

جامعة السودان للعلوم و التكنولوجيا

كلية العمارة و التخطيط

قسم التصميم المعماري

السنة الخامسة بكالوريوس

بحث تكميلي لنيل درجة بكالوريوس العلوم في العمارة من

جامعة السودان للعلوم و التكنولوجيا

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# PREFACE

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The house of architecture is a form of hub for all architects, architectural students and people interested in architecture in general; an international forum to discuss the culture of architecture. The house of architecture greatly believes in how past can perform the present in terms of new development, the creation of better quality neighborhoods, buildings and public spaces across the country, developing greater public understanding of architecture, design and public spaces, nurturing innovation, developing work and advocating the importance of architecture, rethinking and reimagining our built environment and everyday surroundings and bonding between culture, community and place, working with local communities, young people and schools. This project may seem mainly as an exhibition, however it's essential that the building itself reflects a strong architectural statement, housing architecture in architecture. The house of architecture also assists in orientation of potential future architectural students and aims to encourage competitions between architects and students by hosting prize winning contests, in order to raise more qualified architects, leading to the country's nourishment.

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# ACKNOWLEDGEMENT

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*Quote: I believe that architecture has the power to inspire, to elevate the spirit, to feed both the mind and the body. It is for me the most public of the arts. (Richard Meier, 2001)*

**T**hroughout the history, the original purpose of architecture was providing a human shelter; protecting against cold, heat, storms etc. with shelter being provided, humans start to seek ways to make their homes more private and comfortable. Therefore the architectural purpose was extended to cover more of life aspects.

Overtime architecture starts to deal more and more with additional aspects of life. For instant ; sustainability , planning, landscaping etc. while the original of architectural purpose throughout history ( providing shelter and privacy) exceeded the basic human needs to become means of representation and communication of cultural identity.

In modern times, the architectural process became more and more elaborated. Not all people know that behind any architectural work lays a long design process, and through designing, the final product passes through different stages before reaching its final form. Any attempt to interpret and display architecture therefore will be dishonest, if it stays outside the scope of designing process and experience.

### *A House:*

The word house has a variety of meanings, for instant, an establishment whether actual as a pub, or virtual as a website, or more rarely a room or a building in which a deliberative assembly normally meets. To clarify even more, a house is a place to gather in which is a perfect name for a space where architects, students and people interested generally can feel comfortable in.

The house of architecture is an opportunity to form an architectural experience that illustrates the complexity of the architectural design process and it phases for the public, providing them with an underlining quality and sustainability aspects of architecture all within a civic environment, with spaces for social and public activities.

### *Exhibiting Architecture Architecturally:*

Architecture exhibitions could be one of the most important means to communicate Architecture, like any paintings and sculpture Architecture has often been represented pictorially (in frames) or in display cases, where the focus is on the product rather than the process. Unlike exhibitions with fine art, traditionally

architectural exhibitions cannot show completed works and a shift in focus should take place from product to process in the display strategies.

**Let us start with the difference between Architectural and Art exhibitions:**

An art exhibit presents objects which are art itself. An archaeology or natural history exhibition, for example, can revolve around a tool fragment or fossilized remain of an animal and through it, rebuild his history. In practice, all exhibits of all areas present challenges because they need objects to use as starting points from which they can build interpretations and definitions. There seems to be a detail that differentiates the concept of an architectural exhibition from other kinds, such as arts, natural science, industry, technology and so forth. It is a prerogative that any exhibit in an enclosed space should communicate with its visitors by means of their objects. As mentioned above, art exhibits can expose objects or pieces which are 'art itself', whereas architectural exhibits usually present the products of the project phase. The architectural images and representations are used to transmit a concept, an ideology in living manners and construction of social areas, which can then be used as a base to build a discourse relevantly adapted to an exhibition. This method of connecting with an architectural piece, which is not physically there is a "must" in architectural exhibits and influences a totally differentiated curatorial approach. Drawings, sketches, plans, models, notes, audio-visual images and other observations that architects have left about their projects, are objects that have cultural value, both for architecture, as well as museum studies.

The exhibition concept is flexible and is composed of many variables: each exhibit has its own specific characteristics according to its theme and pieces, which presents different needs. In any instance, an exhibit should be put on to provide communication between the pieces and the public. Architecture, however, remains isolated and alone. The problem of how to represent space...has not as yet been even stated. Since up to now there has been no clear conception or definition of the nature and consistency of architectural space, the need for its representation and mass diffusion has consequently not been felt.

*"There is no doubt that although we may never succeed in discovering a method of fully rendering a conception of space in a plan, we shall nevertheless achieve better results in learning how to understand space and how to look at architecture by analyzing and discussing the means we have."*

*[Architecture as space: how to look at architecture, Bruno Zevi, 1947, Horizon Press (1957)]*



*Architecture is not produced simply by adding plans and sections to elevations. It is something else and something more. It is impossible to explain precisely what it is – its limits are by no means well-defined. On the whole, architecture should not be explained; it must be experienced.*  
[*Experiencing Architecture, Steen Eiler Rasmussen, 1964, MIT Press*]

### *A Hub for Students:*

Each and every college has its own way of teaching Architecture, some focus on various headlines, while others provide basic introduction to each subject in-order to leave the rest for student's choice to major in the topic that caught his interest. Students graduate with diverse understanding to Architecture (*Architecture can never be taught, it should be experienced*), as it is after all a form of art. (*We people are all very different. It's is not a problem, it's a resource. Diversity combined with natural selection is the formula for both genetic and development of species, products and new ideas*). Why not provide a place to exchange knowledge and information between graduates and even extend further to exchanging knowledge between international local graduates?

### *The Hub for Knowledge, Innovation, Research and Debate on the built environment:*

For the library to be the only certified database for Architectural books for all students and for the House of Architecture to provide the basic components of Architecture for people who are generally interested in knowing Architecture through workshops and classes. For Training Architects into becoming better and more qualified through intensive classes and labs. Open offices provide the opportunity to share thoughts and conceptualization, to debate and try to solve the issues facing current situation.

## CHAPTER ONE

**Name of Project:** House Architecture

**Definition of Project:** The House of Architecture is a form of hub for all architects, architectural students and people interested in Architecture in general; an international forum to discuss the culture of Architecture. The house of Architecture may be seen mainly as an exhibition or a training facility; however it also provides people with a walk-through experience which will enrich their basic knowledge of Architecture. It's essential that the building itself reflects a strong architectural statement; therefore it might be seen as an exhibition, housing Architecture in Architecture.

### **Project Objectives:**

1. Providing an enriching experience of a persons' basic knowledge about the architectural process and criteria (light, lines, geometry, proportions, etc.), along with the aspects of Architecture all within civic environment for social and public activities.
2. Catering perfect environment for social activities and information exchange between local and international architects.
3. Assisting in orientation of potential future architectural students.
4. Contributing to society by offering scholarships and charity work.
5. Displaying the intelligence of Sudanese architects and clarifying the country's cultural identity.
6. Encouraging competitions between both architects and students by hosting prize winning contests, in-order to raise more qualified architects leading to better professions and a better future for all of us.
7. Celebrate, reward, and promote achievements in graduate students work and research.
8. Taking action to increase the number of women and other under-represented groups in Architecture.
9. For the house of Architecture to be the hub for knowledge, innovation, research and debate on the built environment.
10. Develop an International reputation, influence and membership.

**Importance of Project:** In common with many aspects of modern civilization, architecture has lost its enriching sense of purpose, leading to toxic anomie. *"More recently, architecture has turned into means of making money, entering into the realm of speculation where architecture became about investment and the prospect of making money off the design. Over designed buildings became*

*part of a financial strategy that masked any relationship in architecture's original intent, the creation of space that serves humanity"- Mathias Hollwich.*

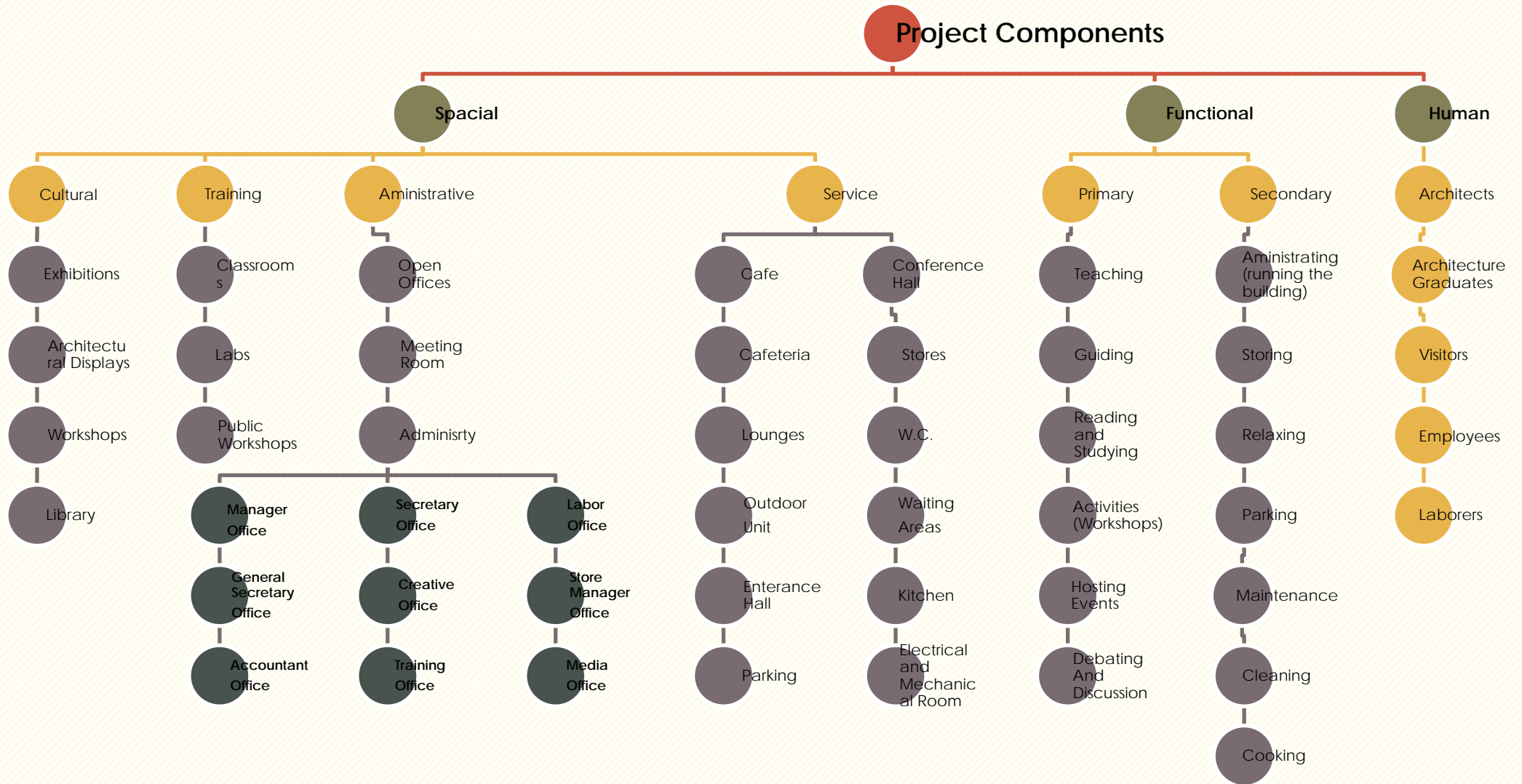
"In seeking to restore architecture's rightful place in culture, as a sustainable art, we must look deeper and redefine what it is to be human and what sort of lives we want to lead and the attempt to rebalance and reconnect with deeper transcendent meaning and purpose" – Peter Buchanan.

In addition to a wide range of issues in Sudan, from random housing to the almost extinct Cultural Identity, financial crisis and pollution, consequently the solution is to form a board institute of Architect to attempt to correct the wrong, introduce one way of design and plan a strategic action to stimulate the production of a solution.

**Project Components:** (see diagram in page 5)



# CHAPTER THREE



## CHAPTER TWO

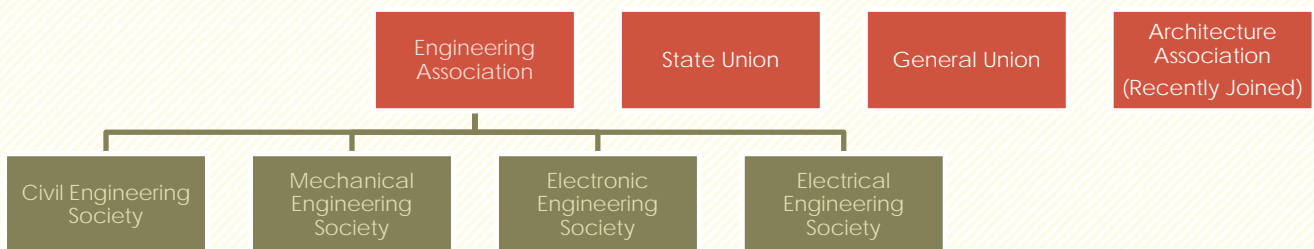
### Local and International Examples:

#### 1. Local Example of Project:

Sudan Engineering Society:

- Historical View:

The House of Engineering was first established in 1965, located originally on Nile Street. The Association moved to Al Amarat Neighborhood, 7<sup>th</sup> street in 1967. There was also the Sudanese Women Engineering Council which has recently become part of the Women General Union. There is no record of them being active. The following diagram illustrates the House of Engineer's Administration Department:



- Each Association Staff consists of an Executive Manager, Secretary, General Secretary, Accountant and Labor Affairs. The House of Engineers has various activities:

1. Membership for engineers.
2. Workshops and topic discussion events.
3. Sports and entertainment.
4. Other various occasions (House of Engineering Hall).
5. Issuing the Sudanese Engineer Magazine Occasionally.

- One of the main events hosted by the Architectural Engineering Society was an African-wide conference held partly at the House of Engineers and partly at Al Salam Rotana Hotel. The house of Engineers has also hosted a competition back in 2006 with the cooperation of the Architectural Engineering Society. The Competition was to design a house of Engineering. The last event ever recorded was also held at the House of Engineers; a seminar about Building Materials and

Entrepreneurship. The program also included galleries in the outdoor unit and inside the building, exhibiting new building materials.

- Site Location:

- The House of Engineers is located at Al Amarat Neighborhood, 7<sup>th</sup> street, Square No.10, Land No.5 at the East Extension.

- Site is 7,550 meters square, rectangle shaped. Recently another 300 meters square was added for the Engineers Union-Khartoum State building, which is still under construction.



- Site Surroundings:

- Site is surrounded by 2 roads; the 7<sup>th</sup> is on the northern side, 15 meters wide, viewing residential areas and King Abdul-Aziz Road, 30 meters wide, viewing the free markets.

- The Coptic Club and the Customs Anti-Smuggling Unit lays on the southern side of the site.

- The Engineers Union-Khartoum State building which is under construction is on the western side of the site.



- Site Analysis:

- There are 2 main entrances; the north-eastern entrance at the corner is the main entrance and the other one enters directly to the House of Engineers Hall.
- There are 2 secondary entrances; one from the north for service vehicles and the other from the east which enters right to the main office buildings on the east edge of the site.
- The Site consumes a large amount of outdoor activity units, while there are only 5 buildings; the main building is the office building and the others are small buildings for certain activities.
- The Main building has 6 offices, 2 meeting halls and 2 multi-purpose rooms used as exhibitions and workshops at the same time.
- Outdoor unit consists of a multi-purpose hall, a playground for children, sitting areas and the beautifully landscaped gardens.
- There are 2 bathrooms, 3 stores and a cafeteria locate behind the office building.
- There are two residential buildings for the laborers also at the back corners of the site.



- Advantages of the House of Engineers:
  1. The House of Engineers offer services to the engineers, for instant, land registry and construction of the engineer's houses.
  2. The House of Engineers has several activities including publishing the semiannual magazine and the quarterly publication: The Engineer.
  3. Hosting events like the scientific conferences, lectures and all that relate to Sudanese development in general.
  4. The House of Engineers often associates with similar international entities to promote the industry and also local ones.
  5. The house also works with the engineering establishment in order to raise the capability and performance of workers in the engineering field.
  6. Part of their plans is to work with charity events in environment development and protection.
  
- Disadvantages of The House of Engineers:
  1. Almost all activities in the House of Engineers doesn't relate to the purpose of the association (mostly entertainment activities).
  2. Activities related to the House of Engineers are seldomly active.
  3. There are no female Architect or student participations in the House of Engineers.
  4. There is a telecommunication tower (Zain tower) constructed inside the site.
  5. The laborer's building is very close to the office building, almost 40 cm apart.
  6. Bathrooms are separated away from the building.
  7. The House of Engineers is a statement to all engineers in Sudan and the building should represent a strong front to the people working behind it.

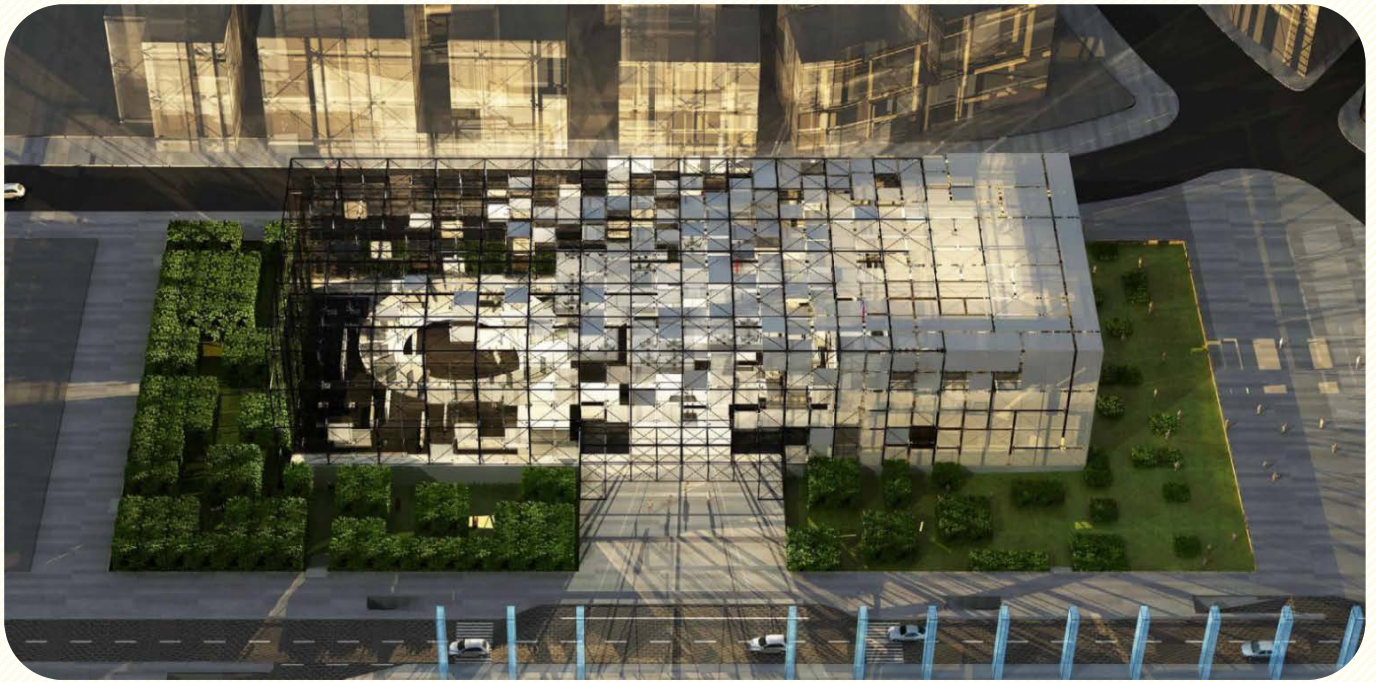
## **2. International Example of Project:**

The House of Architecture:

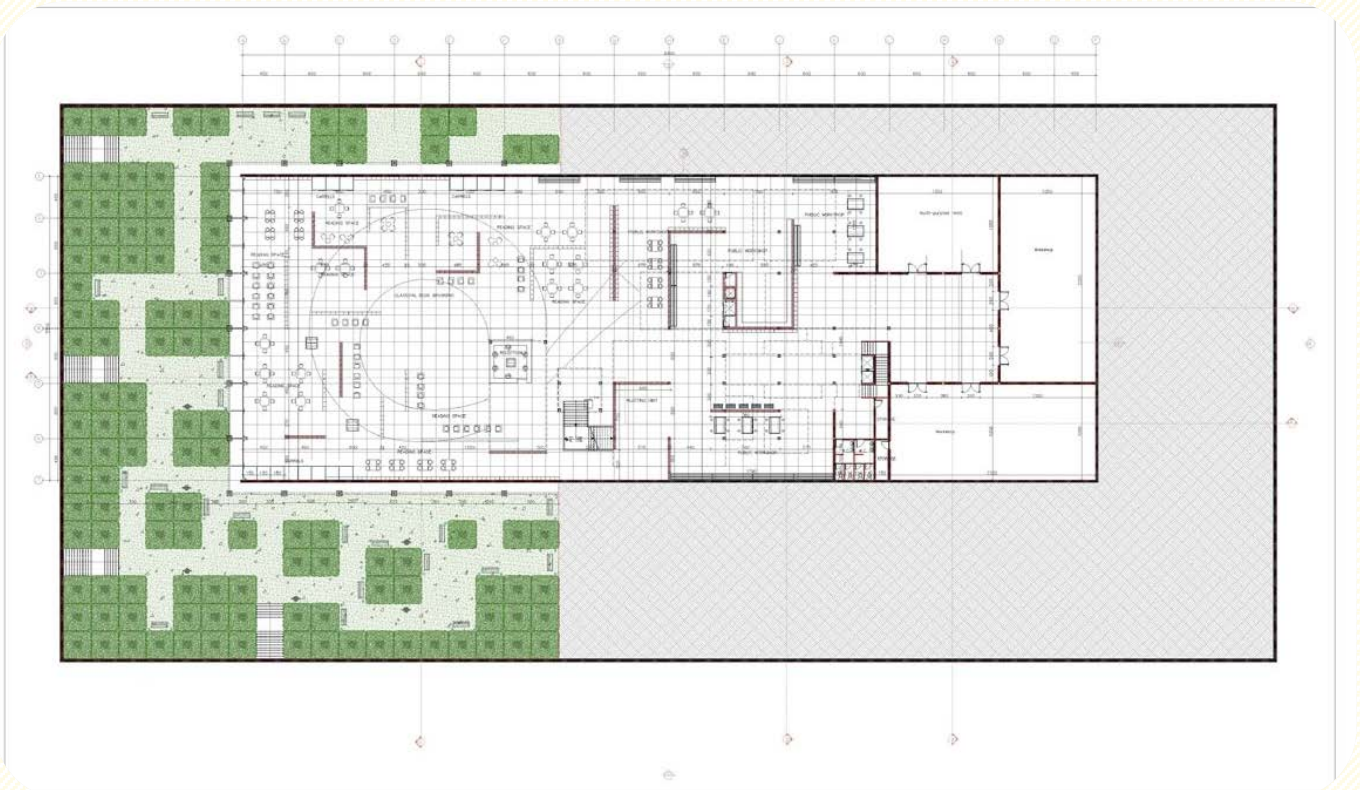
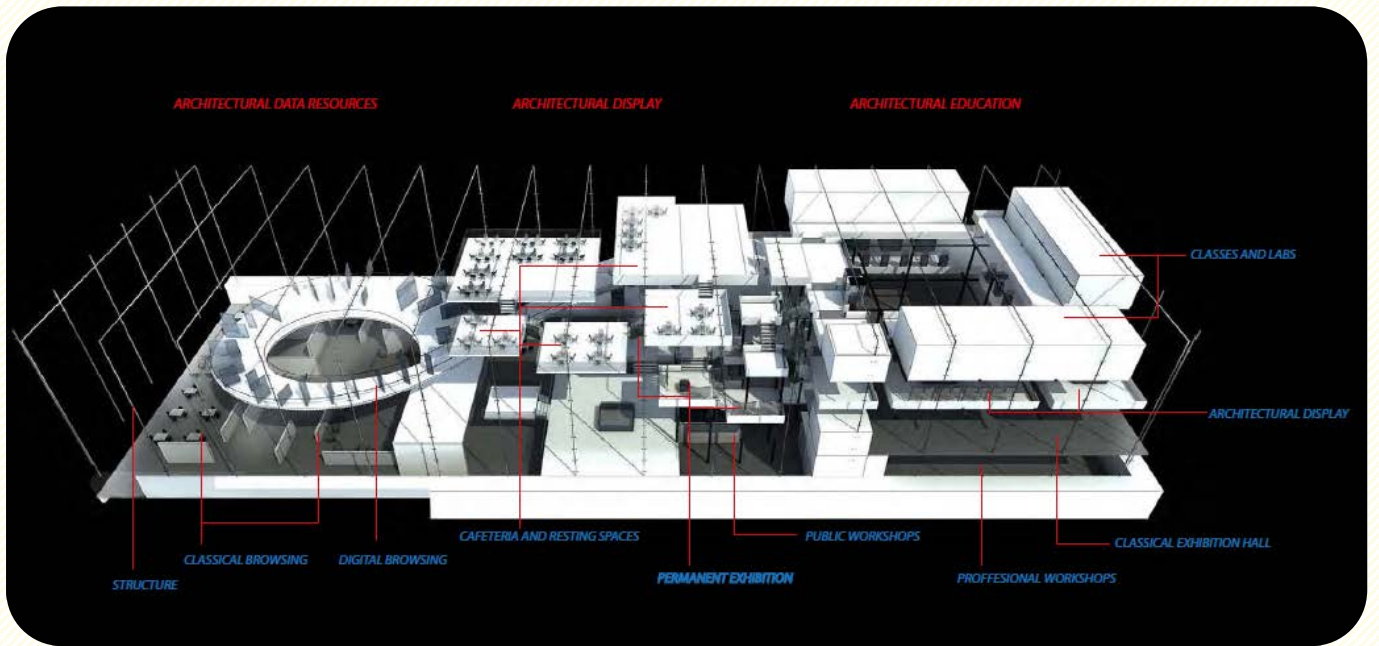
Architect: Jalal Hoblos

