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Report Name:

Khartoum Public Library

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قال تعالى: ﴿ يَرْفَعُ اللَّهُ الَّذِينَ آمَنُوا مِنْكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ
دَرَجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ ﴾

Abstract:

Public Library, is a cultural institute that participates on increasing intellectual level of the people, it is based on the democratic principle of, “for the people, by the people and of the people”. its functions and services across the society. It is regarded as a gateway to knowledge for the community. It is a local center of information, making all kinds of knowledge and information readily available to its users.

The new modern library provides all kinds of data from books
And papers to all types of digital media.

The library building is a very important factor on the success if the library so it must be sufficient to all the standards and intellectual aspects.

This research deals with the study of modern public library project, in four chapters: the first chapter is a general introduction to the project which breaks into the definition, the objectives, and the aspects the and the causes of choice. The second chapter which contains the data and information collected and a brief history and the study of the architectural examples. The third chapter contains in its first section the project components and charts, in the second section there is the causes of the site selection and the analysis of the site down to the indicators and guide lines to find the best zoning based on previous studies. Chapter four includes the whole architecture designing process which contains the design philosophy (concept) and how the beginning of the architectural form and the idea of the design came from the project itself and then to modify the design and problems which existed and the ideas for solving it down till reaching the final design. And the technical solutions for the project in terms of the method of selecting appropriate structure for the project and which achieves requirements and treatments for the project plus the services and the method of prevision and distribution, and in the end there is the references.

the main result of this project is to provide a brilliant library to attract people of all ages and social situations and rise above with the society as a whole.

Dedication:

This report is dedicated to my
Mother

Omaima Abdelaziz

my number one supporter

Everything that I am today and will be is
because of you.

Father

MohamedOsman MohamedElhassan

The one who thought me to be strong smart
and kind

To my Siblings Amr, Dalia, Yassin and Taha

Acknowledgement

With a very grateful heart I thank teacher
Mayada abdelraziq for being the ideal
supervisor with her insightful criticism and her
kindness above all

Thanks to All who helped me in this journey
“Huzafa Mubarak, Mazin satti, Abdelrahman
siddig, Rawan Mohamed elfatih”
with all of the support for me and the project
was greatly needed and appreciated

Special thanks to my brother Amr Mohammed
Osman who has always been there for me and
helped me in every step of the way there is no
amount of words can describe who much I am
blessed to have a mentor like you

And at last I thank my family and friends
Thank you All.

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1-Project introduction:

1-1 Project Name:

Khartoum public library

1-2 Definition of the project:

Public libraries are a cultural and social institution that gathers and manages the sources of knowledge for the benefit of the public, where citizens of different ages, news and culture are meant to read, search, read and exploit leisure time.

1- 3 Public library properties:

- For the general public.
- To provide their services to the public free of charge.
- its establishment and supervision by the State
- services the community

1-4 Cultural centers :

1-4-1 The importance of culture:

It is the human's way of expressing their cultural values and the experiences of nations that have accumulated over time, an important factor that reflects the progress and prosperity of nations.

1-4-2 Definition of Culture :

All the information and theories that allow us and others to identify the ways of thinking, and the total experience gained during the periods of time and how they differ from one environment to another because they reflect the peoples way of developing their life and environment.

1-4-3 Cultural centers Historical development :

1. Cultural and artistic institutions such as the theater were separate units, each of which was a private entity that was turned over by the board trustees. Which led to the weakness of these institutions.
2. In the 1970s during the economic recession, the government resorted to austerity and spending reduction, and cultural institutions were among the largest institutions affected, leading to the thinking of other ways of income.
3. They thought about ways to increase income by tickets. In order to do this, services have to be increased.
4. This led to the emergence of cultural complexes from the space of formalities to the starting point of cultural communities based on the theory of attracting individuals and the use of modern scientific appealing ways .
5. This gave the modern cultural centers which became as a landmarks that reflect the identity of the country and the region.

1-4-4 Types of Cultures in Sudan:

1. The nation culture: tangible - not tangible.
2. Religion : (Islamic - Christian).
3. Historical Culture: Historical Events.
4. Environmental culture: nature.
5. The culture of languages : multi-ethnic and tribal.
6. Contemporary Culture: Theaters - Cinema - Music.
7. Science and Evolution Culture: Technology.

1-4-5 Components of cultural centers:

1. Library, exhibitions and museums.
2. theater and cinema.
3. Multi-purpose halls.

In addition to other services which distinguish the centers from each other

1-3-6 The problems of culture al sector in Sudan:

- Lack of infrastructure for cultural centers.
- Lack of media in spreading the message to the outside and inside.
- The lack of cultural resources in the curricula for children and young people.
- Lack of interest in cultural heritage.
- Emigration of educated minds outside the Sudan.

Lack of interest in the cultural role with qualified specifications to contribute in spreading intellectuality.

1-4 The purpose of the project:

- Encouraging self-education for adults and young people.
- Providing information to the public and educating different kinds of intellectual experiences , stimulating the desire to read and fulfilling individuals desires to read.
- Developing the various technical skills of the citizens, which helps them to develop their profession and raise the level of their performance.

1-5 Postponing the project:

1-5-1 Functional dimension:

- Provide spaces that meet the functional needs of the public Library on design.
- Provide appropriate spaces for book services
- Provide environmental requirements for activities.
- Adding social activities strengthen the library and raise the cultural level of the society.

1-5-2 Economic dimension:

- Creating great job opportunities.
- Increasing tourist traffic, which increases the national income for tourism

1-5-3 Cultural dimension:

- Symbol to rich state culture
- Training and qualifying the book writers.
- Representation of the State in international committees and conferences.
- Documenting and encouraging scientific research.
- Contribute to the advancement of intellectual society.

1-5-4 The aesthetic dimension:

- The aesthetic aspects of the library play a positive role in providing psychological comfort for the pioneers and workers
- The interactive area breaks the stigmata of libraries as a place of book shelves only

1-6 The project aims to:

- Work in spreading intellectual awareness among individuals through it's containment .
- Supporting the educational process in the community
- To raise the level of scientific, technical and professional staff and professionals
- To carry out cultural and social activities that benefit society
- Change the stigma of libraries as a place of books and silence reading only

1-7 Reasons for choosing the project:

Developing a strategy To achieved the following points:

- The lack of libraries and lack of services and attraction elements in the current libraries therefore they have a few visitors .
- Establishing specialized sections for children and encouraging young people to read.
- Establishment of forums and cultural exhibitions, seminars and plays for the dissemination of culture.
- fulfilling the needs of future generations.

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2-1 planning standards for libraries:

2-1-1 Library Location:

When selecting a location for the library, one must consider several basic principles that can be summarized in four main areas:

2-1-2 Planning aspects:

- must be in the national capital
- Near the social city center and the transportation (not inside the center)
- Proximity to other cultural and social constructs
- The appearance of the site as a distinctive landmark and dimension of remote areas
- Considering the strategy of the National Library

2-1-3 Environmental aspects:

- dimension of noise sources
- dimension of pollution sources
- The possibility of directing the main façade to the geographical north for ventilation and lighting
- The presence of a nearby ventilator such as water bodies and green spaces

2-1-4 Accessibility:

- Easy access from gathering centers and public transport stations
- The ability for people with special needs to arrive and access
- Easy access to other cultural facilities (universities, museums, libraries, cultural centers, etc.)
- Must be prominent so that she can be seen as a prominent teacher

2-2 Design standards for the basic spaces:

Libraries are currently focused on the importance of their ability to meet the requirements of information users, It is also expected that the library environment will add a positive addition to the overall experience of the beneficiaries on it. Mason has pointed out that interior design will not be the single most important element that motivates students of undergraduate studies to use the library, this also implies on public libraries

2-3 Case studies.

2-3-1 Local case study :

Sudan National Library:

Established at 1999

The number of folders is 120.45

Actuine Coke 230,000

Specialized in various sciences

Location Khartoum Nile Street

west of the National Museum

area of 115,000 m

2-3-2 Design Idea:

- The concept of design was based on the principle of sustainability and low cost buildings. The designer considered the environment which surround the building and maintained the existing trees with the use of low local and high-temperature materials



Figure 4: location plan (local case study)

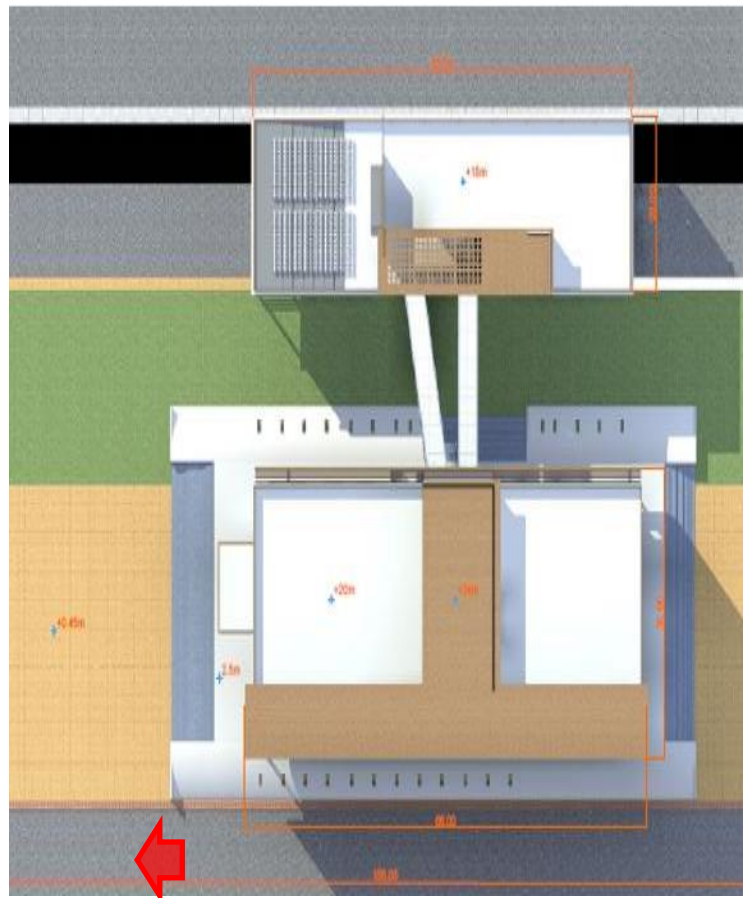


Figure 5: site plan (local case study)

Case study

GROUND FLOOR:

RECEPTION, PHOTO GALLERY, CHILDREN HALL,
DISADVANTAGE HALL



2-3-3 Project Components

Mezzanine Floor Components:

Reception



Children's hall



Disadvantage hall



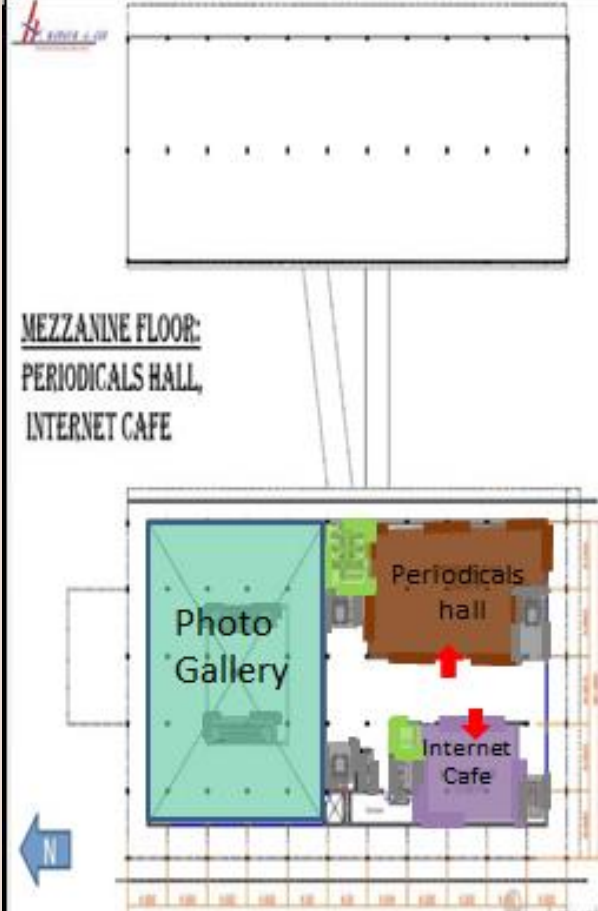
Photo Gallery



Services



Figure 6: Ground floor plan (local case study)



2-3-3 Project Components

Mezzanine Floor Components:





Photo Gallery	
Periodicals hall	
Internet Cafe	
Services	

Figure 7: mezzanine floor plan (local case study)



First Floor Components:








Reception	
Gallery	
Reception	
Training Center	
Reading Hall	
office	
Services	

Figure 8: first floor plan (local case study)

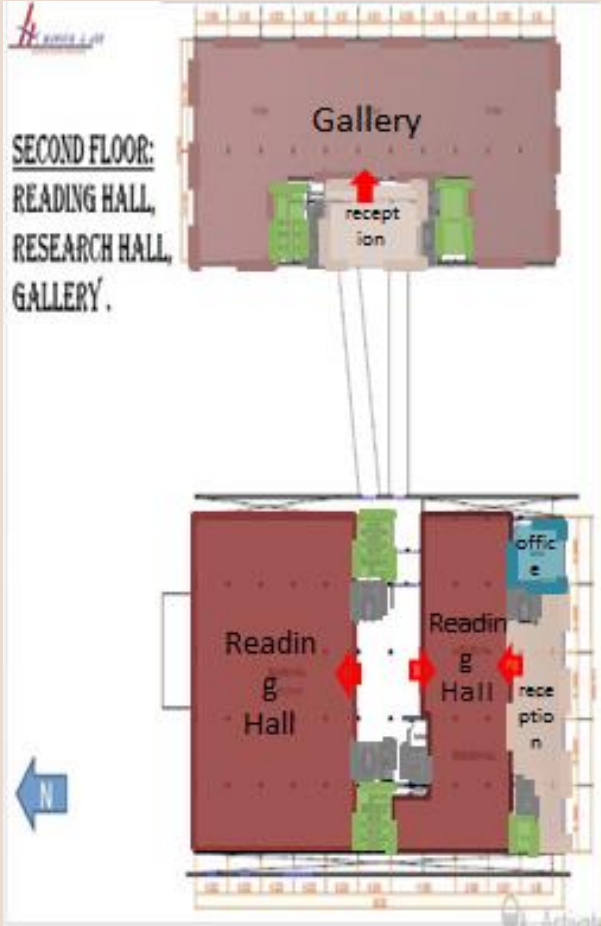


Figure 9: second floor plan (local case study)

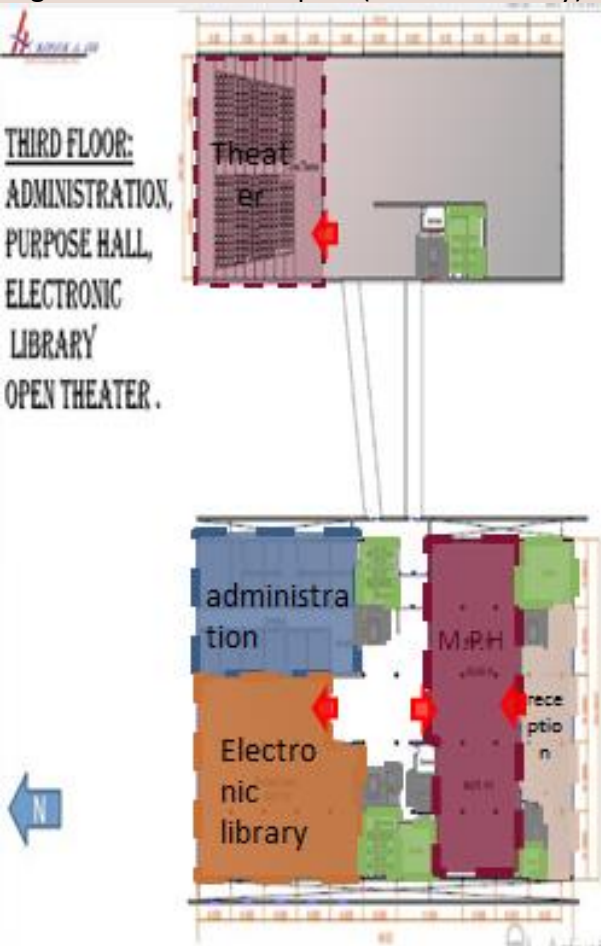


Figure 10: Third floor plan (local case study)

2-3-3 Project Components

Second Floor Components:

Gallery	
Reception	
Reading hall	
Office	
Services	

Third Floor Components:

Theater	
Reception	
Multi purpose hall	
Electronic library	
administration	
Services	

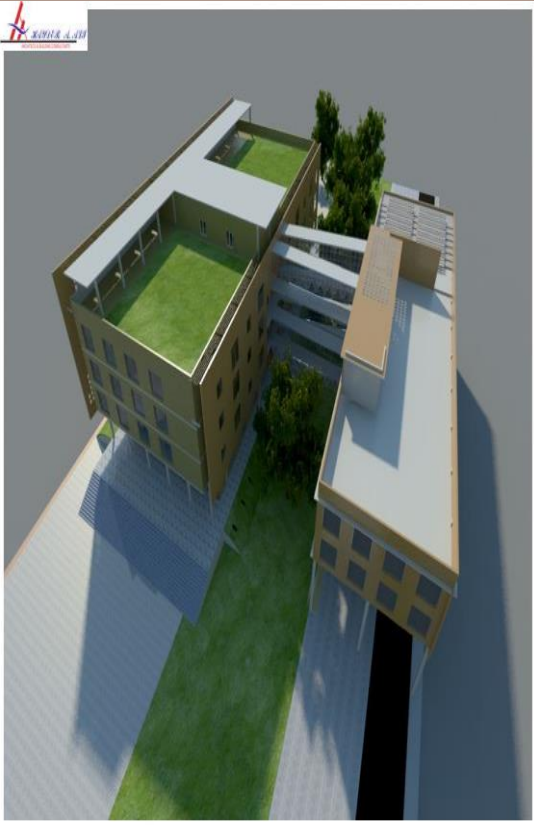


Figure 11: perspective (local case study)



Figure 12: perspective (local case study)



Figure 13: perspective (local case study)

2-3-4 Architectural criticism:

1. The wrong orientation of the building (east - west) led to the resort to technical treatments and increase the economic cost
2. Activities are not effectively interconnected
3. Small areas of activity

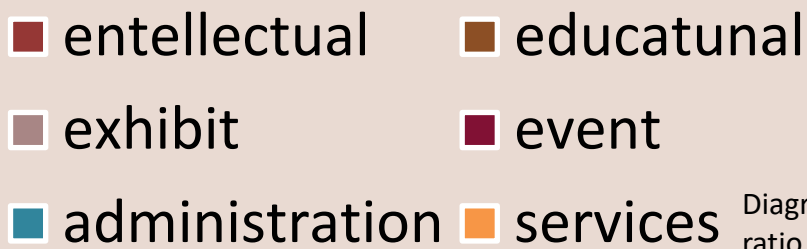
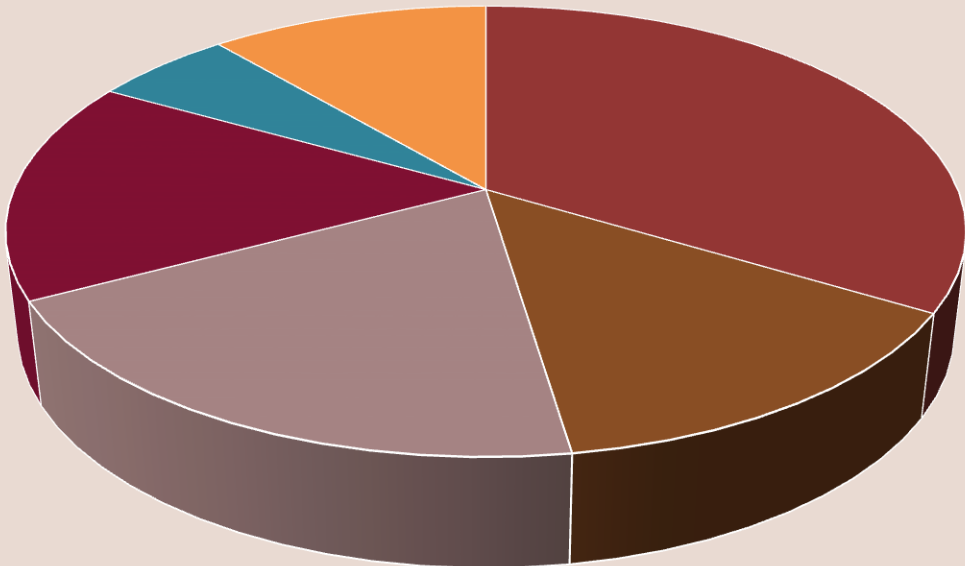


Diagram 1: Activities spaces ratio (local case study)

2-3-5 International case study

Seattle Central Library

Architects: [OMA](#), [LMN](#)
 Location: Seattle, WA, [United States](#)
 Area: 38300.0 sqm
 Project Year: 2004

The [Seattle](#) Central Library redefines the library as an institution no longer exclusively dedicated to the book, but as an information store where all potent forms of media—new and old—are presented equally and legibly

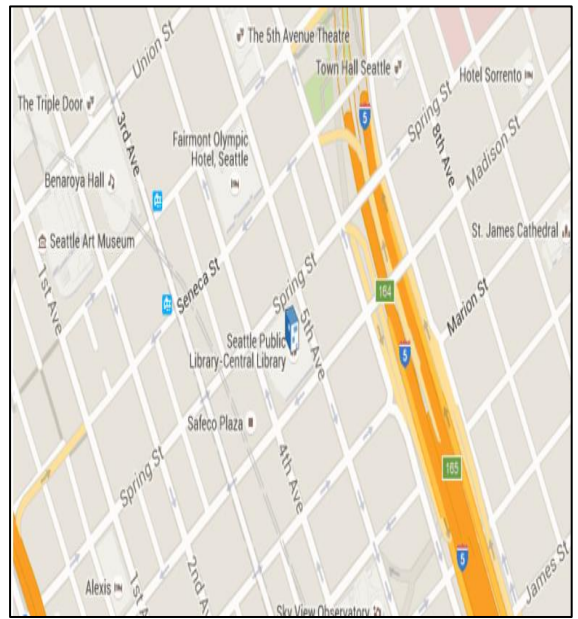


Figure 14: location plan (international case study)

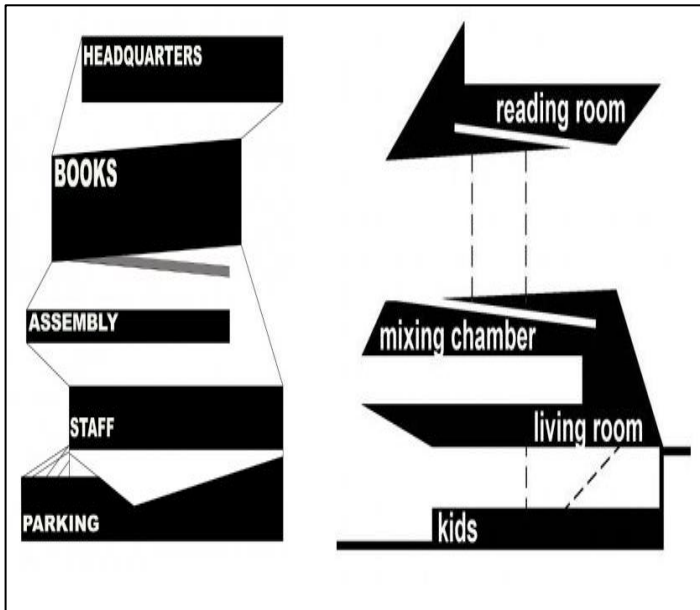


Figure 15: vertical zoning (international case study)

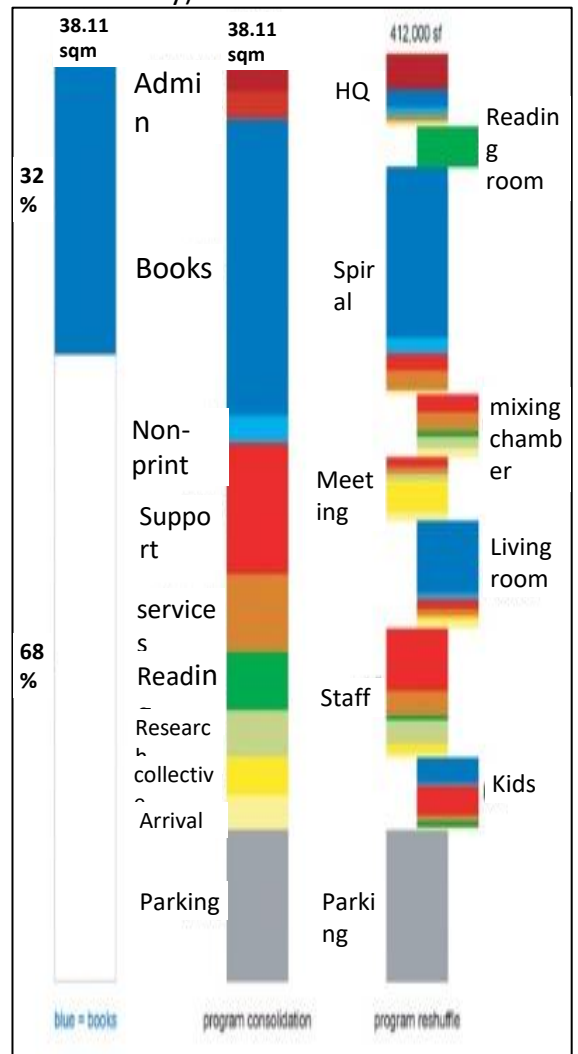
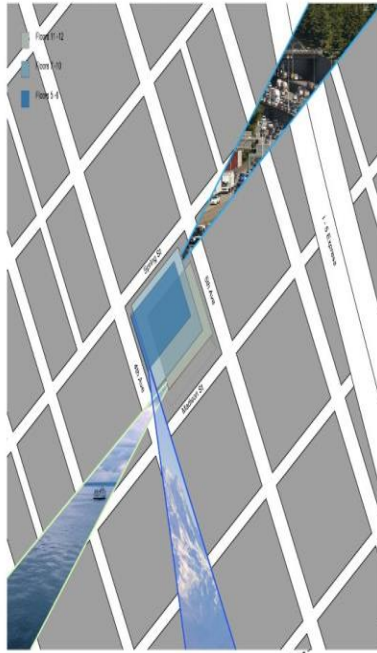
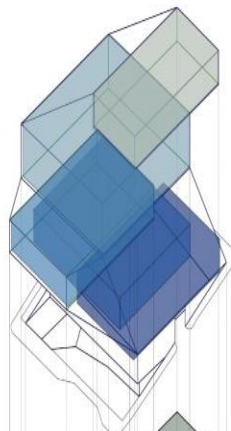


Figure 16: vertical zoning detailed (international case study)

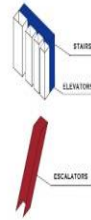
SEATTLE CENTRAL LIBRARY ANALYSIS // REM KOOLHAUS
 ORGANIZATIONAL / CIRCULATION / ENVIRONMENTAL SYSTEMS



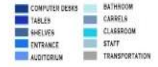
SITE PLAN // PERCEPTION OF WATER, MOUNTAIN, AND CITY



TYPES OF CIRCULATION



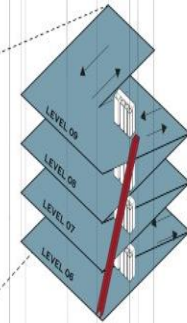
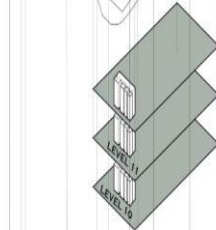
ORGANIZATIONAL SYSTEMS



ELEVATED BOOK-SHELVES ON SLOPE THROUGH-OUT THE RAMPS



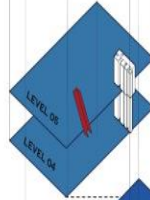
LIVING ROOM



BOOK SPIRAL



MEETING ROOMS



LIVING ROOM



ENTRANCE #2



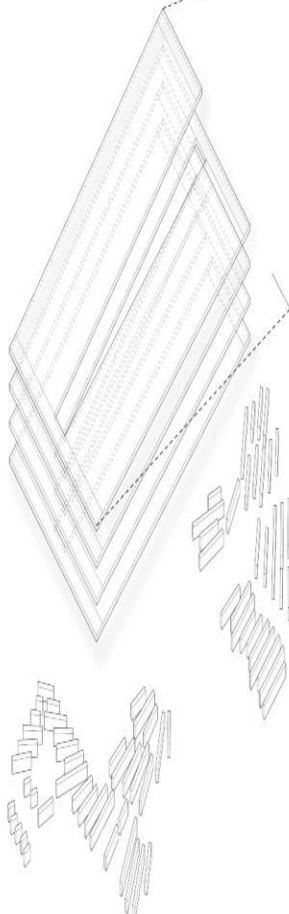
MIXING CHAMBER



ENTRANCE #1



FOURTH AVENUE



BOOK SPIRAL FLOORS 06-09

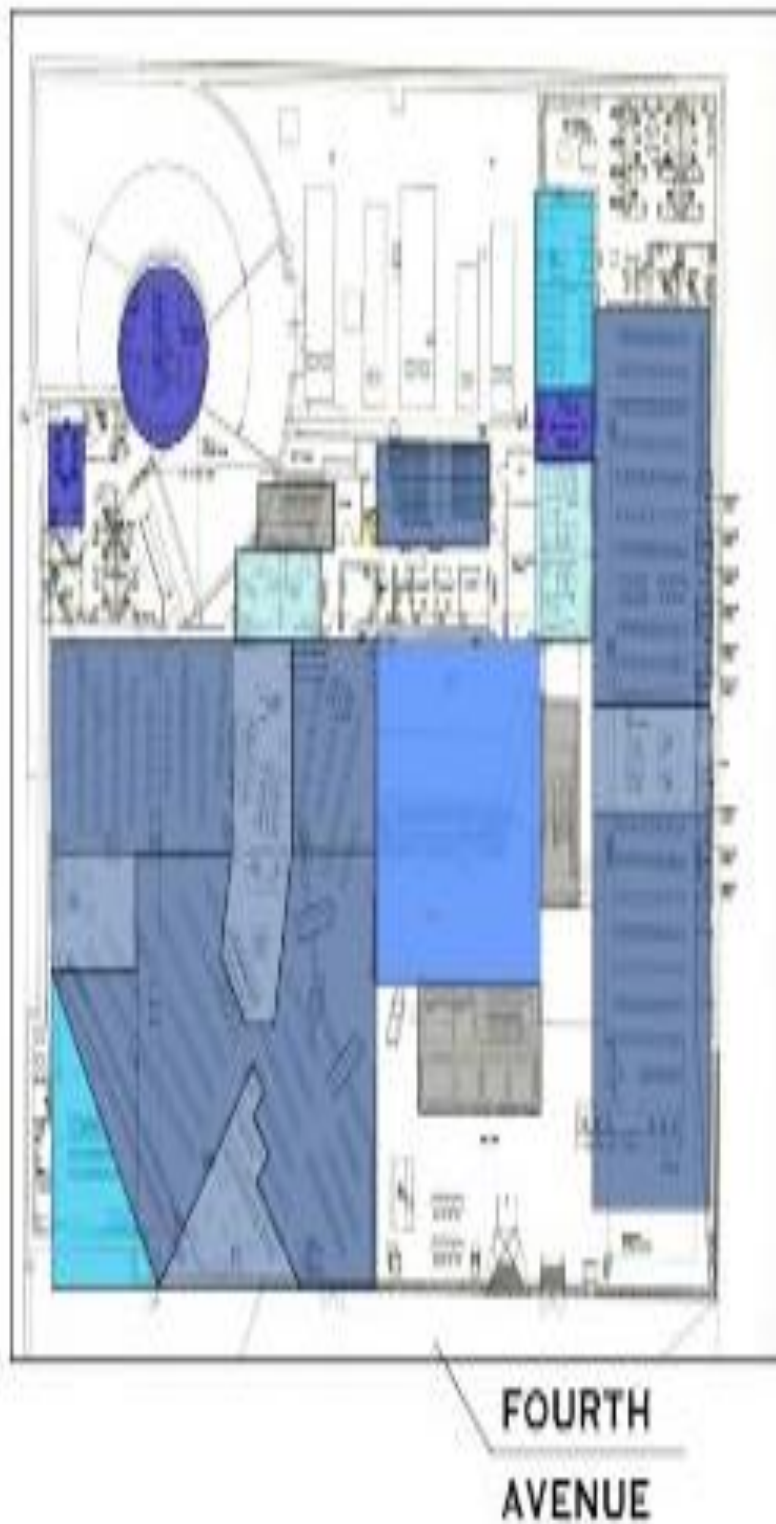
FLOOR 03 BOOK SHELVES

BOOK SPIRAL AXONOMETRIC IN RELATION TO FLOOR 03 BOOKSHELVES

SCALE: 1" = 1/84'

