Philosophy and Practice* (e-journal).
- Irvall, B. and Nielsen, G.S.** (2017). Access to libraries for persons with disabilities — checklist. IFLA Professional Reports No 89. The Hague, Netherlands: International Federation of Library Association and Institutions.
- Iwo Land Urban Renewal**, (2012) unpublished.
- Jackson, S. J.**, 2021. Addressing Energy Efficient Lighting and Ventilation in Libraries: A Case Study of Peckham Library, London, UK. *GSJ: Volume 9, Issue 6*
- Jin, R., Zhong, B., Ma, L., Hashemi, A., & Ding, L.** (2019). Integrating BIM with building performance analysis in project life-cycle. *Automation in Construction*, 106, 102861.
- Komariah, N., Saepudin, E., & Rodiah, S.** (2018, October). CSR for Library A Study On Csr of Bank Bjb for Building the Gasibu Library In Bandung, West Java. In *International Conference on Media and Communication Studies (ICOMACS 2018)* (pp. 246-249). Atlantis Press.
- Kuliga, S. F., Nelligan, B., Dalton, R. C., Marchette, S., Shelton, A. L., Carlson, L., & Hölcher, C.** (2019). Exploring individual differences and building complexity in wayfinding: The case of the Seattle central library. *Environment and Behavior*, 51(5), 622-665.
- Lee, G. J.** (2017). A Basic Study on BIM Library Business Model based on Building Material Information System. *Journal of the Korea Academia-Industrial cooperation Society*, 18(4), 43-49.

- Li, Y., & He, J.** (2021, October). Evaluating the improvement effect of low-energy strategies on the summer indoor thermal environment and cooling energy consumption in a library building: A case study in a hot-humid and less-windy city of China. In *Building Simulation* (Vol. 14, No. 5, pp. 1423-1437). Tsinghua University Press.
- Loh, C. E., Ellis, M., Paculdar, A. A., & Wan, Z. H.** (2017). Building a successful reading culture through the school library: A case study of a Singapore secondary school. *IFLA journal*, 43(4), 335-347.
- Luo, L., & Liang, J.** (2019). Simulation Study on Heating and Cooling Energy-Saving Design of University Library Building Forms in the Severe Cold Region of China based on Honeybee and Ladybug.
- McDonald, A.** (2006) Revisiting the Ten Commandments revisited: the Qualities of Good LibrarySpace:http://www.zhbluzern.ch/LIBERLAG/PP_LAG_06/Wednesday/McDonald_10com-rev.pdf
- Mehaffy, M.W.** (2019); Kryazheva, Y.; Rudd, A.; Salingaros, N. *A New Pattern Language for Growing Regions: Places, Networks, Processes*; Sustasis Press: Portland, OR, USA; pp. 104–234.
- Meilleur, S.** (2020). Building Calgary's New Central Library. *Journal of Library Administration*, 60(2), 175-186.
- Merritt, K.** (2021). Academic Library Makerspaces: A Practical Guide to Planning, Collaborating, and Supporting Campus Innovation. *Planning for Higher Education*, 49(2), 55-58.
- Metacalf, K. D.** (1986). *Planning academic and research library buildings*.
- Microsoft Encyclopedia Premium** (2008 & 2009)

- Naweed, N. A., & Turakulov, A. E.** (2021). The role of urban planning norms and rules in creating a modern design of a library building. *ACADEMICIA: An International Multidisciplinary Research Journal*, 11(6), 385-387.
- Neufert, E** (2000). *Neufert Architects Data*. Blackwell Science Ltd. Oxford
- Oliehoek, F. A., Spaan, M. T., Terwijn, B., Robbel, P., & Messias, J. V.** (2017). The MADP toolbox: An open source library for planning and learning in (multi-) agent systems. *Journal of Machine Learning Research*, 18, 1-5.
- Pierce, A. D.** (2019). *Acoustics: an introduction to its physical principles and applications*. Springer.
- Petrie, H. and Bevan, N.** (2018). The evaluation of accessibility, usability and user experience. In C. Stephanidis (Ed.), *The Universal Access Handbook*. London: Taylor and Francis.
- Rahimi, F., Milios, E. E., & Matwin, S.** (2021, August). MTLV: a library for building deep multi-task learning architectures. In *Proceedings of the 21st ACM Symposium on Document Engineering* (pp. 1-4).
- Salingaros, N.A.** (2015) *Biophilia and healing environments. Healthy Principles for Designing the Built World*; Terrapin Bright Green, LLC: New York, NY, USA, 2015; Available online: https://www.terrapinbrightgreen.com/wpcontent/uploads/2015/10/Biophilia_Healing_Environments-Salingaros-p.pdf (accessed on 7 July 2020)
- Sams, A., & Leither, L.** (2021). Toward new creative services: a case study in building a virtual reality classroom in an academic library. *College & Undergraduate Libraries*, 27(2-4), 227-244.
- Scharnhorst, P., Schubnel, B., Fernández Bandera, C., Salom, J., Taddeo, P., Boegli, M., & Politi, C.** (2021). Energym: A building model library for controller benchmarking. *Applied Sciences*, 11(8), 3518.