Location: The Martyrs Square, Beirut, Lebanon





- The concept of the design was inspired from Architecture itself, the importance of the architectural process and the means of translating it. The Architect was illustrating the design process into space, materials and architectural elements. Form features were divided into 3 sectors. The 3 sectors appear on the elevations where the elements are gradually shifted from transparent to semi-transparent to opaque.
- The form is a simple rectangle using squares as the elevation's unit. Landscape was also designed in square units around the building, gradually starting from short bushes to tall ones.
- The first sector is the transparent sector where the architectural data resource occurs and it contains the library which has 2 classical book browsing rooms and a digital browsing hall.
- The semi-transparent sector where the Architectural display contains a cafeteria and resting spaces, a permanent exhibition and a public workshop.
- The last sector; the opaque where the architectural education exists, contains of classes and labs, the Architectural display rooms, the classical exhibition halls and the professional workshops.
- The building has 3 floors, 1 main entrance and another one for service purposes.

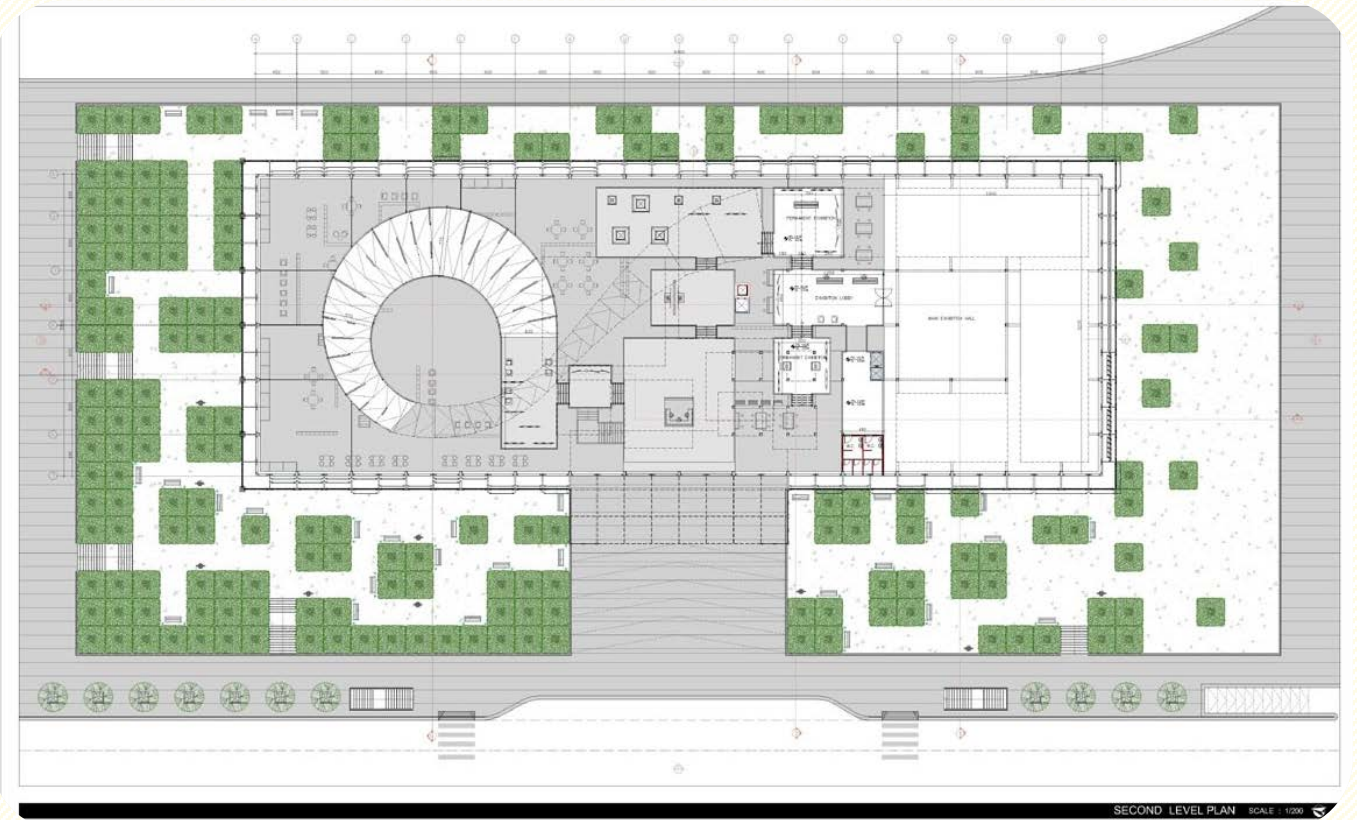


- Basement: classical browsing, professional workshop, public workshop.





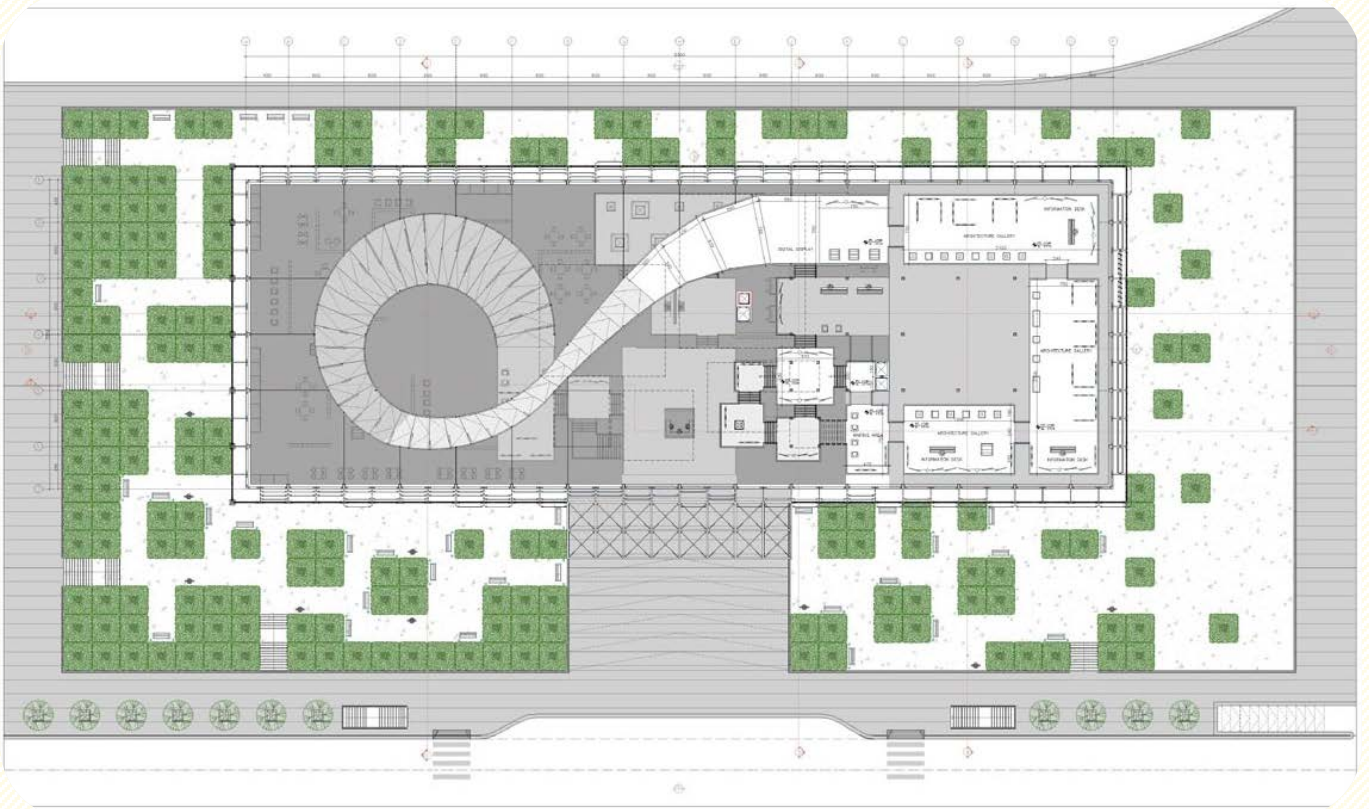
- Ground Floor Plan: Main hall, reception, permanent exhibition.



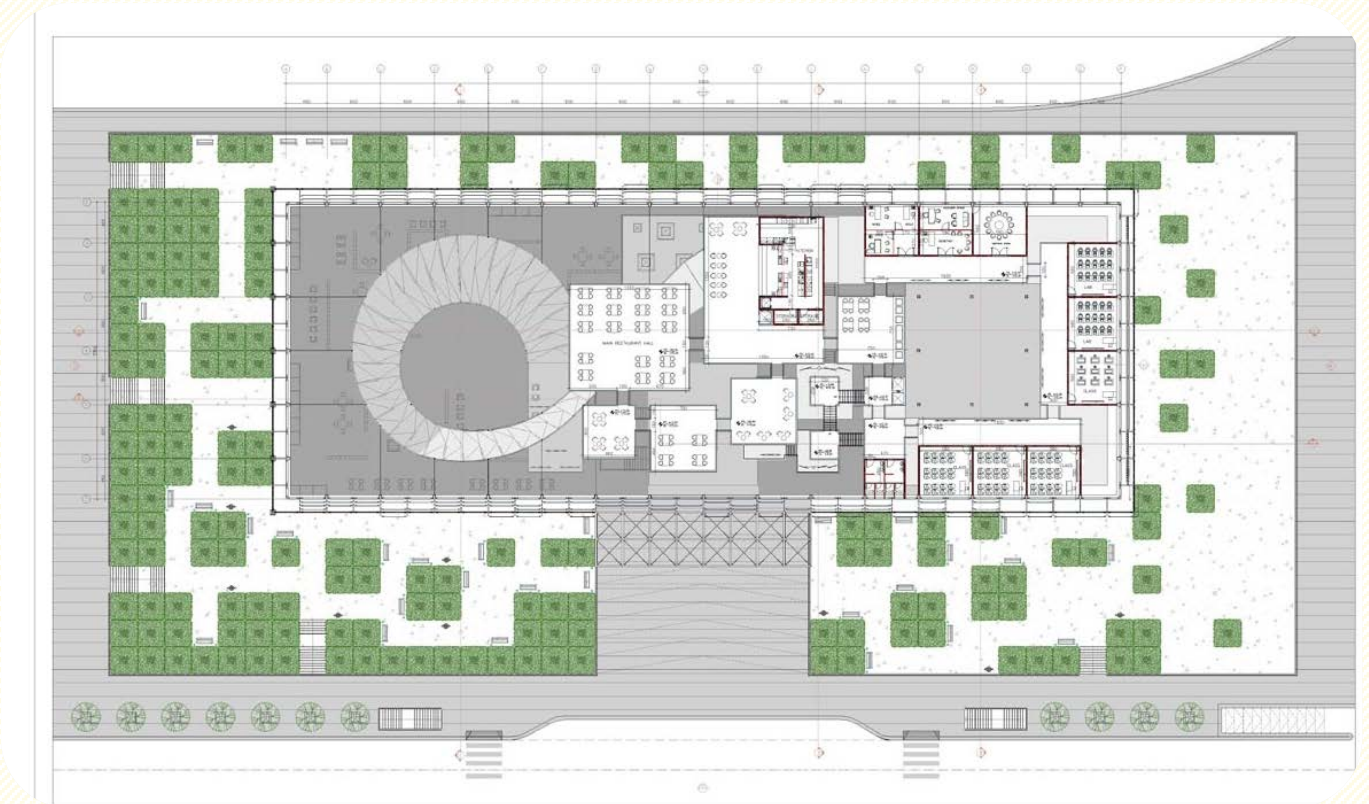
- First Floor Plan: Digital Browsing, Permanent Exhibition, Architectural Display.

SECOND LEVEL PLAN SCALE: 1:200

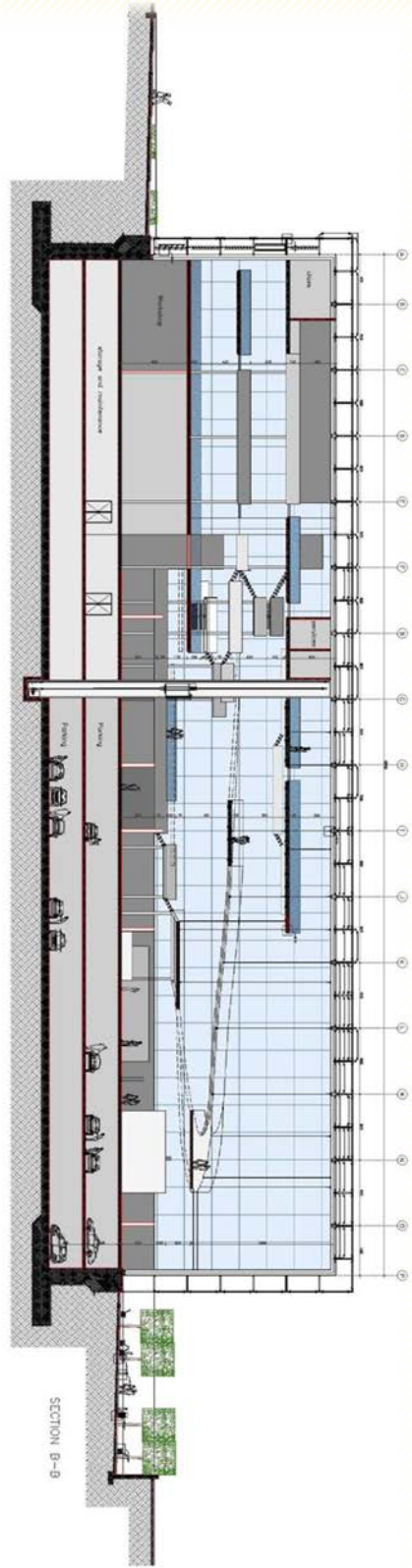
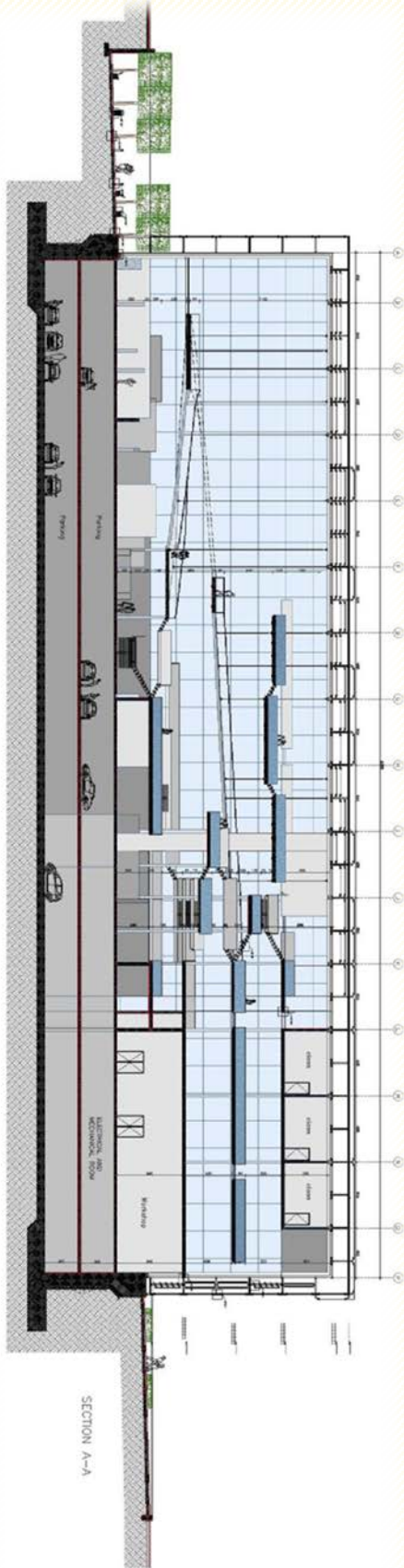




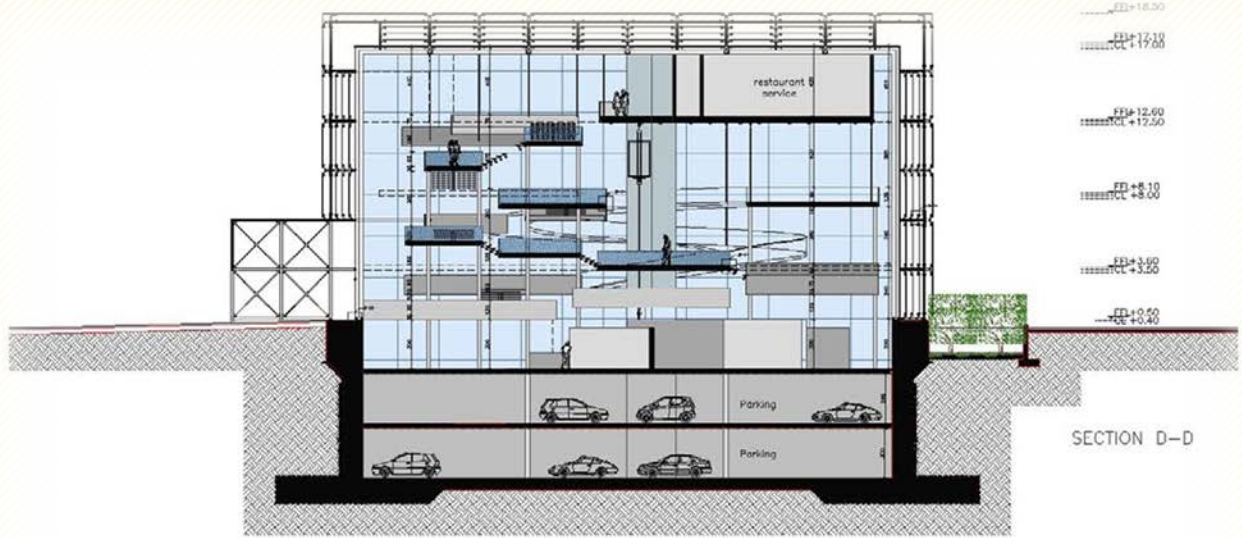
- Second Floor Plan: Exhibitions.



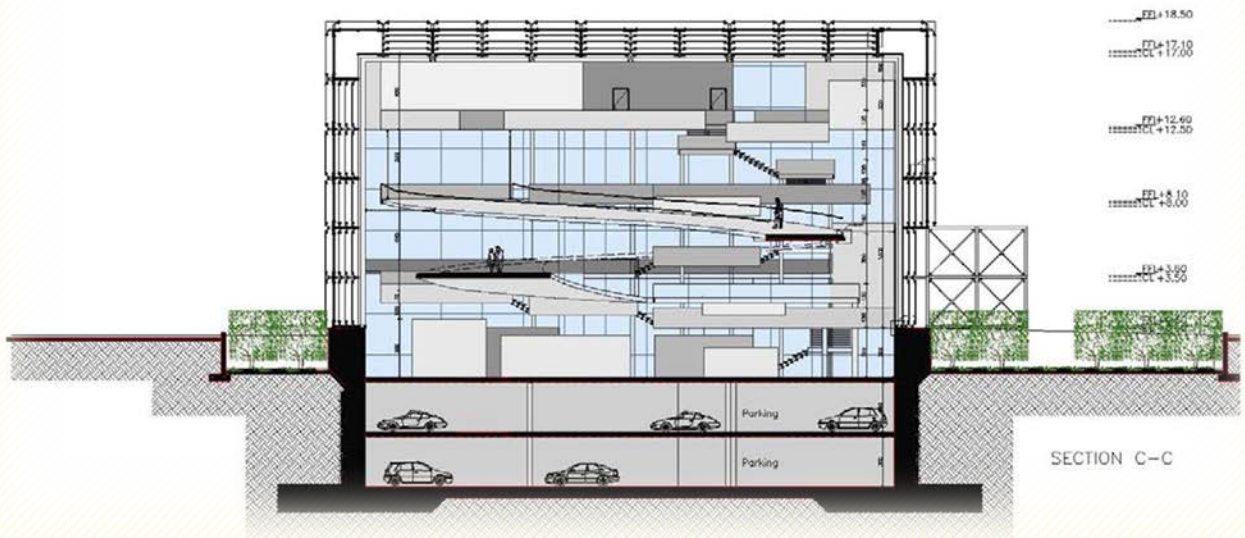
- Third Floor plan: Resting Spaces, Cafeteria, Classes and Labs.