DINA ELFHAM // BLAKE ANTES

Figure 17: structure and plans (international case study)



MIXING
CHAMBER

ORGANIZATIONAL SYSTEMS

- | | |
|--|--|
|  COMPUTER DESKS |  BATHROOM |
|  TABLES |  CARRIERS |
|  SHELVES |  CLASSROOM |
|  ENTRANCE |  STAFF |
|  AUDITORIUM |  TRANSPORTATION |

Figure 18: Ground floor and first floor plans (international case study)

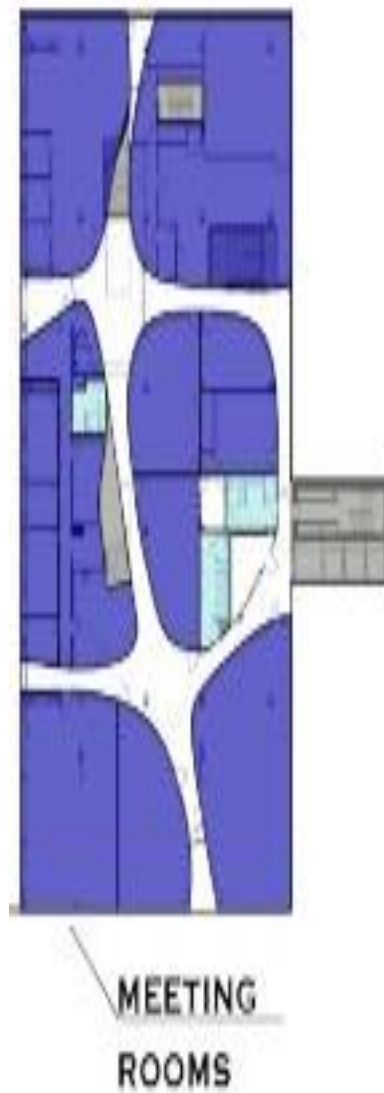


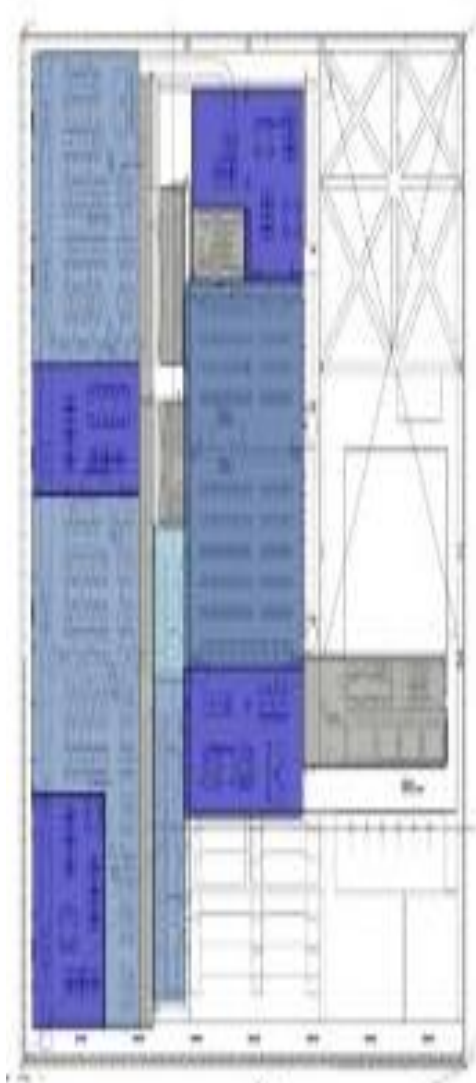
Figure 19: Second floor and Third floor plans (international case study)

ORGANIZATIONAL SYSTEMS

	COMPUTER DESKS		BATHROOM
	TABLES		CARRIERS
	SHELVES		CLASSROOM
	ENTRANCE		STAFF
	AUDITORIUM		TRANSPORTATION



ELEVATED BOOK-SHELVES ON SLOPE THROUGH-OUT THE RAMPS



LIVING



BOOK SPIRAL

ORGANIZATIONAL SYSTEMS

- | | |
|----------------|----------------|
| COMPUTER DESKS | BATHROOM |
| TABLES | CARRELS |
| SHELVES | CLASSROOM |
| ENTRANCE | STAFF |
| AUDITORIUM | TRANSPORTATION |

Figure 20: the book spiral and living room plans(international case study)

Case study

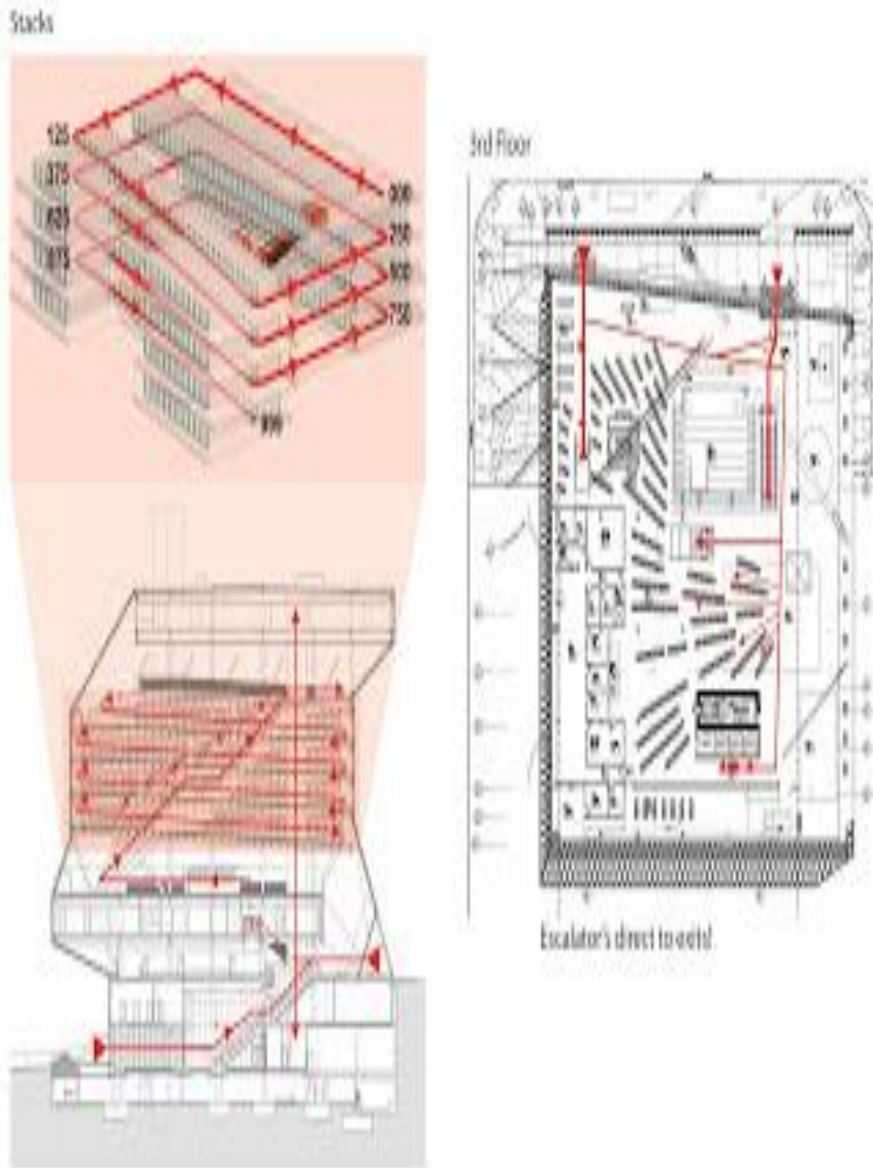
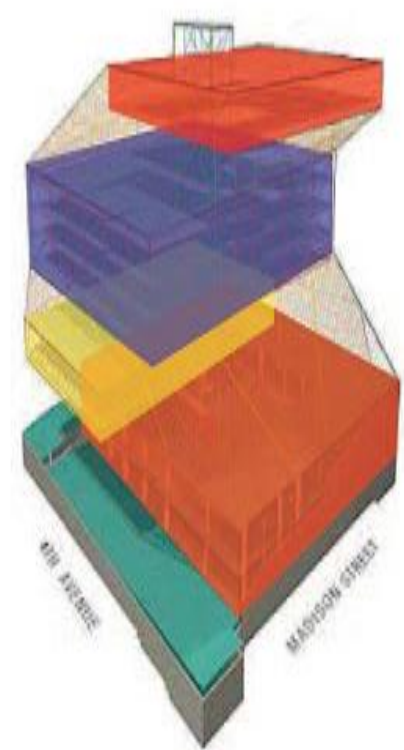
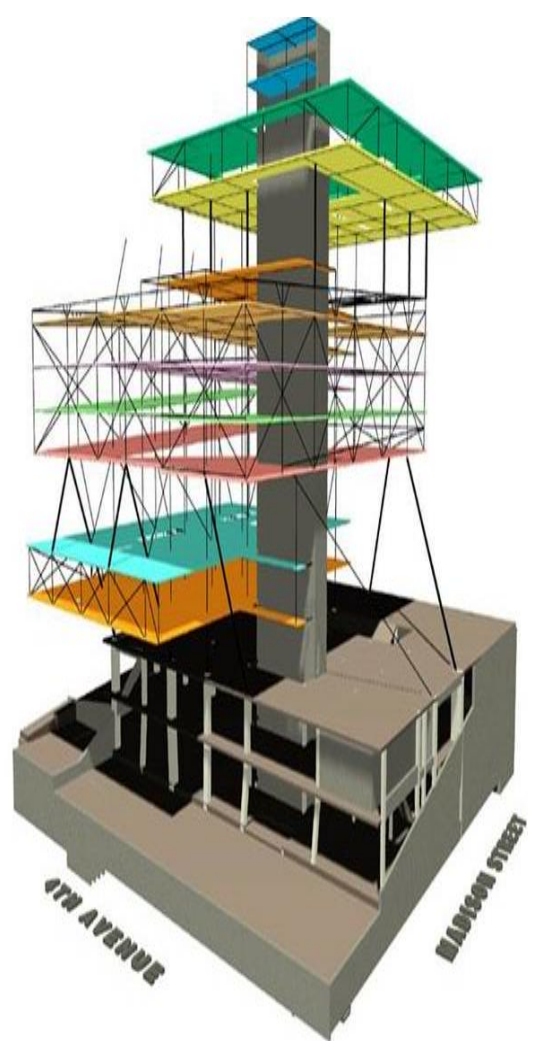
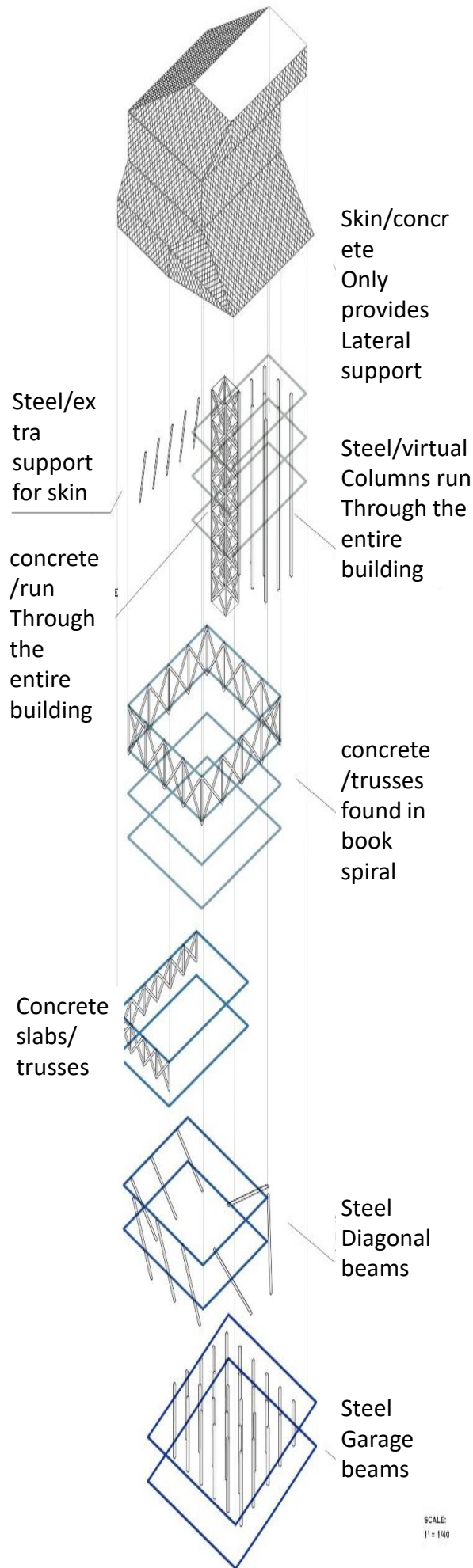


Figure 21: circulation (international case study)



SCALE:
1" = 140'

Figure 22: structure (international case study)

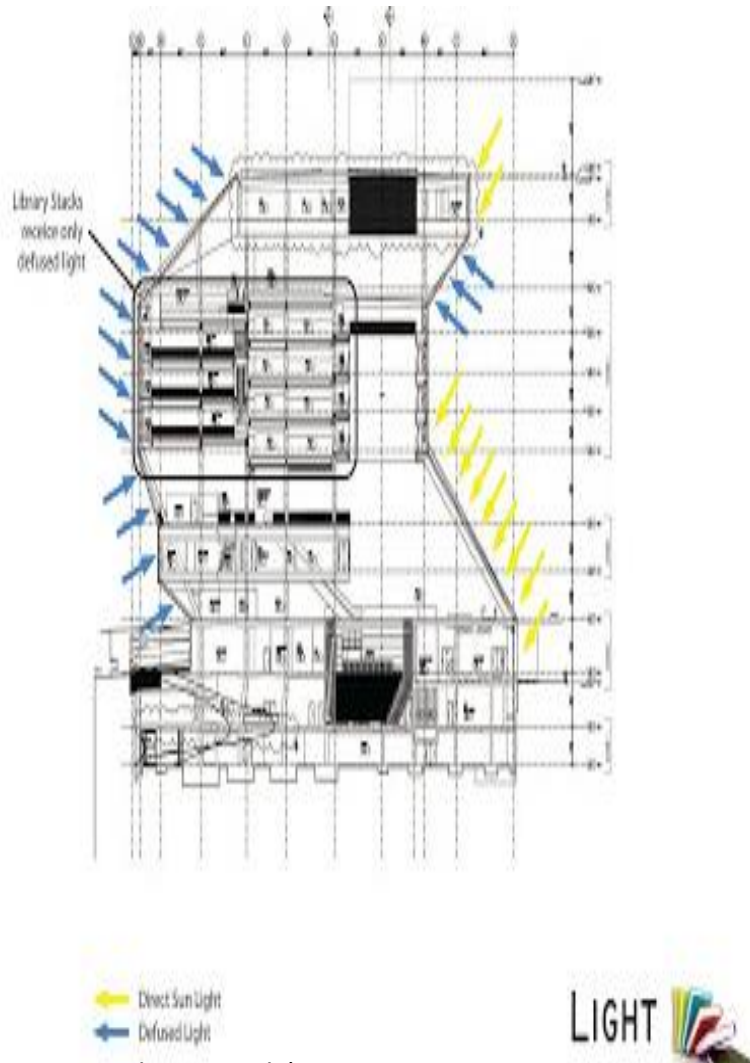


Figure 23: lighting (international case study)

Flexibility in contemporary libraries is conceived as the creation of generic floors on which almost any activity can occur. Programs are not separated, rooms or individual spaces not given unique characters. In practice, this means that bookcases define generous (though nondescript) reading areas on opening day, but, through the collection's relentless expansion, inevitably come to encroach on the public space. Ultimately, in this form of flexibility, the library strangles the very attractions that differentiate it from other information resources

2-3-8 Architectural criticism

1. The movement between the bookshelves is easy for everyone including people with special needs
2. The third floor is at 15 m height which provides good natural ventilation
3. The design provides natural daylight and protects from the sun beams

2-5 Official Entities for Cultural centers:

1. The built area must be at least 2 m away from the neighbor, it depends on the site location.
2. The building high is defined by the ministry of urban planning.

2-6 Specified requirements:

- Providing a rest room for every 150sqm built area, with special bathrooms for people with disabilities and a minimum number of 4 restrooms for the ladies.
- Provide a fire fighting system according to the laws.
- Must be put in consideration the specifications of the event hall if provided in the project



2-6 Site Choosing:

2-6-1 Site Philosophy:

the site should be near a cultural area and should be accessible for all people

And the building should represent it self as a landmark and it should be near the center of the city

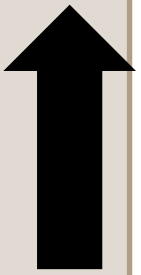


Figure 24: Khartoum center

2-6-2 Site proposals.



First proposal:
Near the national museum & the Friendship hall

Total area:
1.5 hectare
15.533 sqm

Figure 25: first site proposal

Site Neighbors:

The blue Nile from the north
Friendship hall from the east
Friendship hall from the west
Governmental buildings from the south



second proposal:
Khartoum almanshya h
Total area:
2.3 hectare
23.779 sqm

Figure 26: second site proposal

Site Neighbors:

Eldawha street from north and east
The "Alsiteen street" from the west followed by commercial buildings
Sub.street, a high school and 'alsaydah sanhory" mosque



third proposal:
Khartoum Tooti island
Total area:
5.1 hectare
51.533 sqm

Figure 27: third site proposal

Site Neighbors:

Residential area on the north
Green area from the east
Investment area on the west
Blue Nile on the south

2-6-3 Site comparison.

	Comparison	1 st	2 nd	3 rd
Planning aspects	Within the national capital	★	★	★
	Proximity to city center	★	★	★
	Proximity to cultural and educational buildings	★	★	
	The appearance of the site as a landmark		★	
	Site Strategy		★	
	The site ability to attract visitors	★	★	★
	The site ability to fit in the visitor		★	★
Environmental	The possibility of horizontal expansion	★	★	★
	Distant from noise sources			★
	Distant from pollution sources	★	★	★
	The possibility of orientation to the geographical north		★	★
	A nearby outdoor area			★
Arrival	Easy access from the social enters	★	★	★
	The ability of people with special needs to access	★	★	
	Easy access to and from cultural facilities	★	★	★
points		9	13	11

Table 1: site comparison

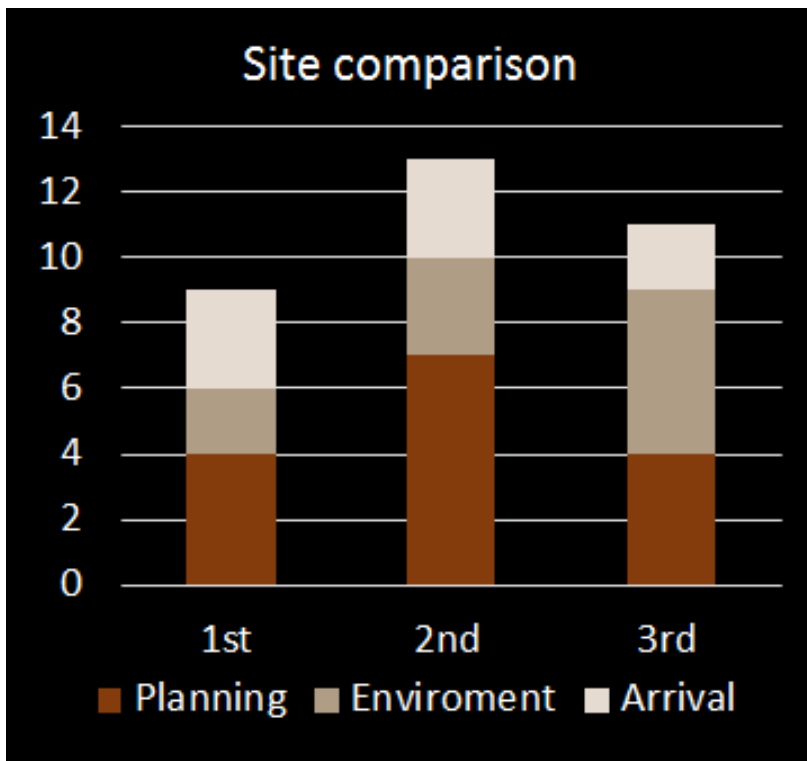
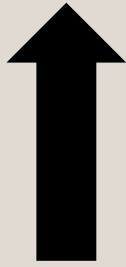


Diagram 2: Site comparison ratio

2-6-4 The site Specification:



The site:
Khartoum
Almanshyah
Total area
2.3 hectare
23.779 sqm

Figure 28: the chosen site

Conclusion

It is clear from the table and the comparison that the first proposal is characterized by achieving the required calm and features a charming view on the Nile, and it is easy to access



Figure 29: arrival from Khartoum

Arrival from Khartoum center:
8.6m
The site arrival within Alsiteen street west the site
Or Aldawha street on the north side of the site



Figure 30: arrival from Khartoum north

Arrival from Khartoum north center:
17.6m
The site arrival within Kobar bridge elma'rad street to alsiteen street








Figure 31: arrival from Omdurman

Arrival from Omdurman center:
16.6m
The site arrival within Alenqaz bridge Alneel street then Aldawha street



Figure 32: neighbors

Saydah Sanhori mosque	
Ibn sena university'	
Garden city university	
Dream specialized hospital	
MTN service center	

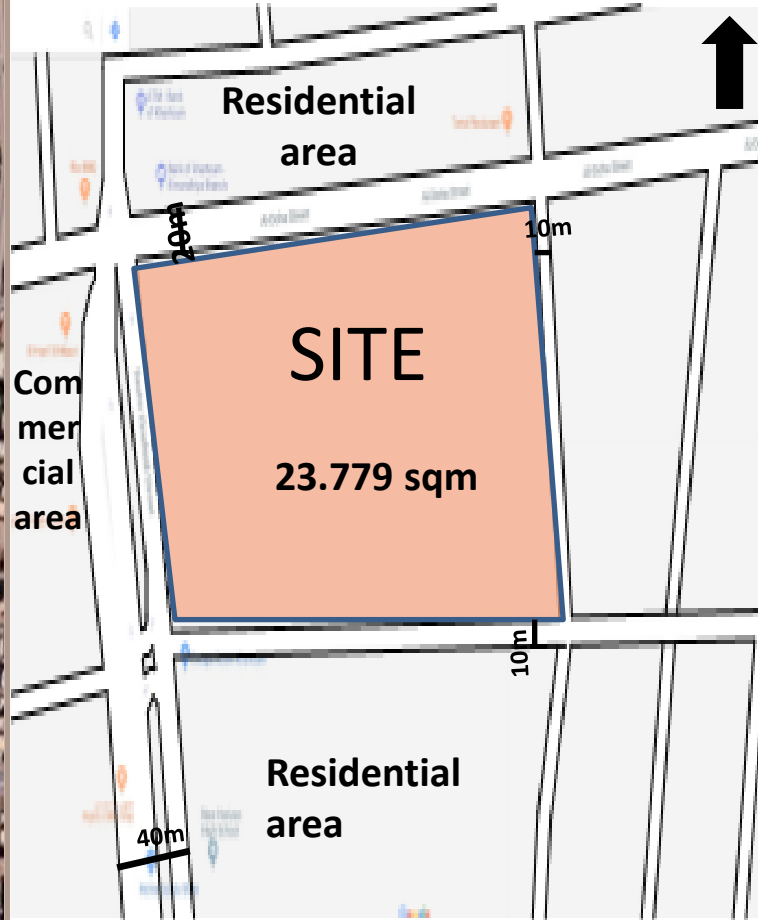


Figure 33: Site details

Street name	Geographical direction	width
Aldauoha street	North	20 m
60 th street	West	40 m
Sub-street	South	10 m
Sub-street	East	10 m

Table 2: Site streets details

2-7 History of libraries

Libraries began in human history with the creation of ancient human civilizations (the civilization of Babylon - the Pharaonic civilization - the Roman civilization). All the remnants of these civilizations show that libraries, most of which are attached to places of worship (temples, churches, etc.).

The Islamic era was characterized by the flourishing of writing, writing and the manufacture of paper. And the transition from papyrus and paperwork to paper and its spread in all parts of the Islamic world: Baghdad, Damascus, Jerusalem, Cairo, Kairouan, Andalusia and all these cities have seen libraries of a high level of organization, management and acquisitions. Especially when the Dar al-Hikma Library was established in Baghdad, that house founded by the successors

2-8 Modern Libraries (Needs of the 21st Century and the Future)

Today's libraries with the rapid transformation of cultures, technological sophistication and rapid population growth are facing major challenges in providing diverse and renewable needs. In order to design a library that meets the needs of the future we need to search all the elements involved today. Lack of need for public libraries today to meet the current needs and not to include the necessary technological means and the emergence of e-books that can be obtained from anywhere in the world through the Internet

We should stop seeing libraries as a functional space to store and borrow books, but as a democratic vacuum where you free your mind "John Dolan". Facilities and services provided by the library must be in line with the offer and must add functional spaces to keep pace with current and future development. The development of libraries includes four main pillars (people behavior - activities - office services - construction techniques)

2-9 Types of Libraries:

According to the mode of services rendered to the readers; libraries are broadly divided into four types:

1. Academic Library.
2. Special Library.
3. Public Library.
4. National Library.

2-9-1 Academic Library:

Academic library is the library which is attached to academic institutions like schools, colleges and universities. An academic library serves more specifically the students, research scholars, teachers and staff of the academic institution. Main objective of an academic library is to give maximum learning materials to its clientele so that they may be fully educated in their respective level. Academic libraries are categorized into school libraries, college libraries and university libraries.

A. School Library:

A school library is a learning laboratory, providing a variety of instructional media, essential for optimum support of the education program. The purpose of the school library is to attain the objectives of the educational program. It concerns with the development of effective methods of thinking, inculcation of social attitudes, acquisition of important information and promoting growth and development among the children. The function of the school library is to help the students in the process of their self-discovery, to adopt high ideals in life, improve scholastic efficiency through self-study and to develop the capacity for critical thinking.

B. College Library:

College performs an important function in educational process. A college without a library is like a tree with no roots. The status of every college is measured through the position of the library that it maintains. Hence every college library should become a teaching instrument in itself. A college library is expected to support the objectives of the college. Thus, the basic function of a college library is to assist its parent body to carry out its programs.

C. University Library:

A library is more important in a University, because a library can do without a University where as a university cannot function without a library. A university library is an integral part of the institution. It is primarily maintained for the benefit of students, officers, faculty members and for those who are engaged in research work. It plays a very important role in the national life of the community by acquiring material for educational use for the benefit of students and teaching departments.

2-9-2 Special Library:

Special library became popular since the beginning of 20th century. A special library is one which serves a particular group of people, such as the employees of a firm of government department, or the staff and members of a professional or research organization. Such a library deals essentially in information

2-9-3 Public Library:

A public library (also called circulating library) is a library which is accessible by the public and is generally funded from public sources (such as tax money) and may be operated by the civil servants. Taxing bodies for public libraries may be at any level from local to national central government level. The public library is an excellent model of government at its best. A locally controlled public good, it serves every individual freely, in as much or as little depth as he or she wants.

2-9-4 National Library:

A national library is a library specifically established by the government of a country to serve as the preeminent repository of information for that country. Unlike public libraries, these rarely allow citizens to borrow books. Often, they include numerous rare, valuable, or significant works. A National Library is that library which has the duty of collecting and preserving the literature of the nation within and outside the country, Thus, National Library are those libraries whose community is the nation at large

Chapter three:

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3-1 Project components.