- Sultana, S., Athientis, A. K., & Zmeureanu, R. G.** (2019). Improving Energy Savings of a Library Building through Mixed Mode Hybrid Ventilation. *Multidisciplinary Digital Publishing Institute Proceedings*, 23(1), 3.
- Van Duinkerken, W., Kaspar, W. A., & Sullenger, P.** (2018). Library storage facilities: from planning to construction to operation. Chandos Publishing.
- Tronchin, L., & Fabbri, K.** (2017). Energy and microclimate simulation in a heritage building: further studies on the Malatestiana Library. *Energies*, 10(10), 1621.
- United Nations Enable**, 2003.
- WALLACE, D.** Organizational Design Considerations for Delivering Value in the 21st-Century Academic Library.
- Wikipedia**, (2018).
- Whittington, W.** (2021). Sound Design. In *Sound Design and Science Fiction* (pp. 15-38). University of Texas Press.
- Zhang, Z.** (2019). The effect of library indoor environments on occupant satisfaction and performance in Chinese universities using SEMs. *Building and Environment*, 150, 322-329.

BIODATA

A. Personal Data:

- 1. Name:** Solomon Tunde ADEYI
- Permanent Home Address:** House 12, road 2, Ifedapo Olobiworoko,
Jenriyin Estate off Wofun/olodo road, Ibadan.
- Contact Address:** Alma Rohm Baptist Church, Hospital road, Iwo.

E-mail address: gracemercy02@yahoo.com
Phone Number: 08034231143
2. Date of Birth: 11th august, 1973
Place of Birth: Ibadan
3. Nationality: Nigerian
4. Next of Kin
Name: Mrs. J.F. Akintnde-Adeyi
Address: Plot 4, block 1, Bowen University Cooperative
Quarters, Aladura Area, Oluponna, Iwo.

B. Educational background with dates

I. Institution attended with dates

- i. Lead City University, Toll Gate, Ibadan Oyo State. 2020 to 2022
- ii. Lead City University, Toll Gate, Ibadan Oyo State. 2018 to 2020
- iii. The Polytechnic Ibadan Oyo State. 2001 to 2002
- iv. The Polytechnic Ibadan Oyo State. 1996 to 1998
- v. Oke'badan High School, Oluyoro, Ibadan Oyo State. 1985 to 1991
- vi. Baptist Day School I, Idikan, Ibadan Oyo State. 1979 to 1985

II. Qualifications with dates

- i. Master of Science in Architecture 2022
- ii. Bachelor of Science in Architecture 2020
- iii. Higher National Diploma in Architectural Technology 2002
- iv. Ordinary Diploma in Architecture 1998
- v. Senior School Certificate 1993
- vi. Senior School Certificate 2010
- vii. Primary School Leaving Certificate 1985

C. Working Experience with Dates

- i. Principal Technical Officer I, Physical Planning Unit, Directorate of Estate Management,
Bowen University, Iwo. October, 2018 to June, 2020
- ii. Principal Technical Officer II, Physical Planning, Works and Services Department,
Bowen University, Iwo. October, 2015 to September, 2018
- iii. Senior Technical Officer, (Building), Physical Planning, Works and Services Department,
Bowen University, Iwo. October, 2010 to September, 2015
- iv. Higher Technical Officer (Building), Works and Services Department,
Bowen University, Iwo September, 2006 to September, 2010
- v. Clerk of Works, Works and Services Department,
Bowen University, Iwo. March, 2005 to August, 2006
- vi. Project Supervisor, Uthman Company Limited, Bodija Market, Ibadan. March 2004 to February 2005
- vii. Architect, Ministry of Works and Transport, Sokoto State. March 2003 to February 2004
- vii. Clerk of Works, Centenary Building Project, First Baptist Church Ibadan, Idikan Street, Ibadan.
April 1998 to December 2000

D. Membership of Academic Professional Bodies

Nil

E. Publications

1. Examination of Patient Oriented Design of Healthcare Facility at Iwo Township (Unpublished)
2. Architectural Design Considerations for College Library (Unpublished)

F. Referees

- i. Mr. Dayo Akinluyi
Coordinator, Physical Planning Unit,

Directorate of Estate Management,

Bowen University Iwo.

Phone Number: 08032285211

ii. Architect Johnson Fadeyi

Fad Consult, Mokola, Ibadan.

Telephone Number: 08030509385

iii. Dr. Olusegun Adejare

Physiotherapy Clinical Service,

University College Hospital, Ibadan.

Telephone Number: 08034731026

University Compliance Form

This is to certify that this thesis by Solomon Tunde ADEYI with matriculation number LCU/PG/002147 in the Department of Architecture, Faculty of Environmental Design and Management, Lead City University, Ibadan is in full compliance with the approval of the University's format and style.

Signature

Date

DO NOT COPY. LEAD CITY UNIVERSITY, NIGERIA