SECTION D-D



SECTION C-C

## Spatial studies:

First I want to start by explaining some of my spaces, what activities it creates and their types:

1. Open offices: Open offices provide the opportunity to have conceptualization, discussions and debates between architects; to discuss events, to promote students and to determine the future of Architecture and sustainability. Open offices provide an adequate atmosphere of knowledge and the perfect environment to solve issues facing the current situations.
2. Workshops: There are two types of workshops:
  - Public Workshops: it is mainly for people interested in knowing Architecture; it has many programs including building 2D and 3D models, sketching, drawing and basic designing.
  - Professional Workshops: Professional workshops are for architects' in-order to help in the process of conceptualizing and the first step in solving issues. It is where the actual application to the process of executing an ongoing project happens.
3. Library: There are 4 ways to study in a library; individually at the main reading hall, as a group which requires an isolated room for the discussions or the outdoor unit.
  - The library has many sections; The Architectural books section, Magazines section and the History Section. Along with the Architectural display section, digital browsing, Audio Room and Research room.
4. Exhibitions: The House of Architecture will have three exhibitions:
  - First exhibition is the Historical Exhibition that views the architectural history of Khartoum city, the urban planning, individual buildings and the building materials used over the years and how it has evolved.
  - Second exhibition will view the work of Arab and International projects. Both exhibitions are permanent.
  - Third exhibition will be a temporary exhibition where students work and the winners of architectural competitions' work will be featured in.
5. Outdoor Unit: It's an extension of the Café and Cafeteria and the library. It serves as a relaxing space that views another important part of Architecture, which is Landscape.

## Architectural Exhibitions:

There are several factors to consider in an exhibition:

- A Concept defines the Architectural representation and the Scenery of the exhibition space. Concept is flexible and it has many variables; each

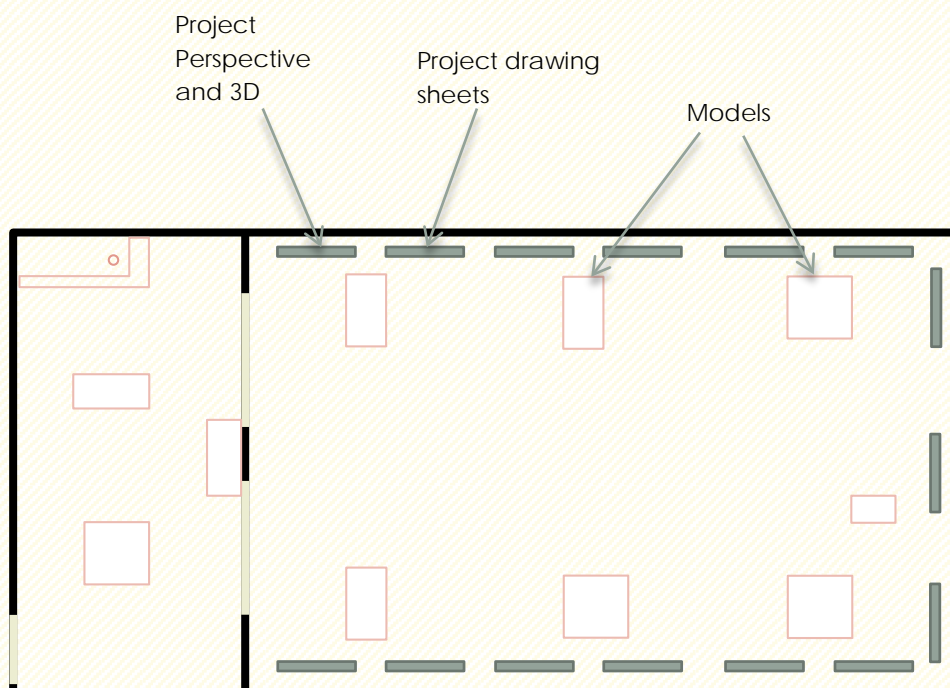
exhibition has a character depending on the theme of it and the main goal is to communicate between the pieces and the public:

- Most international pavilions has its own theme for instant, the First Architectural Biennale in Rotterdam's theme was mobility. It focused on the flow of public transportation in large cities.
- Theme should be essential; in Sao Paulo's Architecture Biennale each exhibition has its own presentation and this resulted in lack of clarity when it comes to continuity of the exhibitions as a whole and visitors leapt from one exhibit to other without establishing any link between them what so ever.
- There should be Basic projects of educational activities and small workshops for the public; in Sao Paulo's Architecture Biennale the event was very successful event but with very little audience whom were architects and students. They had to call the media to stimulate more visitors and several educational seminars and activities were held.

Layout:

I'm going to study some of the international Architectural Exhibitions:

1. Architekturforum Aedes Exhibition in Berlin Germany (established in 1980):
  - The exhibition is called TU-MU, held in 2001. The exhibit exposed the work of the first generation of independent architects in China.



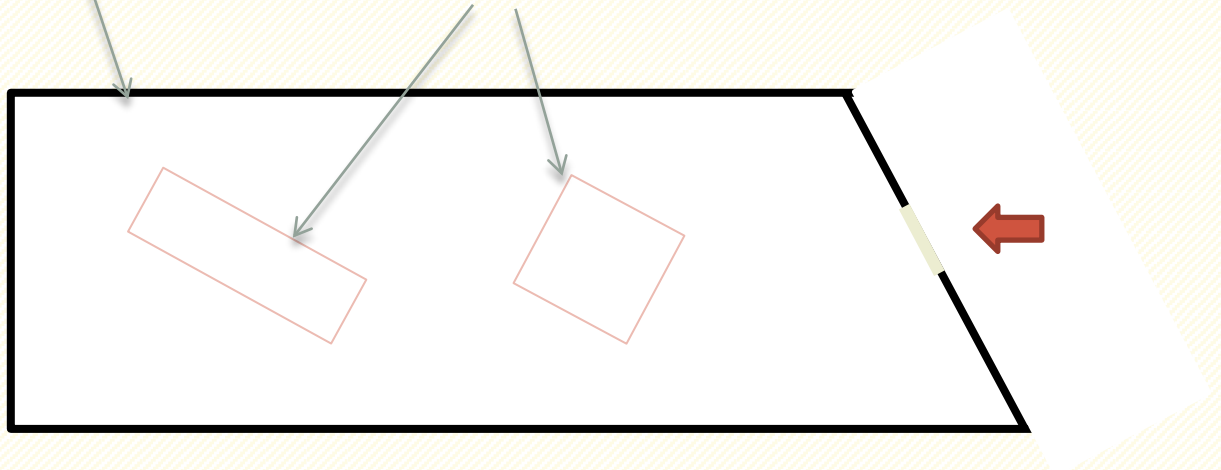




- Spotlights were focused on the sheets and models. The rest of the room is dark.
  - Sheets were placed inside a thin glass case and hung from the ceiling with wire strings. Models were also hung from the ceiling.
2. Architektur Galerie Munchen, Germany (established in 1989):
- The gallery was hosted in 2011 by BIG (Bjarke Ingels Group), called 'Yes Is More'.
  - The theme of the gallery was inspired from comic books, with cloud dialogues of quotes from famous architects hung along with the architectural drawings.
  - The whole gallery was in black and white including the drawings.

Drawing sheets were hung on the walls

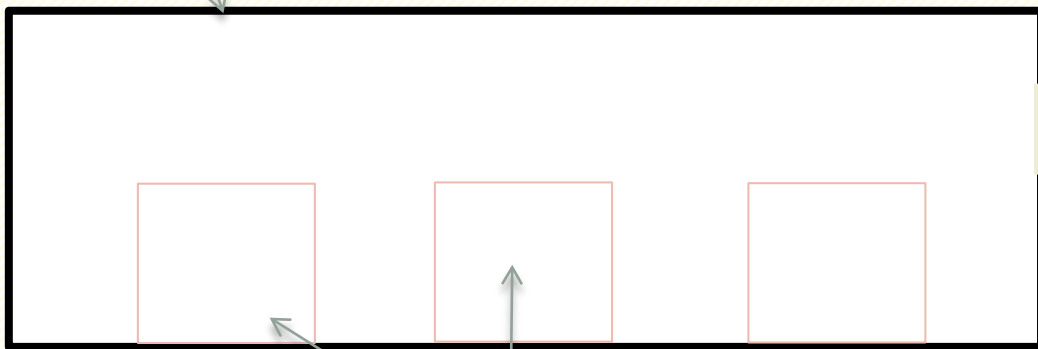
Models







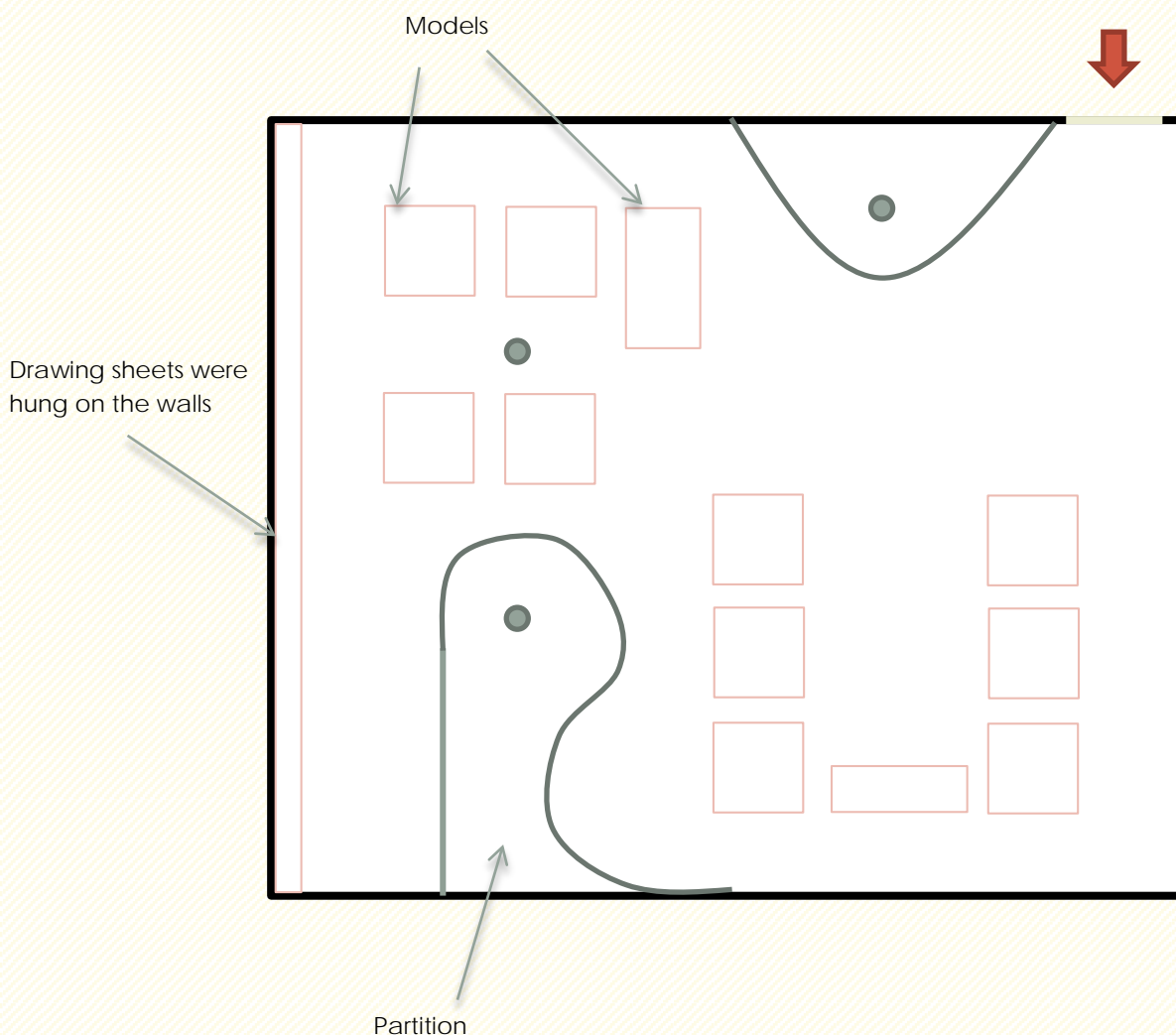
Drawing sheets were hung on the walls



Models



- Another gallery the company has also held where the exhibition was one path with the drawing sheets hung on the right and models on the left side.
  - Spotlights were also focused on the walls and models.
  - Both galleries had a narrow long rectangle shape with only one or two walk paths.
    - An exhibition should have a circular flow in walk paths.
    - Models should be seen from every angle in order to assure full understanding to the architect's concept.
3. Danish Architecture Center: Yes Is More Exhibition:
- The BIG Company has also exhibited some of their achievements on the Danish Architecture Center as part of pop culture proportions.
  - The theme was not specific but the layout was the same; models in the center and drawing sheets hung on the walls, only this time special partitions were used to divide areas into several sections in-order to prevent repetition.







- This time the light was installed behind the drawing sheets and inside the models.
  - The place was very crowded and the walking paths were narrow
  - Lights may have been too bright for the visitors.

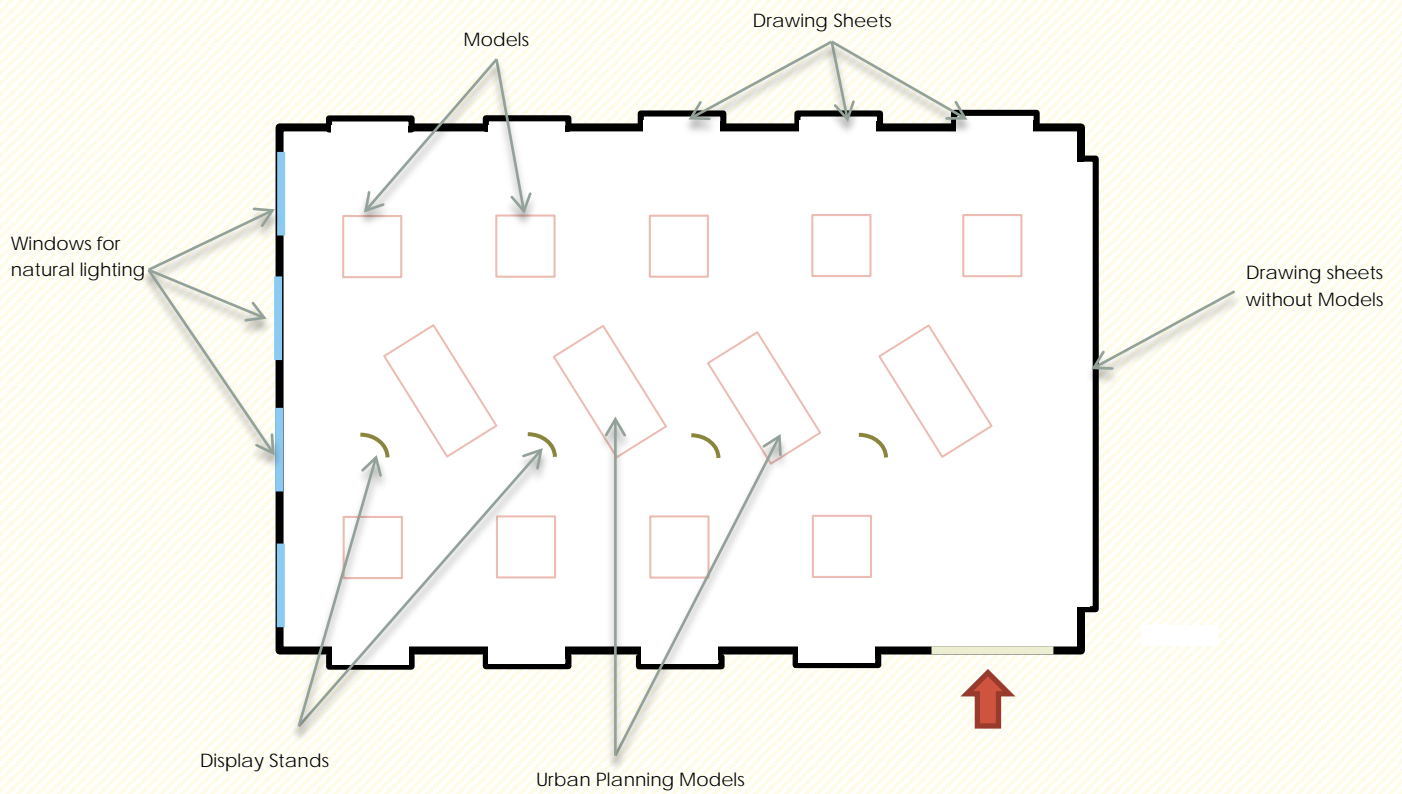
As for Urban planning layouts; in the co-evolution exhibition in 2006 at the Danish Architectural Center the urban planning models and the sheets were all centered in the middle of the exhibitions. The drawing sheets that explain each model were displayed in display stands around the model. This layout has been used in most of international exhibitions.





- My Layout:

- Each of the exhibitions above all has positive and negative points in their layouts. By combining the good points in all previous exhibitions, I have come up with the ideal layout for my exhibitions.
- From the name 'Historical Exhibition', it is already determined what the theme would be set on.
- The Arab and International Exhibition don't have a specific theme due to the variety of projects it will hold. Therefore it will be left optional. Both Exhibitions will be permanent, so display cases and glass stands will be the right furniture.
- The third exhibition will be in constant change in themes and the displayed projects in it, therefore it will not have permanent display cases. Projects and models will be hung from the ceiling.



Permanat exhibition display cases



Freestyle KF-1500-4A1  
Display Stands

-Pathways through the exhibit and around freestanding casework must allow unrestricted, safe movement of people and wheelchairs. Americans with Disabilities Act (ADA) standards call for a minimum of 36 inches (0.9M) for any walkway and a 60-inch (1.5M) diameter for turns. Cases or other display components that protrude from a wall should allow a 27-inch (0.68M) clearance from the floor.

- Library:

A branch library can play an important role as a cultural center. In addition to providing books, it can provide record and tape lending, music listening facilities, and lecture series as well as act as a general information center. With such an expanded role, the library or cultural center will be important element in neighborhood.

-basic principles when planning for the library are :

1. Location to insure maximum accessibility
2. Simplicity of design concept
3. Ease of supervision by library staff
4. Provision for future expansion

The basic statistics of the library for 4000 readers are:

Book Collection: 12,000 volumes

Space for book collection: 243 meters square

Space for readers: 170 meters square

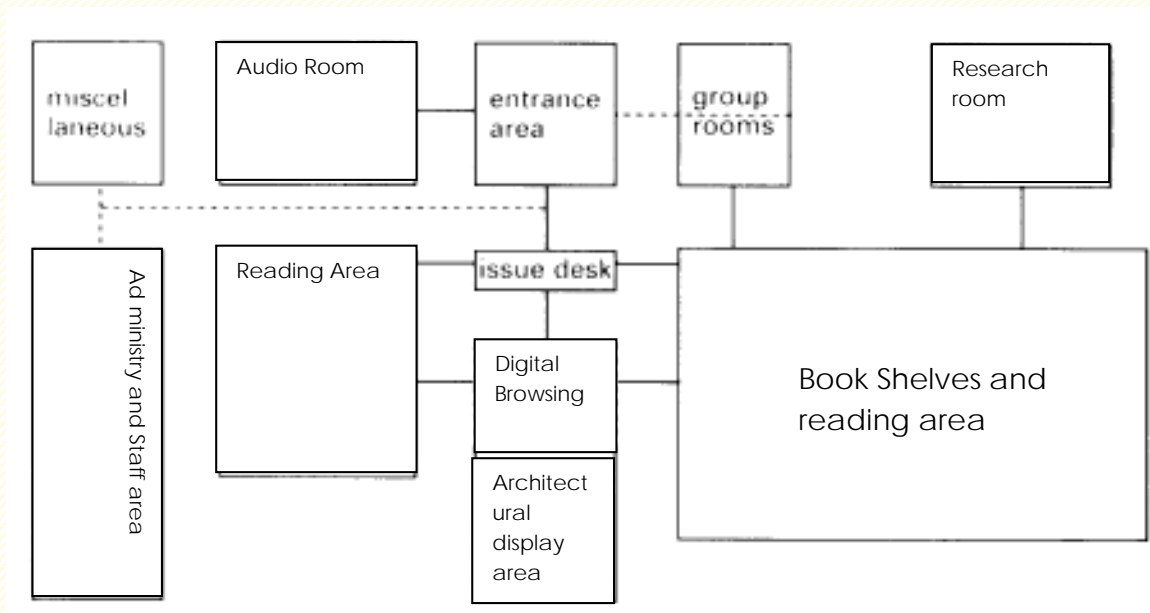
Staff works space: 121 meters square

Estimated additional span for utilities,

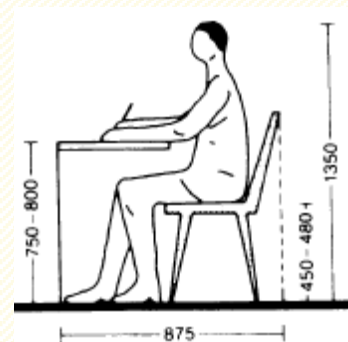
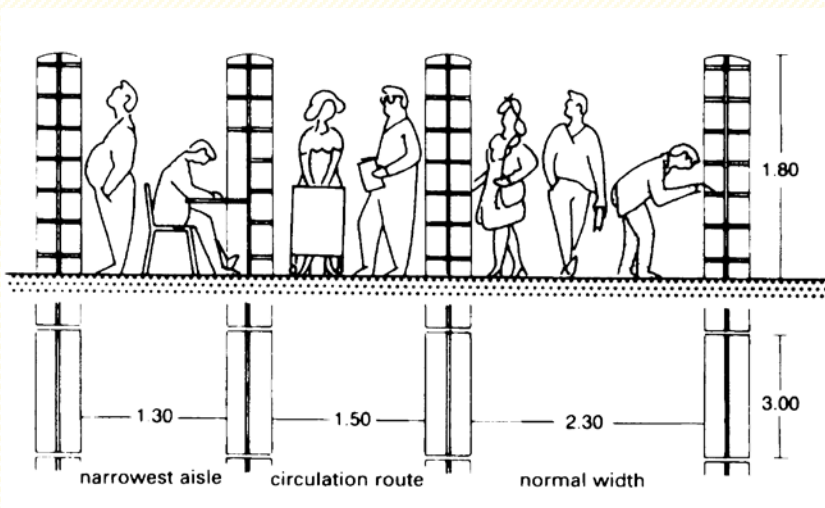
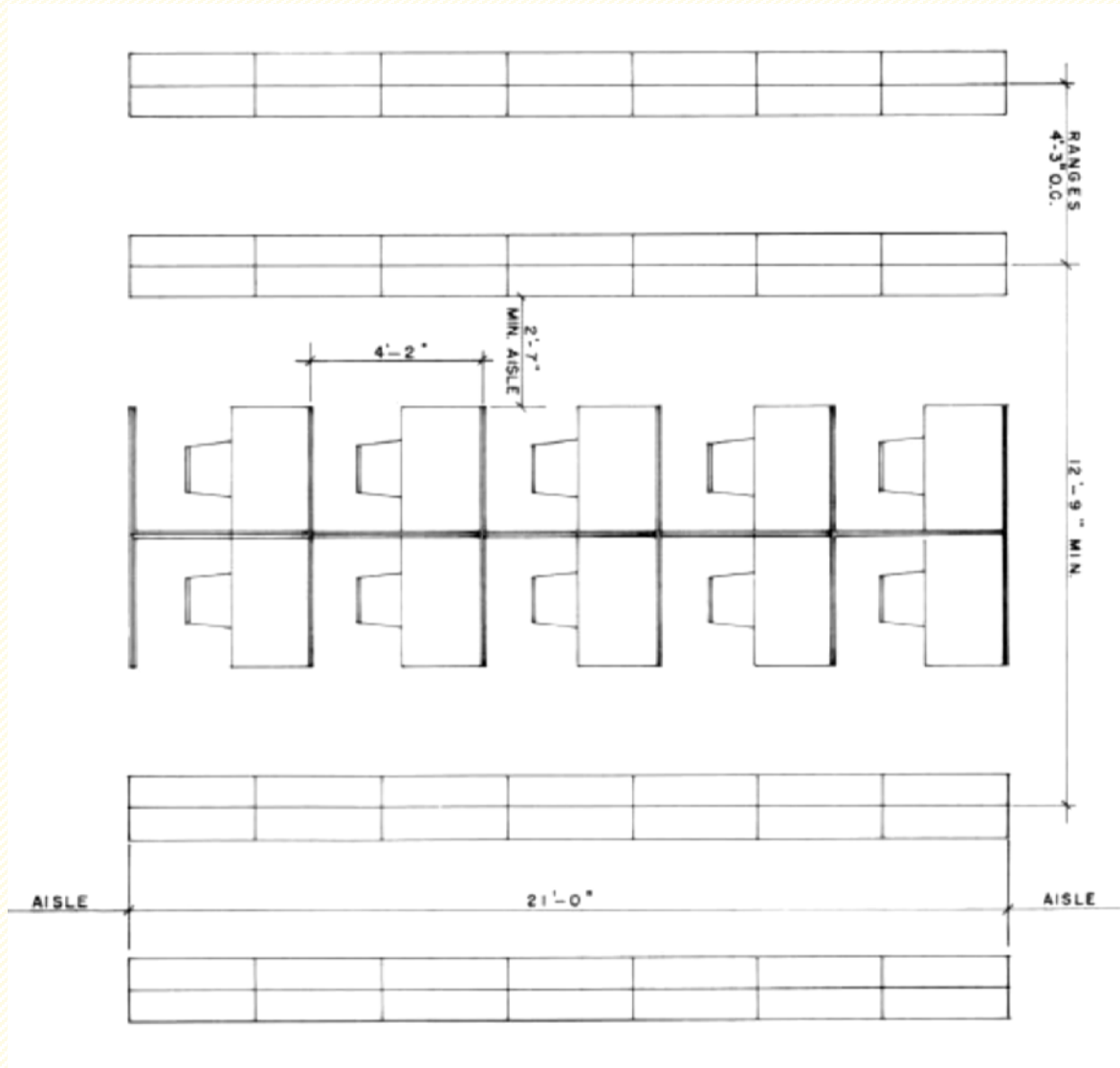
Circulation, and miscellaneous: 195 meters square