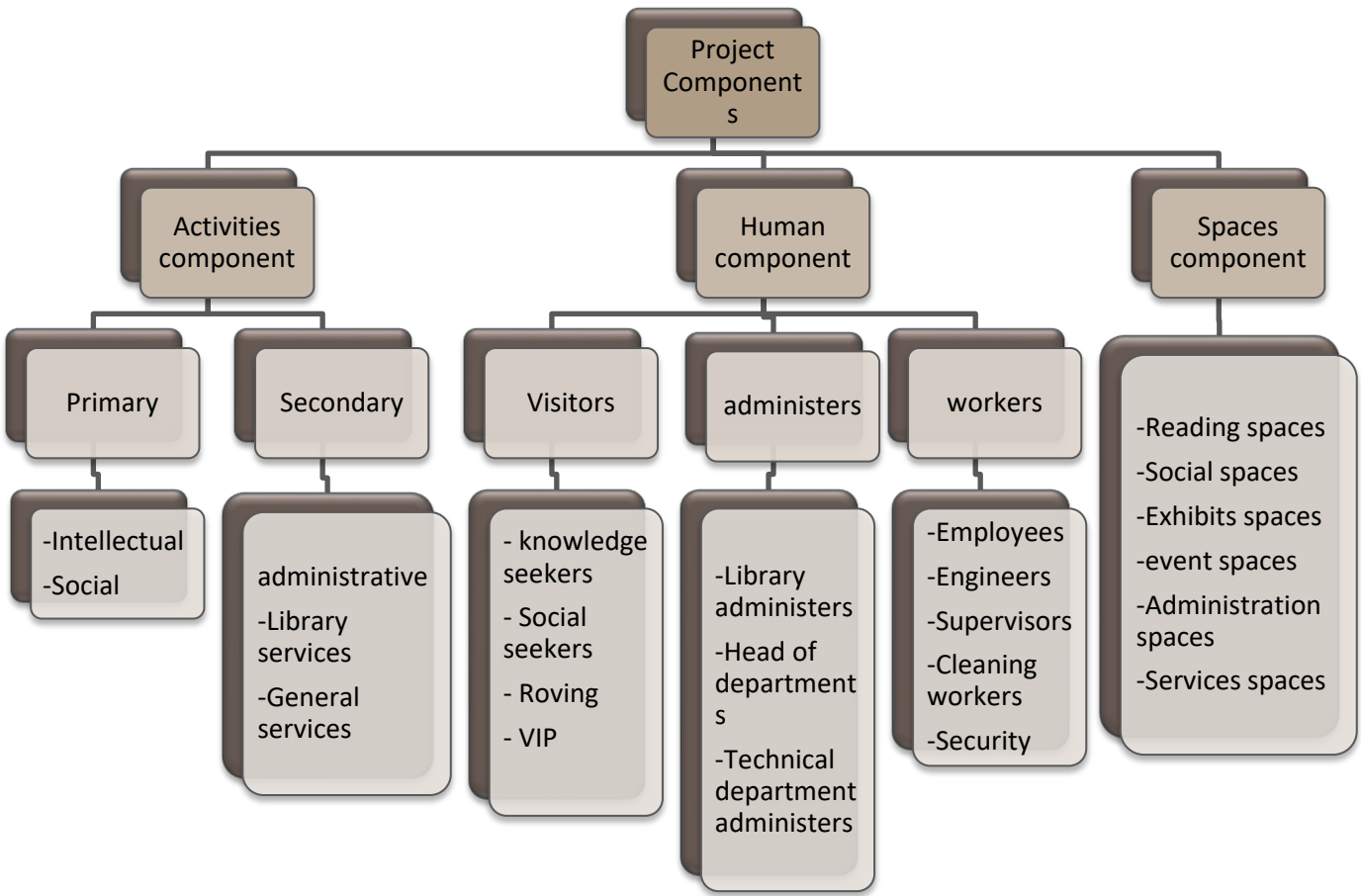


Diagram 3: Project components

3-2 Human components.

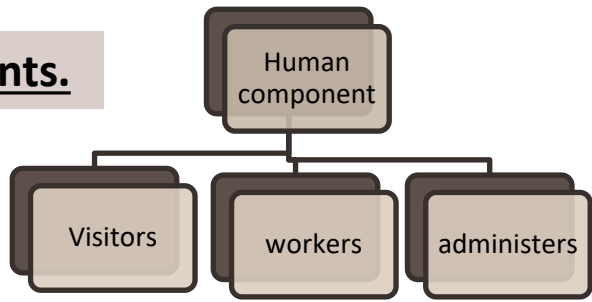


Diagram 3: Human components

3-2-1 Visitors components.

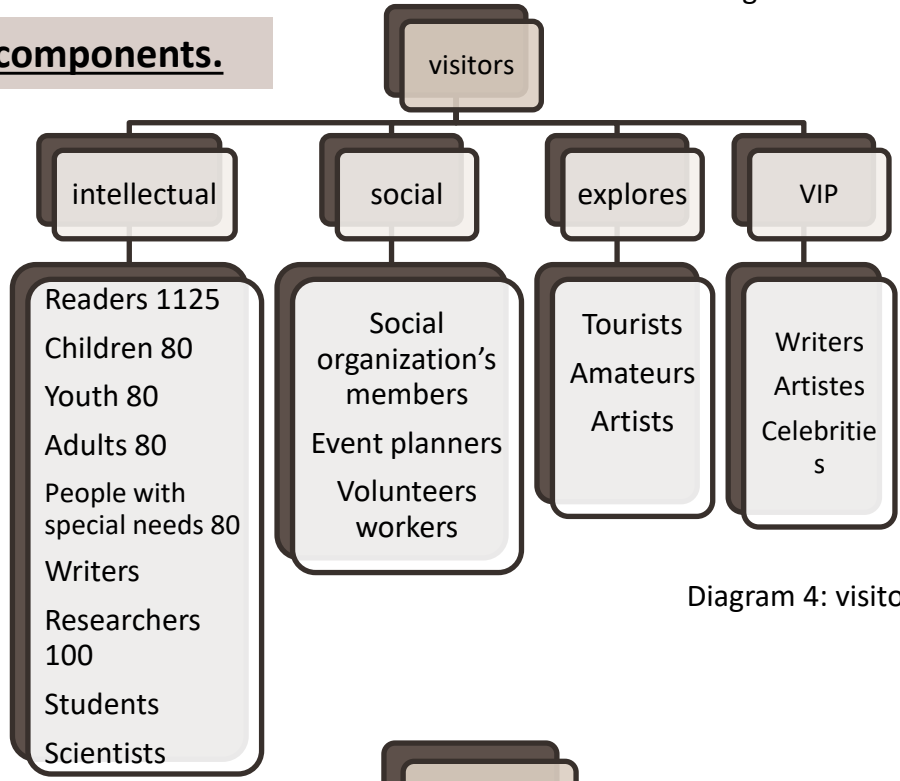


Diagram 4: visitors components

3-2-1 Admins components.

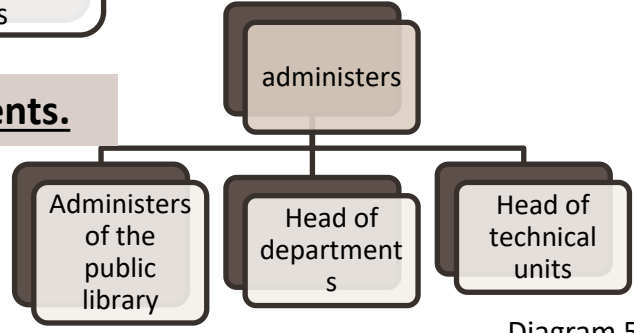


Diagram 5: admisters components

3-2-1 Workers components.

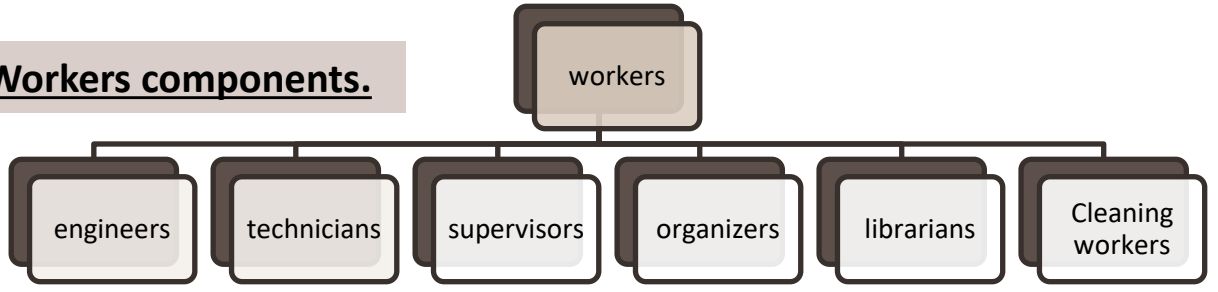


Diagram 6: workers components

3-3 Activities components.

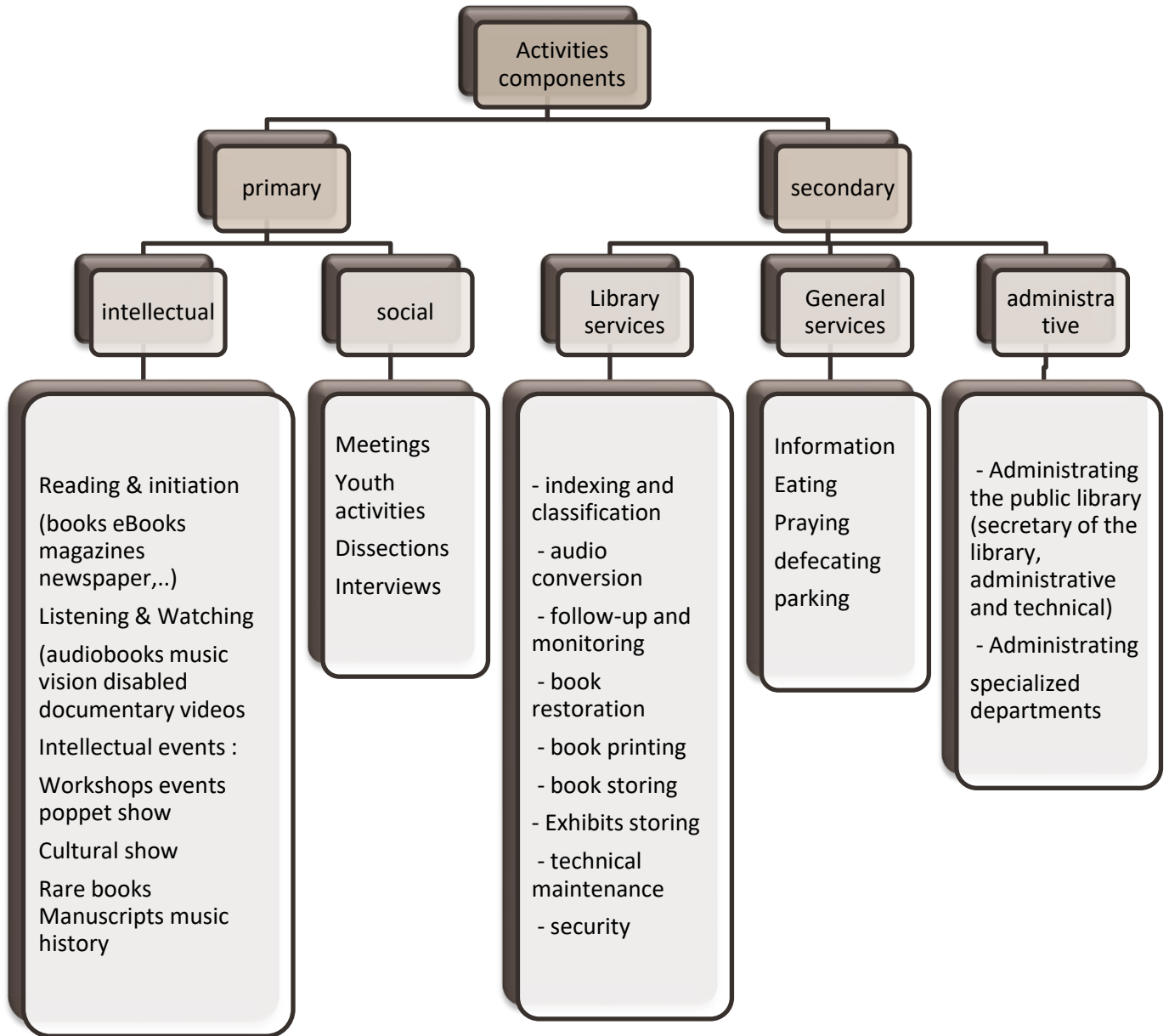


Diagram 6:Activities components

3-4 Spaces components

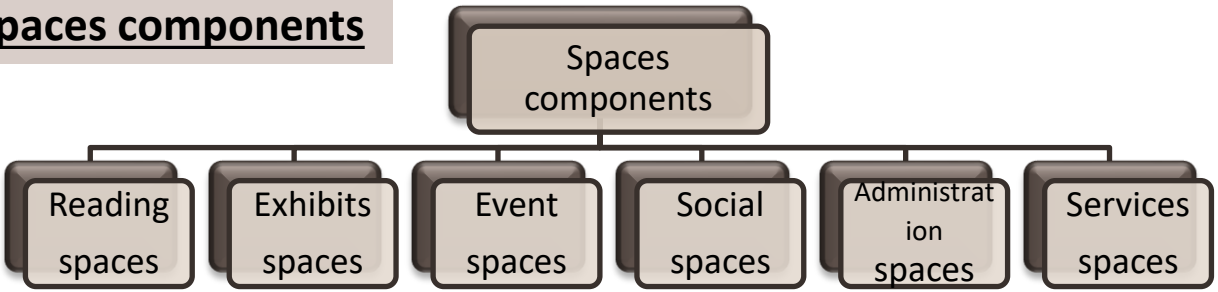


Diagram 7: Spaces components

3-4-1 Reading spaces components.

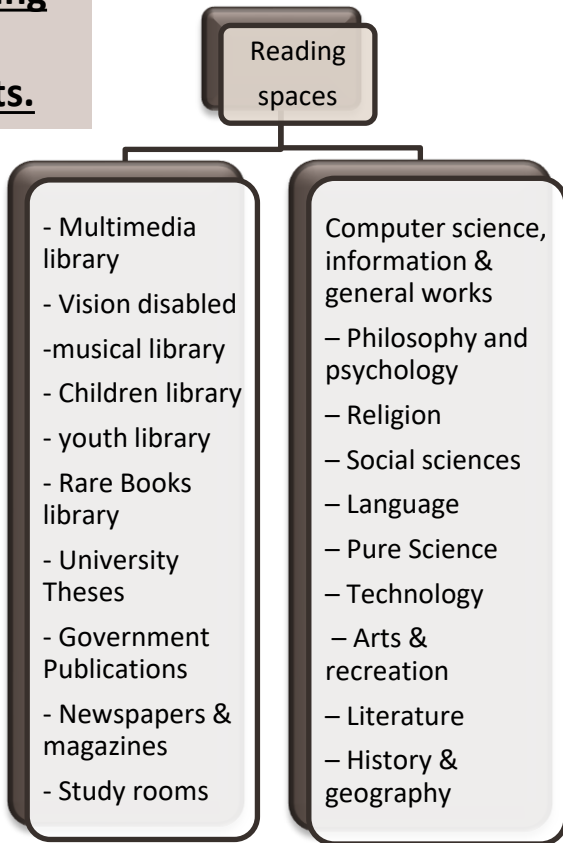


Diagram 8: Reading spaces components

3-4-2 Exhibit spaces components.

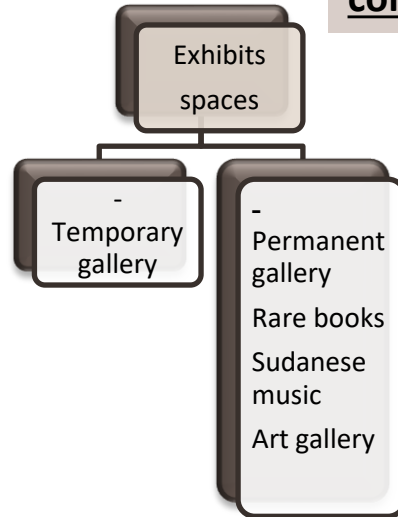


Diagram 9: exhibits spaces components

3-4-3 Event spaces components.

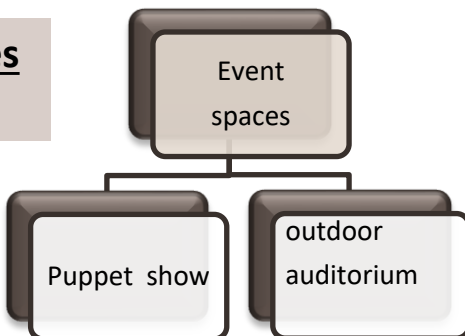


Diagram 10: Event spaces components

3-4-4 Social spaces components.

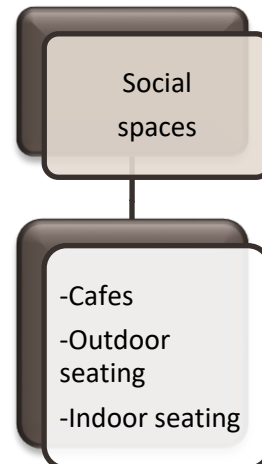


Diagram 11: Social spaces components

Spaces components

3-4-5 Services spaces components

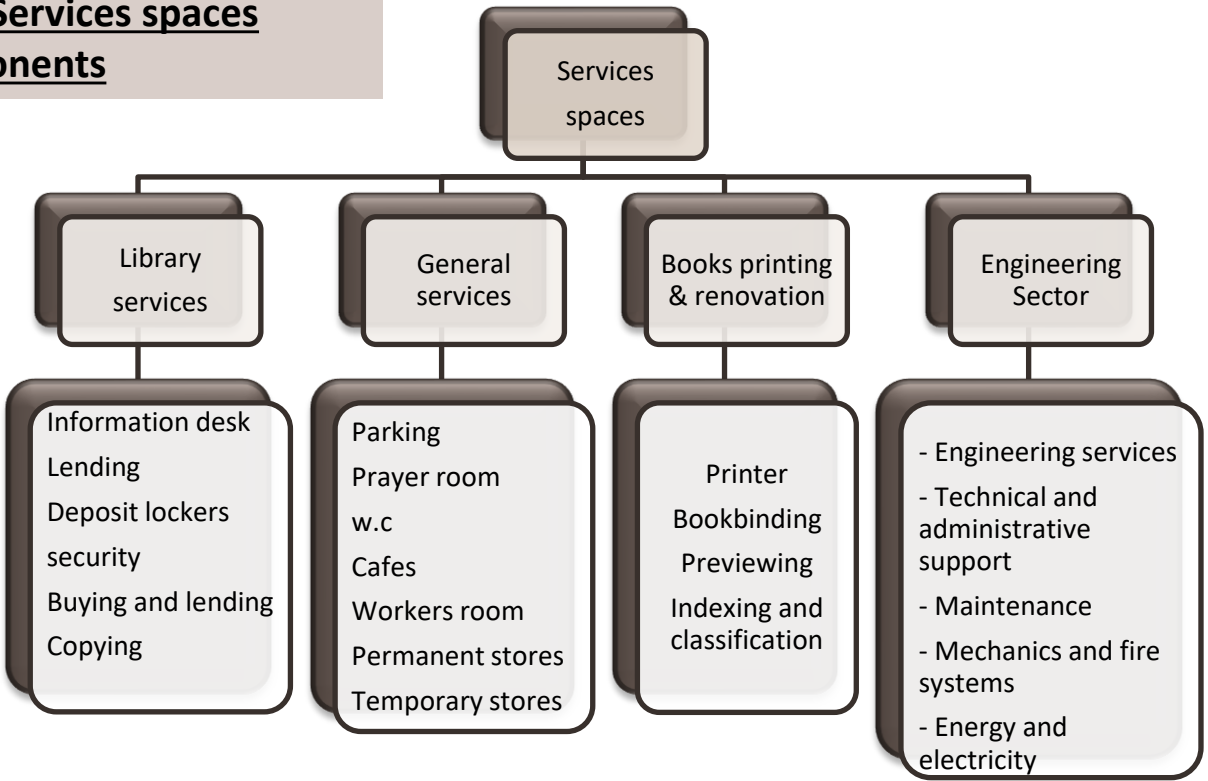


Diagram 12: Services spaces components

3-4-5 Admin spaces components.

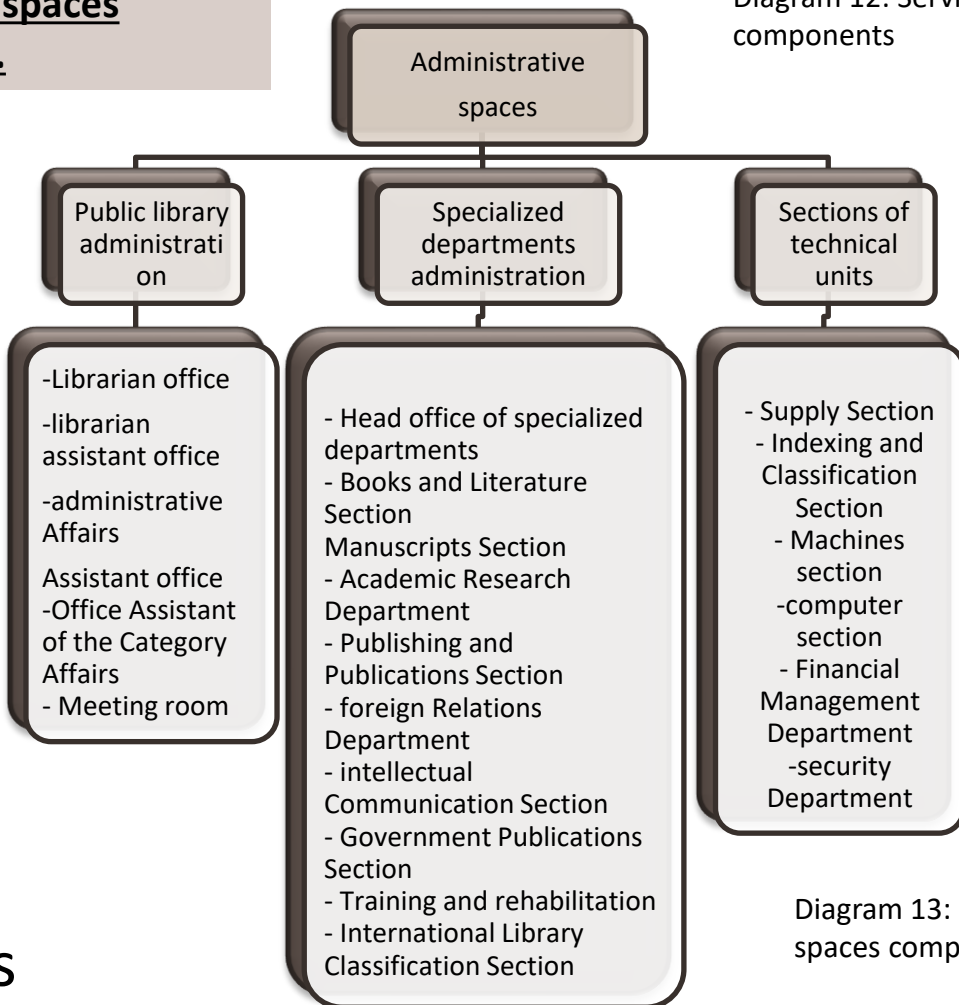


Diagram 13: administrative spaces components

Spaces components

3-5 14:Main components matrix diagram

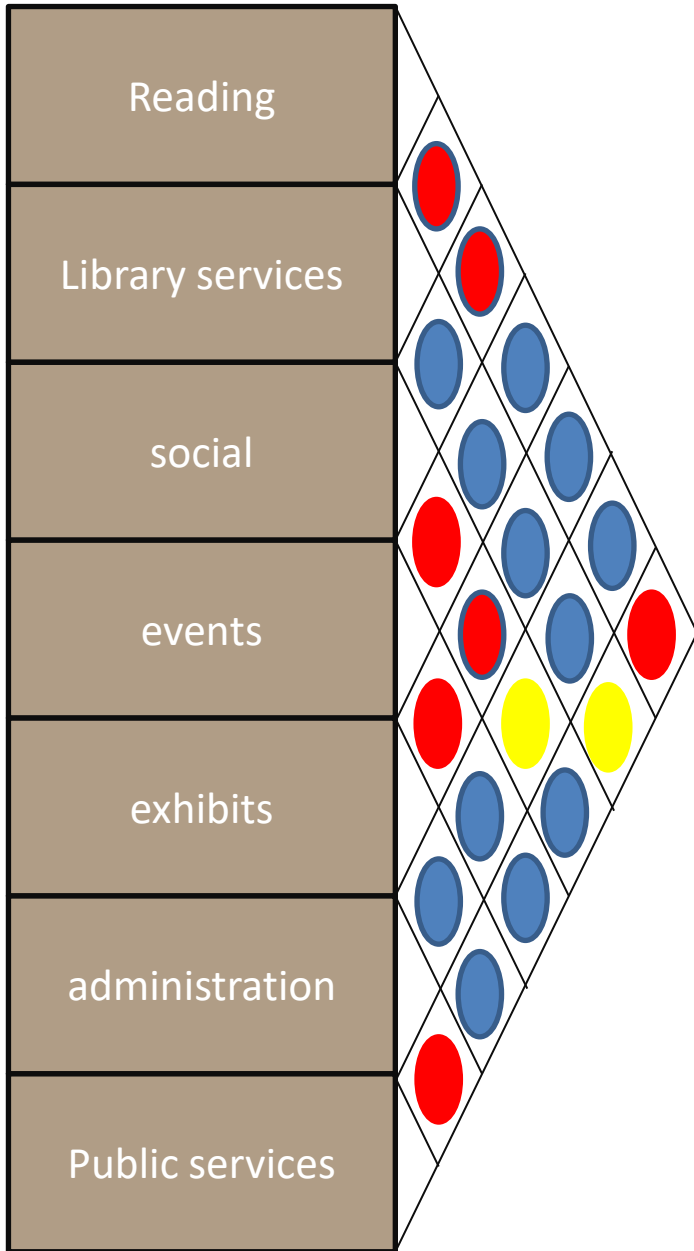


Diagram 14:Main components matrix diagram

Key:

Strong relation



medium relation



weak relation



Result:

Spaces with strong relations should be together according to the relationship between the activities

matrix Diagram

3-6 Main matrix diagram

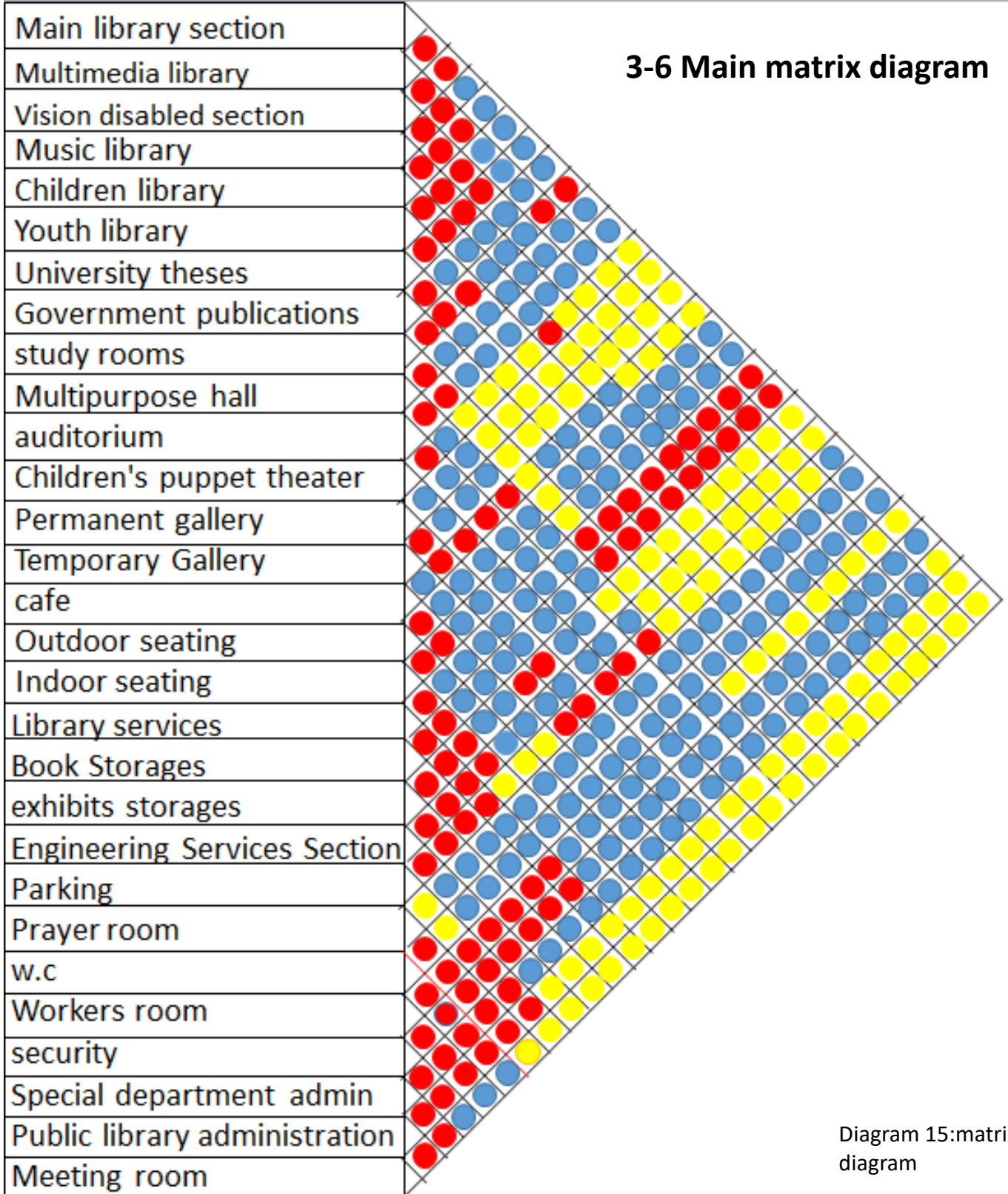


Diagram 15:matrix diagram

Result:

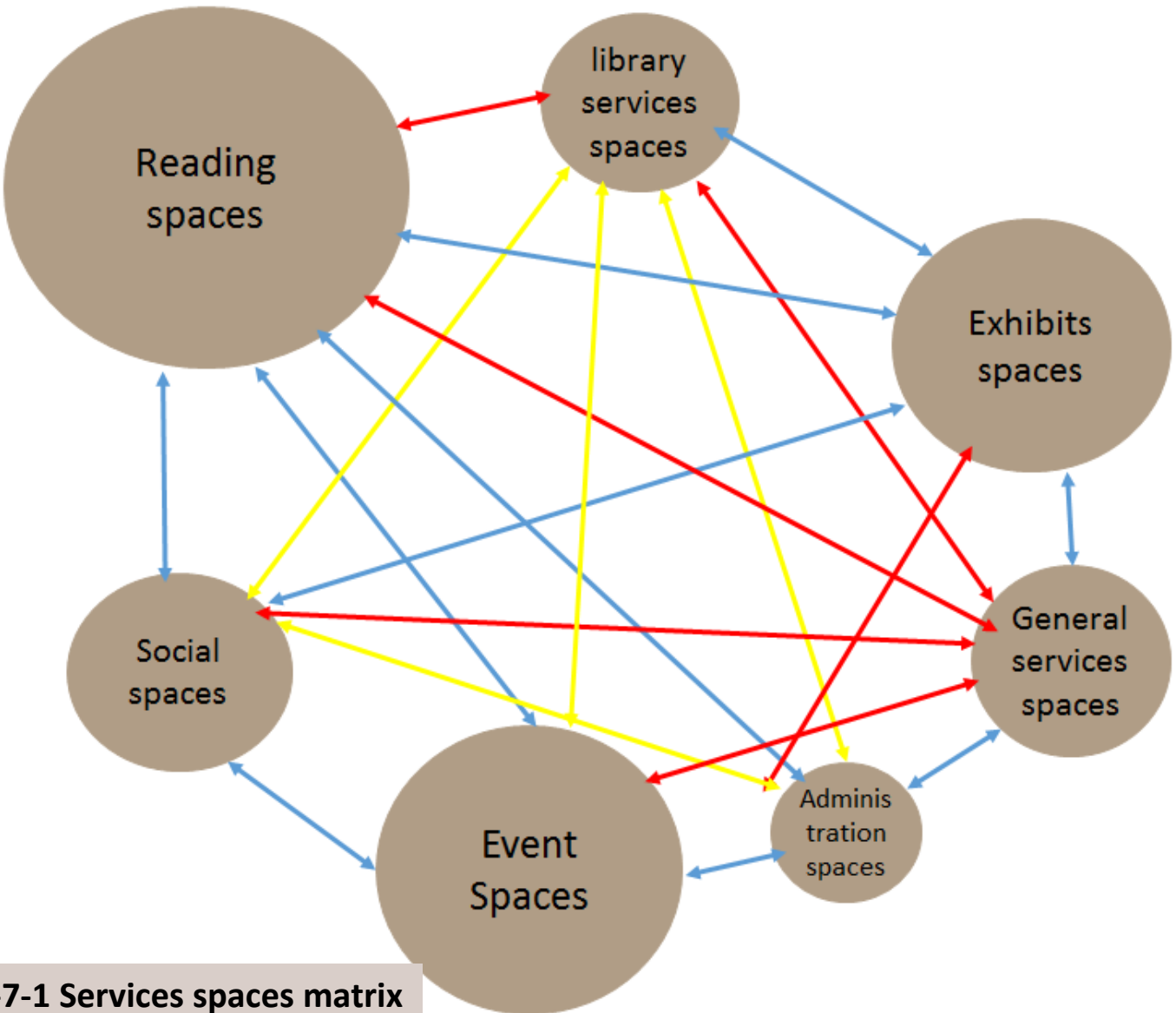
Spaces with strong relations should be together according to the relationship between the activities

Key:

- Strong relation ●
- medium relation ●
- weak relation ●

matrix Diagram

3-7 Main bubble diagram



3-7-1 Services spaces matrix diagram

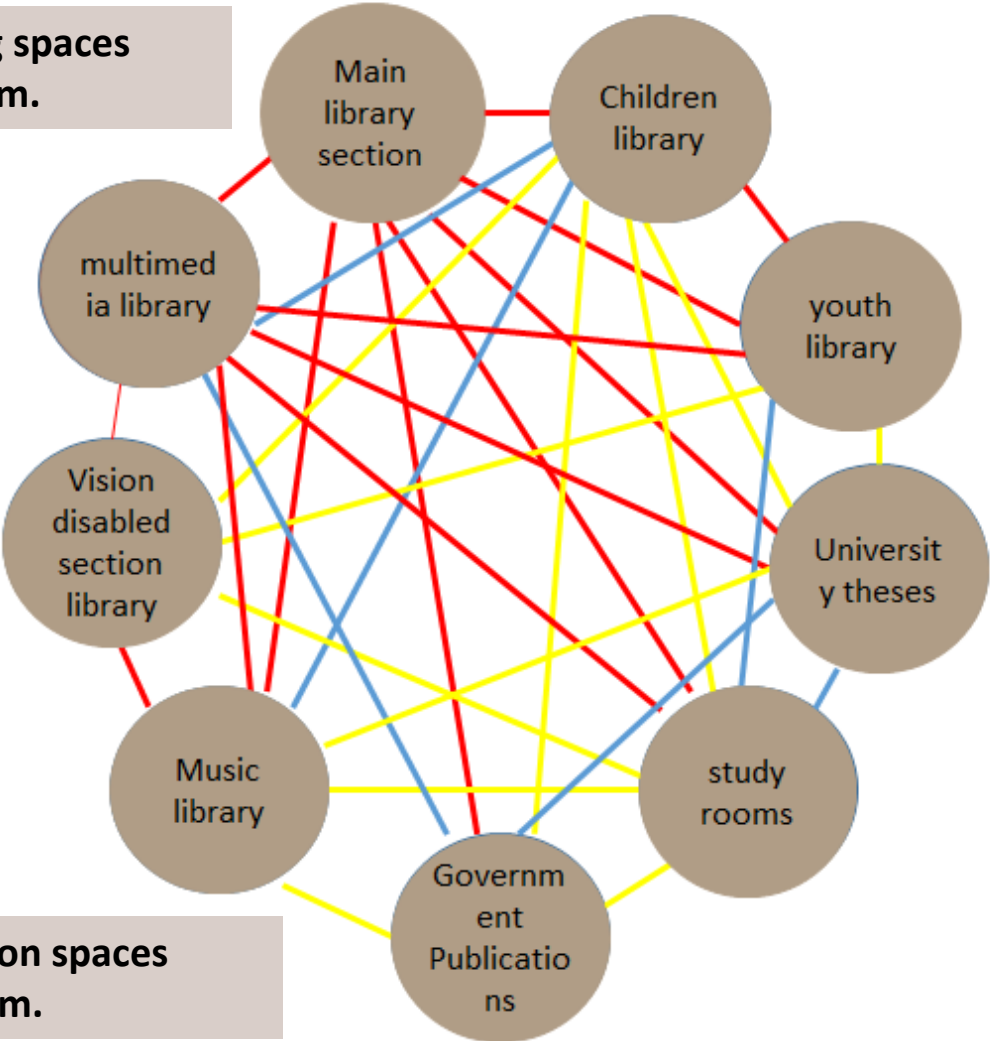
Diagram 16: Main spaces Bubbles diagram

3-7-1 Event spaces matrix diagram.

Key:

- Strong relation ↔
- medium relation ↔
- weak relation ↔

3-7-1 Reading spaces matrix diagram.



3-7-2 Exhibition spaces matrix diagram.

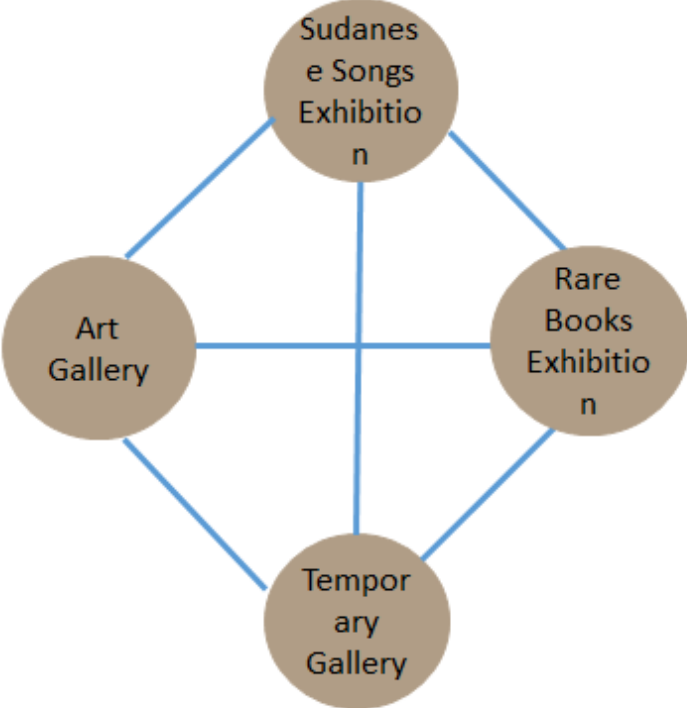


Diagram 18: Reading spaces Bubbles diagram

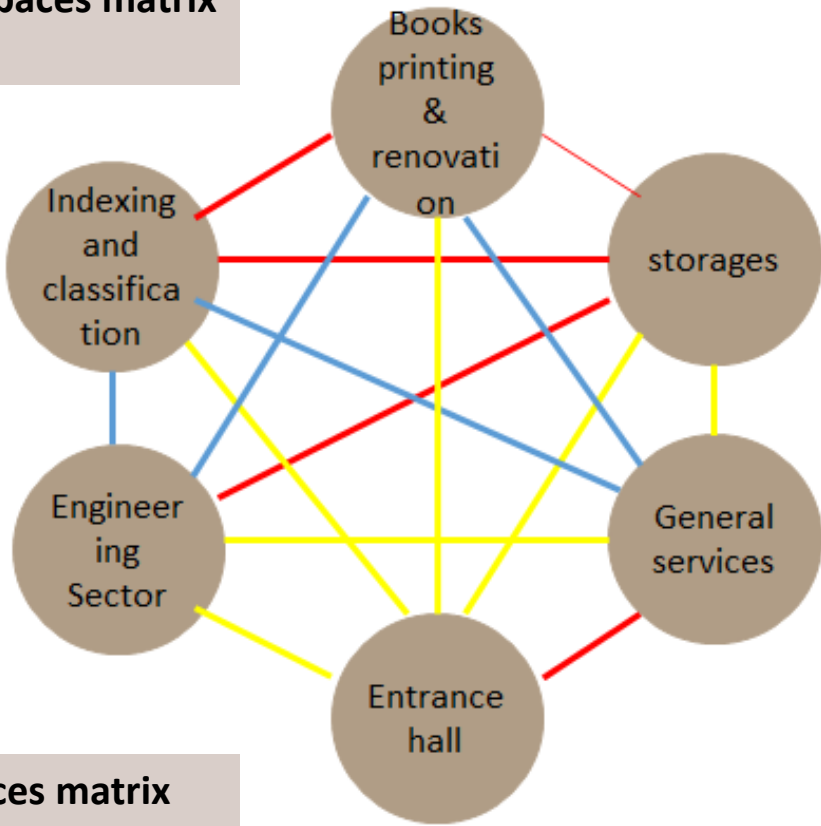
Key:

- Strong relation ↔
- medium relation ↔
- weak relation ↔

Diagram 19: Social spaces Bubbles diagram

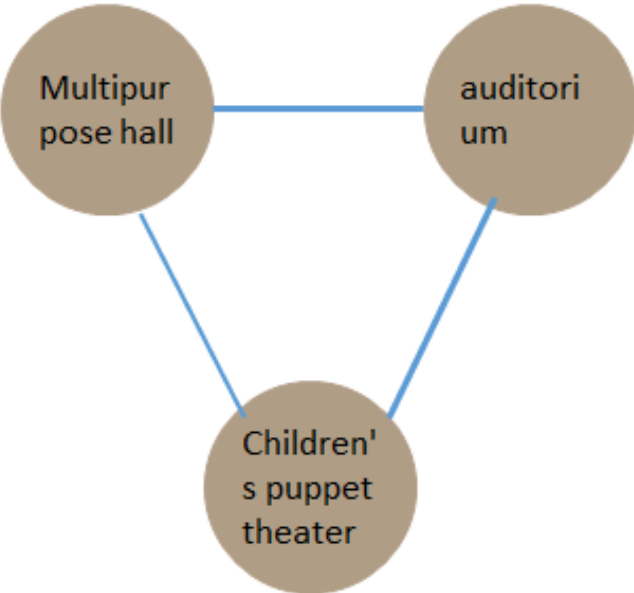
Bubbles Diagram

3-7-1 Services spaces matrix diagram



3-7-1 Event spaces matrix diagram.

Diagram 20: Services spaces Bubbles diagram



Key:

- Strong relation ↔
- medium relation ↔
- weak relation ↔

Diagram 21: Event spaces Bubbles diagram

Bubbles Diagram

3-8 Movement schemes.

3-8-1 Reader Movement scheme.

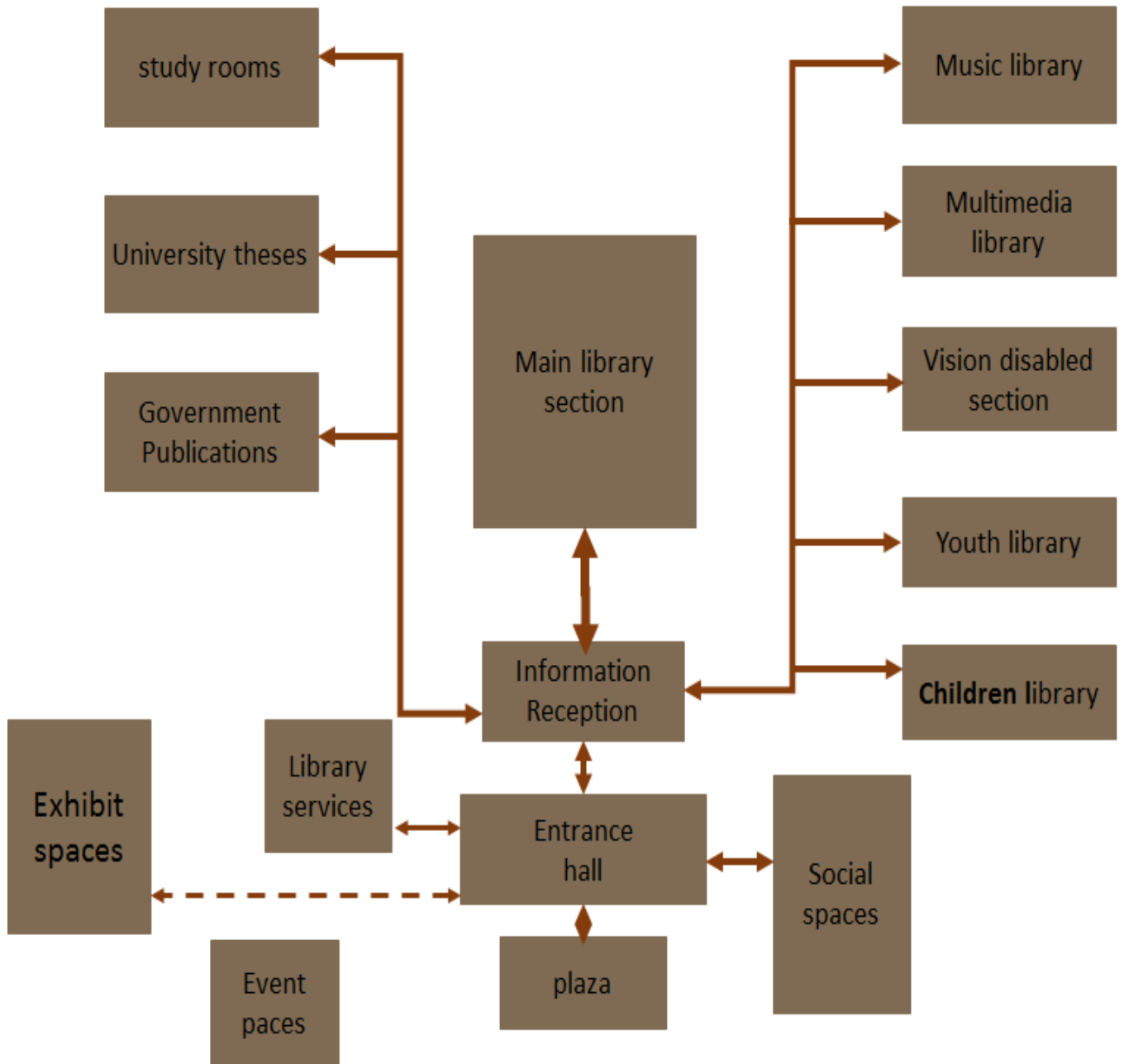
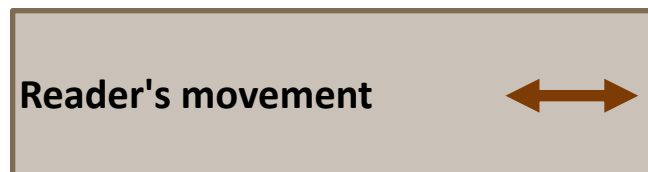


Diagram 22: Readers movement scheme



3-8-2 Admins Movement scheme.

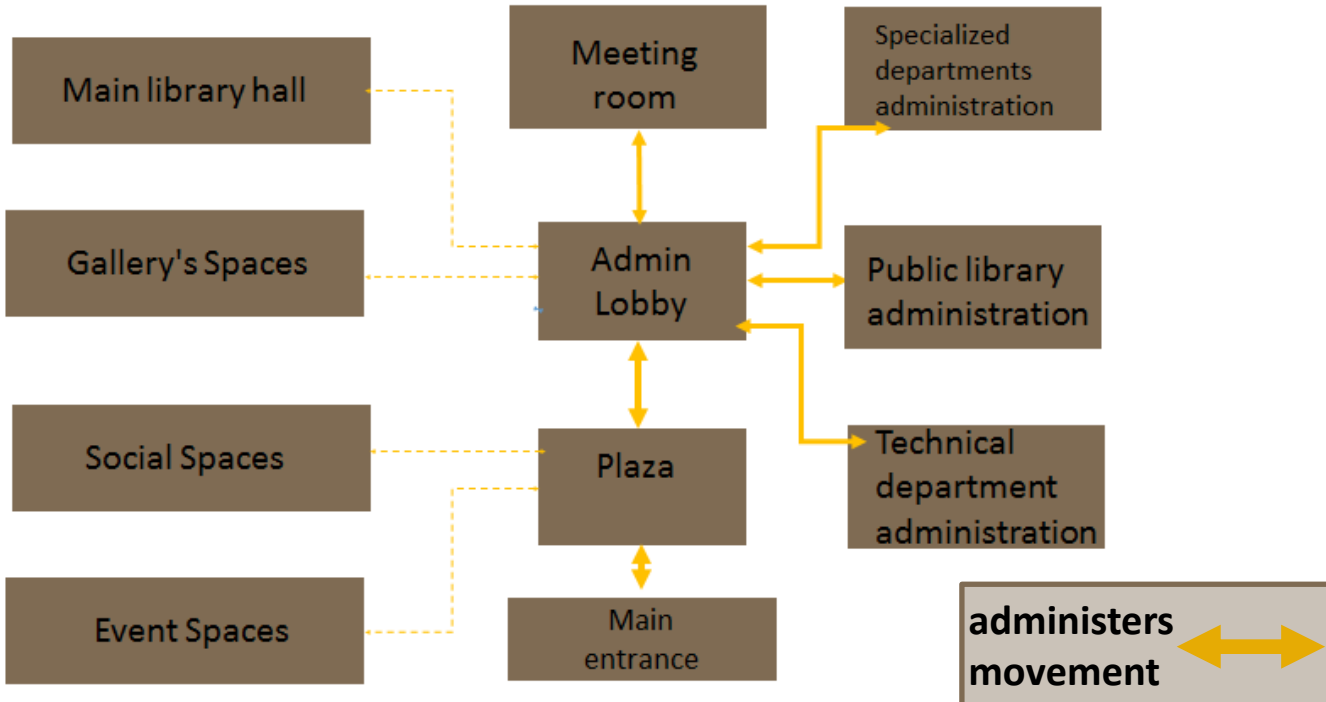


Diagram 23: administrators movement scheme

3-8-3 Workers Movement scheme.

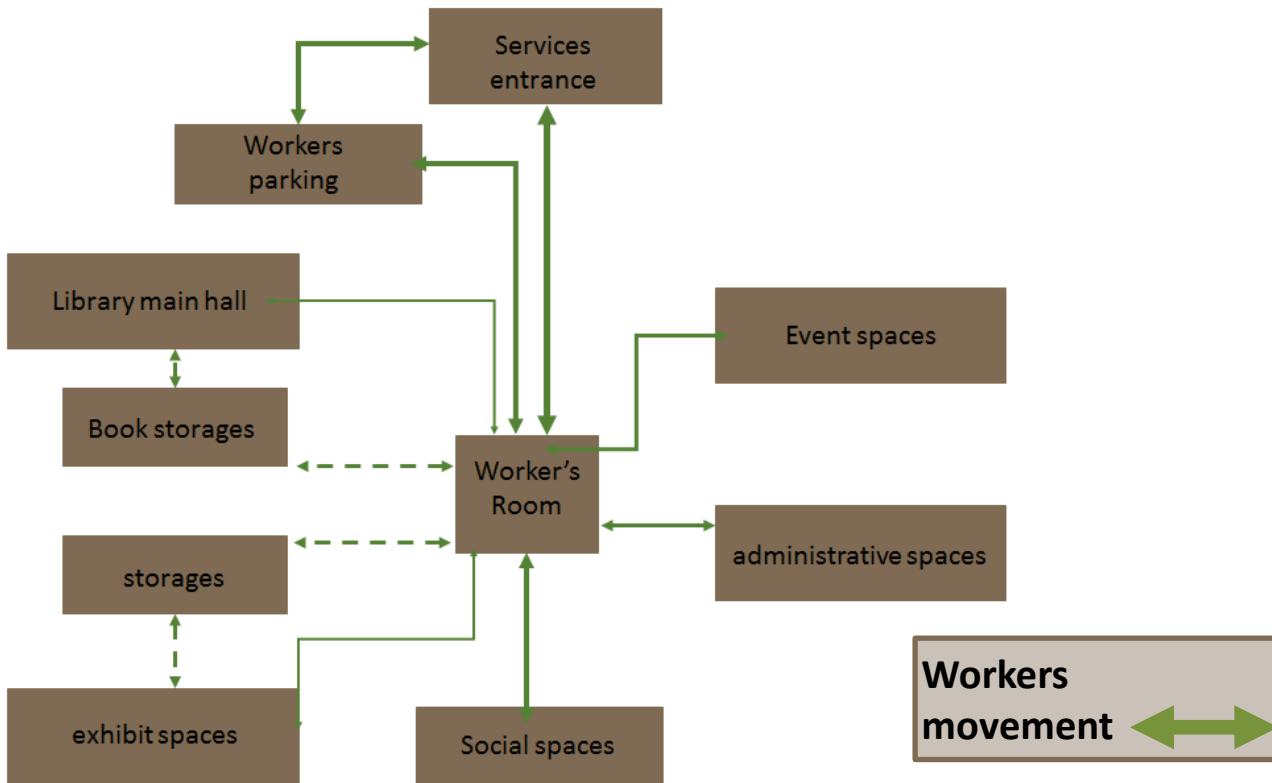


Diagram 24: Workers movement scheme

3-8-4 Books Movement scheme.

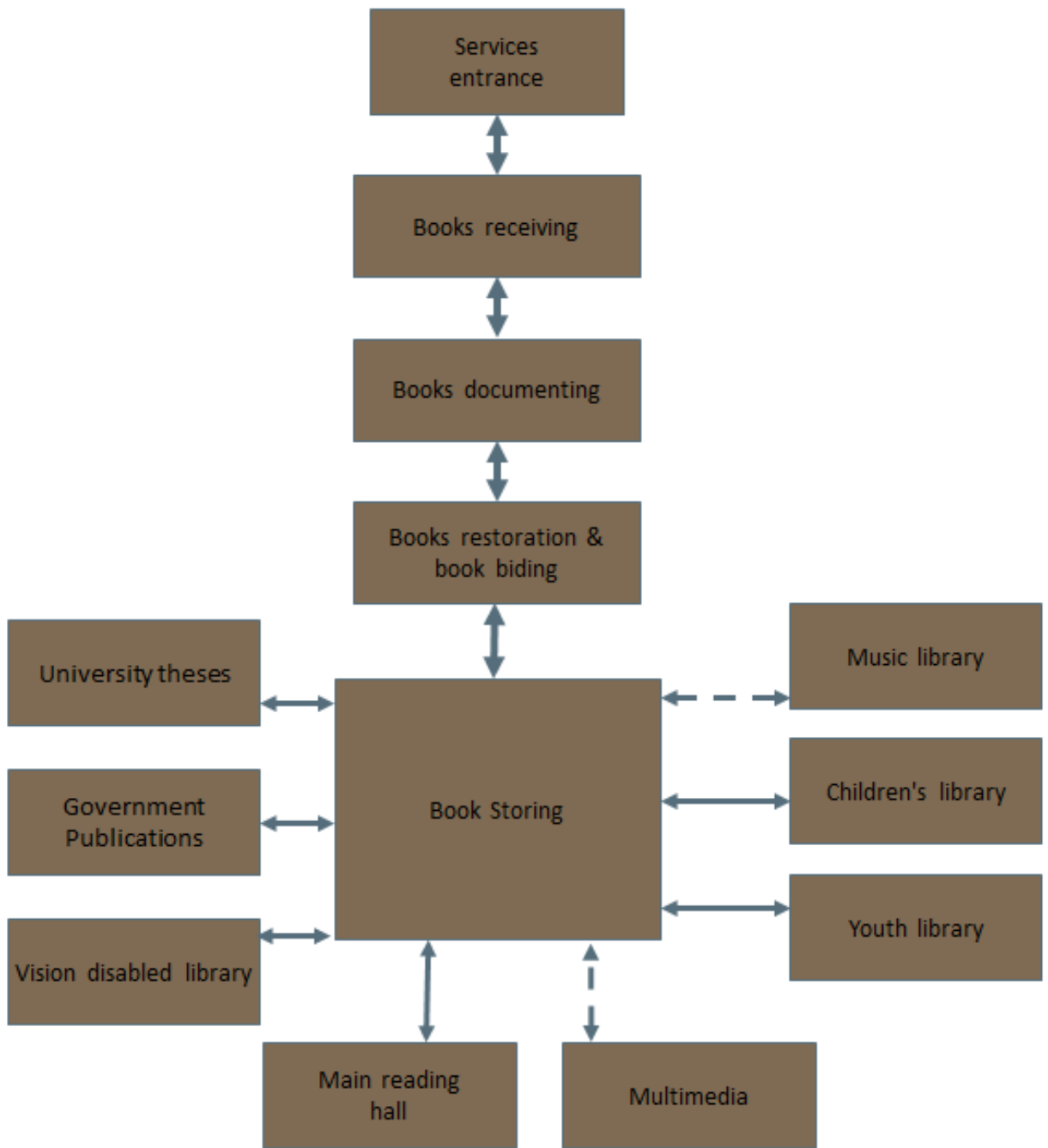


Diagram 25: Books movement scheme

books movement 

3-8-5 General Movement scheme.

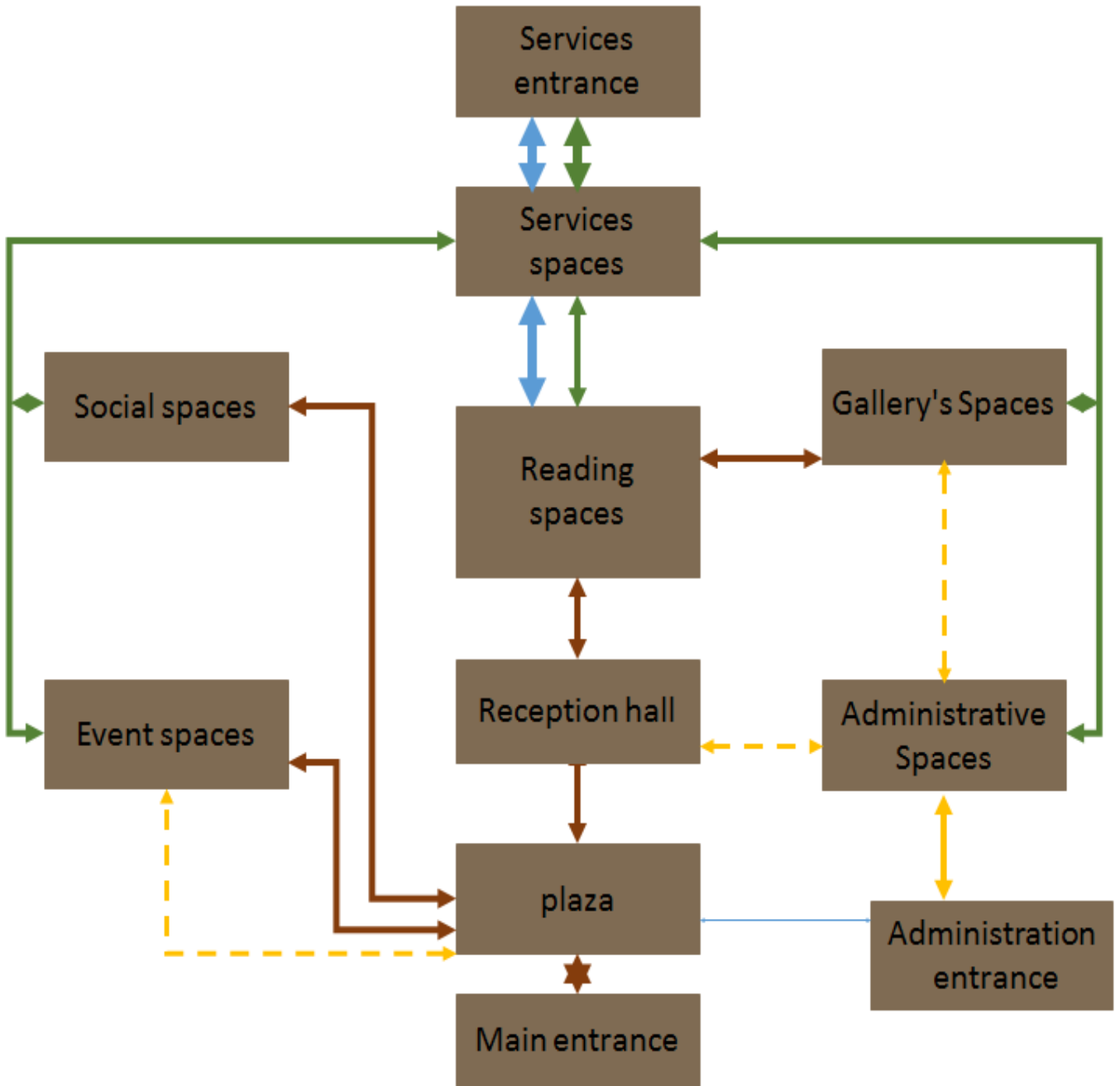
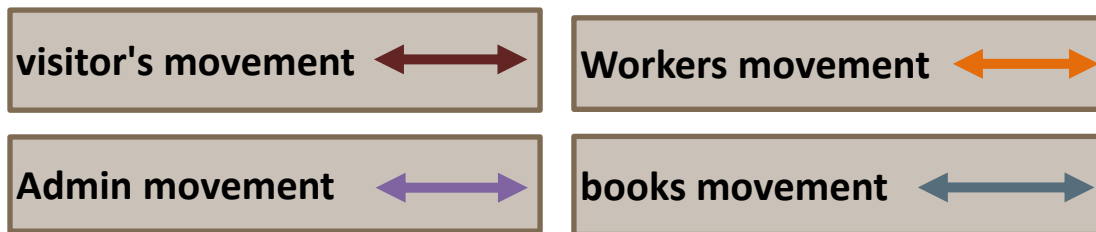


Diagram 26: General movement scheme



3-9 environmental analysis

3-9-1 Sun Movement:

This diagram views the actual sun movement for the northern half 50 of the world between 40 degrees and degrees.

Result:

choosing the right location for trees and its density, height and types of plants which hold out solar radiation.