Total estimated floor space: 853 meters square

- Library Layout:

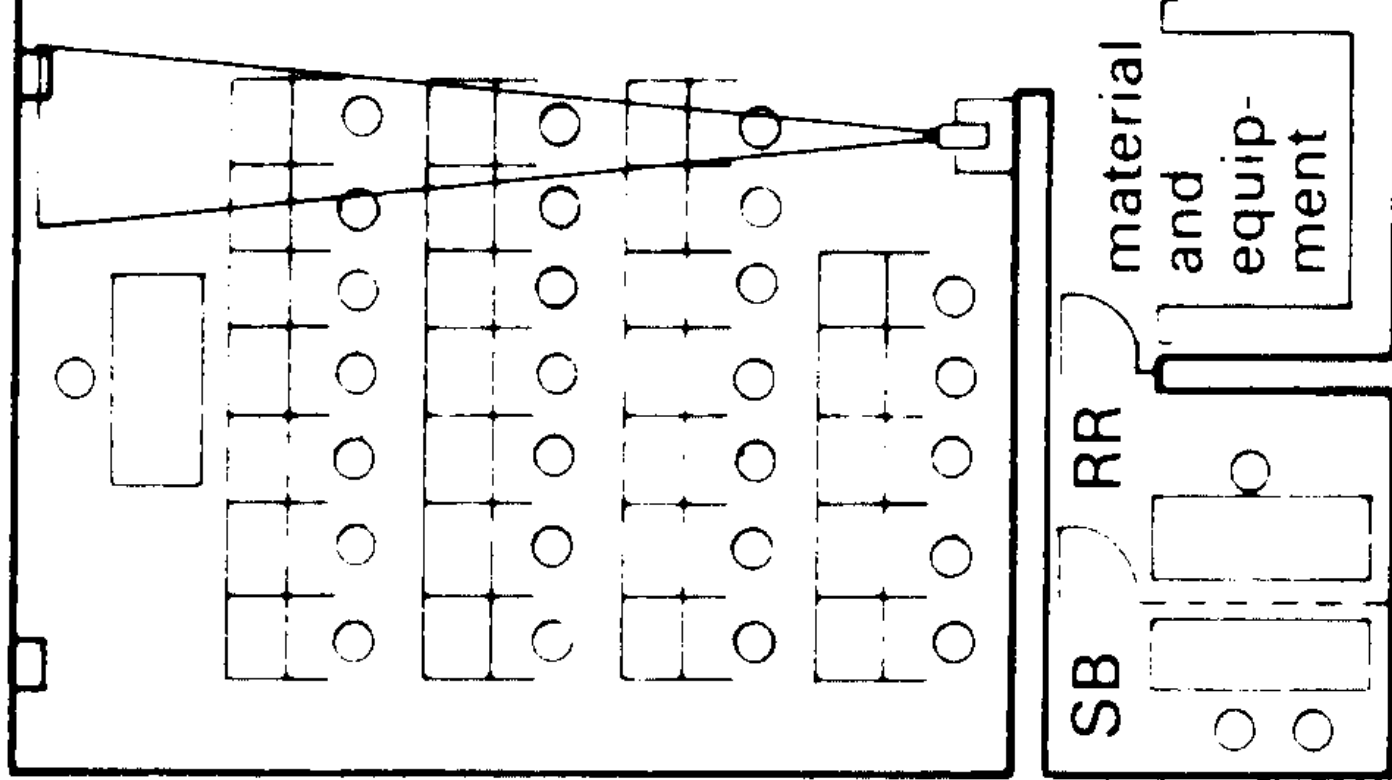


- Book Shelves and Reading Area:

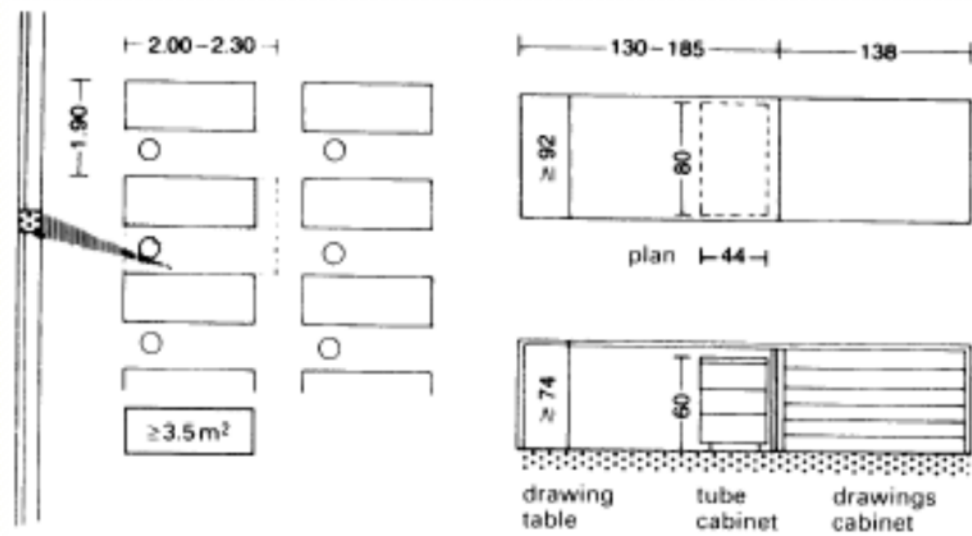


- Minimum distance between book shelves.





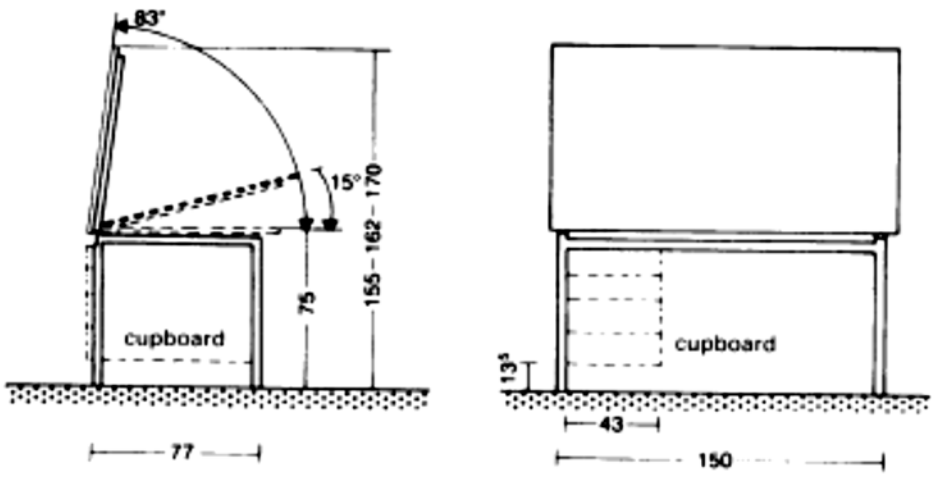
- Workshops:  
Various space requirements for technical subjects, including architecture, and art academies (painting and modelling rooms):



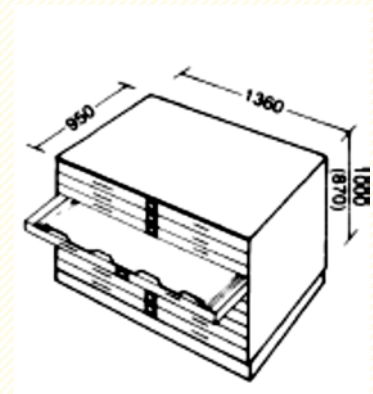
-typical architectural drawing studio







-Adjustable Angle Desk and drawing table with cabinet



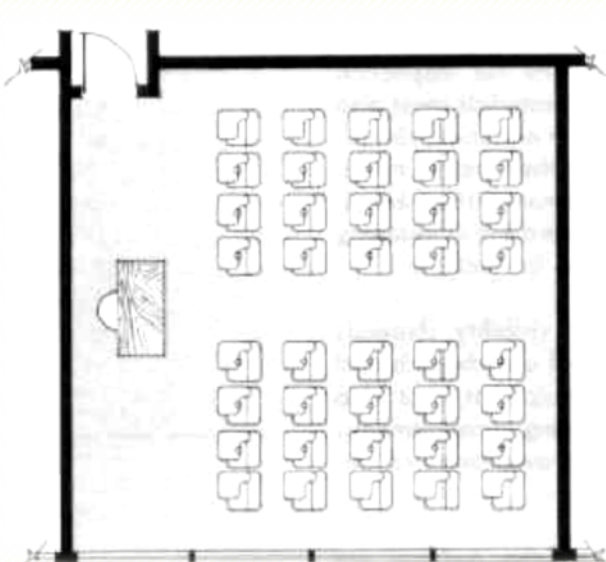
-Sheet Drawing Steel Cabinet

- Classrooms and Labs:

There are 2 classrooms and 2 labs. Each classroom holds up to 40 students. Computer Labs should be within or directly related to the general purpose teaching area and close to the library. Approximately 3 computer lab places per 100 pupils will be needed. Booths are 1\*2 meters.

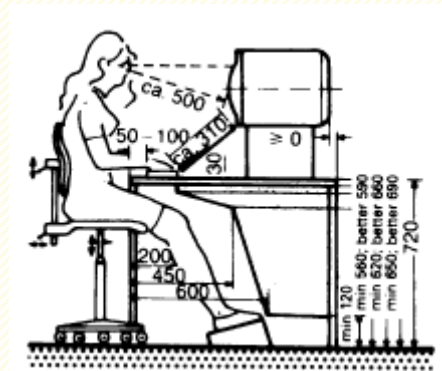
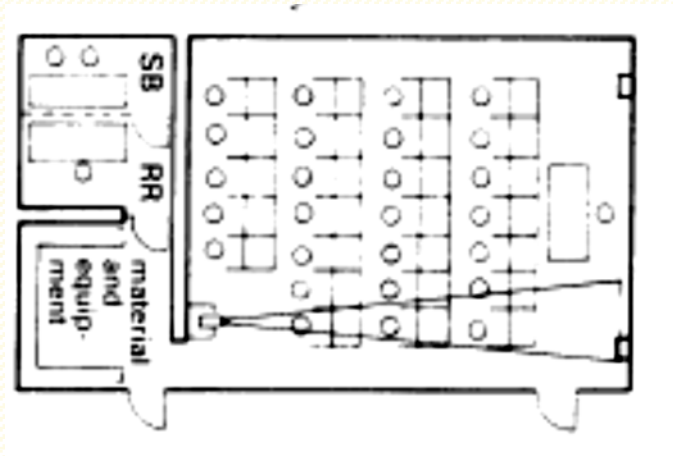
Major Factors to be considered in designing a classroom:

1. Seating and writing surfaces
2. Space and furnishing for the lecture
3. The use of wall space, including chalkboards, Screens, Size and location of windows, etc.
4. Acoustic and Lighting
5. Heating and air conditioning
6. Storage and other conveniences

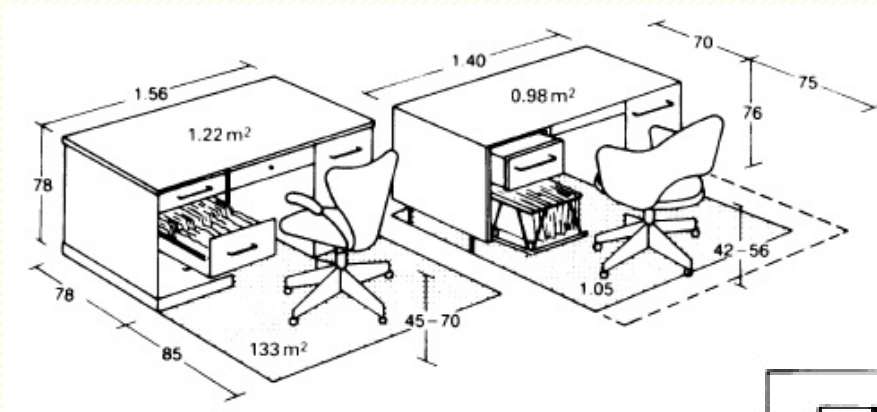
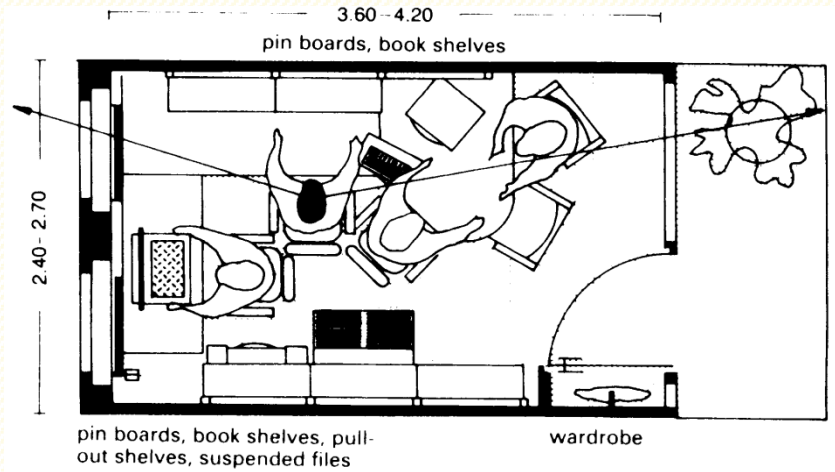


-Classroom for 40 students. 26 inch x 26

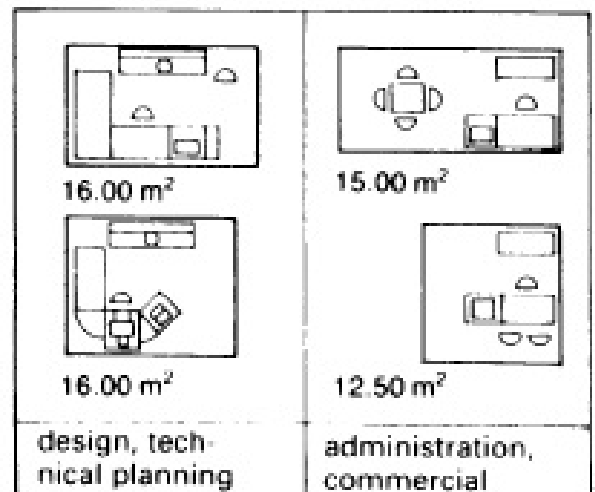
- Computer lab



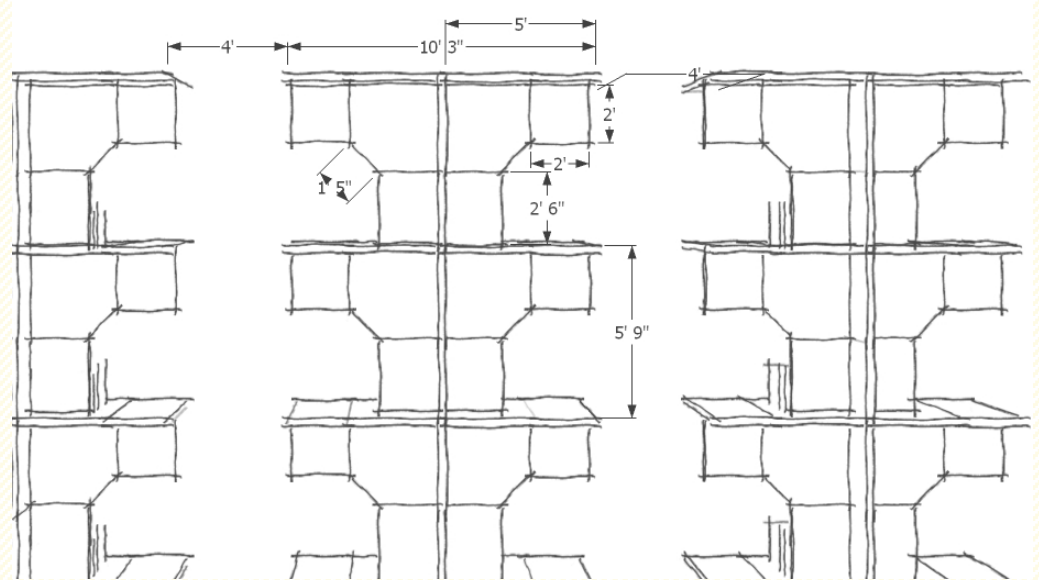
- Offices and Open Offices:



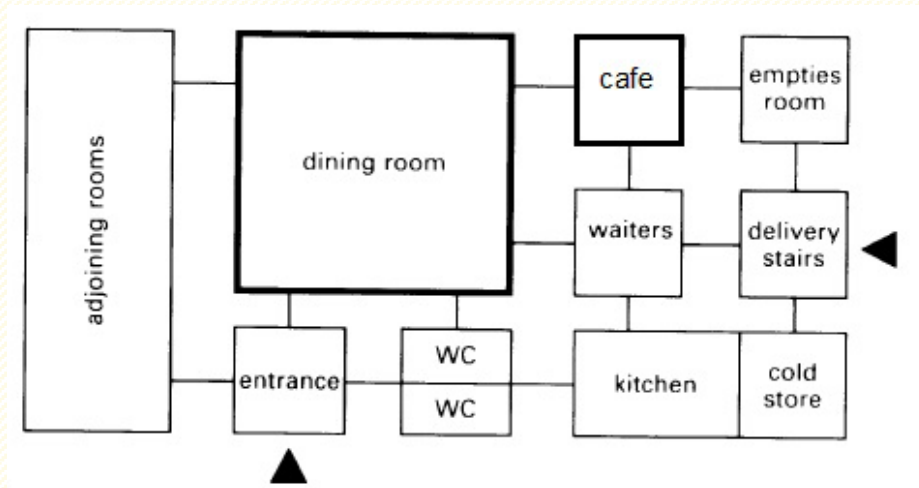
- Employee offices range between 9 – 20 meters square, and an average height of 4 meters, depending on the number of users and furniture sizes required in the space. The drawing on the right shows ideal work stations for several types of offices.



- Open offices.