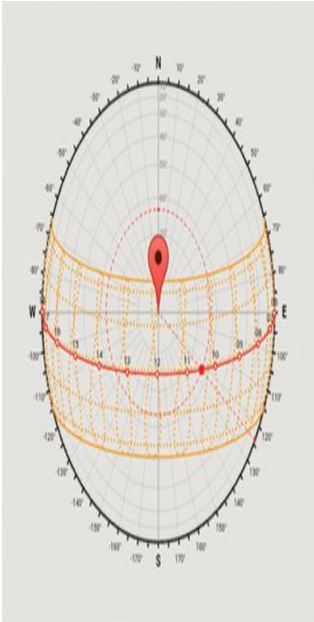


Figure 34: sun movement scheme



Figure 35: The sun and wind Site

3-9-2 The Wind:

From the south west in Summer

From north east in Winter

The average speed of the wind is 10.8 mile/hour

Result:

Use landscape elements to reduce the dust on the wind
Larger open spaces towards the north and smaller toward the south

Reduce the numbers of windows on the east and west

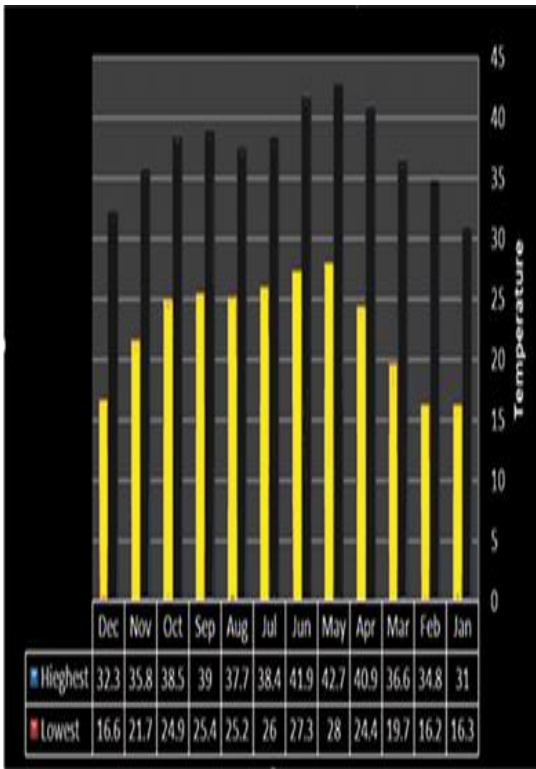


Diagram 27: Khartoum temperature ratio

3-9-3 Temperature:

June is the warmest month with temperature average is 33.8 c. while January is the coldest month with temperature average 22.6c.

Result:

- using building materials which absorb the heat at day and lose it at night .
- using different vegetarian elements inside yards or on walls .

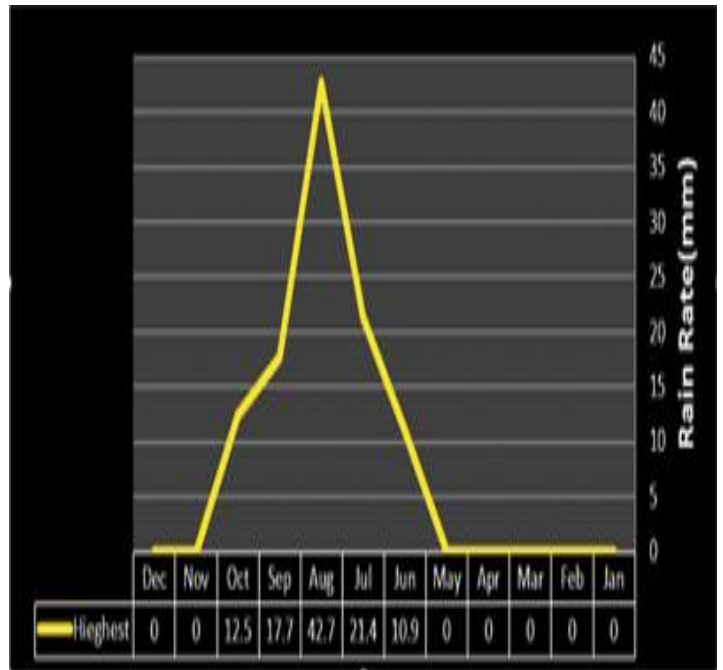


Diagram 28: Khartoum rain ratio

3-9-4 Rain:

The driest month during the year is January with 0.0 mm rain, while the most rain average is in August which about 52.0 mm.

3-9-5 Humidity:

Affect the choice of plants guard affect the choice of isolators That we may use and type of building materials

Result:

Determine types of building materials and shapes of buildings. Affect the types of plants and trees in the area.

3-10 Site analysis.

3-10-1 Noise and neighbors :

The neighbors on the site:

Residential neighbors

The high school students will attend to the library

The site affect on the neighbors:

Will raise the level of intellectuality.

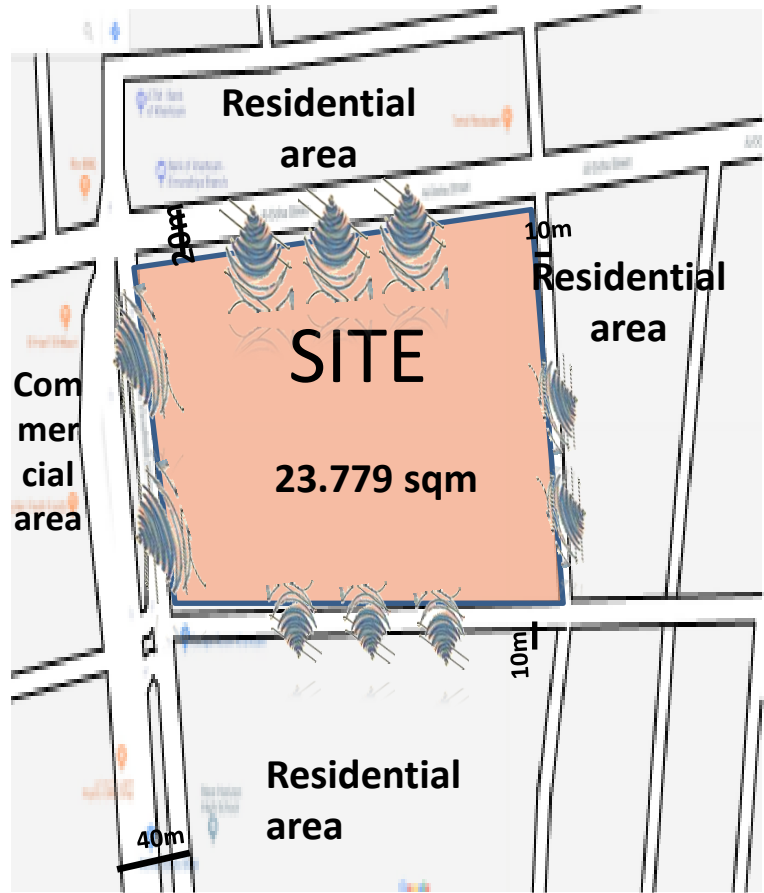


Figure 36: The noise and neighbor site

3-10-2 Services:

Electricity:

220 V Electricity conduct from the west side

Water:

Main water supply lane from the west side

Sewage and rain water

There is no lane for the waste

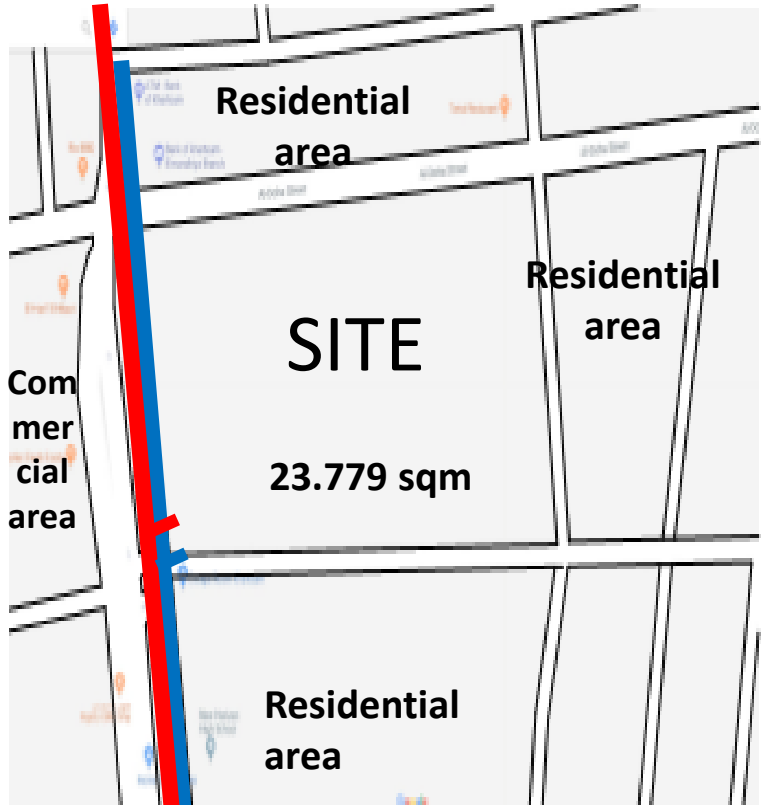


Figure 37: The services site

3-11 Spaces Study:

Preliminary study of the area according to the standards of the libraries:

3-11-1 Reading Area

Which is a vital and very important in terms of movement and activity, The area is defined by the number of users and it shall be as follows:

- The Reading hall should be in the heart of the library
- close to the area of the bookstands and directly connected to it.
- Taking into account the northern direction of the hall for the most efficient lighting and ventilation

Reading space

- The area of 2.79 m² per person
- The area of the child is 1.86
- Preferably oriented North to prevent luster due to lighting

Area of books in circulation

- The book space is calculated for every 30 cm long 7 books.
- Each 30 cm vertical 50 books calculate the height of 7 shelves.
- The area of one book is 0.007 m.

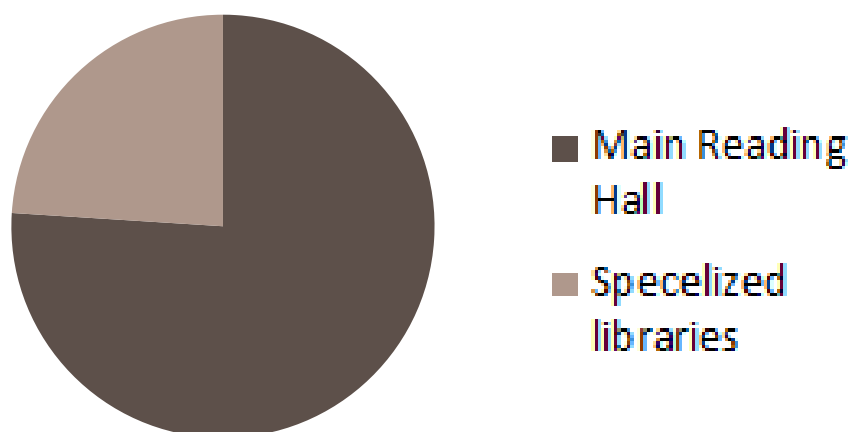


Diagram 29: Reading sections percentage

Spreads Reading Master It includes several different sections based on the decimal classification of libraries:

- Computer science, information & general works
- Philosophy and psychology
- Religion
- Social sciences
- Language
- Pure Science
- Technology
- Arts & recreation
- Literature
- History & geography



- general works
- Philosophy and psychology
- Religion
- Social sciences
- Language
- Pure Science
- Technology
- Arts & recreation
- Literature
- History & geography

Diagram 30: Books sections percentage

Containing 70% of the number allocated for seats and distributed on the ten sections vary

Number of seats
 $1875/60 = 1125$ seats

Number of seats = total area
 $2.79 * 1125 = 3138.75$ m²

Number of books
 Book books in terms of conservation

Books in open shelves = 60%
 Books in closed warehouses = 15%

Books Specialized Libraries = 25%
 The total number of books in the main reading section

$1.500.000 * 6. = 900.000$
 Total area of books traded
 $900,000 * 0.007 = 6300$ m²
 Space and services = 20%
 $3138.75 + 6300 = 9438$

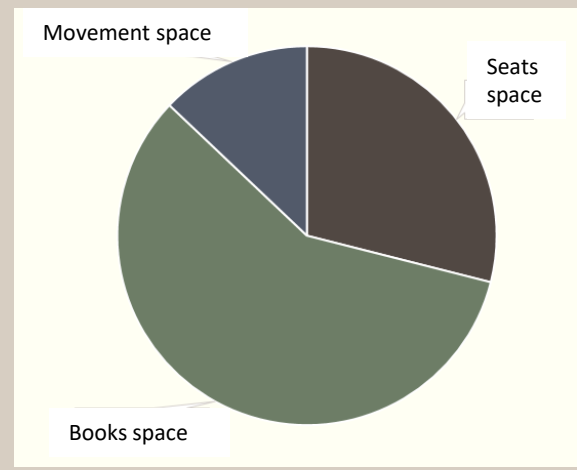


Diagram 31: Reading hall area percentage

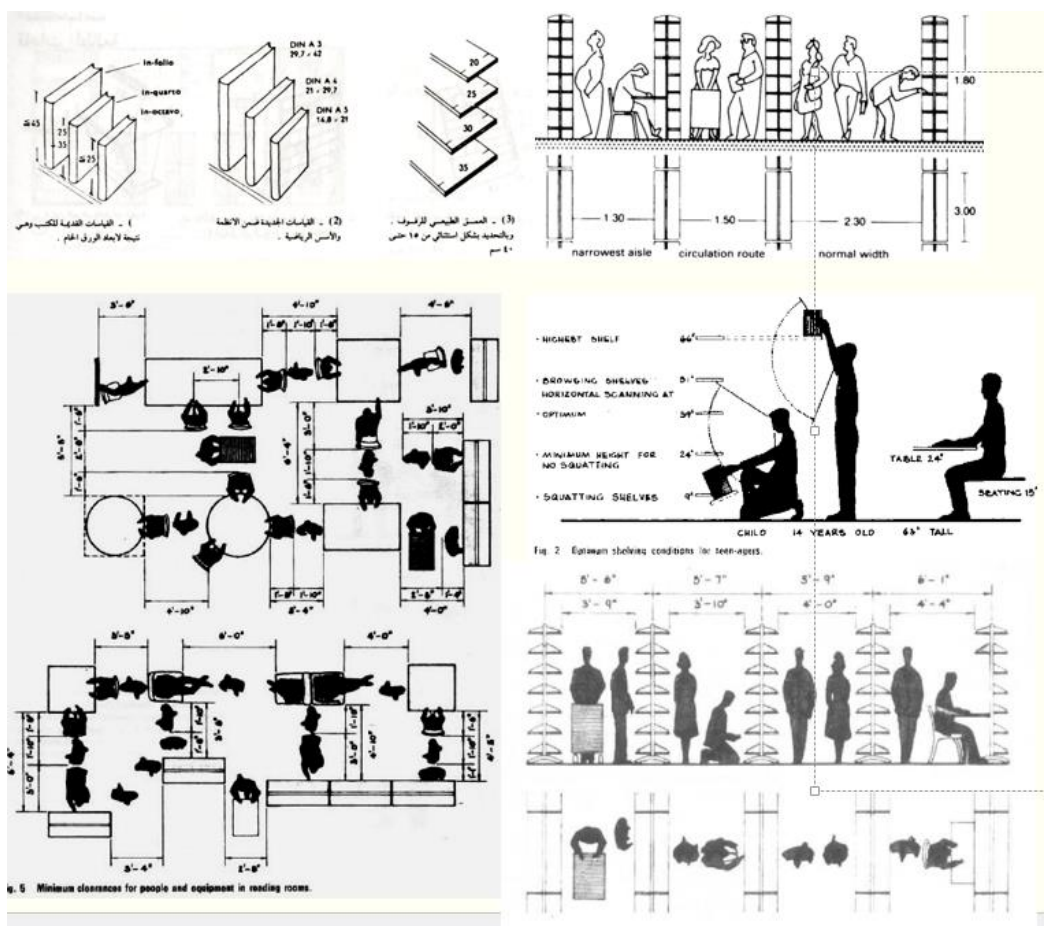


Figure 38: Reading hall Space study

Spaces study

3-11-2 Multimedia library:

This section includes the following section

Audio materials (recordings - songs - audio books)

Visual materials (pictures, photographs, musical notes)

Multimedia (movies - recordings - educational programs ..)

Design Considerations

The per capita share is 305 m²

Number of individuals = .60

Area = 60 * 3.5 = 210

Functional requirements

- Computer table:

Its length is about 115 cm, and its width is about 70 cm

- the chair:

The chair height is about 45 cm fits the computer desk.

Take good care of the inside of the internet room in order to preserve the existing equipment.

The lighting level in the screen does not even

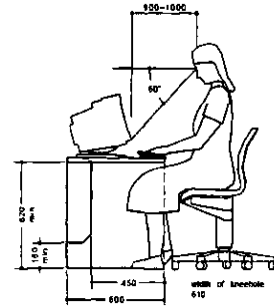
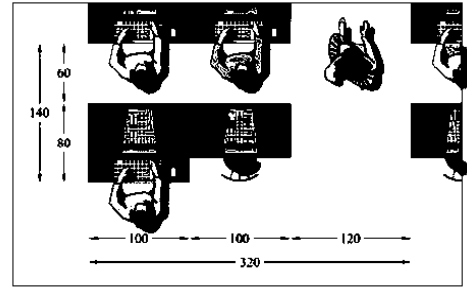


Figure 39: Multimedia Space study

3-11-3 Vision disabled library:

The section includes books for blind people and reading machines for the blind and must take into account the blind guides

The area of the individual = 4.00 m²

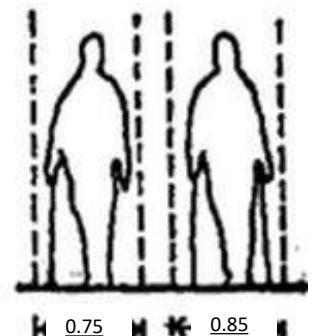
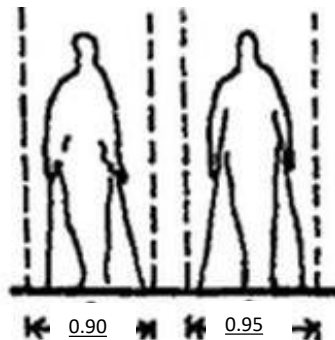
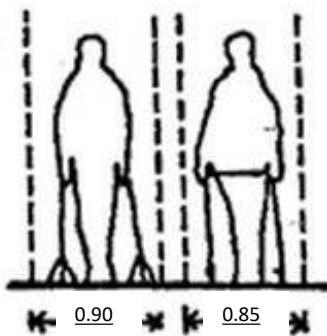
Number of individuals = 40

Reading area = 4 * 40 = 160 m²

Book space

Number of books = 10.000

10.000 * .009 = 84 m²



For special help device users

For guiding stick users

Figure 40: vision disabled Space

3 -11-5 children library

Children's books and children's entertainment

The friendly gauge must be applied in the design and interior design

Child space in library = 1.86

Number of children = 80

Area of reading places = $80 * 1.86 = 148.8$

Number of books = 40,000

Custom space = $40,000 * 0.006 = 240$

Space Games = 20%

= 77m

Total area of the department = 465 sqm

Exhibit Spaces: -

The following sections are included:

- Rare books exhibition
- Art exhibition
- Music exhibition
- Sudanese music history exhibition

3-11-6 Exhibitions:

The salon is about 300 people.

According to statistics from similar sites and diseases, the area of the individual as the smallest area 1.2 m² - 1.8 m²

2 - 1.8 m²

$300 * 1.2 = 360$

20% (for movement) = 432

$300 * 1.8 = 540$

20% (for movement) = 648

Average area of exhibition halls and museums $648 + 432 \div 2 = 540$ m²

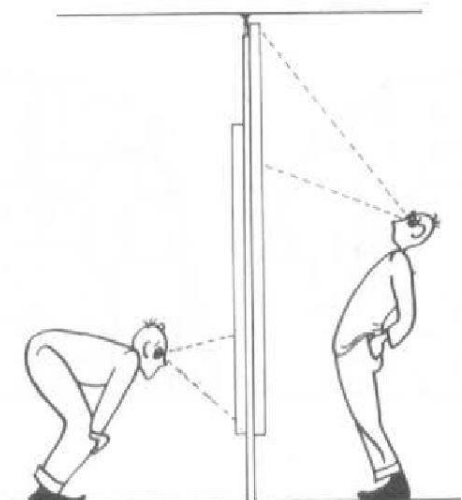


Figure 41: Display below and above eye level

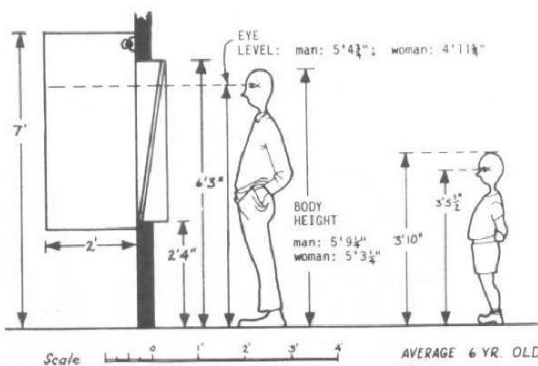


Figure 43: Display space study

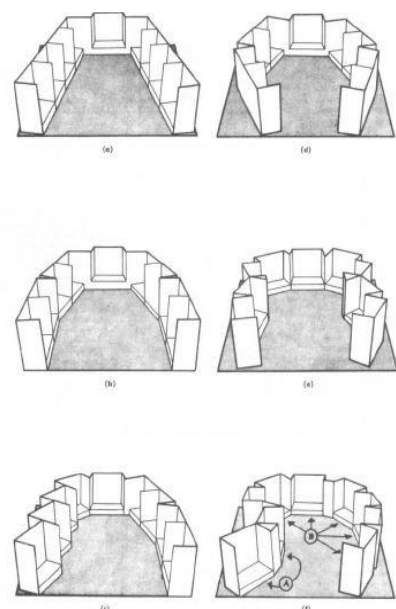


Figure 42: Display examples

Spaces study

3-11-6 Services spaces

Book Storages:

As a solution to the problem of storing books in large volumes in permanent warehouses, a system known as automated storage and retrieval systems (ASRS) Recently, the system has been used in the storage room, books and less-shelf folders (permanent storage) and adequate environmental conditions have been included so as not to damage books

The most important feature of this technique is the economy of storage space where books can be stored in seven area estimated by traditional methods of conservation

Number of books stored = 15%

= .15 * 1.500.000 = 225,000 m²

The future is estimated at 800,000

Provide storage space for books with an area of 5600 m²

If conventional methods are used in storage

Or 800 m² using the automatic system

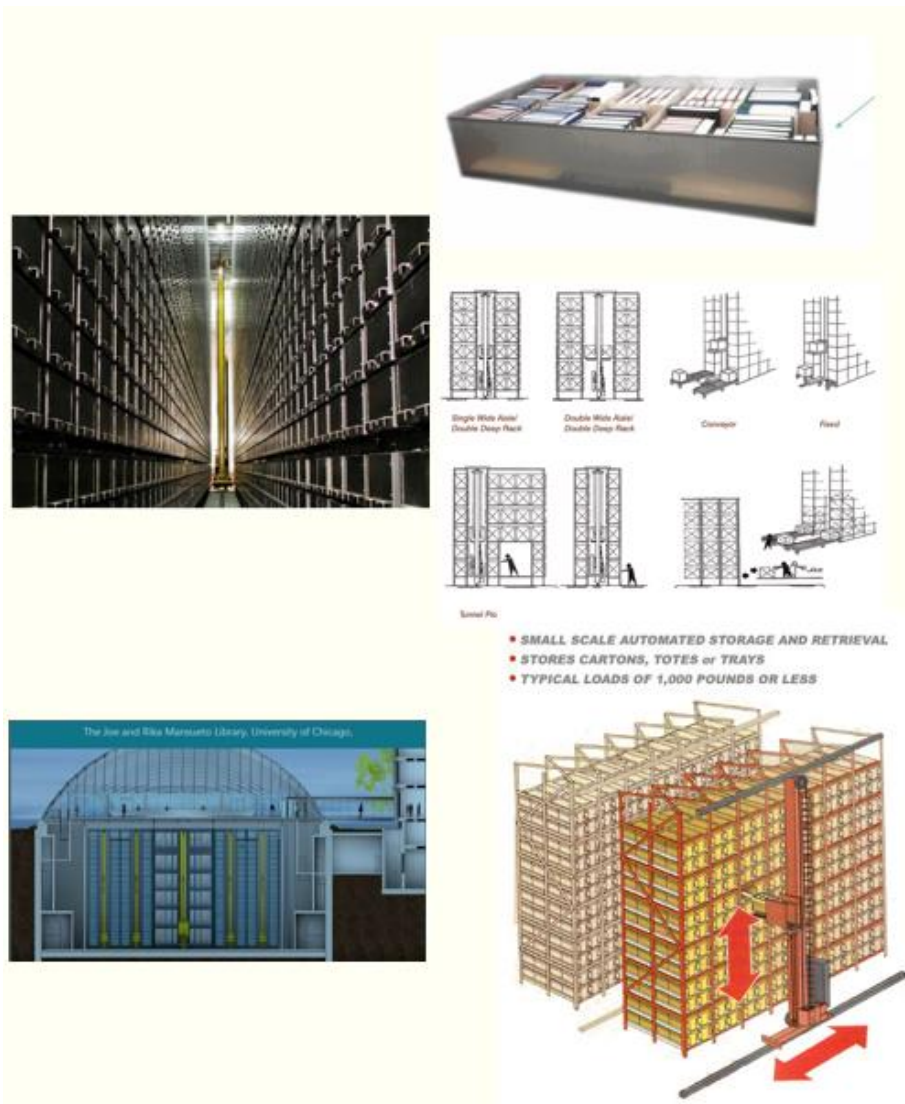


Figure 44: Storing and retrieving system

Activities		Space name	Person area	Number of users	area	Space no.	Total area	
Intellectual	Reading	Main library section	10 sqm	1125	11250 sqm	1	11250 sqm	
		Multimedia library	1.98 sqm	126	250 sqm	1	250 sqm	
		Vision disabled section	4 sqm	80	320 sqm	1	320 sqm	
		Children library	3.8 sqm	80	308 sqm	1	308 sqm	
		Youth library	4 sqm	80	320 sqm	1	320 sqm	
		Music library	3 sqm	50	150 sqm	1	150 sqm	
		study rooms	6 sqm	20	120 sqm	4	480 sqm	
		University theses	2.4 sqm	51	128 sqm	1	128 sqm	
		Government Publications	2.3 sqm	53	127 sqm	1	127 sqm	
			Total area 12278 sqm					
	Event	Multipurpose hall	0.6 sqm	400	240 sqm	1	240 sqm	
		auditorium	1.25 sqm	400	500 sqm	1	1100 sqm	
		Children's puppet theater	1.25 sqm	40	50 sqm	1	50 sqm	
				Total area 1390 sqm				
	Exhibit	Art Gallery	1.2 sqm	300	360 sqm	1	360 sqm	
		Sudanese Songs Exhibition	1.2 sqm	300	360 sqm	1	360 sqm	
		Rare Books Exhibition	1.2 sqm	300	360 sqm	1	360 sqm	
		Temporary Gallery	1.6 sqm	150	240 sqm	2	480 sqm	
				Total area 1560				
	Social	Social	cafe	0.5 sqm	100	50 sqm	1	50 sqm
Outdoor seating			0.5 sqm	400	800 sqm	1	800 sqm	
Indoor seating			1 sqm	200	200 sqm	1	200 sqm	
			Total area 1050 sqm					
Activities		Space name		Number of users	area	Space no.	Total area	
Services	Library Services	Book Storages	1 sqm	10	10 sqm	3	300 sqm	
		exhibits stores	3.8 sqm	13	50 sqm	2	100 sqm	
		Indexing Section	17.2 sqm	5	86 sqm	1	86 sqm	
		Classification Section	17.2 sqm	5	86 sqm	1	86 sqm	
		Documentation Section	17.2sqm	5	86 sqm	1	86 sqm	
		Printing Press	3 sqm	15	45 sqm	2	90 sqm	
		Book Packaging Section	5.3 sqm	9	48 sqm	1	48 sqm	
		Preview section	6 sqm	5	30 sqm	3	90 sqm	
		Engineering Services Section	1 sqm	10	10 sqm	10	10 sqm	
		Technical and Administrative Support Section	5 sqm	12	60 sqm	1	60 sqm	
		Maintenance Department	7 sqm	7	49 sqm	2	98 sqm	
		Department of Mechanics and Fire Systems	5.6 sqm	10	56 sqm	1	56 sqm	
		Department of Energy and Electricity	6.75 sqm	4	27 sqm	1	27 sqm	
	General services	Parking	4.3 sqm	200	860 sqm	1	860 sqm	
		Prayer room	0.8 sqm	200	160 sqm	2	320 sqm	
		w.c	1 sqm	90	90 sqm	1	90 sqm	
		Cafes	0.83 sqm	300	250 sqm	1	250 sqm	
		Workers room	5.4 sqm	20	108 sqm	2	216 sqm	
		Reception hall	0.35 sqm	1000	350 sqm	1	350 sqm	
		Information desk	5.4 sqm	5	27 sqm	5	135 sqm	
Lending books	10 sqm	3	30 sqm	3	90 sqm			
Safety despite box	7.5 sqm	2	15 sqm	5	75 sqm			
security	2 sqm	3	6 sqm	3	18 sqm			
Total area: 3543 sqm								

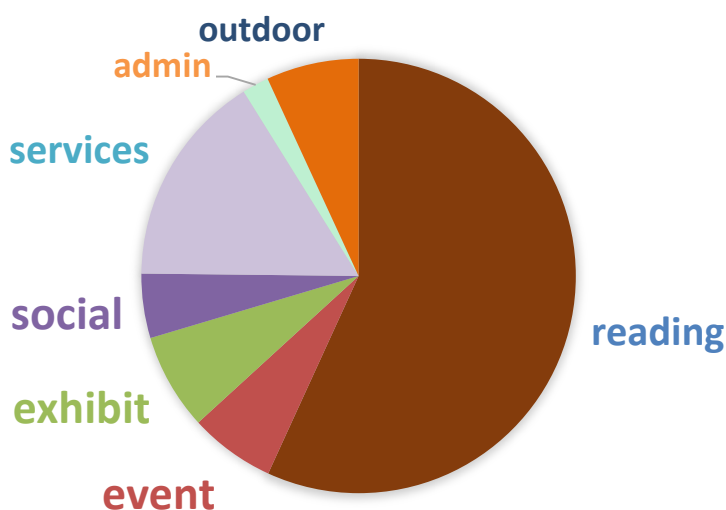
Activities					area	Space no.	
Administration	Administration	Public library administration	1.5 sqm	1	36 sqm	1	36 sqm
		Specialized sections administration	1.5 sqm	10	30 sqm	5	150 sqm
		Librarian Office	1.5 sqm	1	30 sqm	1	30 sqm
		Office of Administrative Assistant	1.5 sqm	1	36 sqm	1	36 sqm
		Meeting Room	1.5 sqm	2	66 sqm	2	132 sqm
		Offices	1.5 sqm	5	27 sqm	4	108 sqm
	Total area: 492 sqm						

Table 3: activities scheme

Sector name	Users num.	area	Area in hectare
reading spaces	1600	12278 m	
Event spaces	440	1390 m	
exhibit spaces	1050	1560 m	
Social spaces	700	1050 m	
Services spaces	2800	3543 m	
Admin spaces	20	492 m	
Outdoor areas	2000	1500 m	
Total area		21570 m	2.1 hectare

Table 4: spaces Area scheme

SALES



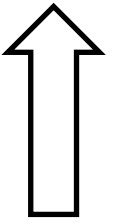
3-14 indicators and guides.