- Kitchen, Restaurant and cafe:



- Kitchens usually divide into several areas; cold stores, freezers and dry store areas, vegetables and fruits washing area, cooking hall, changing rooms and other services.

area	proportion in %
goods deliveries, including inspection and waste storage	10
storage in deep freeze, cold and dry rooms	20
daily store	
vegetable and salad preparation kitchen	2
cold meals, desserts	8
cake shop	8
meat preparation	
cooking area	2
washing area	8
walkways	10
staff rooms and office	17
	15
	100

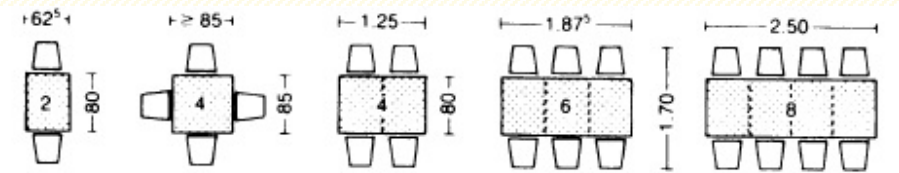
④ Basis for dimensions and space requirements

type	chair occupancy per meal	kitchen area required (m <sup>2</sup> /cover)	dining area required (m <sup>2</sup> /seat)
exclusive restaurant	1	0.7	1.8-2.0
restaurant with high seat turnover	2-3	0.5-0.6	1.4-1.6
normal restaurant	1.5	0.4-0.5	1.6-1.8
inn/ guesthouse	1	0.3-0.4	1.6-1.8

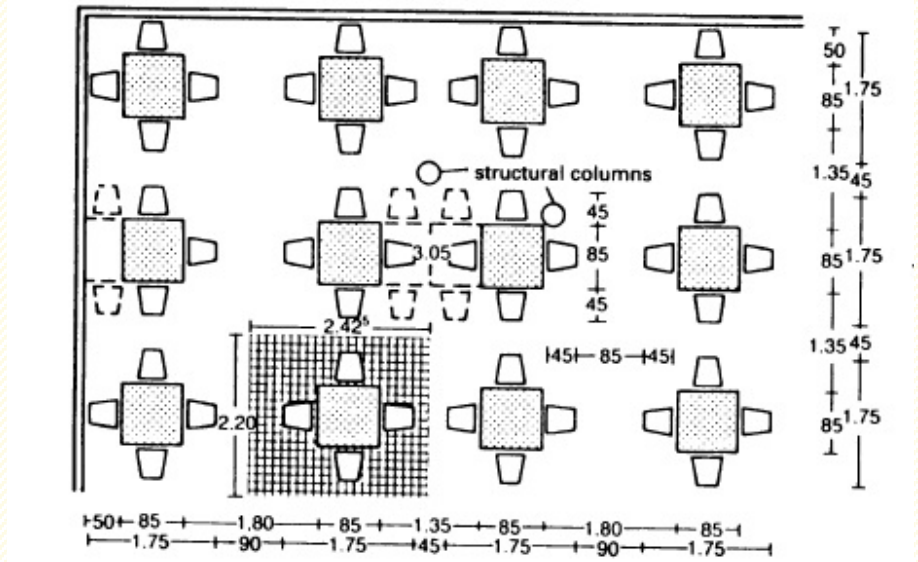
approx. 80% supplement is added for storage rooms, personnel rooms etc.  
cover = seat × no. of seat changeovers

floor area requirements

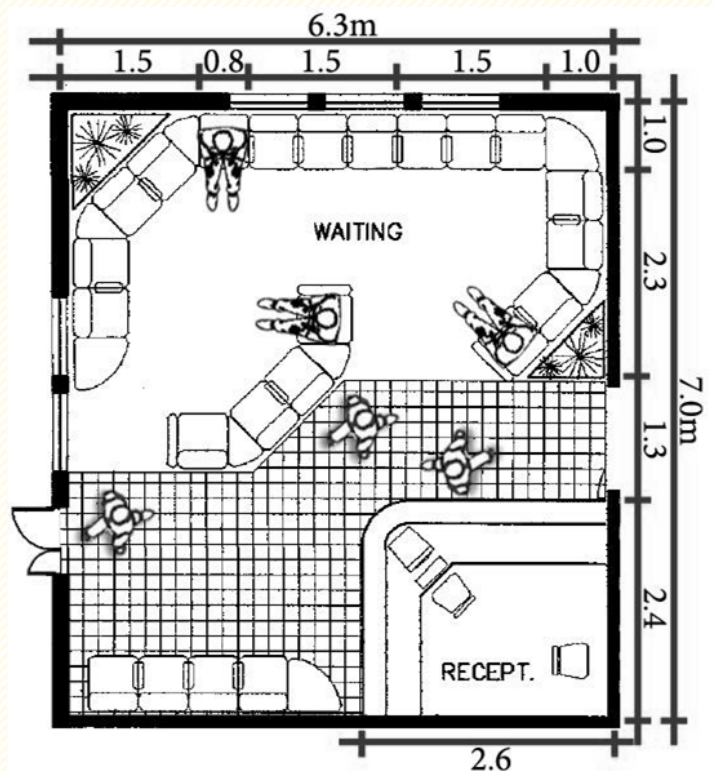




- Dining room measurements



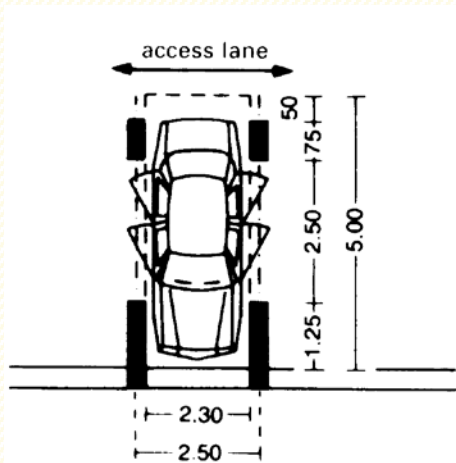
- Waiting areas and relaxing areas requirements:



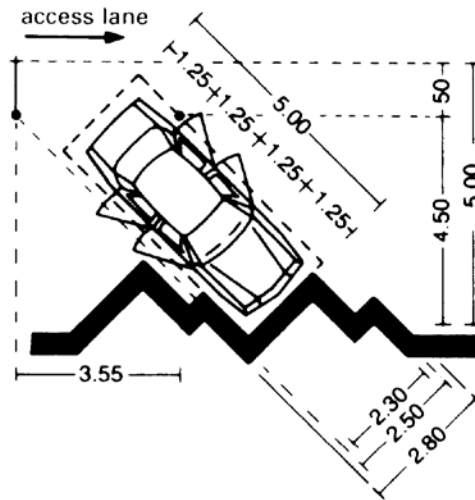
- Parking spaces:

- In general parking lot measurements have been set to 5x3.3 meters in order to match the handicapped requirements according to standards.

- 
-

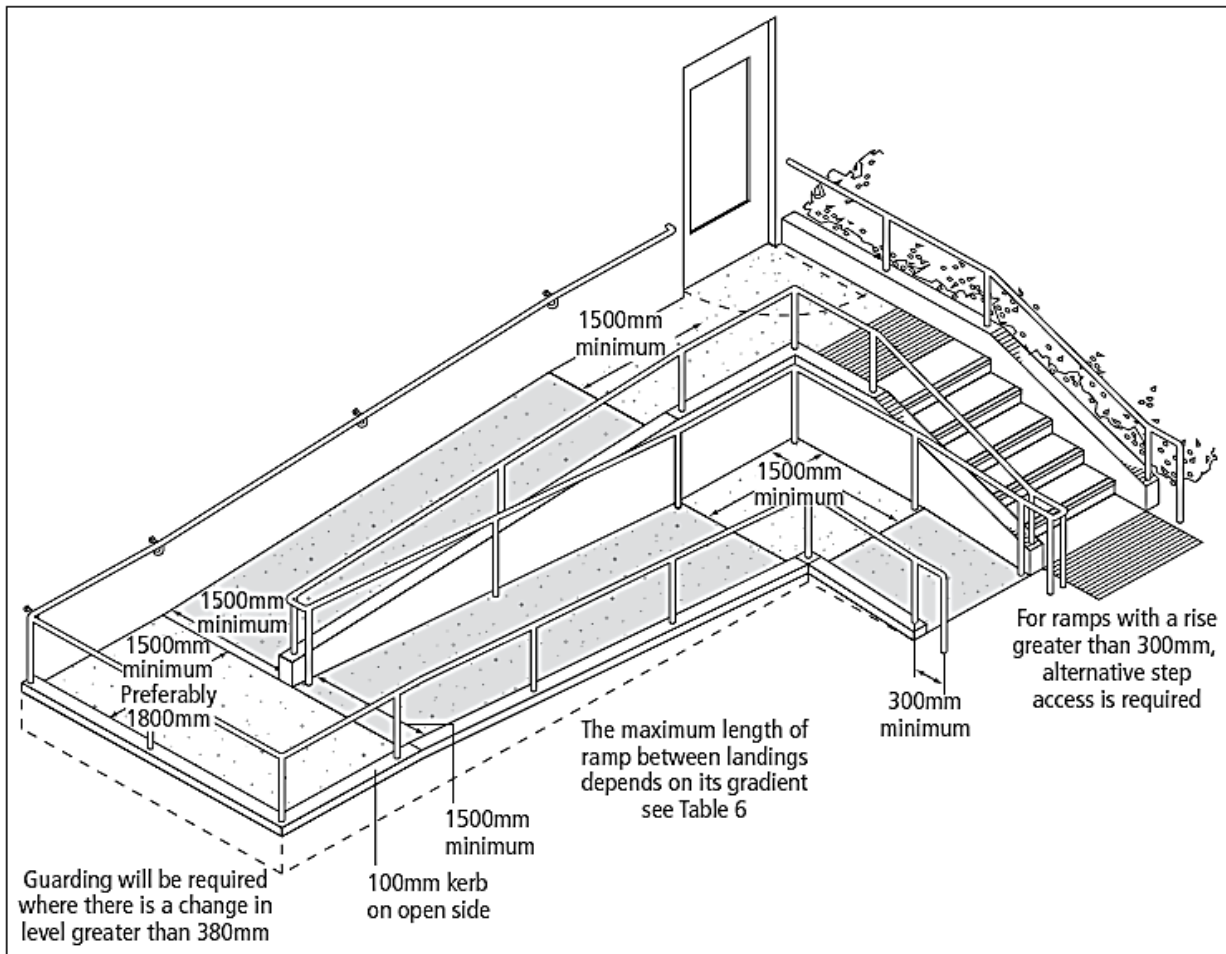


① Possible column positions, parking at 90° to access lane



② Parking at 45° to access lane

- Ramps safety requirements:



## STATISTICS:

- According to the current Architectural Engineering Society, which is the only existing association for Architects and Graduate Students, there are 41 Consultants in Sudan whom all are registered to the Association, 620 Specialists and 1910 Graduate Students. 80% of All Engineering College Students register at Sudan Engineering Society every year, take notice that some graduates travel abroad to other countries.

As for Graduates of Architectural Departments, there are 15 College Architectural Departments in Khartoum. List below illustrates each University and the average number of Students.

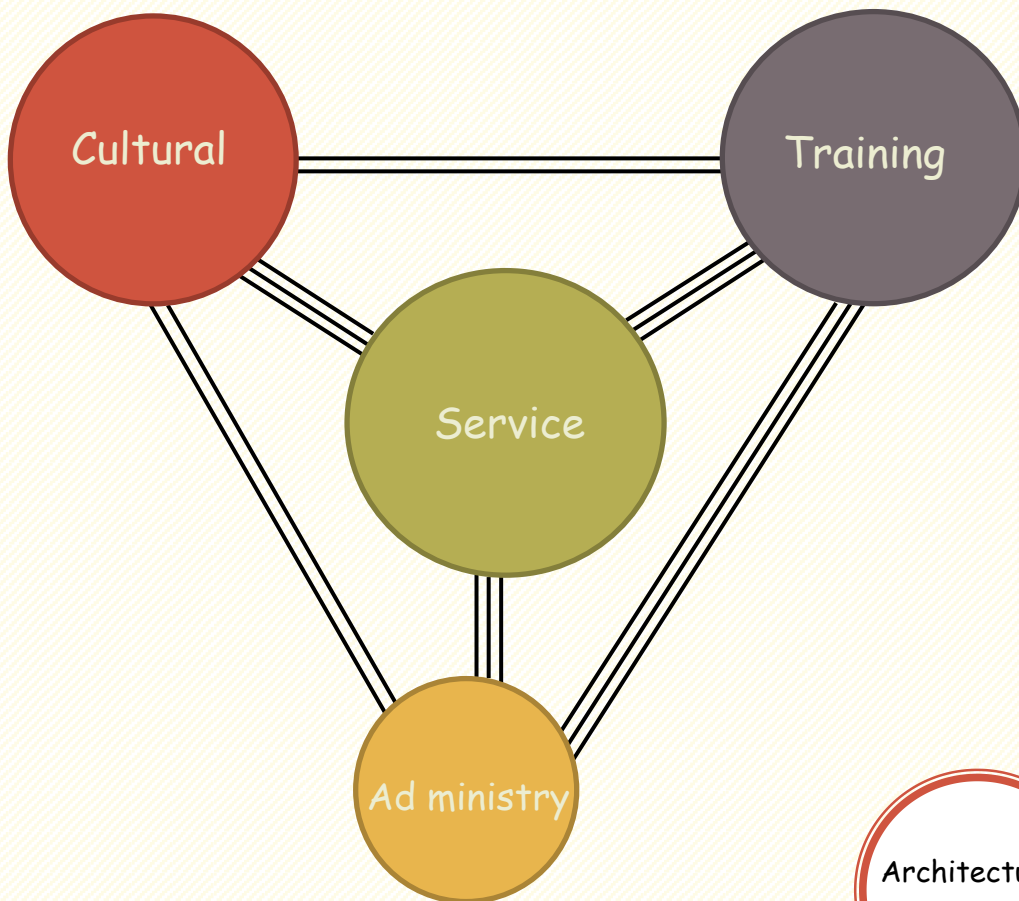
<i>University</i>	<i>No. Of Students</i>
<i>Khartoum University</i>	60
<i>Omdurman Islamic University</i>	60
<i>Sudan University of Science and Technology</i>	100
<i>Bahri University</i>	30
<i>National Ribat University</i>	60
<i>Omdurman Ahli University</i>	50
<i>Science &amp; Technology University</i>	70
<i>Future University</i>	130
<i>East Nile College</i>	55
<i>Nasr Technology College</i>	65
<i>Applied Khartoum College</i>	50
<i>Emirates Technology College</i>	100
<i>Science Engineering Academy</i>	60
<i>Garden City of Science &amp; Technology College</i>	50
<i>Al Jazeera Technology College</i>	



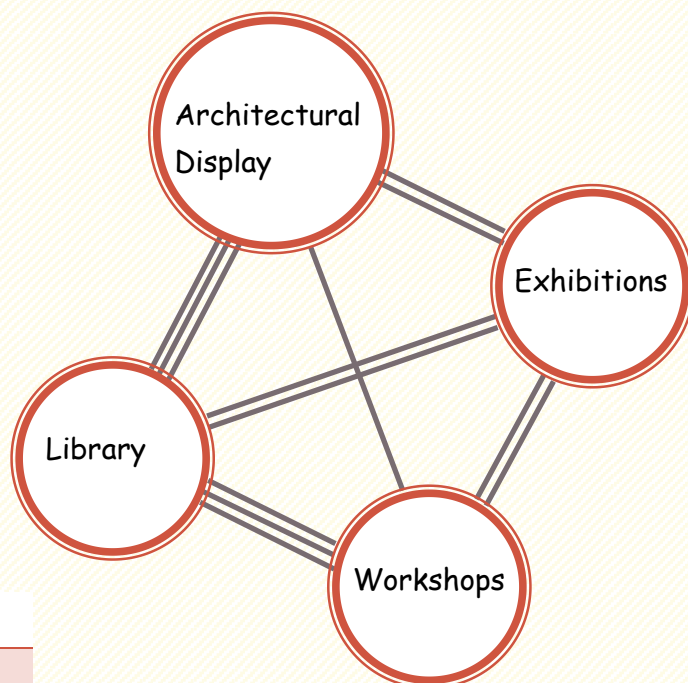
## Bubble Diagrams, Motion Diagrams and the Pyramid Diagram

- Bubble Diagrams:

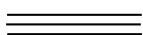
Main Spatial components of Project:



- Cultural Spaces



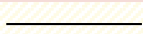
*Strong Functional bond*

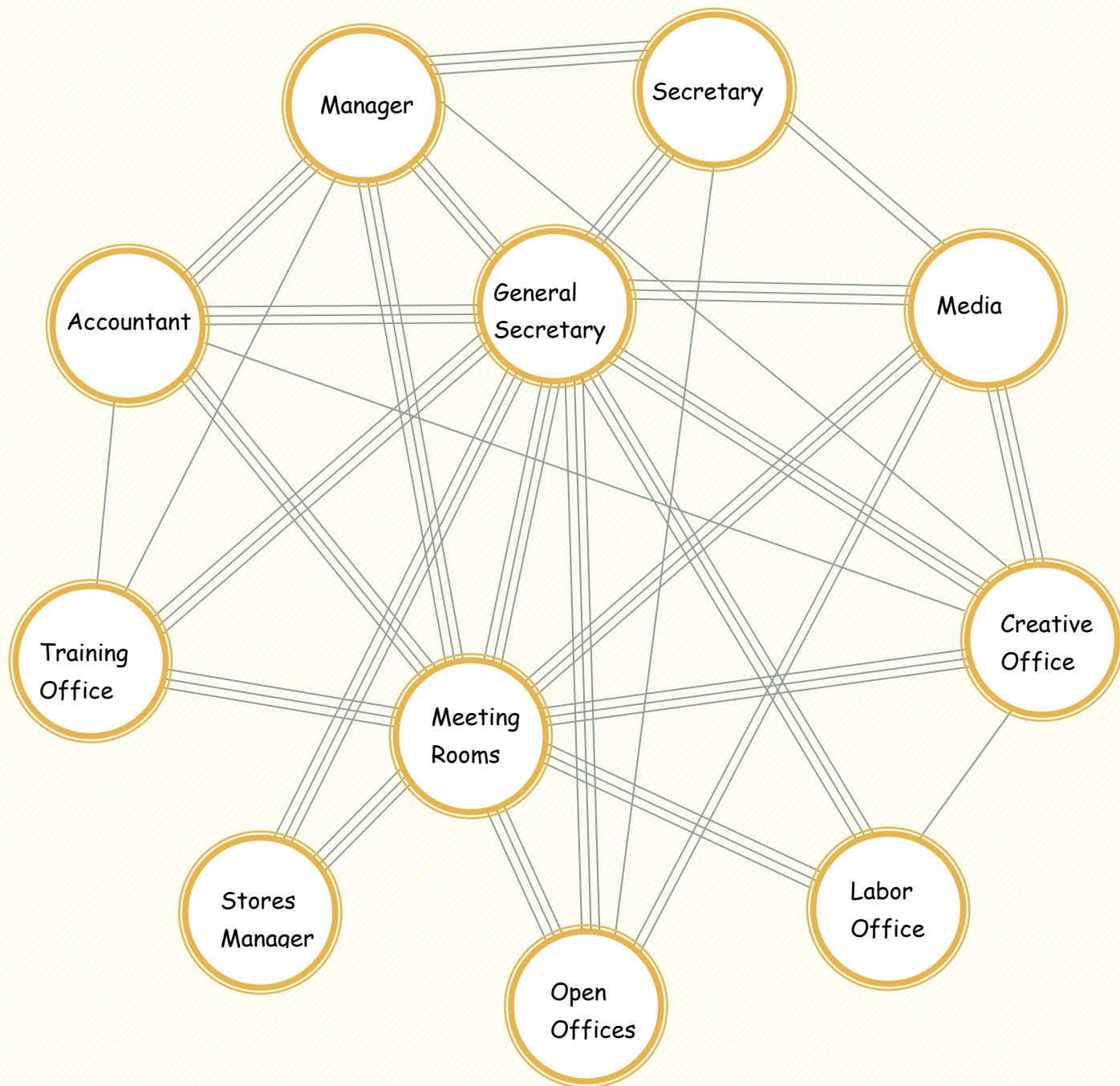


*Medium-Strength bond*

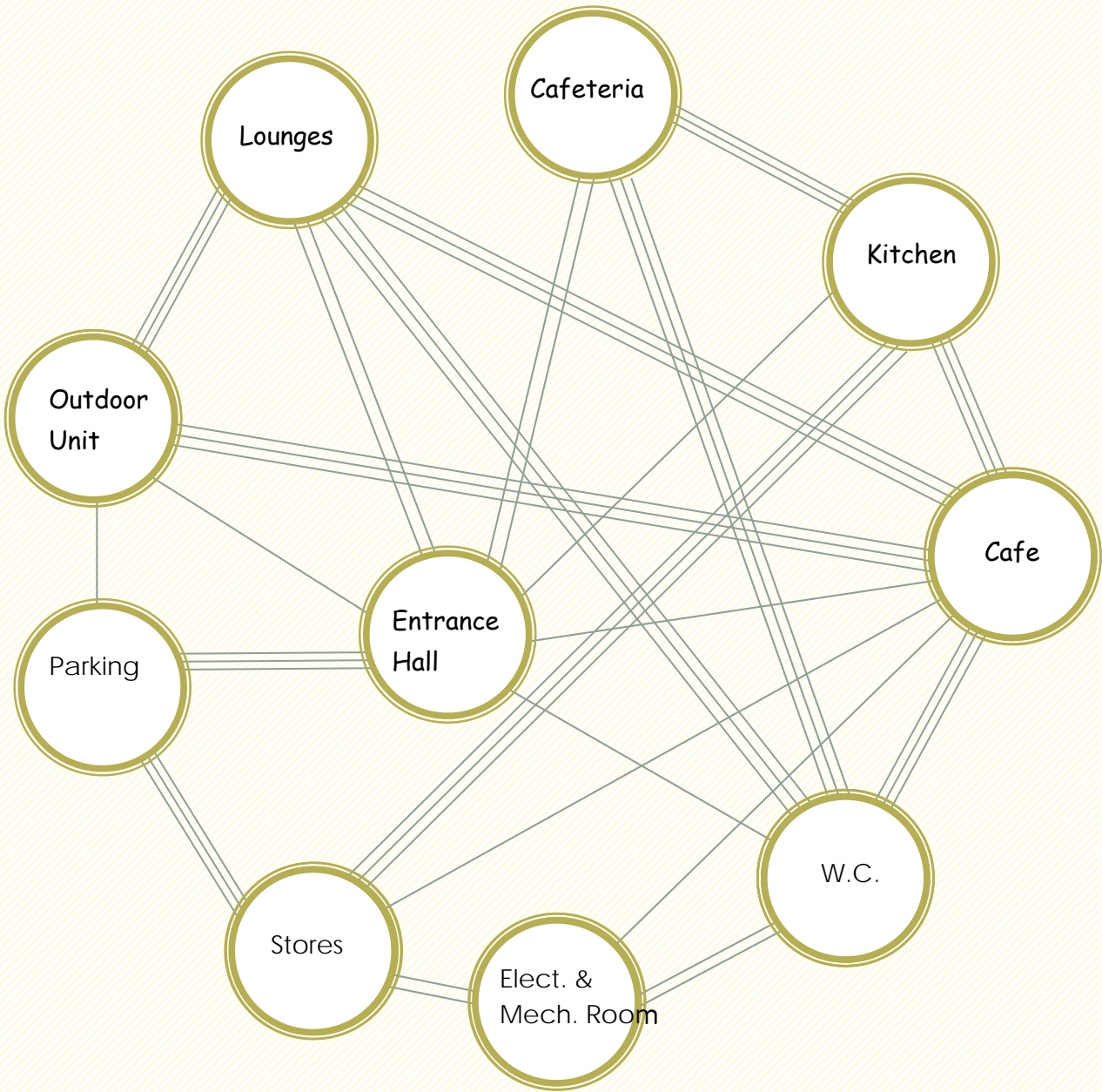


*Weak Functional Bond*





<i>Strong Functional bond</i>	≡≡≡
<i>Medium-Strength bond</i>	≡≡
<i>Weak Functional Bond</i>	≡

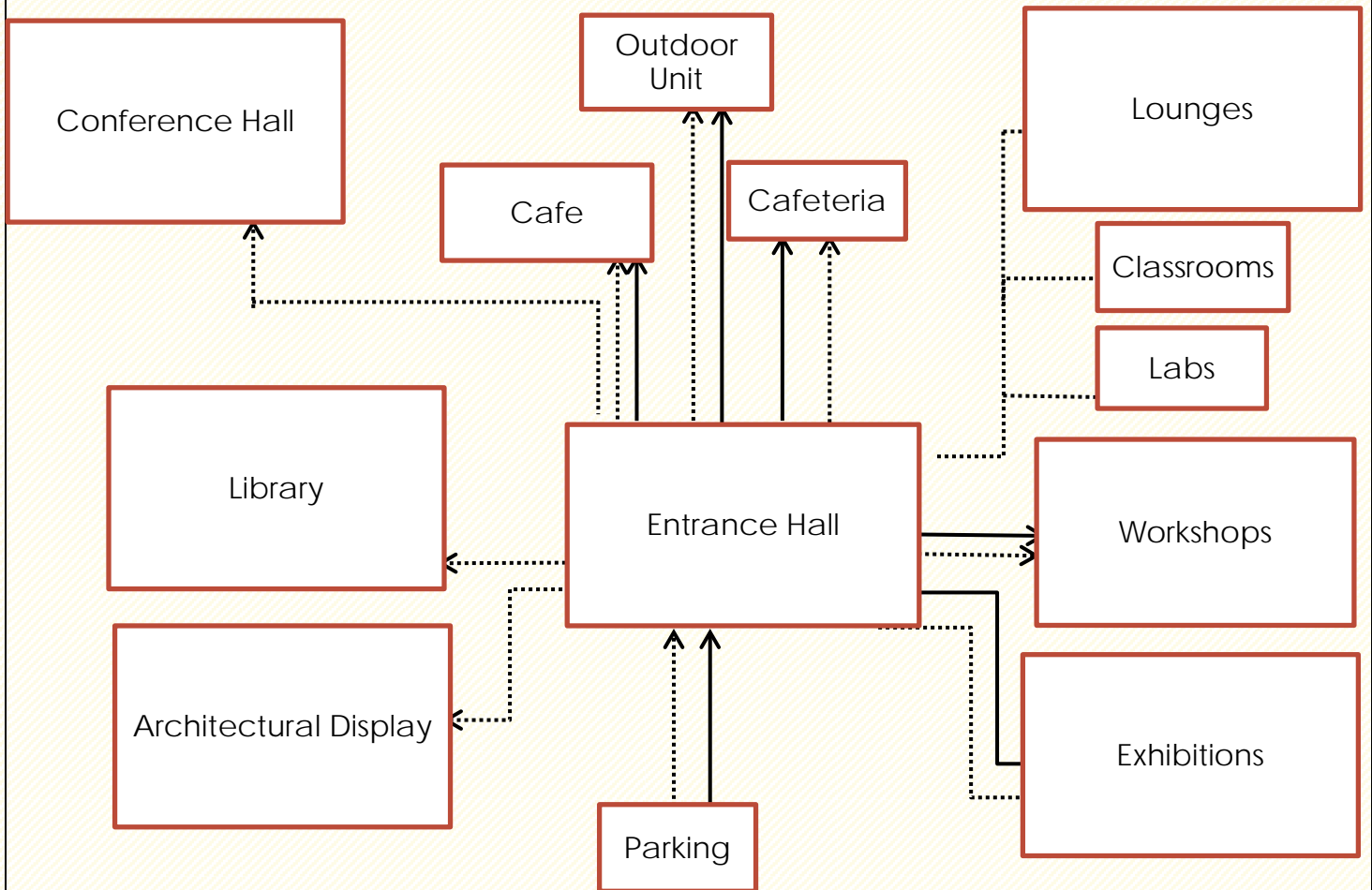


<i>Strong Functional bond</i>	====
<i>Medium-Strength bond</i>	=====
<i>Weak Functional Bond</i>	-----



- Motion Diagram:  
Visitors – Architects – Graduates – Employees – Laborers

(Visitors and Graduates)



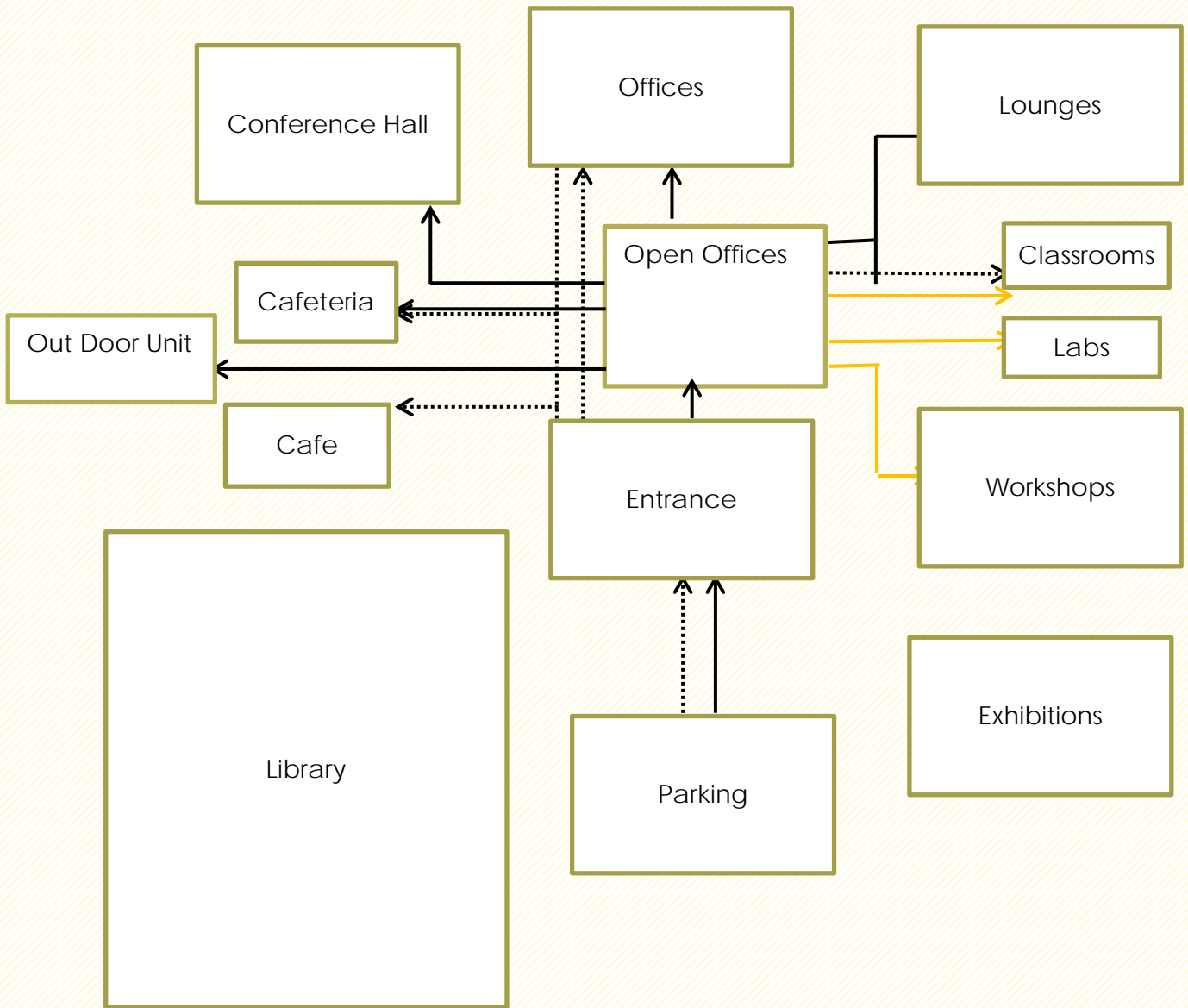
**Graduates**



**Visitors**



- The Diagram shows the difference between Graduates and Visitors activities. Graduates are considered "Registered Members", therefore they can access more areas unlike visitors, which are divided into two categories; visitors who are interested in Architecture and visitors who already know about architecture.

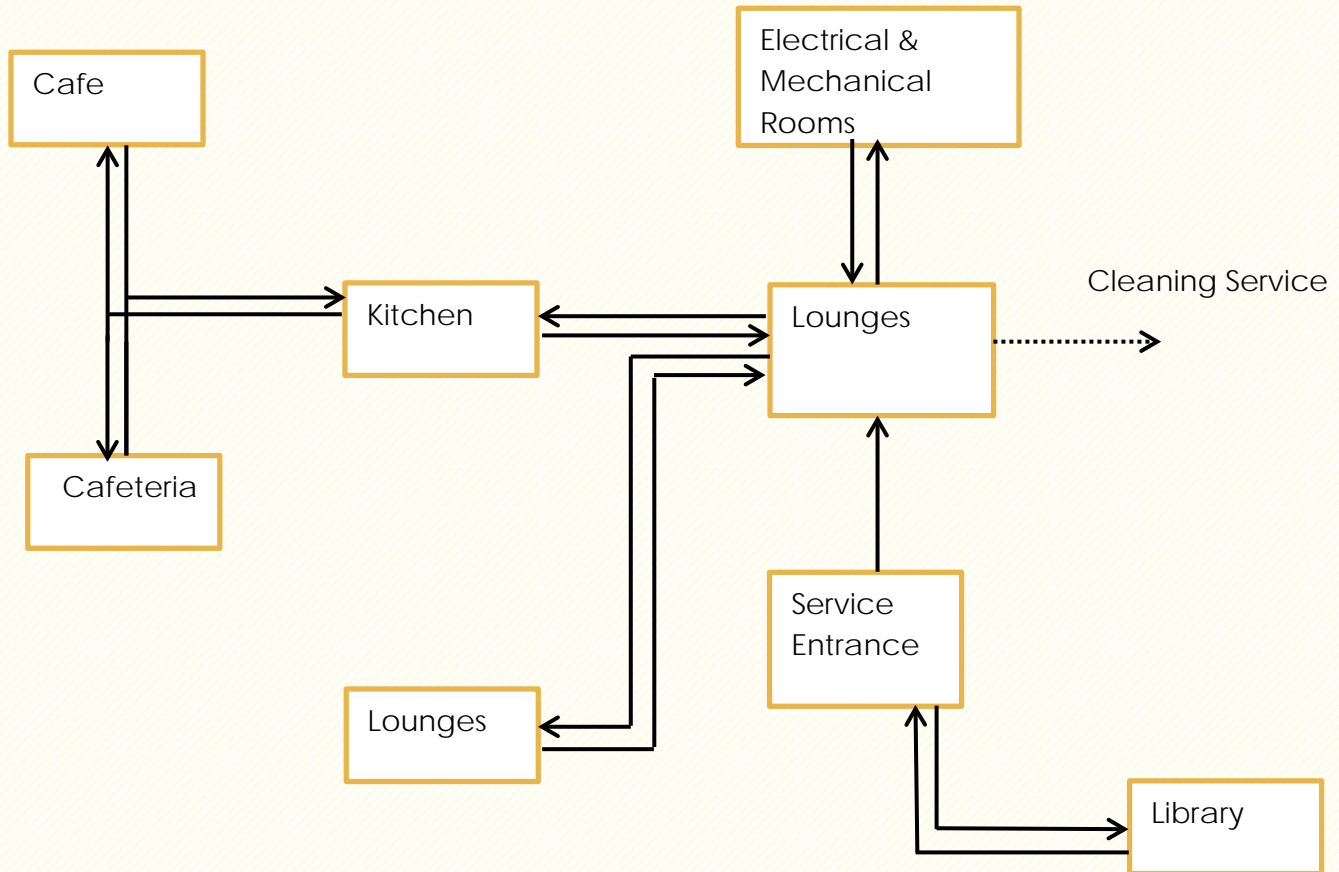


(Employees - Architects)

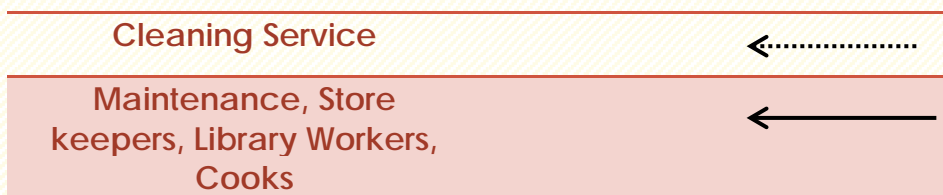


- Architects don't have direct contacts with classrooms, labs and workshops; however architects also offer teaching and training services to visitors and graduates. The Orange line is for Architects who will be teaching every once and a while. Architects only meet with employees in meeting rooms to discuss ideas and events, otherwise architects have their own offices

(Laborer Motion Diagram)



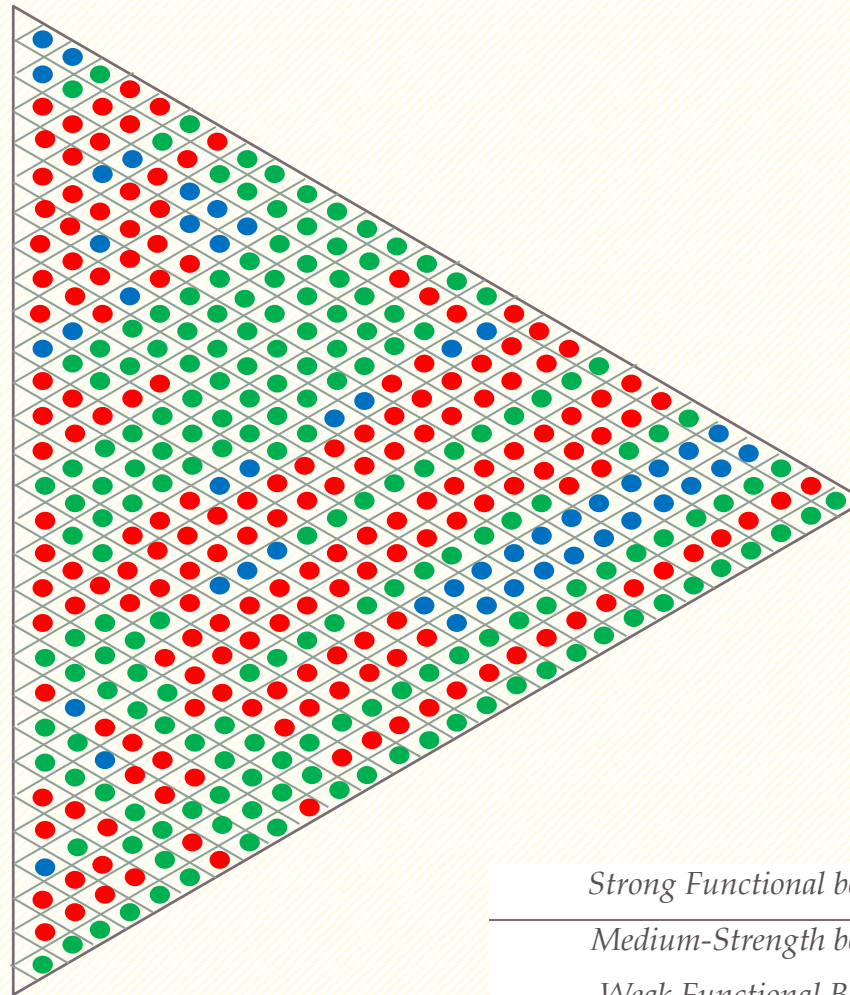
- Cleaning service access all areas at a specific time schedule.








- Pyramid Function Diagram:

Labors Office
Store Manager
Accountant
Manager
General Secretary
Secretary
Media Office
<Meeting Room
Open Offices
Creative Office
Training Office
Labs
Classrooms
Workshops
Library
Architectural Display
Exhibitions
Waiting Area
Entrance Hall
Lounges
Outdoor Unit
Parking
W.C.
Conference Hall
Café
Cafeteria
Kitchen
Stores
Elect. & Mech. Room



<i>Strong Functional bond</i>	
<i>Medium-Strength bond</i>	
<i>Weak Functional Bond</i>	

## Spatial Studies

<b>Informal Meeting Spaces</b>					
	Public gathering			300	300
	Public workplaces			150	150
	Architectural services			100	100
<b>Semi-formal meeting spaces</b>					
	The forum		2	100	200
	Digital browsing			150	150
	Classical browsing			250	250
	Study spaces			200	200
	Reading spaces:				
		Quite	40	2.5	100
		silent	50	2	100
		Group	25	4	100
<b>Formal meeting spaces</b>					
	Workshops/studios				
	• Modeling (small)		2	150	300
	• Modeling (big)		1	300	300
	• Sketching/drawing		2	100	200
	• Basic designing		2	200	400
	• Experimental		2	200	400
	• Other uses		2	150	300
	Labs		8	40	320

	Classes		4	50	200
<b>Data sources</b>					
	Books			800	800
	Periodicals/magazines			200	200
	Displaying architecture via digital		1		500
<b>Space of experience</b>					
	New technologies exhibition		1	500	500
	Architecture Competitions		1	500	500
<b>Administration</b>					300
<b>others</b>					
	Cafeteria				300
	Services				400
	Maintenance and storages				300
<b>Total</b>					9500 m2
<b>Circulation</b>			30%	9500	3000 m2
<b>Total Area</b>					12,500 m2



## Site Proposals, Site Studies and Analysis:-

Before we pick the better suited site for the project we review the requirements of the house of Architecture:

- a. The House of Architecture will represent a national statement, a social, cultural and educational hub for Architectural minds; it will attract local, regional and international visitors, therefore it is only fair for it to be located in the capital of Sudan, Khartoum City. It's preferable for the location to lie next to other social gatherings, festivals, international events and place that would attract tourists around the world. Also a place that can possibly be centered in an area where it's reachable to all architectural students and graduates and close to the transportation line.

I was given the option to choose between 2 sites to design my project in, which were presented from the Surveying Department of the Ministry of Planning and Urban Development:

- a. First site is located at Al Sahafa, at the intersection of Mohamed Najeeb St. and Mamoon Behery St. The Athletic City of Sudan University of Science and Technology lies on the west. On the north lies an empty land which belongs to Saad Aboulela University Hospital.



**Site Advantages:**

- Site is well centered in the middle of Khartoum. It's also at an intersection of two main roads.
- The site is reachable from Khartoum, Omdurman and Bahri.
- It's located next to SUST, which is ranked the 4<sup>th</sup> best engineering college in Sudan. It's also located next to the headquarters of the Ministry of Planning and Urban Development.
- Area of Site is 20,000 meters square.
- Mohamed Najeeb is a commercial road. The site is located next to Sudatel Conference hall (Social Gallery).
- There are 2 branch roads on the northern and western side of the site, which can function as service roads.

**Site Disadvantages:**

- The House of Architecture forms events and gatherings which might cause disturbance to the residential area lying south to the site.
- The Hospital area might cause noise issue if built.

- b. Second Site is located at Arkaweet, Ebed Khatim St next to the Football Field, the International Center of Quality and Ali Ibn Abi Talib Mosque. (See Site on page 41).

**Site Advantages:**

- Site is 15600 meters square.
- Reachable by public transportation.
- Square shaped site makes it easier to design freely, not affected by wind direction and ventilation.

**Site Disadvantages:**

- Site surroundings have no social events or gatherings
- Site is surrounded by residential areas, which can cause disturbance to the neighborhood.



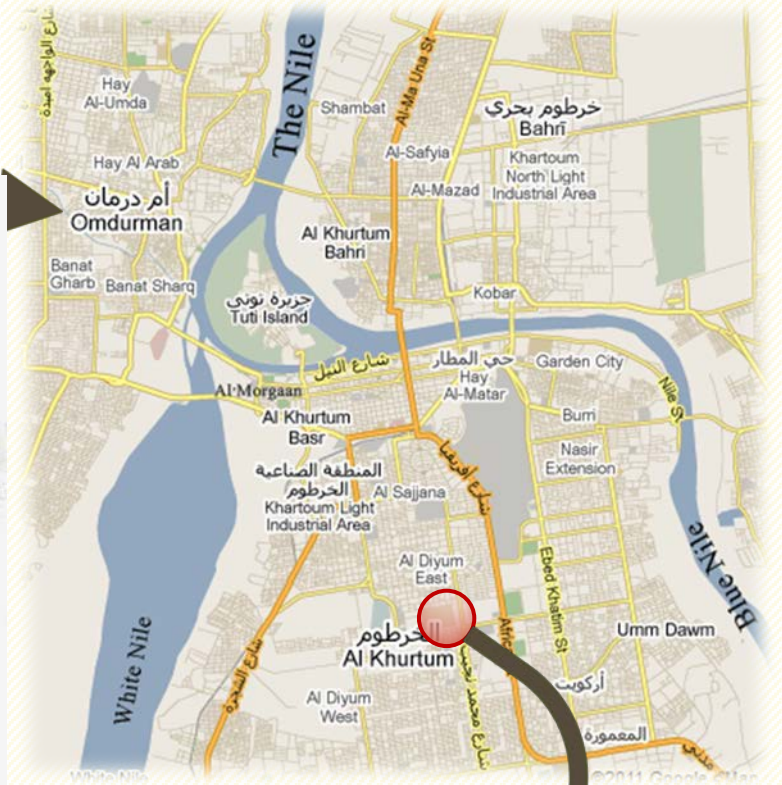
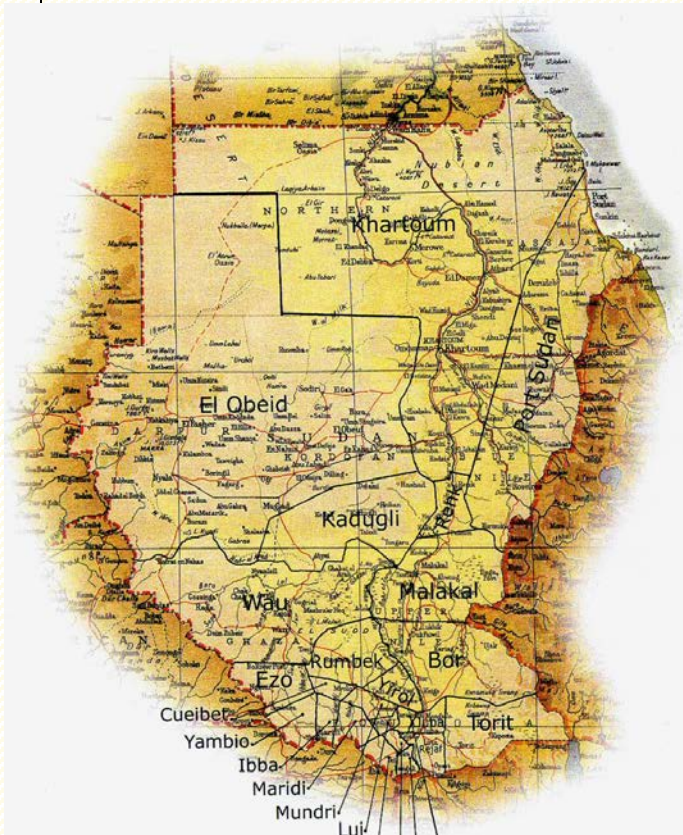


- Based on the comparison analysis between the first and second site, I have chosen the first site location at the intersection of Mohammed Najeeb ST. and Mamoon Buhery ST.



## Site Studies and Analysis:

- Location:



-Khartoum, Al Sahafa, Mamoon Buhery and Mohamed Najeeb St. intersection.

-2 Branch roads at the Western and Northern side.

-2 Main roads at the eastern and southern side.

-Residential Areas lie within the Southern and Eastern side, there's a Petrol Station by the Eastern side of the site.

-At the Northern side lies an empty land belonging to the University Hospital of Saad Abulela, at the Western side lies Sudan University of Science and Technology, one of the advantages benefiting the construction of the Project.

- 20,000 meters square.

- Site currently contains trees and piles of sand, uneven ground levels.