Indicators:

- 1- the site is surrounded with two main streets from the north and west
- 2- the east and the south sides are less noise polluted
- 3- the site is non symmetrical rectangular

Guides:

- 1- the main entrance is on the north because its less crowded
- 2- put the spaces that needs quite on the east and south
- 3- use tree belt and gran areas to clean the weather
- 4- orient the building north south for a maximum use of the natural ventilation



3-15 Zoning.



Figure 45: Ground floor plan zoning



Figure 46: first floor plan zoning

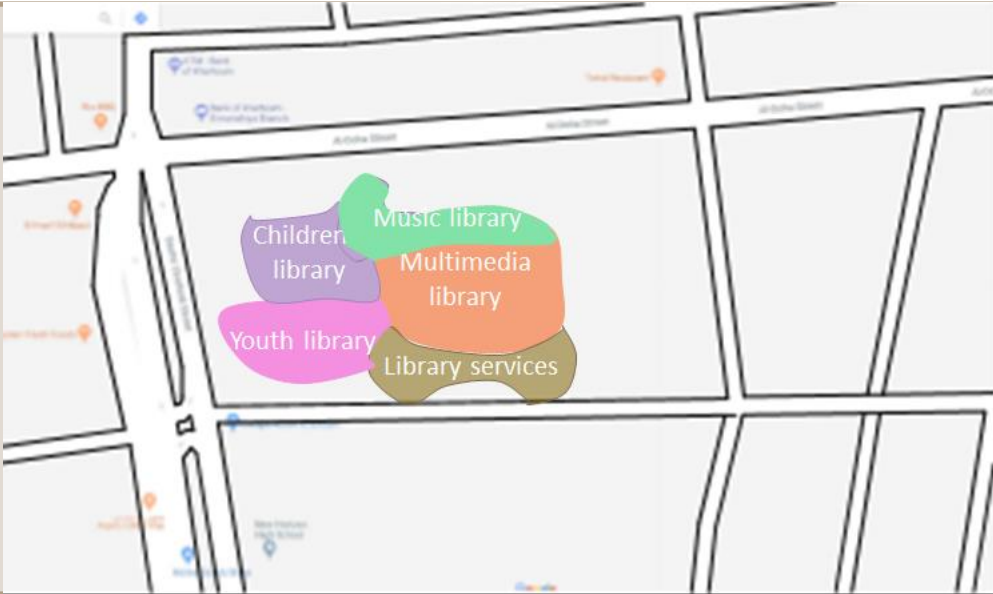
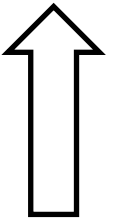


Figure 47: Second floor plan zoning



Figure 48: Third floor plan zoning

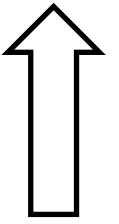


Figure 49: Fourth floor plan zoning

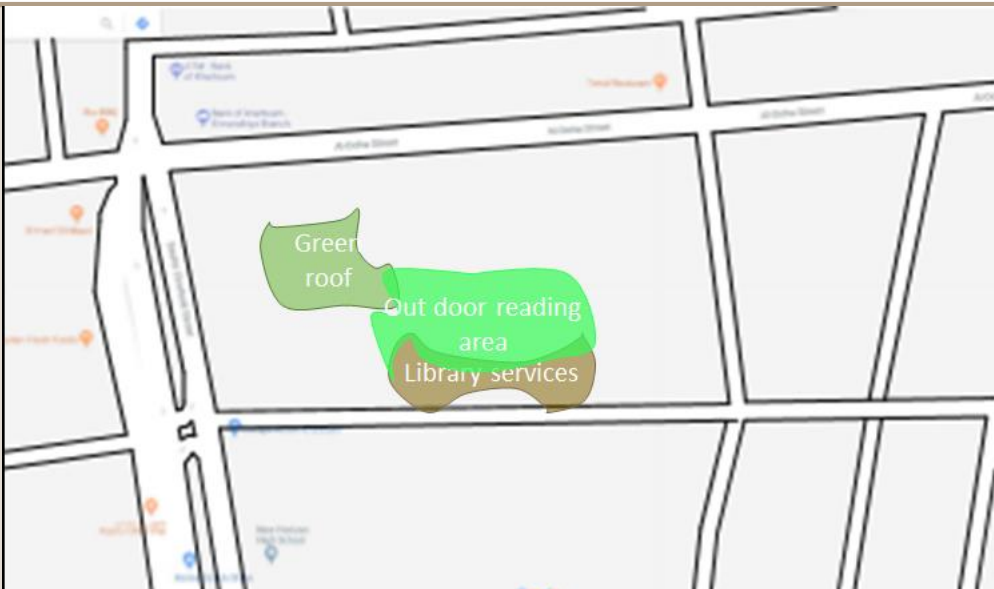


Figure 50: Fifth floor plan zoning

Chapter Four:

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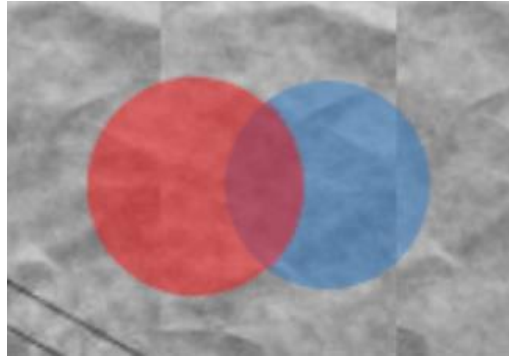
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4-1 Primarily design.

4-1-1 The Concept:

Knowledge gaining dose not only amplifies on reading it has various forms that engages with all of the human senses

Knowledge
From
interactive
media



Knowledge
From
books

Knowledge

Figure 45: The concept

4-1-2 The philosophy:

The library design highly depends on sounds thus it divided to three main sections according to the autistic needs:

- Silent reading and humming area
- Discussions area
- Interactive area

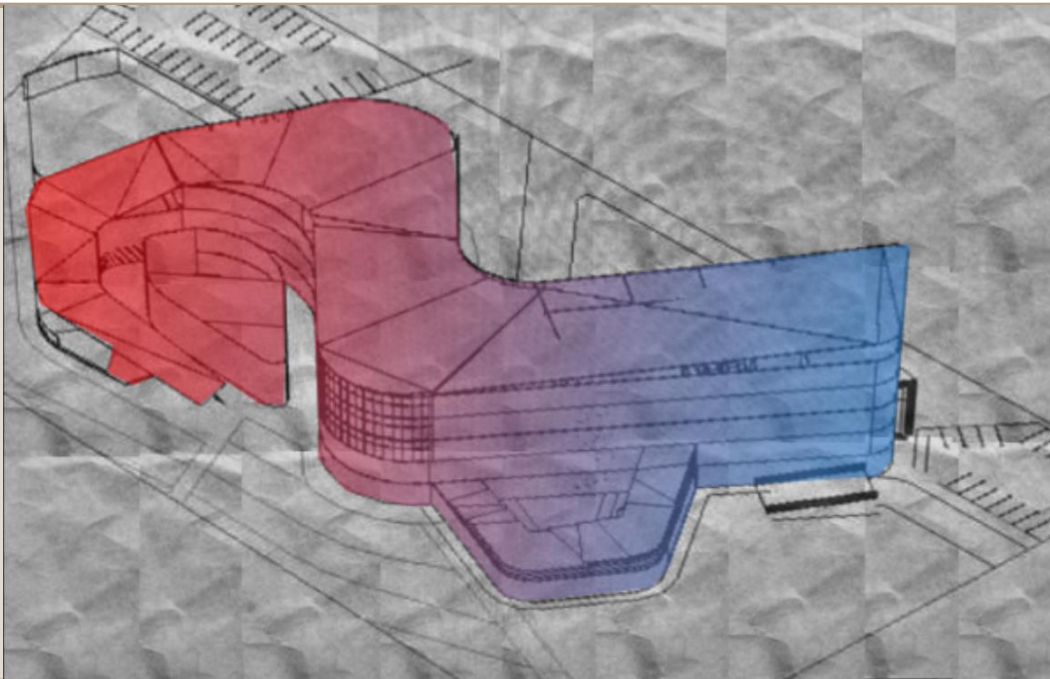


Figure 46: The philosophy

4-1-3 The plans

Ground floor plan:

The ground contains the entrance, reception, administration, general services, children's library vision disabled library, M.P.H and interactive exhibitions

basement floor plan:

Contains library services

First floor plan:

Contains the main library reading hall, outdoor reading, services, the multimedia library and exhibition

Second floor plan:

Contains the main library reading hall, outdoor reading, services, music library and exhibition

third floor plan:

Contains the main library reading hall, silent reading, services and an outdoor stage

Forth floor plan:

Contains study and discussion rooms

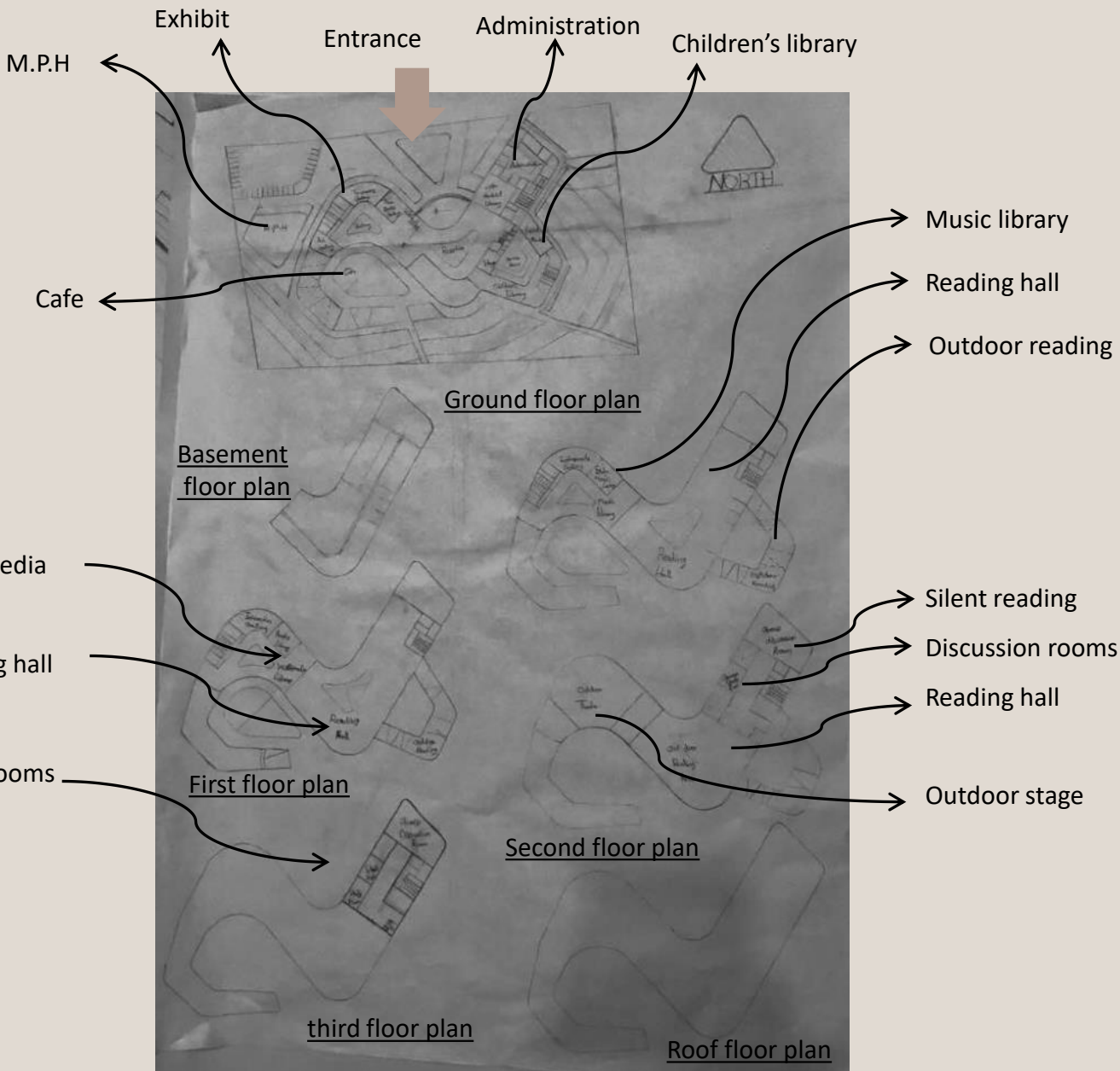


Figure 47: Primarily design plans

4-2 The primarily design developing:

4-2-1 The problems that accorded to the primary design are:

- The weakness of the liner formation of design.
- The mass forming doesn't define the variation of activities .
- Waste areas.
- Interactions in the users movement.
- The reading hall space is not defined, doesn't stand for itself.
- Engaging outdoor activities.

4-2-2 The occurred modification:

- Dividing the building into three masses according to their activities.
- separating and arranging movement corridors
- The perfect usage of spaces
- The reading is more specified
- Adding outdoor stage and various open reading areas.



Figure 48: Site plan (primarily design developing)

4-2-3 Site plan:

The project building is divided to three main masses:

- The Reading section.
- The discussion section.
- The interactive section.

4-2-2 Ground floor plan:

- The main entrance leads to the main library hall and the sub entrance leads to the outdoor interactive activities.
- The ground floor contains the entrance that leads to the main hall which connects the different sections together .
- Each of the reading activities and the interactive ones has indoor and outdoor areas.



Figure 49: Ground floor plan (primarily design developing)

The ground floor plan contains:

1. The main lobby.
2. Bookstore.
3. Indoor reading area .
4. Outdoor reading area.
5. Vision disabled library.
6. children's library.
7. Main permanent exhibit
8. Temporary exhibit
9. General services area.

4-2-3 Mezzanine Floor Plan:

The children's library continues to this floor so does the exhibits and the reading area

4-2-4 First Floor Plan:

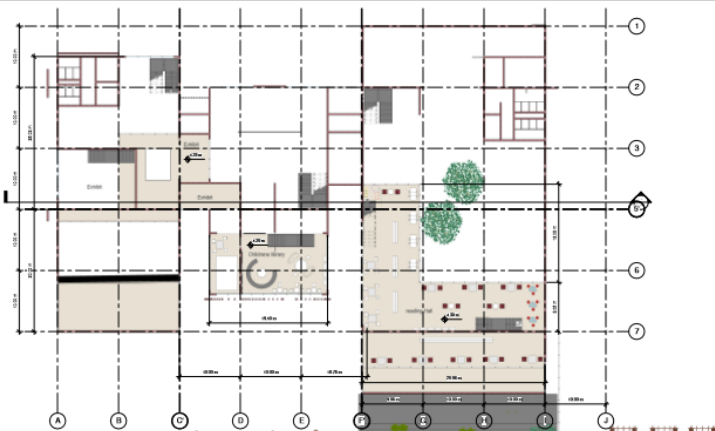
Main reading hall, internet area, outdoor reading area, the blue rooms in the middle mass and the music library in the interactive mass

4-2-5 Second Floor Plan:

Main reading hall with furniture that is less strict to give the sense of coziness and variation while reading, the lecture rooms in the middle mass and the Multimedia library in the interactive mass

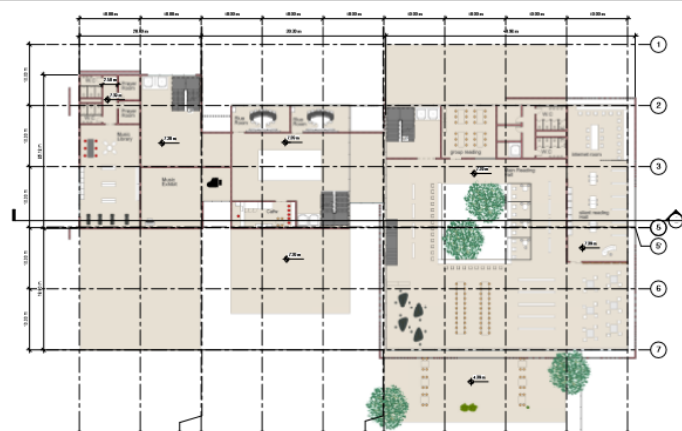
4-2-6 Third Floor Plan:

Main reading hall is connected with an outdoor reading space for more conferring feeling for the reader and combining the indoor and outdoor environment



Mezzanine Floor Plan:

Figure 50: Mezzanine floor plan (primarily design developing)



First Floor Plan:

Figure 51: First floor plan (primarily design developing)



Figure 52: Second floor plan (primarily design developing)



Figure 53: Third floor plan (primarily design developing)

Primarily design developing

4-2-7 Sub Basement Floor Plan:

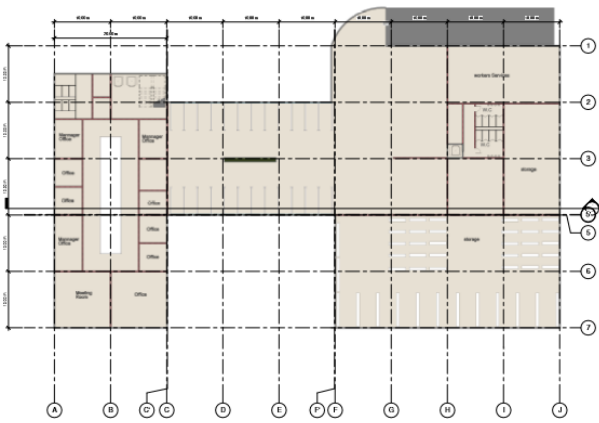
Silent reading hall and general services

4-2-8 Basement Floor Plan:

The administration and its parking's, the workers changing room and the books storages and services

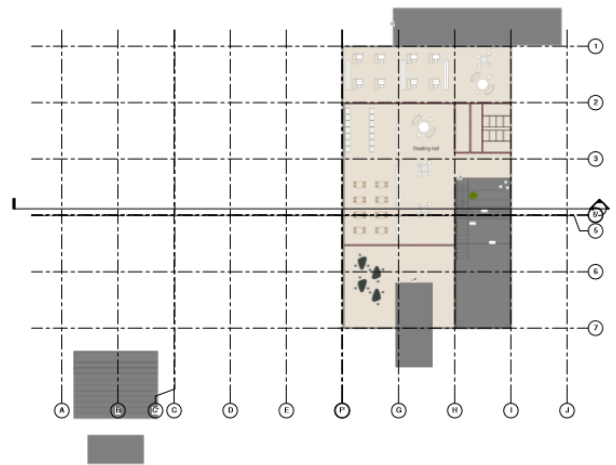
4-2-9 Fourth Floor Plan:

Main reading hall with a liberated furniture which gives more relaxation to the reader and also general services are available



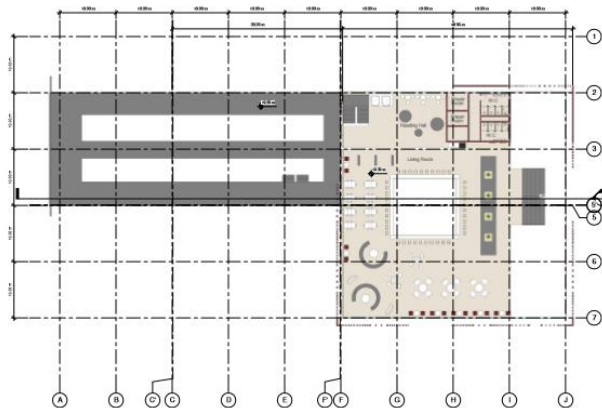
Basement Plan:

Figure 54: Basement floor plan (primarily design developing)



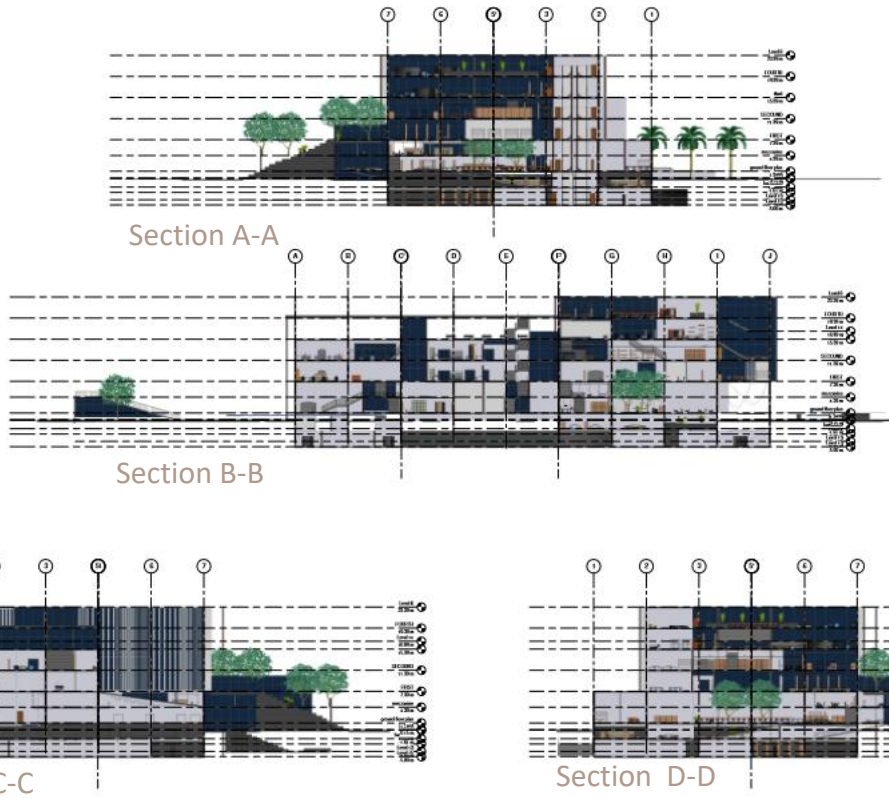
Sub basement Floor Plan:

Figure 55: Sub basement plan (primarily design developing)



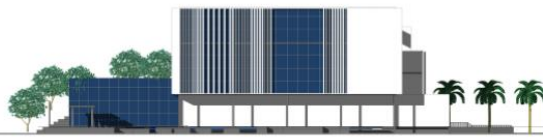
Fourth Floor Plan:

Figure 56: Forth floor plan (primarily design developing)



4-2-10 Sections

Figure 57: Sections (primarily design developing)



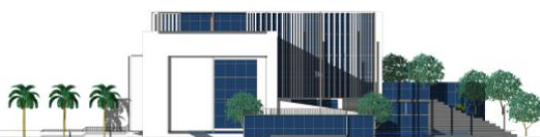
East Elevation



North Elevation



South Elevation



West Elevation

4-2-11 elevations

Figure 58: Elevations (primarily design developing)

Primarily design developing

Site location:
Sudan Khartoum,
almanshya



Figure 59: Location plan
(Developed design)

4-3-2 concept.

Knowledge gaining is not only
by reading it is by all forms of
interacting



Main three libraries zones
according to sounds:

- Reading zone
- Dissection zone
- Interactive zone

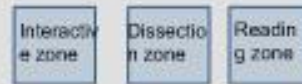
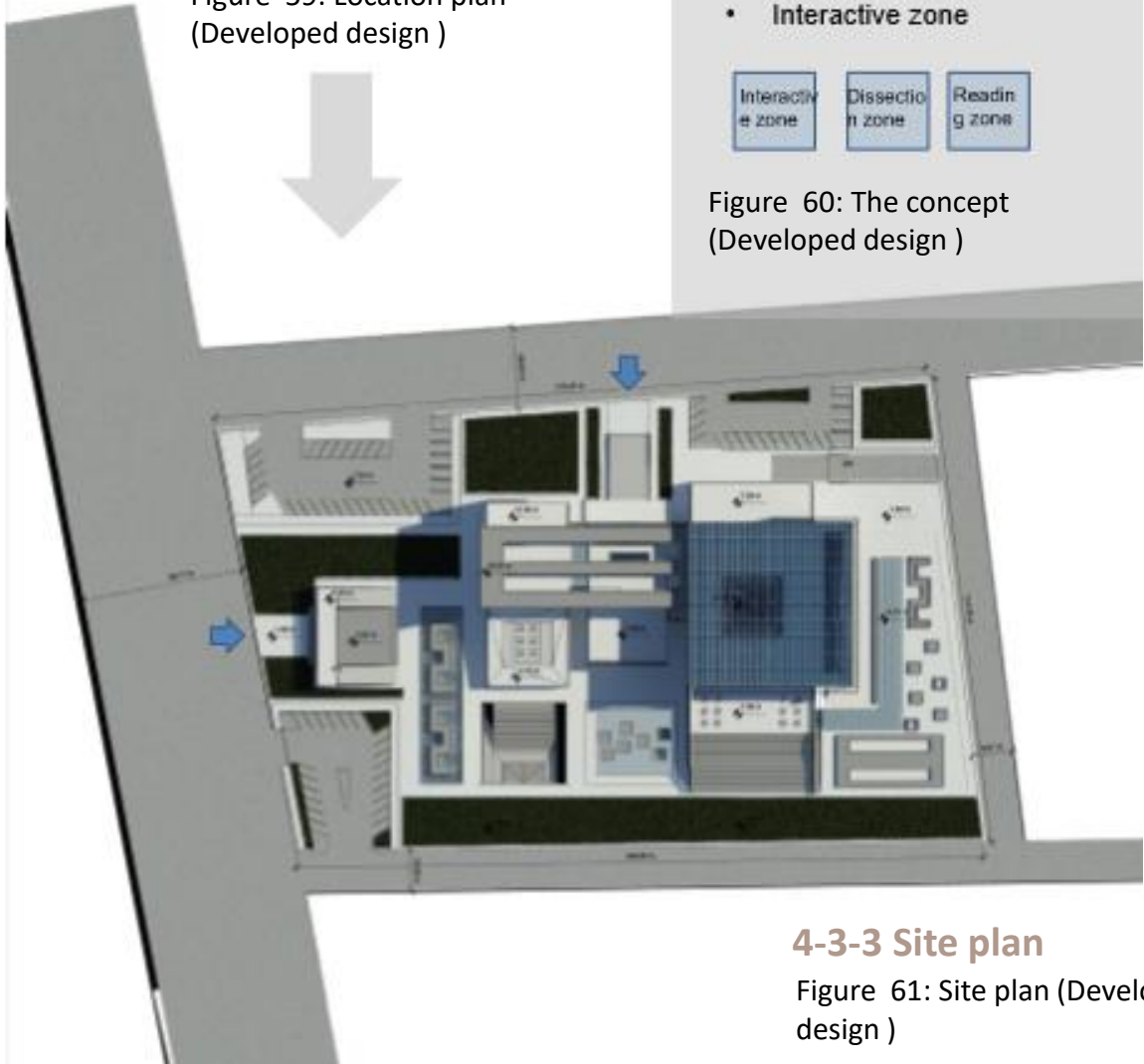


Figure 60: The concept
(Developed design)



4-3-3 Site plan

Figure 61: Site plan (Developed design)

4-3-1 The primarily design developing:

The problems that accorded to the initial design are:

- Waist areas due bad furniture organizing
- Outdated storing system
- Connection between outdoor and indoor activities

The developed design

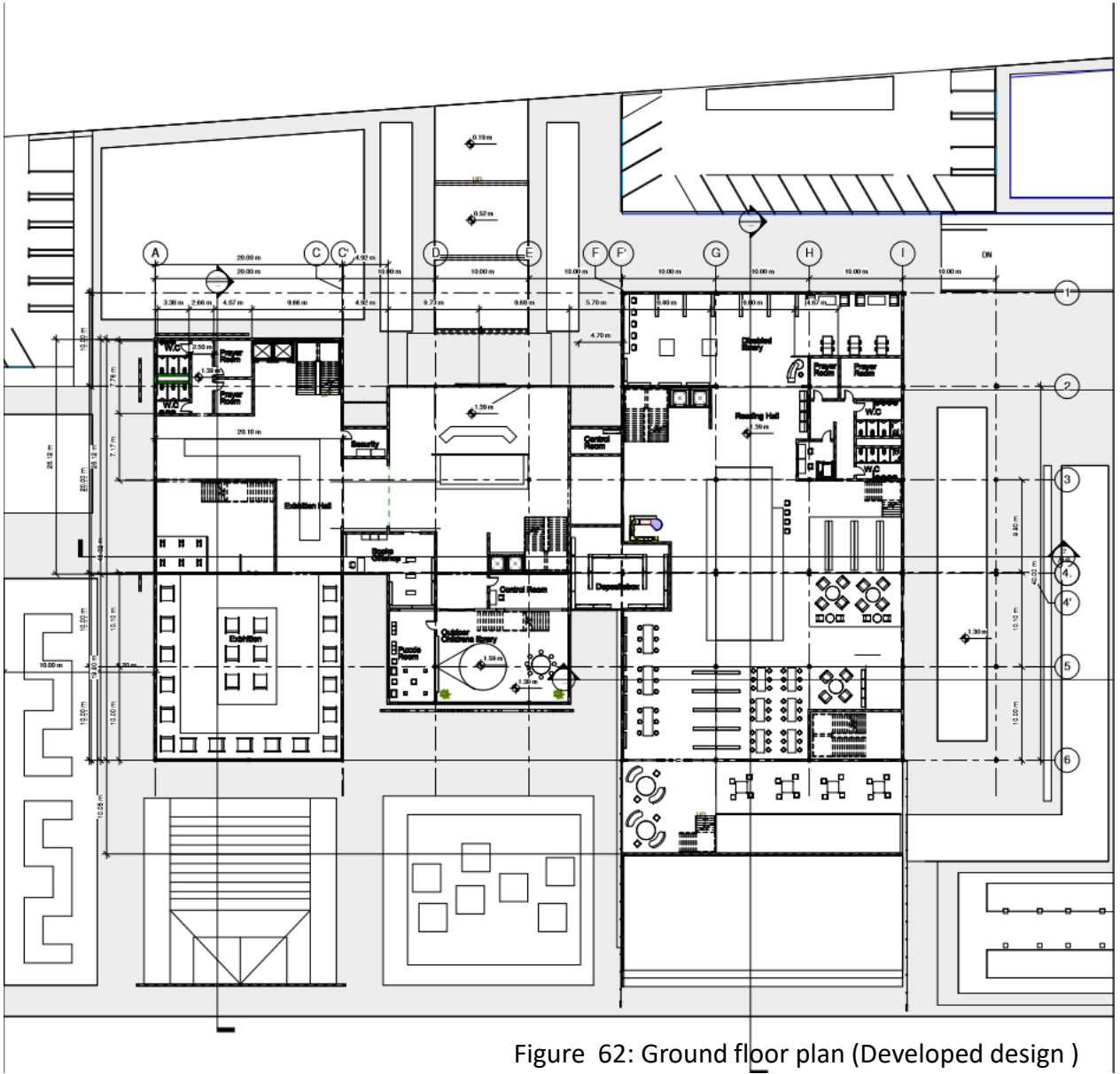


Figure 62: Ground floor plan (Developed design)

4-3-2 Ground floor plan

- Added deposit lockers for the library section.
- Reorganizing the furniture for more beneficial usage of space.
- Developing the main exhibit idea.

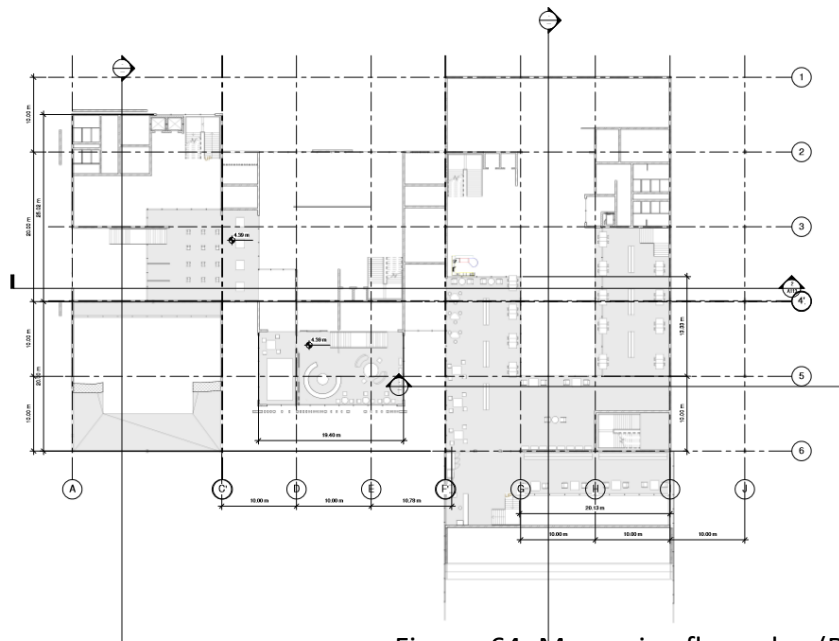


Figure 64: Mezzanine floor plan (Developed design)

4-3-3 Mezzanine floor plan:

- The café and the reading space.
- Children's library.
- Rare books exhibition.

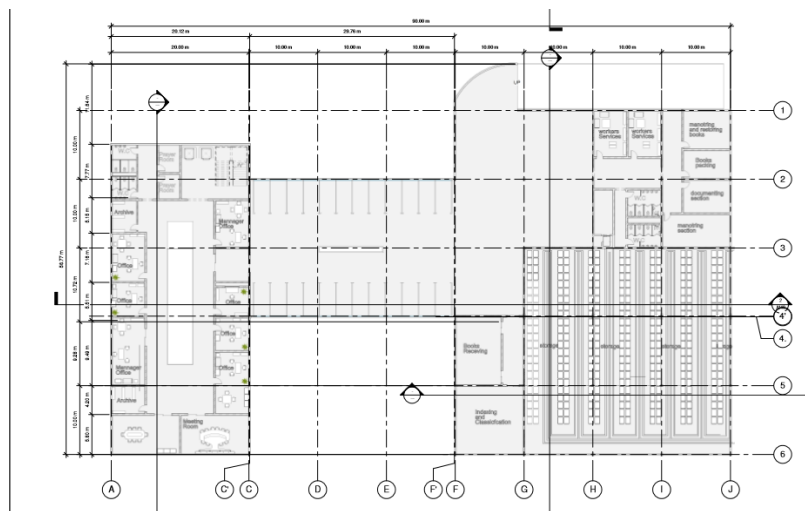


Figure 65: Basement floor plan (Developed design)

4-3-4 Basement floor plan:

- The administration.
- Books services.
- Books storages (storing and retrieving system).

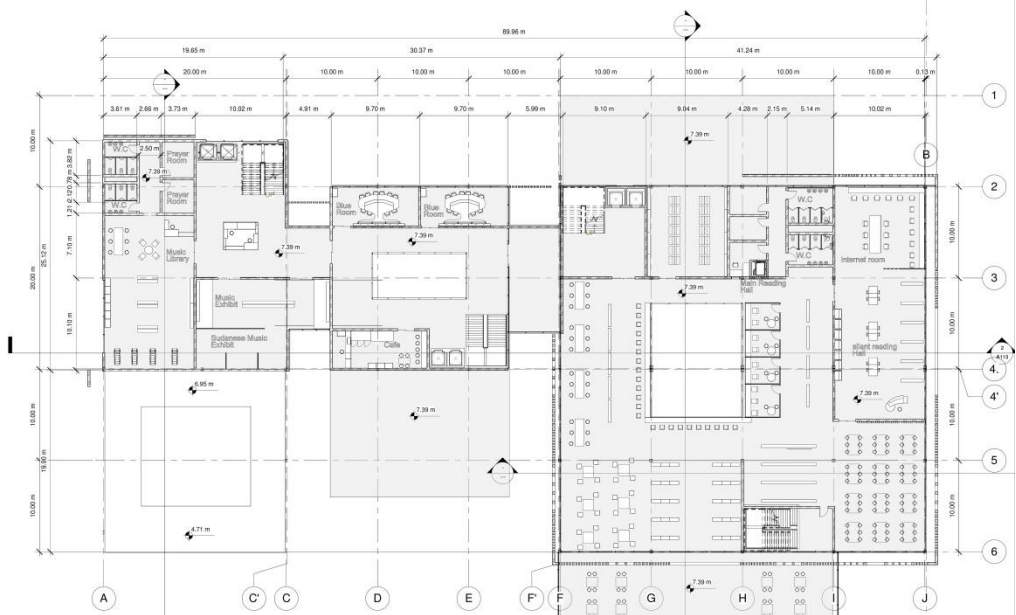


Figure 66: First floor plan (Developed design)

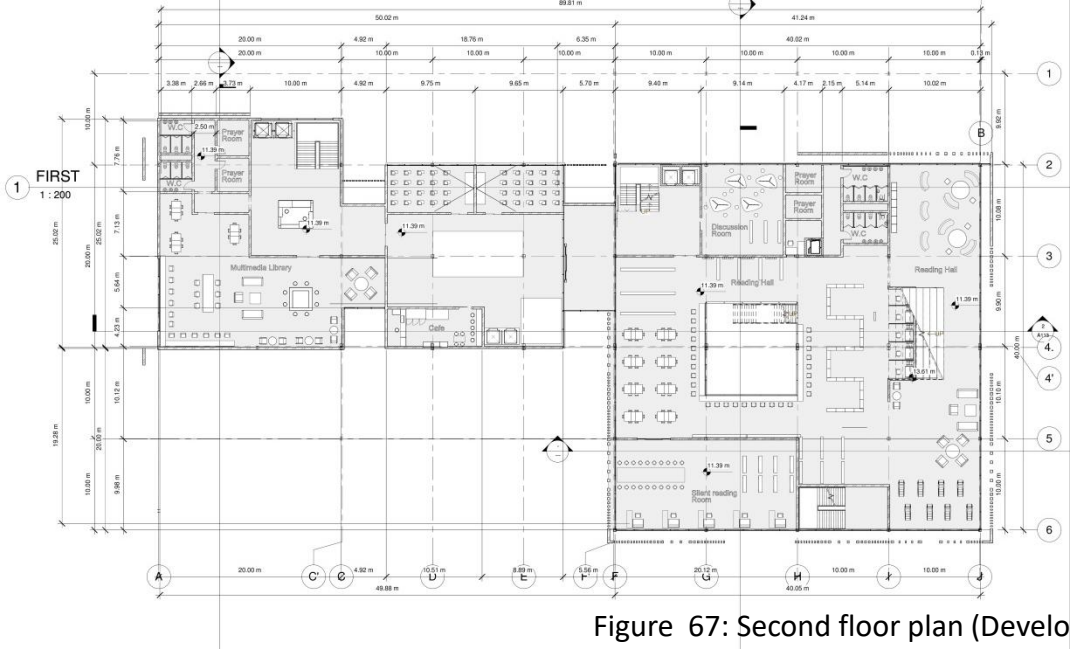


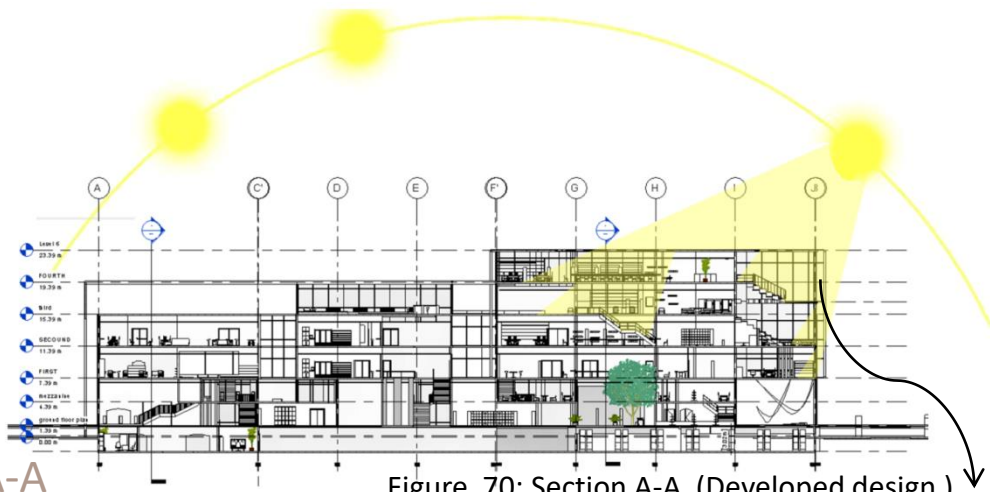
Figure 67: Second floor plan (Developed design)

4-3-5 First floor plan:

- Adjusting the furniture places for the best usage of space.
- Adding books lending space

4-3-6 Second floor plan:

- Adjusting the services area in the interactive building mass
- Adjusting the furniture places for the best usage of space.

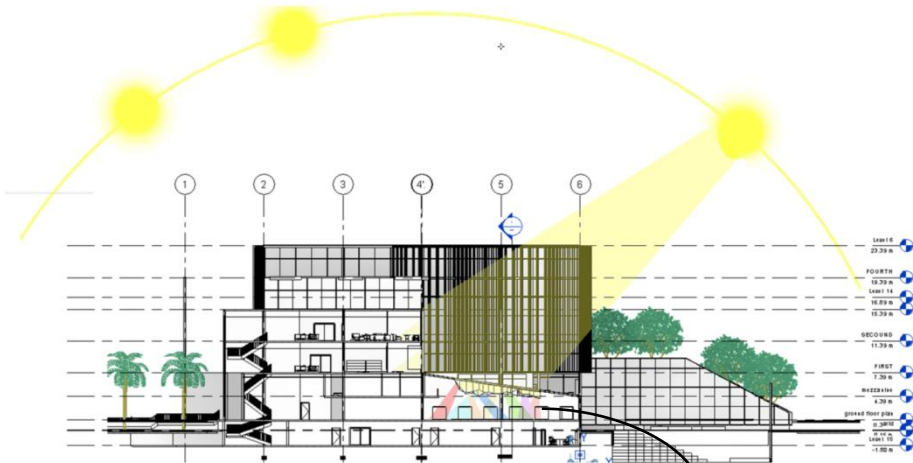


Section A-A

Figure 70: Section A-A (Developed design)

- The building is covered by glazing glass that allows direct sunlight to enter the early morning hours and prevents direct heated rays by the façade that covers the mass

Figure 71: reading step sunlight s view (Developed design)



Section B-B

Figure 72: Section B-B (Developed design)

- Using a unique lighting way in the exhibit by using colored glass with different angles to reflect the light in beautiful colorful way

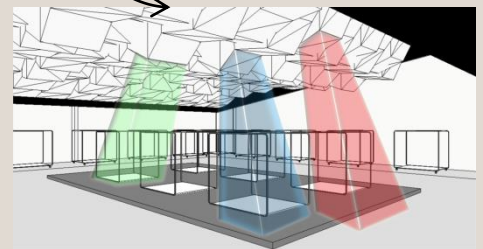


Figure 73: Exhibit light view (Developed design)

4-2-9 Sections

The developed design



North Elevation



East Elevation



South Elevation



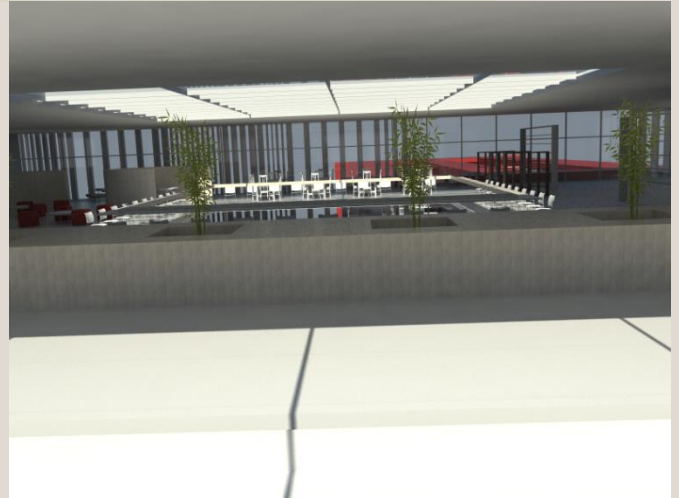
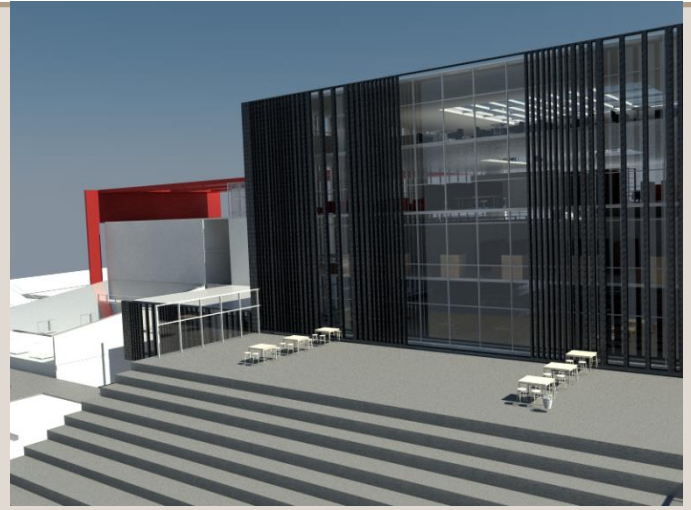
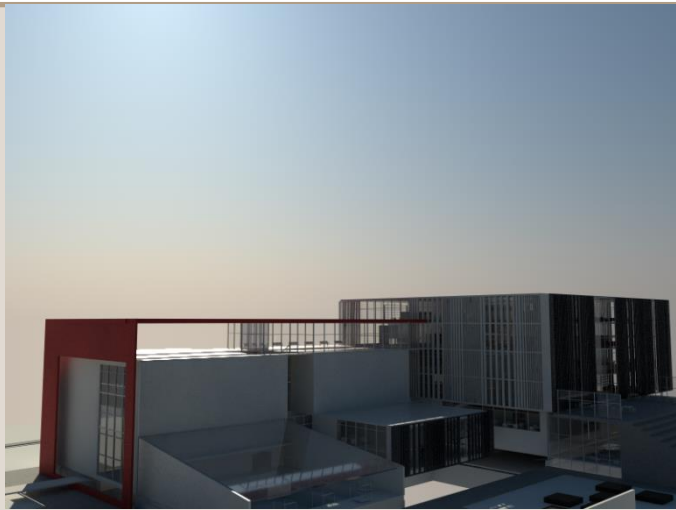
west Elevation

Figure 74: Elevations (Developed design)



Figure 75: Perspective (Developed design)

4-2-10 Elevations
The developed design



4-2-11 perspective and views

The developed design

Figure 76: Perspective and views(Developed design)

4-3-1 The structural system:

Overview :

As for the design of public Library of the flexibility of the interior spaces in addition to the multiplicity of functional spaces of reading halls and exhibitions, you must choose a structural system that features easy internal formation.

- **steel frame system– column and beam is chosen because it is most convenient to the design**

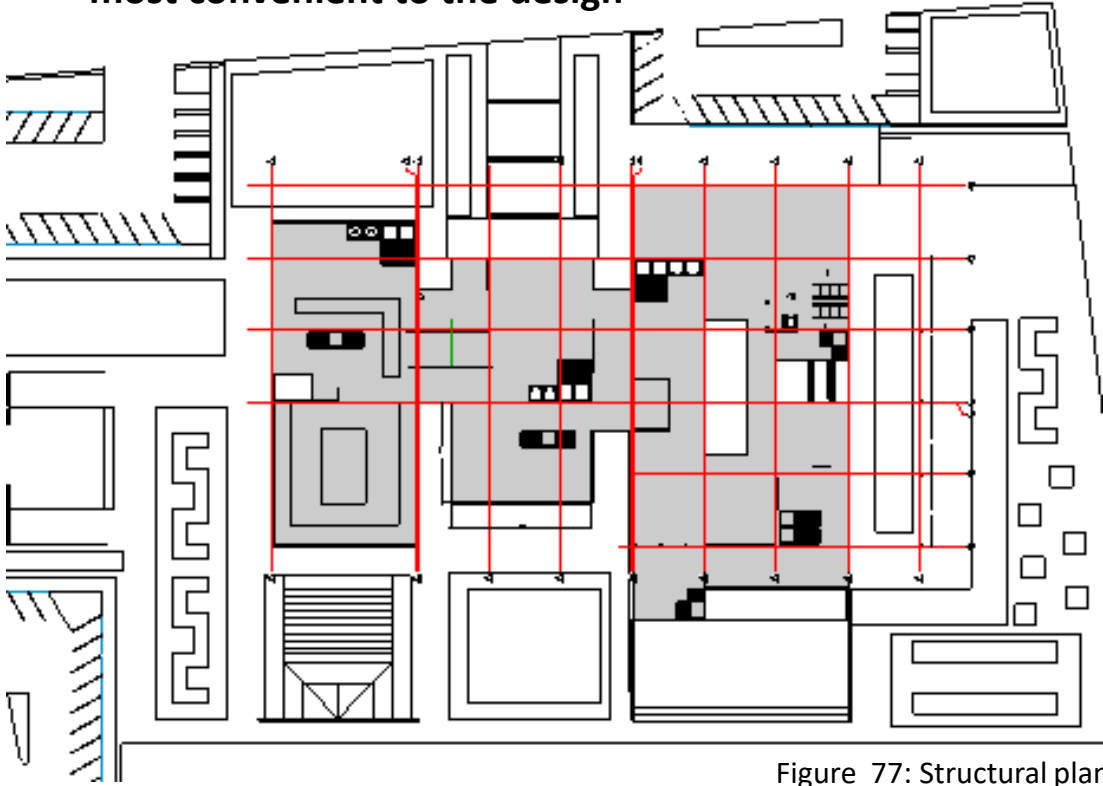
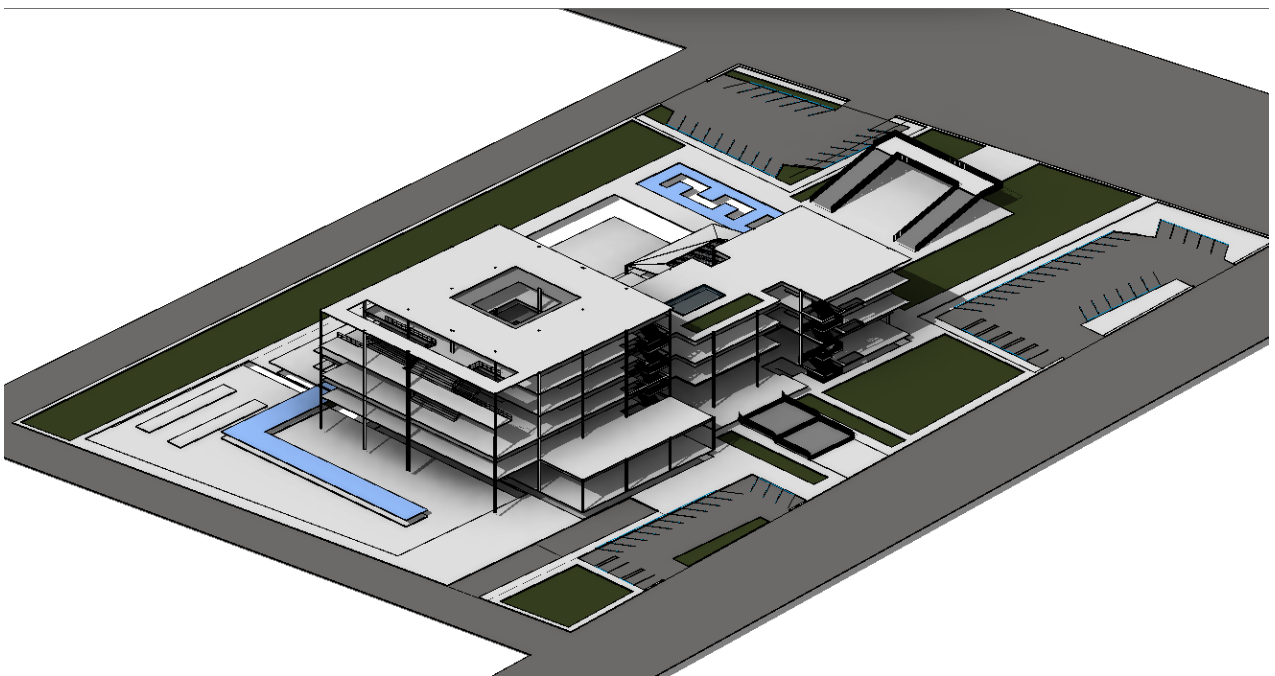


Figure 77: Structural plan



Technical solution:

Figure 78: structural 3D

Foundation:

According to the conditions of soil and the loads on the building the used foundation is Raft Foundation.

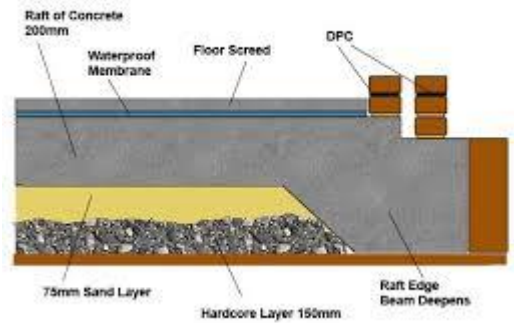
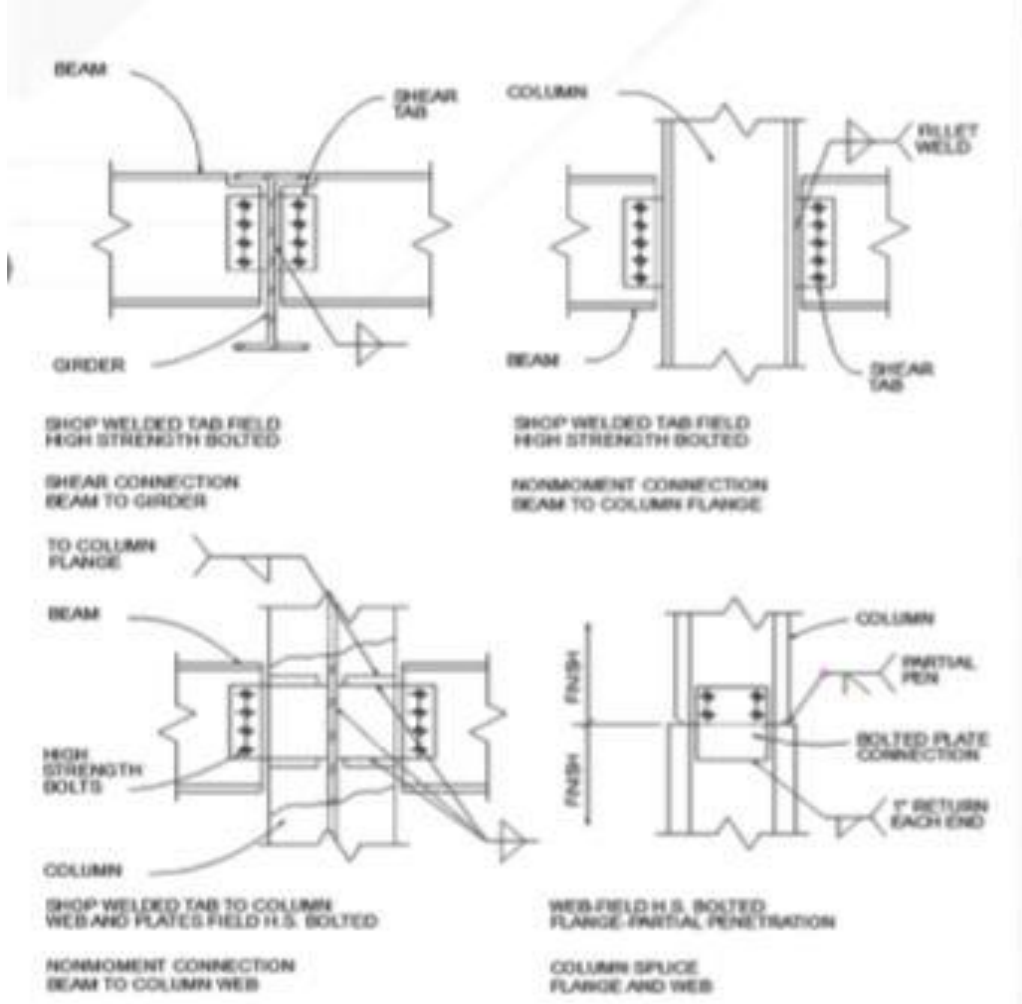


Figure 79: Raft foundation

Columns :

It is the elements that transmit the loads for the foundations and they resist the wind loads.

The various standard sizes of the universal beams are used, these variations due the different loads and the column place.

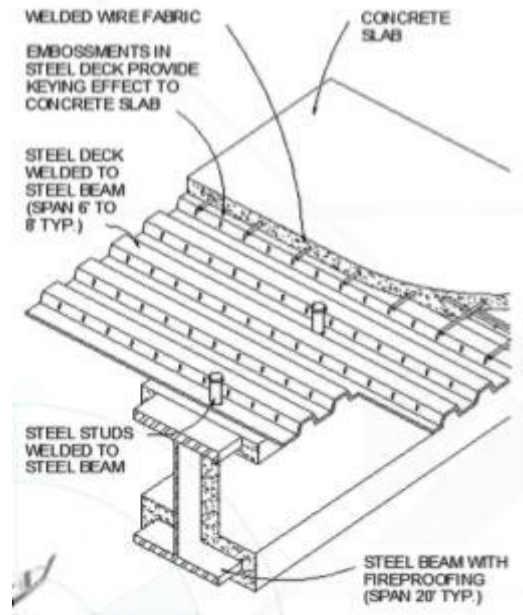


Technical solution:

Figure 80: The Column details

Slabs:

Two way waffle slab is used
 It's a two way ribbed concrete system that can resist high loads in long spans
 And it allows interior ceiling work



Two-Way Waffle Slab

A waffle slab is a two-way concrete slab reinforced by ribs in two directions. Waffle slabs are able to carry heavier loads and span longer distances than flat slabs.

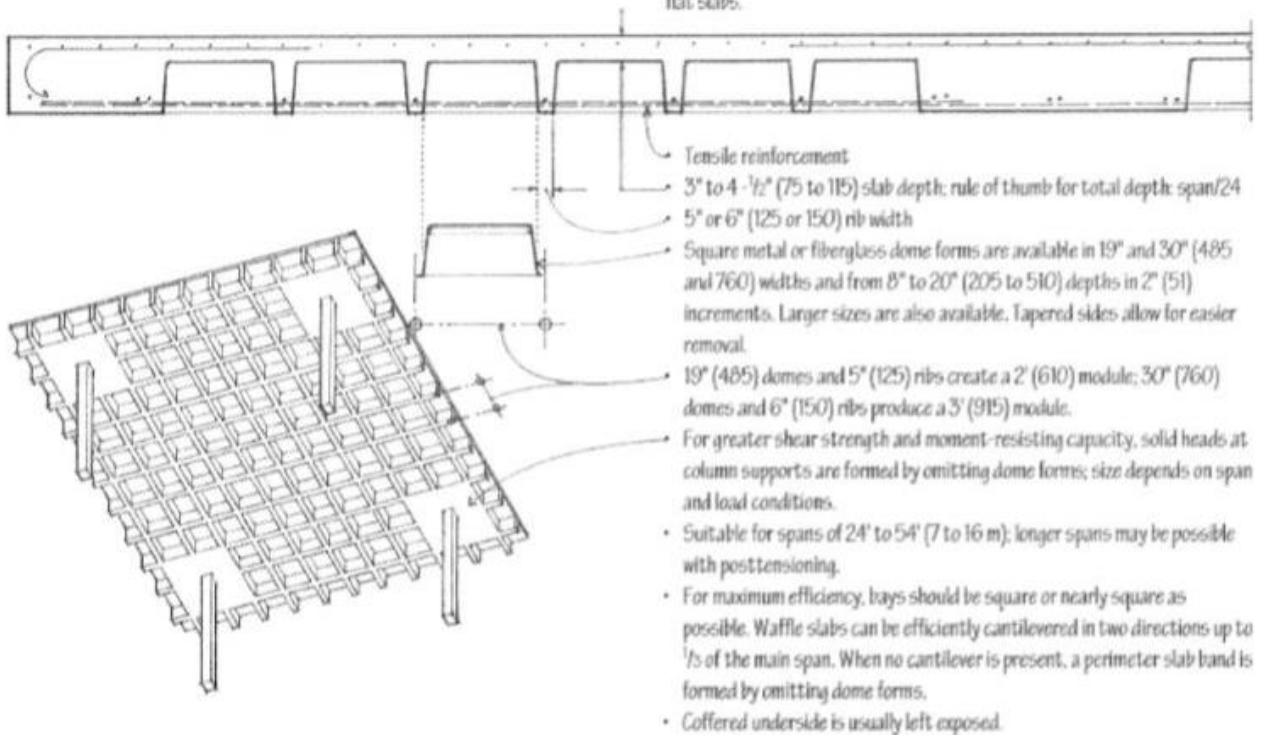


Figure 81: Waffle slab details

Technical solution:

Finishes:

4-3-2 Outdoor finishes:

Landscape Coordinating:

- The plants provide the project with a healthy environment and outdoor green areas for book clubs, discussion and other activities .
- Palm trees to define the entrance, shading trees all over the site and flowering trees and flowers.



Floors and corridors:

- The main corridors were paved with natural granite stone due to the aesthetic shape and the nature of the project, its strength to sustain against friction by the number of users and to match the nature of the project with the surrounding environment.
- Ebony wooden floors are used under the pergolas.