### Site effect on the surrounding:

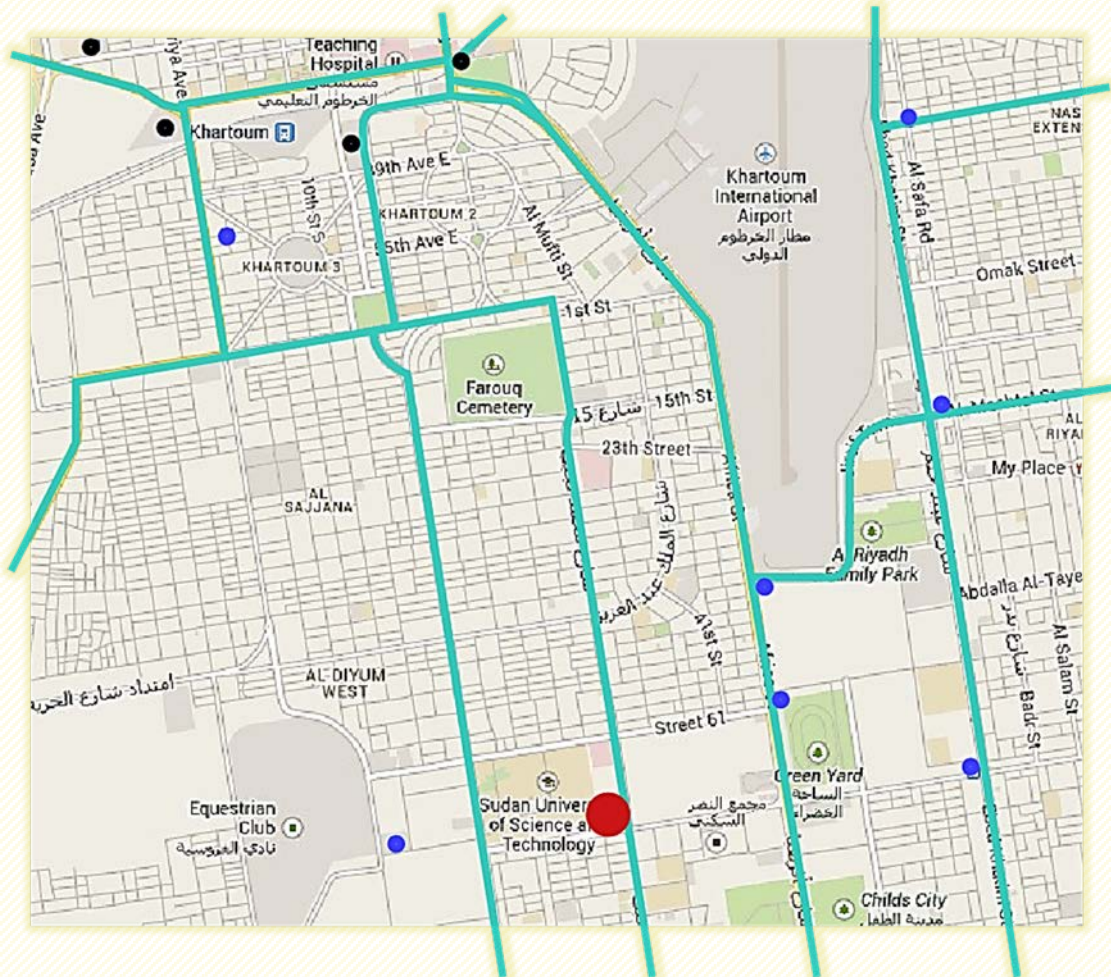
-Site location is almost situated at the center of Khartoum. This aims more in stating the project as a national statement that attracts the public.

- The project also aims in evolving Mohamed Najeeb St. which is currently a commercial road into a street with more cultural and educational facilities.



-Site is situated next to several colleges, along with the headquarters of the Ministry of Planning and Urban Development whom benefit the most from the project.

- **Accessibility:**



● Site Location

● Bus Stops

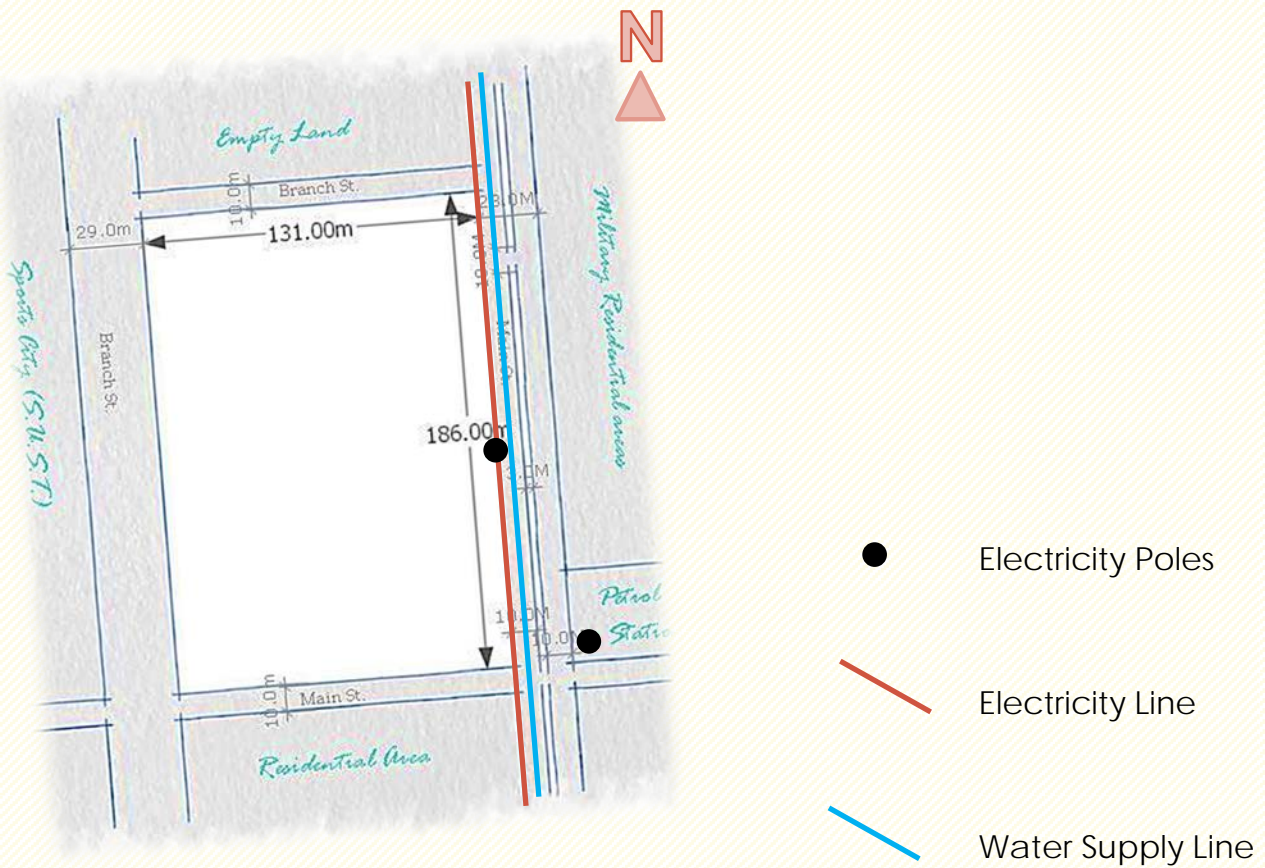
● Bus Stations

— Transportation Line  
 — Rickshaw Line

**-From Bahri and Omdurman:** Jackson Station or Stadium Bus Station, to Sharwani Bus Station, either Alshafa transportation Or Africa St or Mohamed Najeeb St. transportation buses, private transportation vehicle (Rickshaw).

**-From Khartoum:** Sharwani bus station, Mohamed Najeeb St., transportation buses.

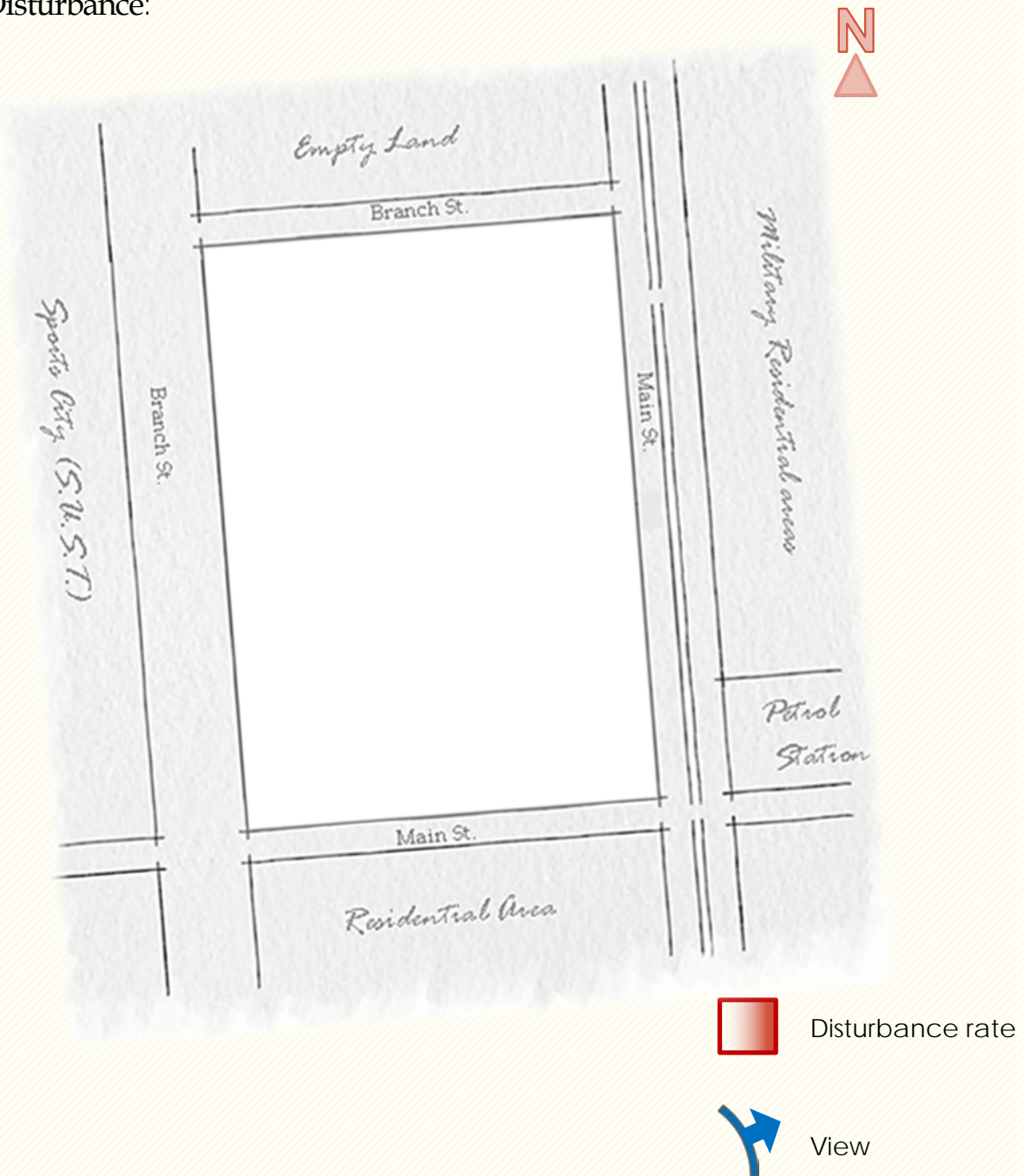
- Electricity and Water Supply:



-**Water:** water supply comes from Al-Sahafa Extension three from Mohamed Najeeb Street.

-**Electricity:** Electricity lines extend from Al-Amarat Electricity Station with the total amount of 220 v.

- Disturbance:



<b>Advantages of Site</b>	<b>Dis Advantages of Site</b>
Site has sufficient area for construction of project	Pollution and disturbance on the Eastern and Southern side on the main roads
Rectangular-square shaped site makes it easy to design	longer side of the site is facing North-South
No Similar projects in the area increases the beneficial use of project	There are no drainage and Sewage system installed in the area.
Available services (Electricity, Water...etc)	There are no attractive sceneries around the site
The sight achieves the architectural necessity for the building to clearly exhibit itself for the public passing by the street.	



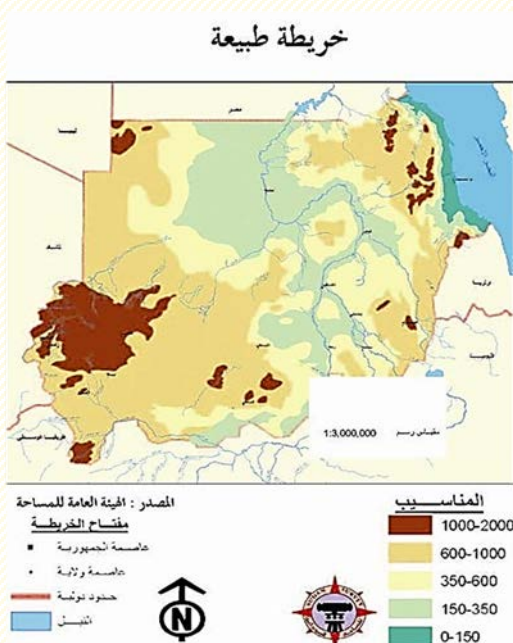
- Spaces that require a quiet environment should be situated in the North -western side (Labs, Classrooms, workshops, Library, etc).
- The building's main elevation will face the Eastern Side, viewing the commercial road (Mohammed Najeeb st.)
- The longer side of the site is facing North-South, therefore the building will be rotated 45 degrees to ensure the best ventilation for every space.

## Environmental Studies:

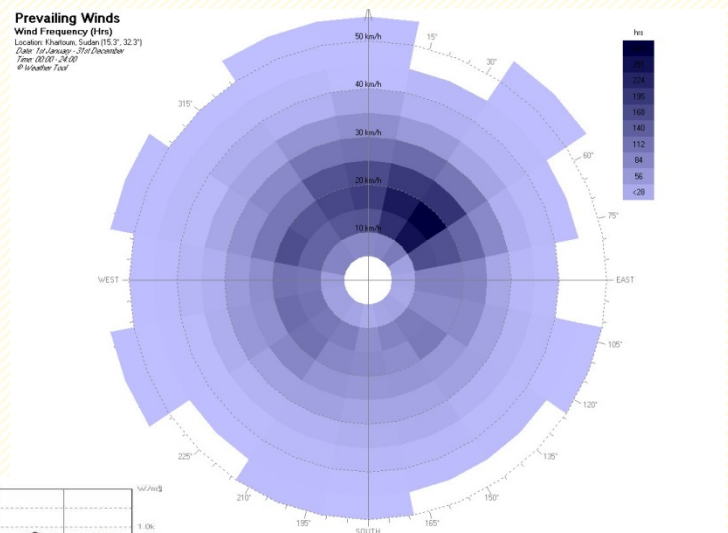
**Sudan General Climate:** The tropical Climate which features high temperature degrees throughout the year, grading from the north (Hot and Dry) to the south (Hot and Humid).

**Khartoum Climate:** The seasonal composite of distinct seasonal changes in Solar Radiation and Wind Direction. Generally there are two seasons; Hot and Dry weather which takes two-third of the year and warm and humid which take the remaining third of the year.

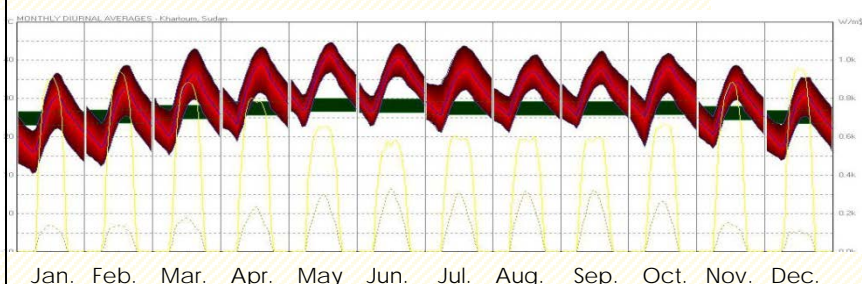
- Wind direction is North-Eastern during winter and South Western during summer.
- Highest wind speed is during June and the lowest in during November.



- Building should be painted with light paints to avoid Heat absorption and heat isolation methods must be applied.
- Landscaping and water elements help in purifying the environment.
- Blocking direct sunlight into the building and avoid using heat-absorbing materials.



-Ground Levels



-Wind Rose

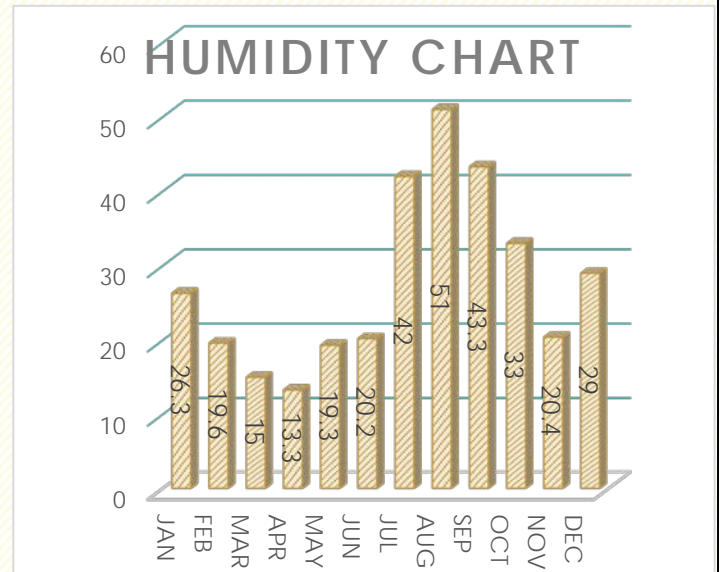
Diagram Shows Temperature Studies in Khartoum



## Average Rain Fall and Humidity temperature according to Meteorology:

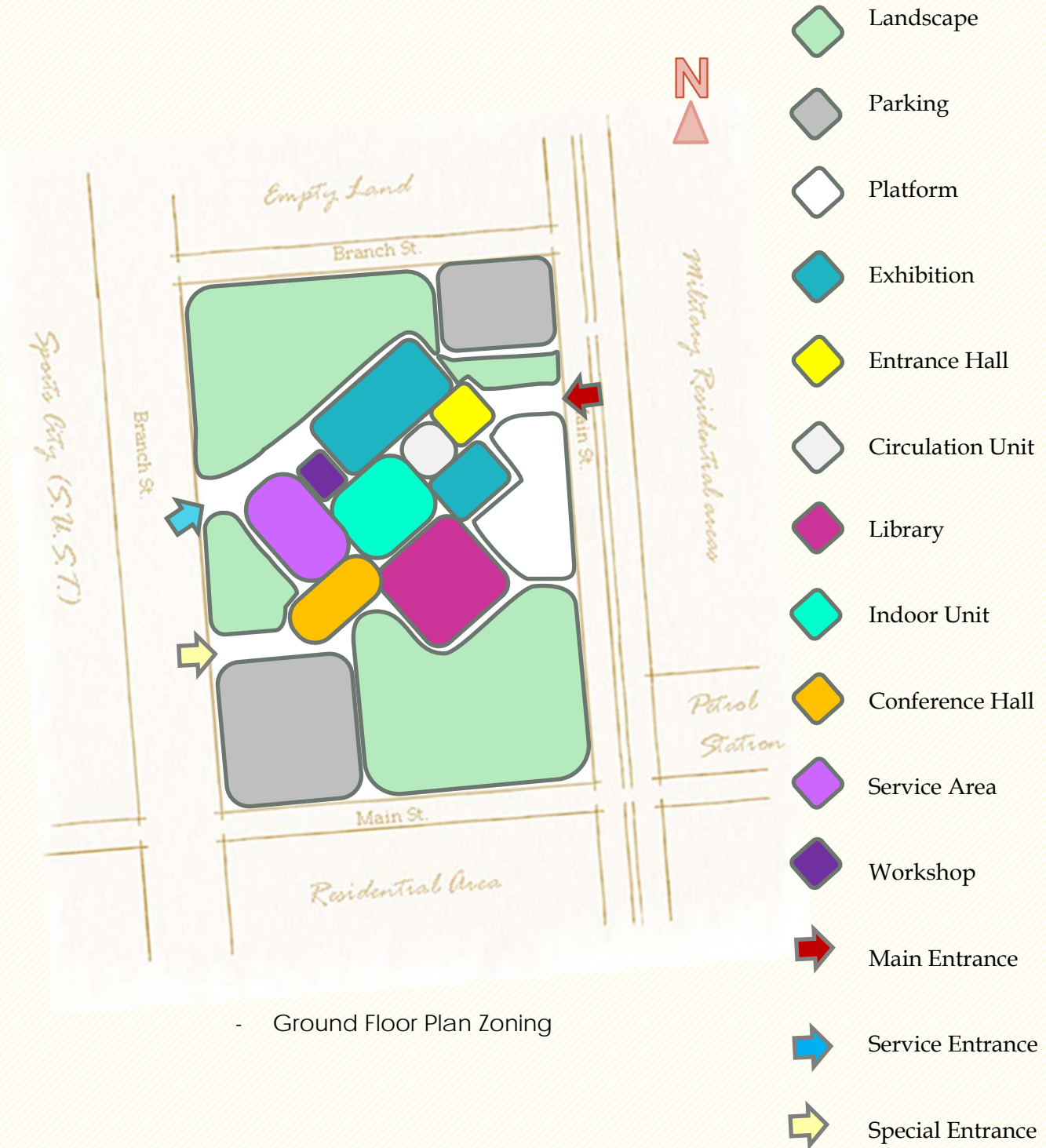
- Highest Humidity rate is in August which is equivalent to 51%.
- Lowest Humidity rate is in April which is equivalent to 13.3%.

- Distributing Landscape at the Northern side in order to purify the Northern wind in summer.
- Long spaces are to be distributed at the South-Eastern side.
- Rotating spaces towards the wind direction (South-Western and North-Eastern), as wind direction is most constant throughout most of the year.