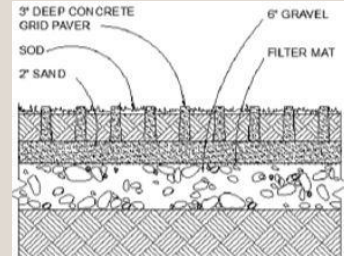


Figure 82: floor slab details

Hardscape Coordinating:

- The use of water elements to create a refreshing environment
- Paved corridors.
- Create different levels for a better connections between activities and separate the ones that needs privacy .
- The use of sunshades with natural climbing plants such as grapes.

Roof finishes:

- The external surfaces of the roofs have been finished with a waterproof insulation layer (DPC 3 layer), in addition to thermal insulation and a layer of foam in a thickness suitable for AC, roof and drainage or concrete slabs 20 * 20
- The component layers of the surfaces vary according to the type of construction of the roof according to the following:
 - Two - way waffle slab.
 - Space frame.
 - Sky light.

Technical solution:

Materials used in finishing:

Floors:

- The luxurious carpet is lined with a rubber lining with light colors in the corridors
- Wood surfaces
- Porcelain tiles 40 * 40
- Concrete slabs 60 * 60
- Ceramic tiles 60 * 60
- Marble 50 * 30
- Ceiling wicker
- A gypsum roof is made of gypsum blocks installed on the pathways of the ammonium, which is anchored to the ceiling by cables
- White thickness 2 cm

Walls:

- Walls for acoustic insulation
- Paints with light colors Type of paint

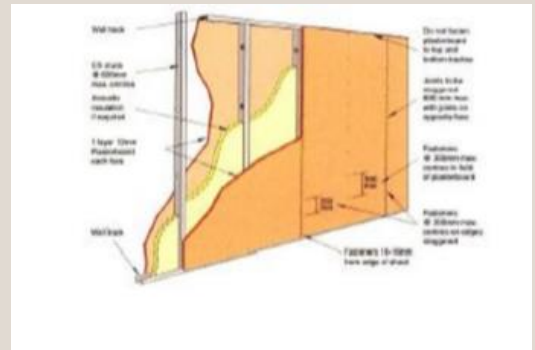


Figure 84: wall details

4-3-6 Lighting Design:

Natural light: -

- The library is designed so that it can benefit from as much natural lighting as possible through the design of interior decorations in a way that allows the natural light to penetrate.
- The building is covered by glazing glass that allows direct sunlight to enter the early morning hours and prevents direct heated rays by the façade that covers the mass.
- Skylight were added for achieving the maximum benefit of the sunlight.

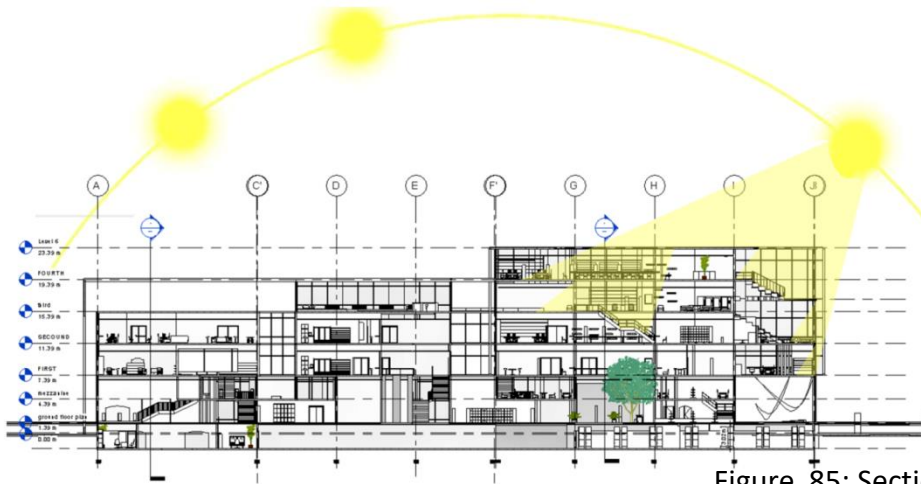


Figure 85: Section A-A for sunlight

- Adding colorful glazing glass structured layer that is oriented into variant angels to give beautiful colorful rays in the main exhibit.

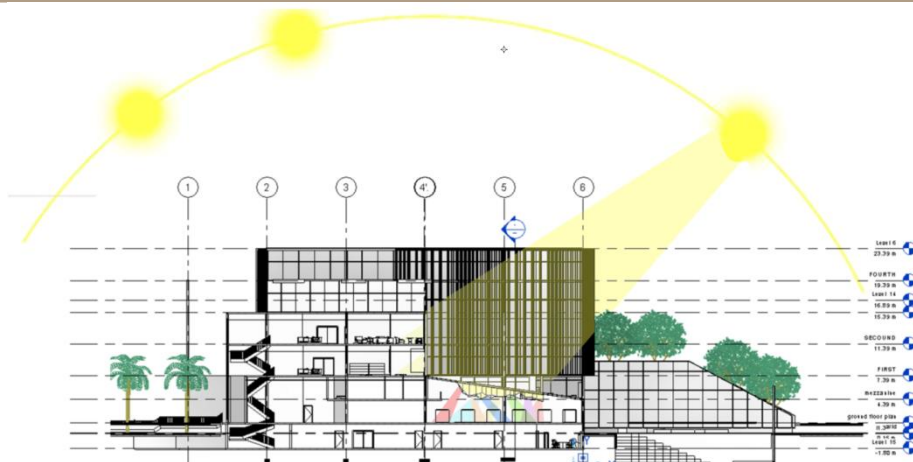


Figure 86: Section B-B for sunlight

Technical solution:

Design of lighting in the library:

Artificial lighting:

- The needs of lighting for the various spaces of the library vary in quantity, quality and location depending on the work carried out in the vacuum.
- The public reading Hall differs from the reading rooms of the media and the electronic halls, in order to differ the material in order to differ the material presented in the reading books in the reading rooms for display screens, pictures, Reference services, loan areas, entrance, general group areas and other complementary spaces. The different needs for lighting in the library can be summarized in the following table:

Space name	Optical requirement (wax / square feet)	Type of light
Reading areas	50-30	Use of different lighting levels depending on the nature of the reading material and the use of target light
General group areas (open shelves)	70-55	Use light sources in parallel to shelves and use spotlight
Entrance area	100	The use of lamps of aesthetic nature and it is advisable to take advantage of natural lighting
Lending area	60-50	Use of spotlight as well as indirect alveolar lamps
Services area	60-50	Use of spotlight as well as indirect alveolar lamps
Multimedia area	30-20	Avoid focusing the natural and artificial lighting on the screens
Offices and workplaces	150-20	spotlight

Technical solution:

4-3-7 Design of Acoustics in the library:

- Acoustics are an important factor in the internal environment of the libraries. It is necessary to provide a suitable reading environment that is characterized by calmness.
- in addition to the multiplicity of sources of noise caused by users, mechanical devices, elevators, writing machines, computers and others Therefore, the internal sound of the library must be controlled by selecting the appropriate materials that absorb as much sound as possible.
- in addition to the use of sound insulators in areas requiring Here are some basic aspects that have been designed in the reading rooms.
- The stairs and elevators were completely isolated with acoustic insulators of glass fibers and rubber Brushes of thick-moving areas with carpets and a layer of rubber to dampen movement sounds.
- The finishing materials were selected with optimal absorption factors to minimize the sound reflection.
- Use the "Two way waffle slab" system to form geometrical shapes with depth in the roof, resulting in dispersing sound.
- increasing reflections and absorbing as much sound as possible.
- Use absorbent materials for the roof Isolation of adaptive systems and mechanical systems.
- The use of hollow pebbles and sound absorbent materials in places where activity is expected to be as annoying as exhibitions.

4-3-8 electricity supply

The main line that supply the electricity in the site is located in the southern-east side of the site "the main street ".

The electric current is 33 kilo volt the moment of entering the site.

The electric current exposed to lowering in the value to 11 kilo volt by the adapter. And then to 415 volt, the electric current gets distributed to the main control panel.

There is a switch key that transfer the electric current from the generators when there is a blackout.

The exterior lightings are designed to work automatically by the solar panels.

Each building on the site has its own electric panel which is connected to the main panel

Technical solution:

4-3-9 Water supply systems:

Calculation of the quantity of water required: -

Quantity of required water = daily water use + fire fighting water

Daily use water = consumption of users + irrigation of gardens

Of daily water use.

Consumption of theaters and galleries

= 5 gallons per day

Consumption of readers and library users

= 15 gallons per day

Consumption of workers and managers

= 15 gallons per day

Total consumption = Number of users * Daily consumption

Theater users and galleries are 6700 people

Library users and reading rooms 1650

Workers and administrators 600

Total consumption of the day = $(6700 * 5) + (1650 * 15) + (600 * 15)$

= $33500 + 24750 + 9000$

= 67250 gallons per day

$67250 * 4.4 = 295500$ liters

Irrigation of gardens

Each square meter needs 5 liters per day

Total green area 5119.05 square meters

Consumption of garden irrigation = $5119.05 * 5 = 25095$ liters per day

Total Daily Consumption = 320595 liters

Table 1. Design criteria for daily water requirements based on building occupancy. Source: Building Officials and Code Administration (1990).

Type of occupancy	Minimum quantity of water per person per day in gallons (or as indicated)
Small dwelling and cottages with seasonal occupancy	50
Single family dwellings	75
Multiple family dwellings (apartments)	60
Rooming houses	40
Boarding houses	50
Additional kitchen usage for nonresident boarders	10
Hotels without private baths	50
Hotels with private baths (2 persons per room)	60
Restaurants (toilet and kitchen usage per patron)	7 to 10
Restaurants (kitchen usage per meal served)	2 1/2 to 3
Additional for bars and cocktail lounges	2
Tourist camps or trailer parks with central bathhouse	35
Tourist camps or mobile home parks with individual bath units	50
Resort camps (night and day) with limited plumbing	50
Luxury camps	100 to 150
Work or construction camps (semipermanent)	50
Camp (with complete plumbing)	45 (Ind.w.s.)
Camp (with flush toilets, no showers)	25 (Ind.w.s.)
Day camp (no meals served)	15
Day schools, without cafeteria, gymnasiums, or showers	15
Day schools with cafeterias, but no gymnasiums or showers	20
Day schools with cafeterias, gymnasiums and showers	25
Boarding schools	75 to 100
Day workers at schools and offices (per shift)	15
Hospitals (per bed)	150-250
Institutions other than hospitals (per bed)	75 to 125
Factories (gallons per person per shift, exclusive of industrial wastes)	15 to 35
Picnic parks [toilet usage only (gallons per picnicker)]	5
Picnic parks with bathhouses, showers and flush toilets	10
Swimming pools and bathhouses	10
Luxury residences and estates	100 to 150
Country clubs (per resident member)	100
Country clubs (per nonresident member)	25
Motel (per bed space)	40
Motels with bath, toilet, and kitchen range	50
Drive-in theaters (per car space)	5
Movie theaters (per auditorium seat)	5
Airports (per passenger)	3 to 5
Self-service laundries (gallons per wash, i.e., per customer)	50
Stores (per toilet room)	400
Service stations (per vehicle serviced)	10

Figure 87: Daily water requirement

Technical solution:

Specification of water tanks:

Material:

Polyethylene with layer of light insulator and anti-bacterial layer

Capacity:

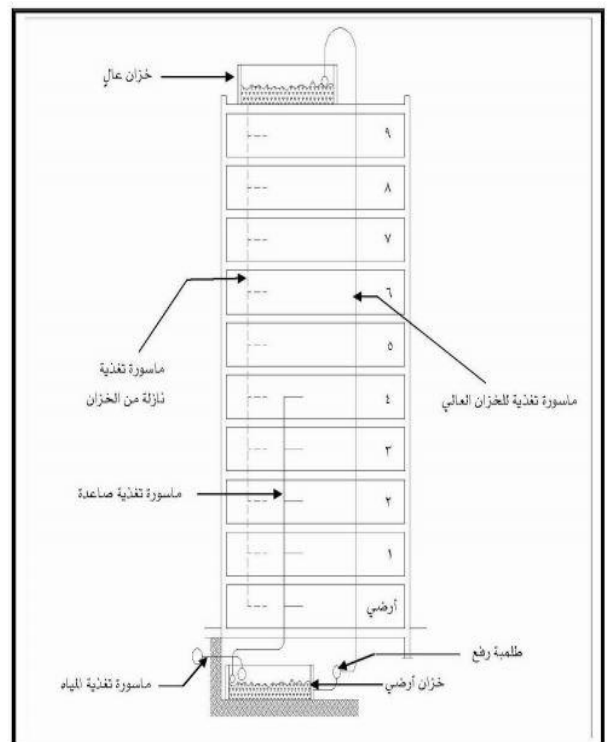
The main ground tank

- Ground tank capacity is 600,000 liters of water reserved backup for 3 days.
- Recycled water ground tank
- 300,000 liters water tank for the irrigation of the gardens
- Upper tank for building water supply
- There are 3 upper tanks with a capacity of 8000 liters to cover 50% of requirement daily water

Building Water supply system:

The supply system is from the pressure of the public network with the pressure of tanks

In this system, the water pressure in the public network is used to feed the first floors. At the same time, the ground tank is filled with water and the water is controlled by a buoy. Then the water is pumped to the tank located at the top of the building by means of a lifting pump connected to a main feeding pipe. in the upper floors water is pumped into all the building's roof There are three sets of upper tanks that gives the supply units for distributing water between the two sides of the building which is supplied from the ground tank



التغذية بتجميع ضغط الشبكة و ضغط الخزان و الرفع بطلمبات للخران العالي من خزان أرضي و تغذية الأدوار المنخفضة بضغط الشبكة

Figure 88: water supply system

Technical solution:

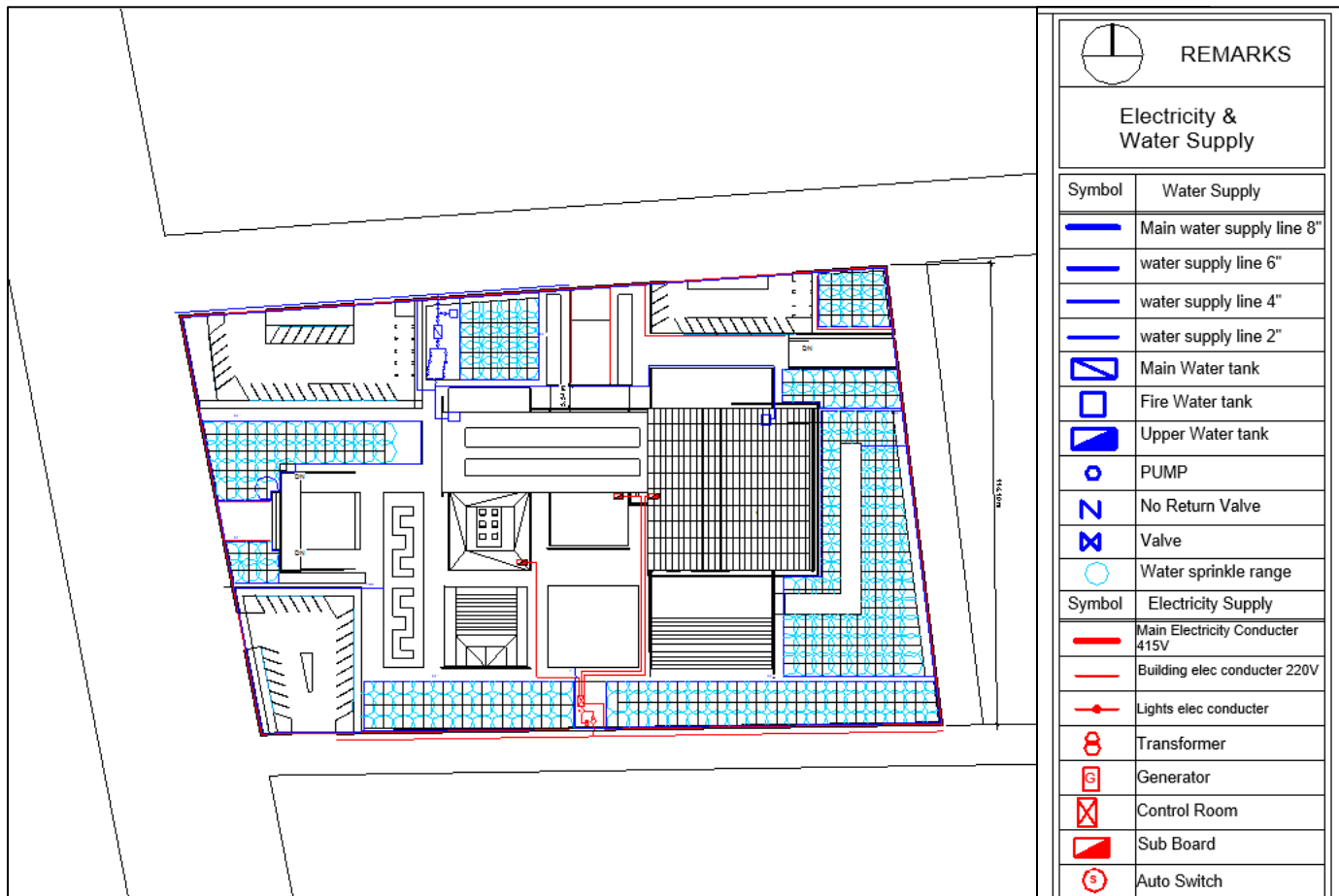


Figure 89: water supply site

4-3-10 water supply site.

4-3-11 Sewage and Surface Systems

Sewage :

- The system is by connected man halls that drops on a septic tank then the well on the east and the other on the west.
- The sewage pipe is sloped by 1:6 and the main pipe diameter is between 5" to 3".
- The two pipes system is used for the sewage of the bathrooms to get rid of the smell and to make sure that the pipes don't get close, by helping to maintain the air pressure inside of the pipes, then the waste is transferred into the lines where it goes through the manholes till it reaches the main sewage line that is surrounding the building.

Technical solution:

Surface draining water:

Draining the water from the roofs of the buildings from the rain is done by slope of 1:100 directing the water towards the down pipes placed inside the ducts of the buildings which will affect the elevations and so on. The water will then be drained towards the landscape of the project then the angle of the landscape will take it outside.

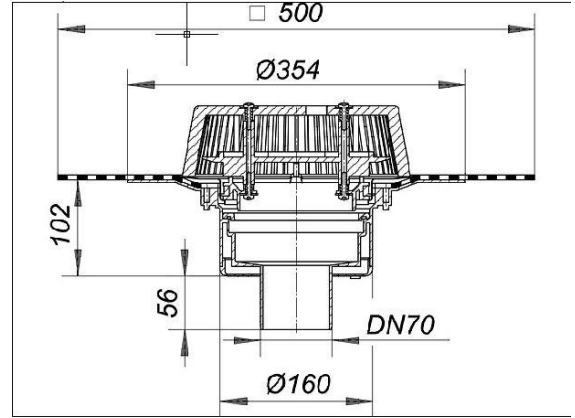
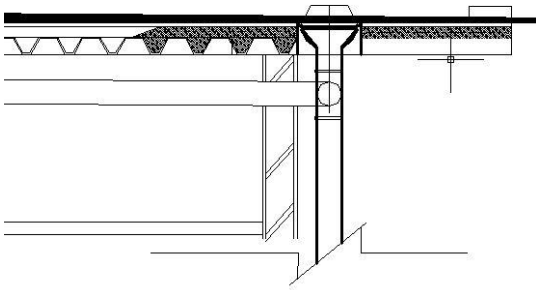
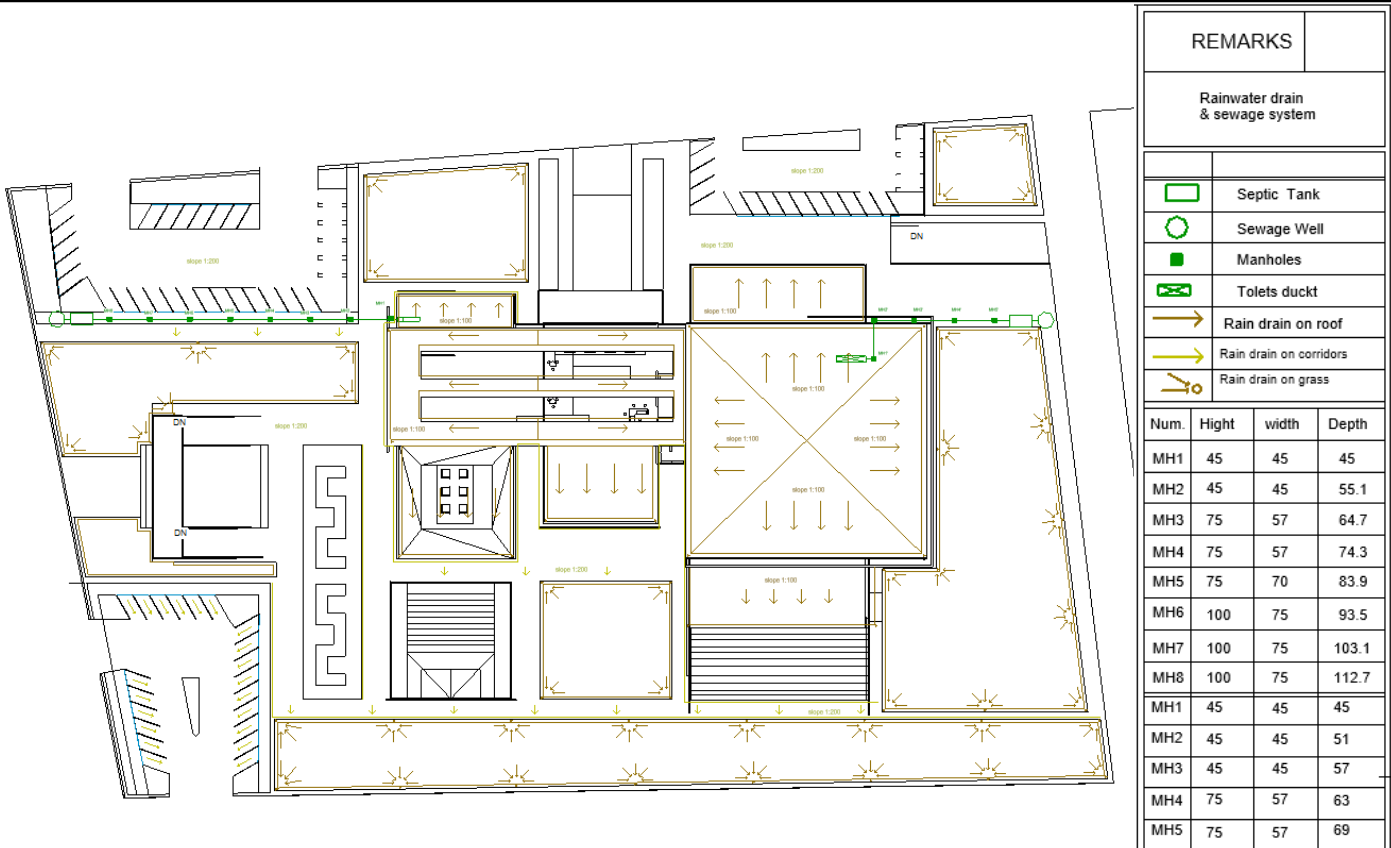


Figure 89: water supply site



4-3-12 Sewage and draining water Site Technical solution:

Figure 91: Sewage and draining water site

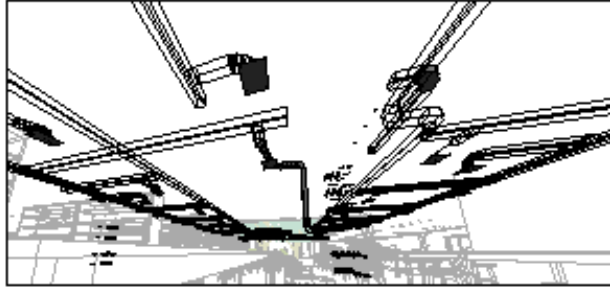
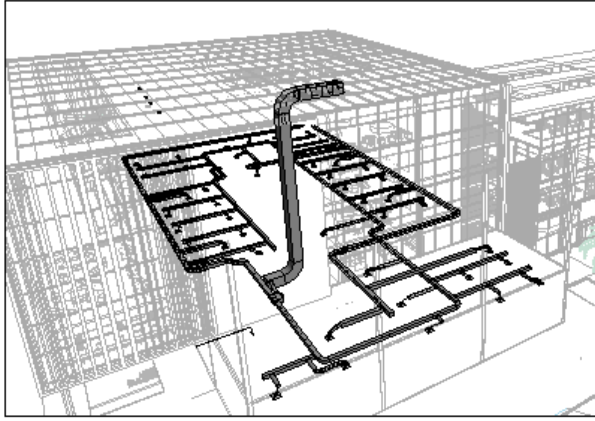


Figure 94: Air conditioning perspective

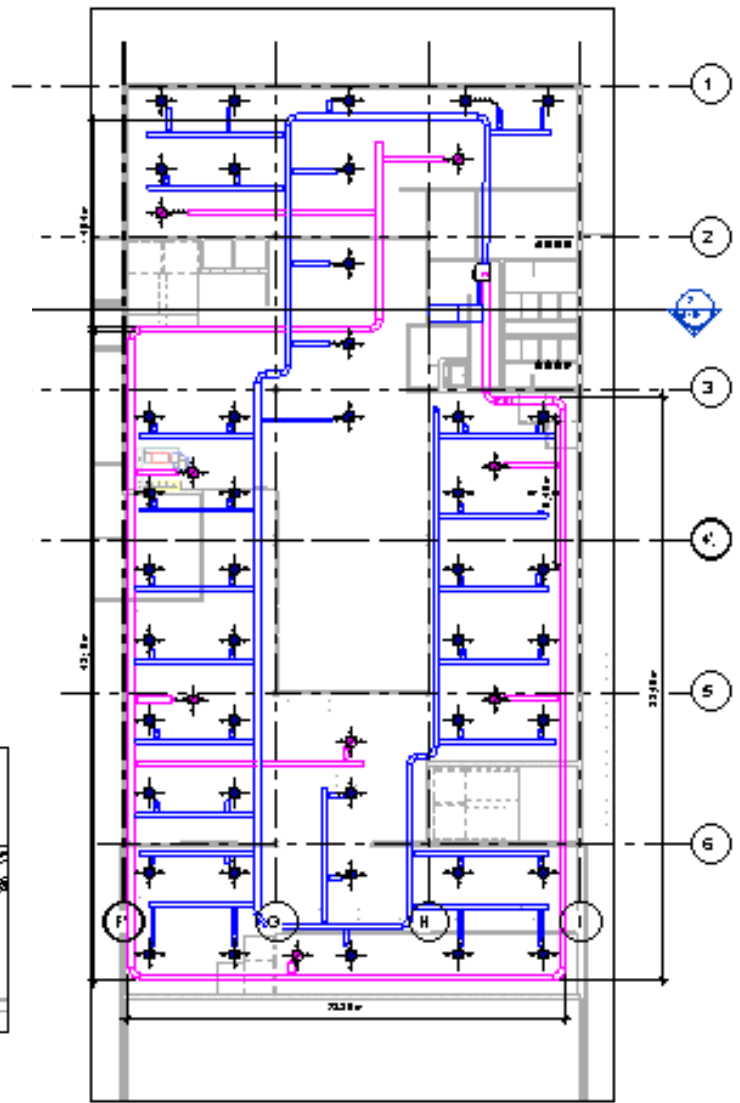


Figure 93: Air conditioning plan

4-3-14 Air conditioning plan



Figure 95: Air conditioning section

Technical solution:

4-3-14 Firefighting system:

Sprinklers system.(GAS)

Reasons behind choosing this system:

- The project consists of main buildings with some scattered units.
- It has an ordinary level of hazard.
- Spaces are divided into: storage, reading hall, offices and galleries .
- In case a fire took place the materials that would catch fire are divided into: carbonic solid materials, electrical equipment
- The building go higher than 3 floors

After keeping the above points in mind, the firefighting system should have the following stuff in it :

- having fire blankets in the workshops.
- using co2 and dry powder to put down the fire so it doesn't affect the electrical equipment.
- the use of sprinklers is a must because of the height of the building plus putting hand held fire extinguisher inside of the spaces too where they are put beside of the door of each space.
- each sprinkler will cover 8 square meters.
- for the fire detecting an ionic detector is put in the storage areas to detect the smallest sigh of fire in them.in the offices and classrooms a smoke detector is needed. And in the cultural building smoke detector are put there too.

4-3-15 Fire fighting system plan

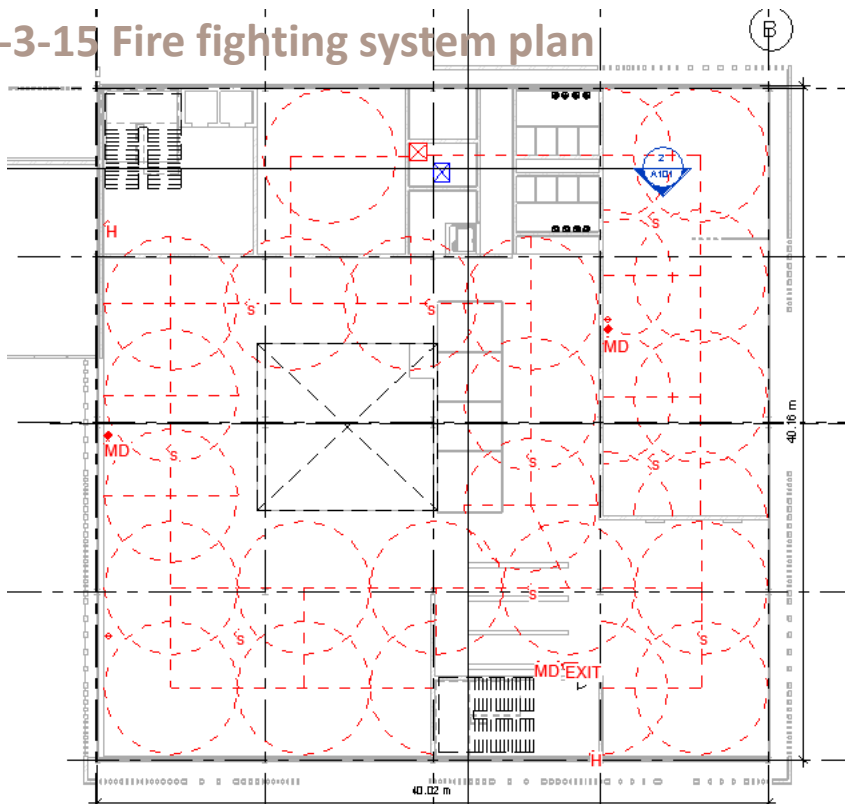


Figure 96: Fire fighting system plan

Technical solution:

4-4 References:

- Time saver for building type 2nd edition by joseph de Chiara & john calendar
- Neufert Ernst & peter- Architecture data 3rd edition
- Ministry of national planning in Khartoum
- Architect's Handbook
- Google
- Wikipedia
- Archdaily
- <https://www.wbdg.org> whole building design guide
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