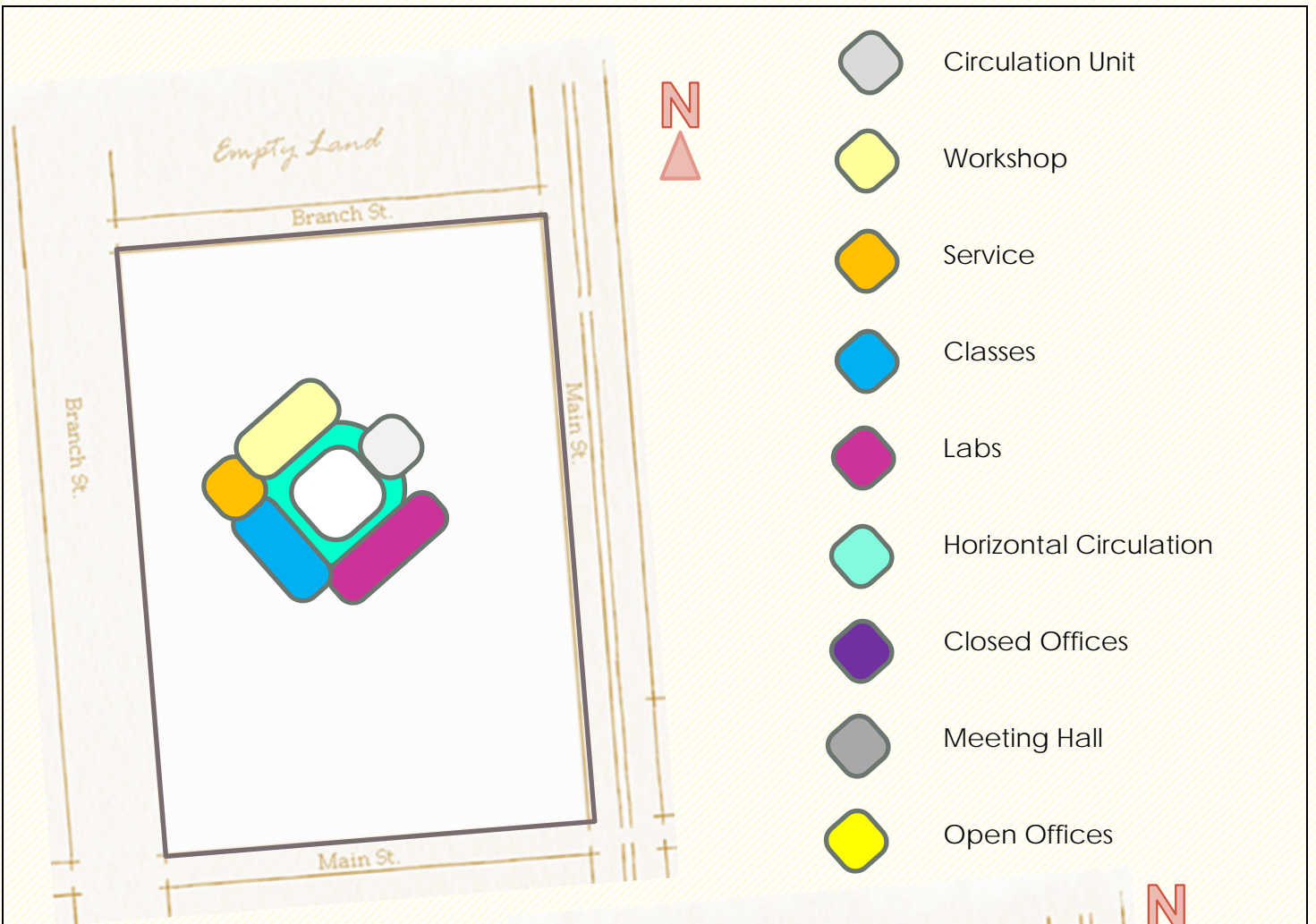


## Zoning:

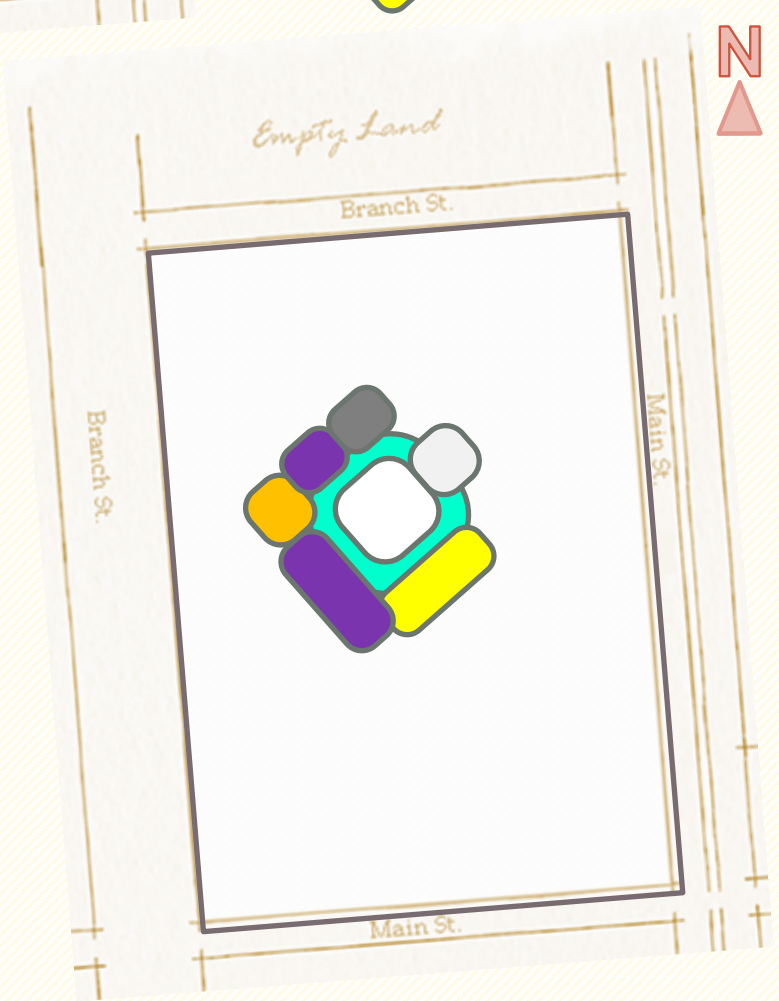
By applying the design indicators mentioned above I have formed my basic zoning plan:



- Ground Floor Plan Zoning



- First Floor Plan Zoning



- Second Floor Plan Zoning

## CHAPTER FOUR

### Design Concept, Initial Advanced and Final Submission

- **Concept Design:**

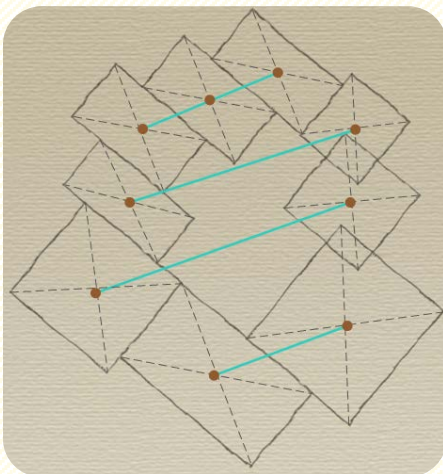
*“There is no doubt that although we may never succeed in discovering a method of fully rendering a conception of space in a plan, we shall nevertheless achieve better results in learning how to understand space and how to look at architecture by analyzing and discussing the means we have.”*

[Architecture as space: how to look at architecture, Bruno Zevi, 1947, Horizon Press (1957)]

Architecture can never be captured into a building; it can never be defined by walls, floors and ceilings. Architecture has always been the creation of imagination molded into a building, and because imagination is limitless, it's impossible for Architecture to take one form. The goal here is to try to represent a fraction of it, if possible, into my project.

The House of Architecture is a Cultural-Training Center that hopes to inspire the public and help them understand Architecture through basic classes. So I've decided to extract my concept design from the basic architectural lessons.

*“More recently, architecture has turned into means of making money, entering into the realm of speculation where architecture became about investment and the prospect of making money off the design. Over designed buildings became part of a financial strategy that masked any relationship in architecture's original intent, the creation of space that serves humanity” - Mathias Hollwich.*

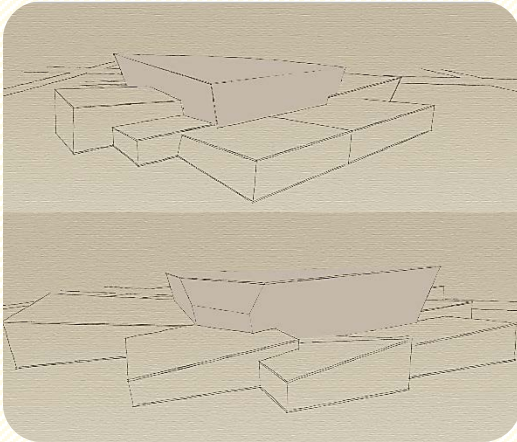


*“Less is more” “The Simpler the better”*

Shifted Squares and Rectangles are the most basic shapes that imply my idea of simplicity. In order to develop this idea I have chosen to apply the deconstruction Architectural style with the staggering and different levels of masses on the 3D. I have also slanted all exterior walls and rotated some of my masses.

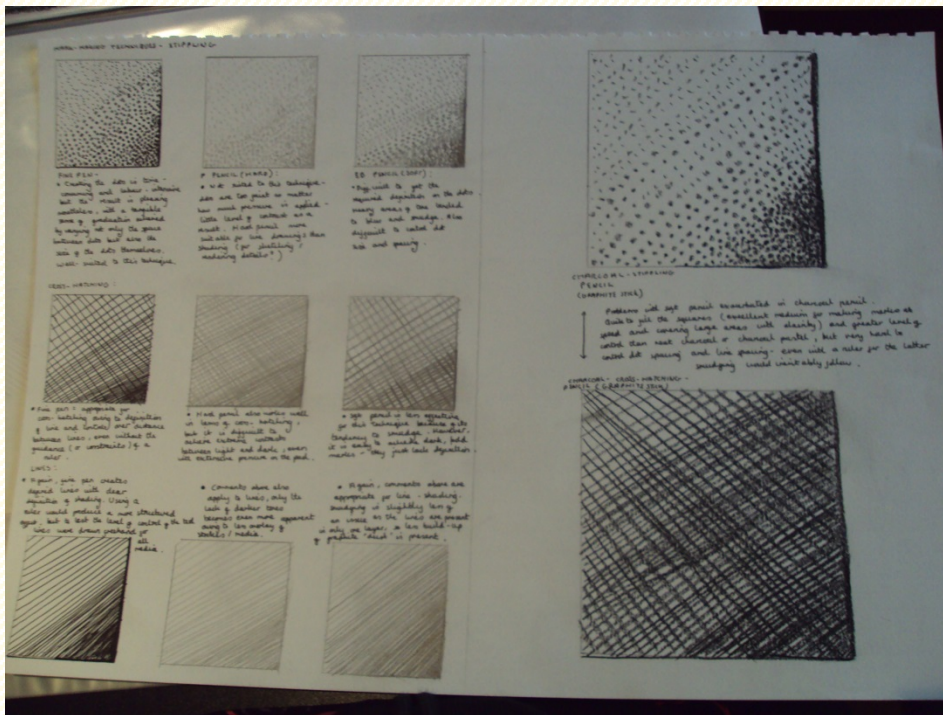


-Drawing shows Form of Spaces and the relationship between each center.



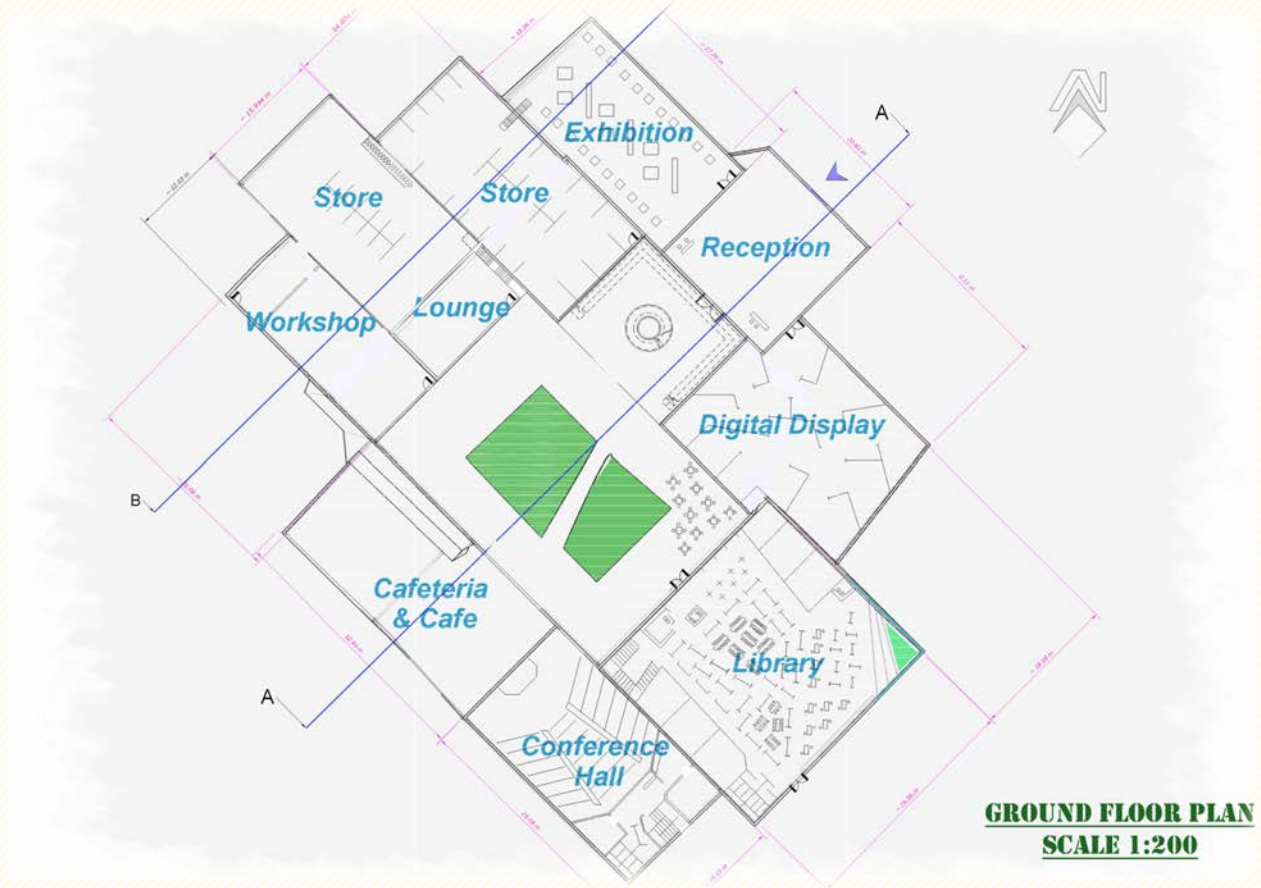
- Drawing shows 3D form of masses, as a plan, each mass is formed originally as a square or a rectangle. As each shape rises in a 3D form, basic shapes expand in an irregular way.

-In order to house Architecture in Architecture I've chosen to use the primary basics of Architecture I've studied on my first year, Lines, Shades and tonal patterns and apply them on the site and elevations:



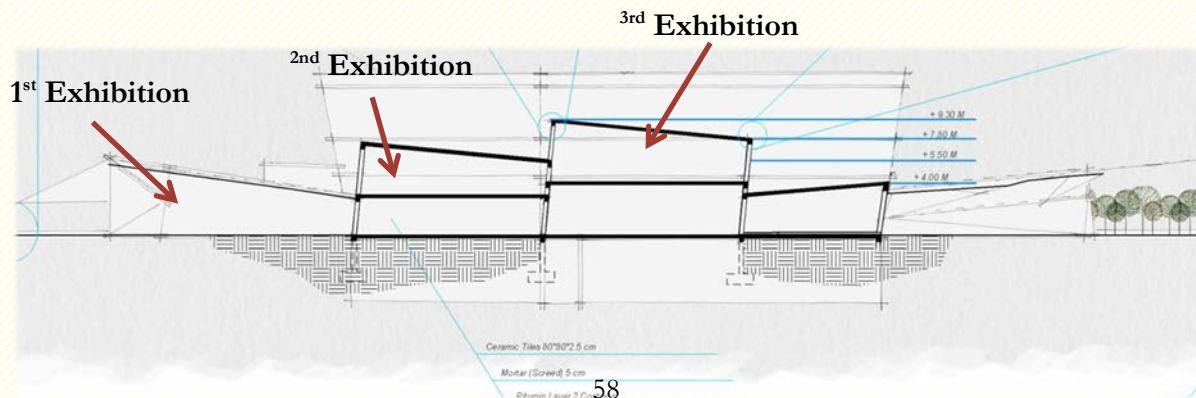
## INITIAL AND ADVANCED DESIGN:

### -Primary Submission Design:



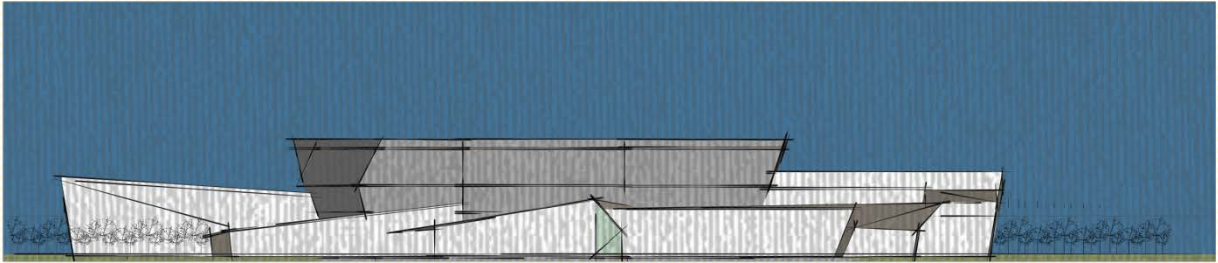
### Dis advantages:

- Core was open which allowed rainfall and dirt inside the building.
- The odd connection between the Workshop and the Conference hall.
- Ramp was too steep.
- Conference Hall was too small.
- There were no elevators included in the design
- The difference in height between the first exhibition and the second added more stair steps which might get too tiring for visitors to climb.



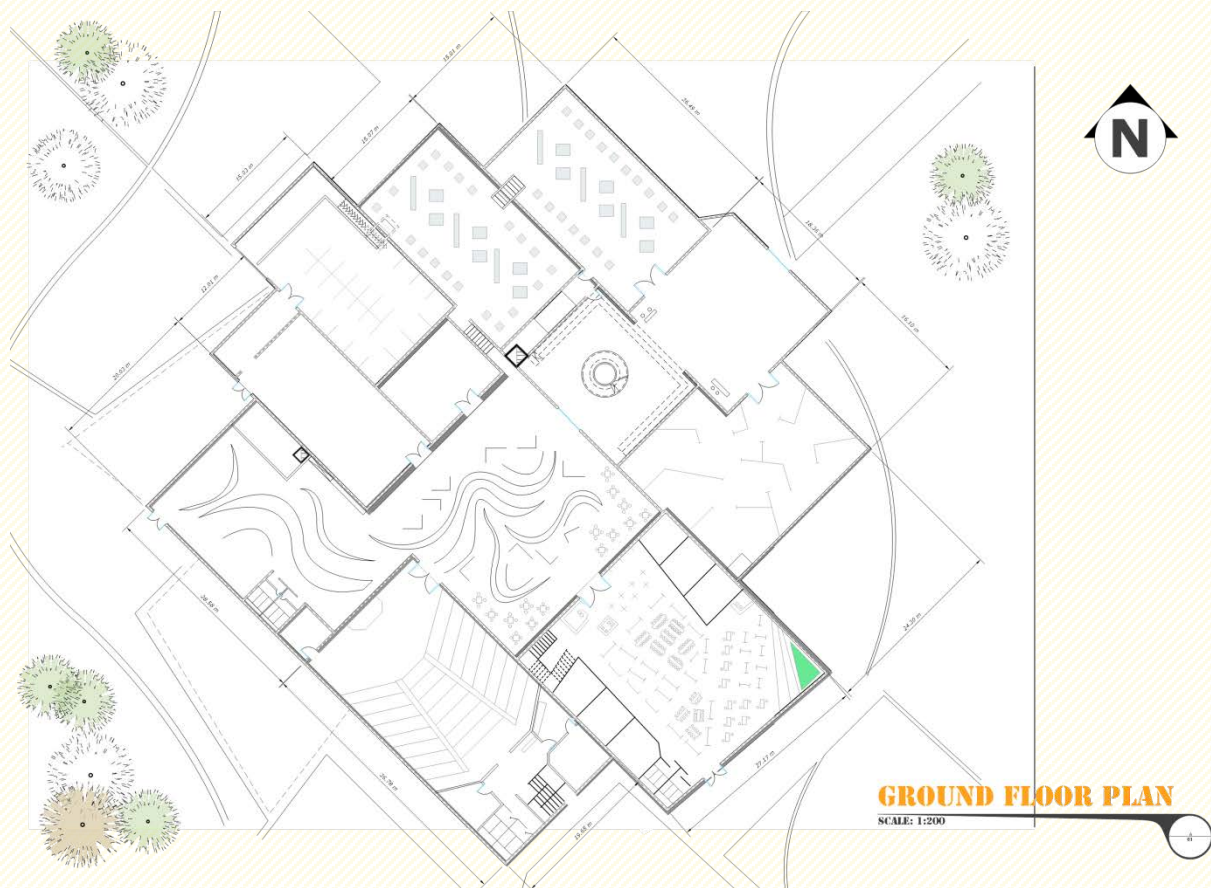


- Building masses were too stiff in elevation.



**- Advanced Submission Design:**

Several adjustments took place in this phase as the masses were shifted and staggered more. Service area was divided between the basement and the ground floor in order to simplify the service procedure. Library was more organized and the main pathways became more clear. Spaces in general were brought closer in order to ease access. Landscape design was curved into contouric lines to break the square-rectangle shape of the general concept.

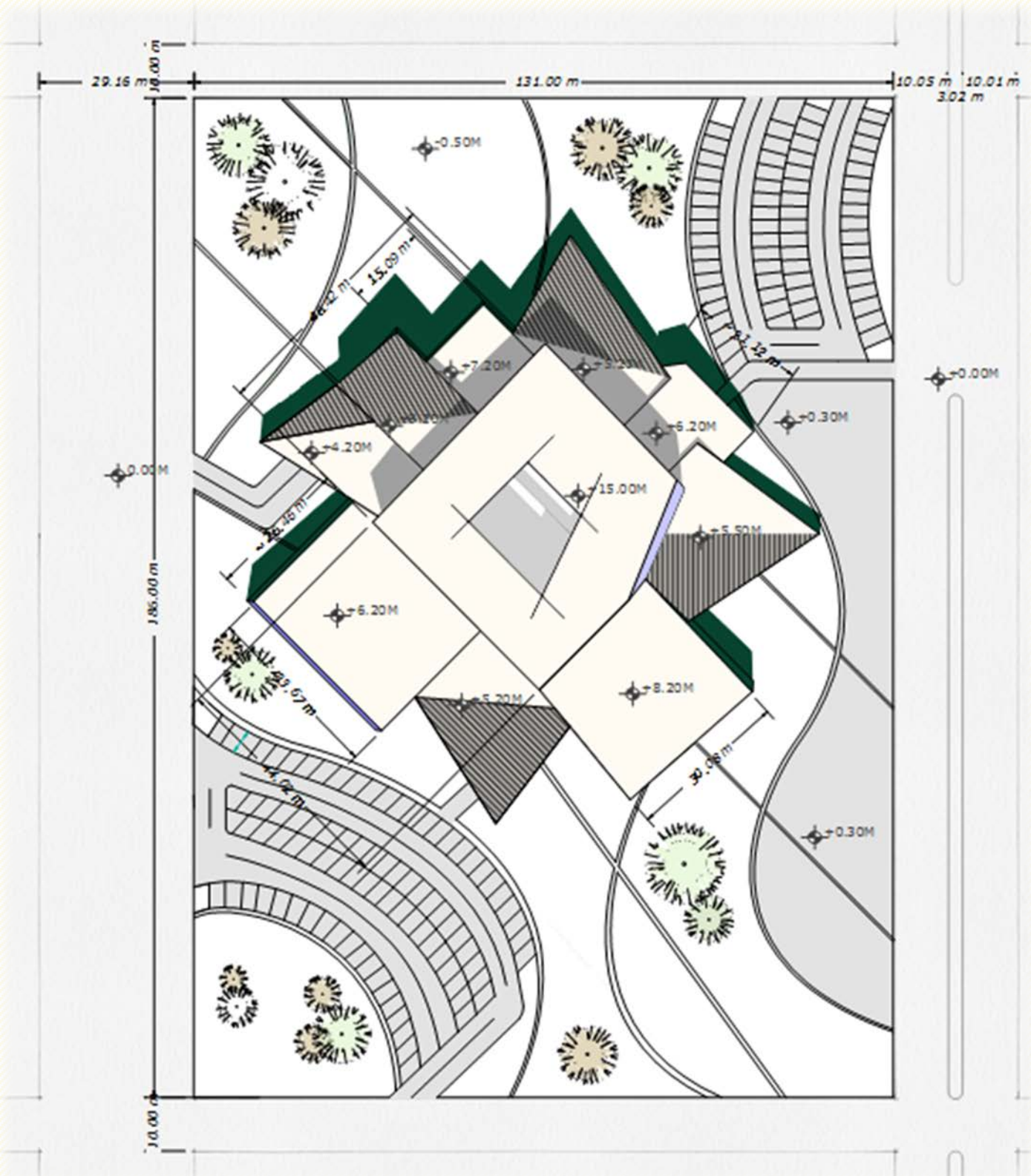


**Disadvantages:**

- Service area was clustered on the ground floor level.
- Reception room in conference hall was too small.

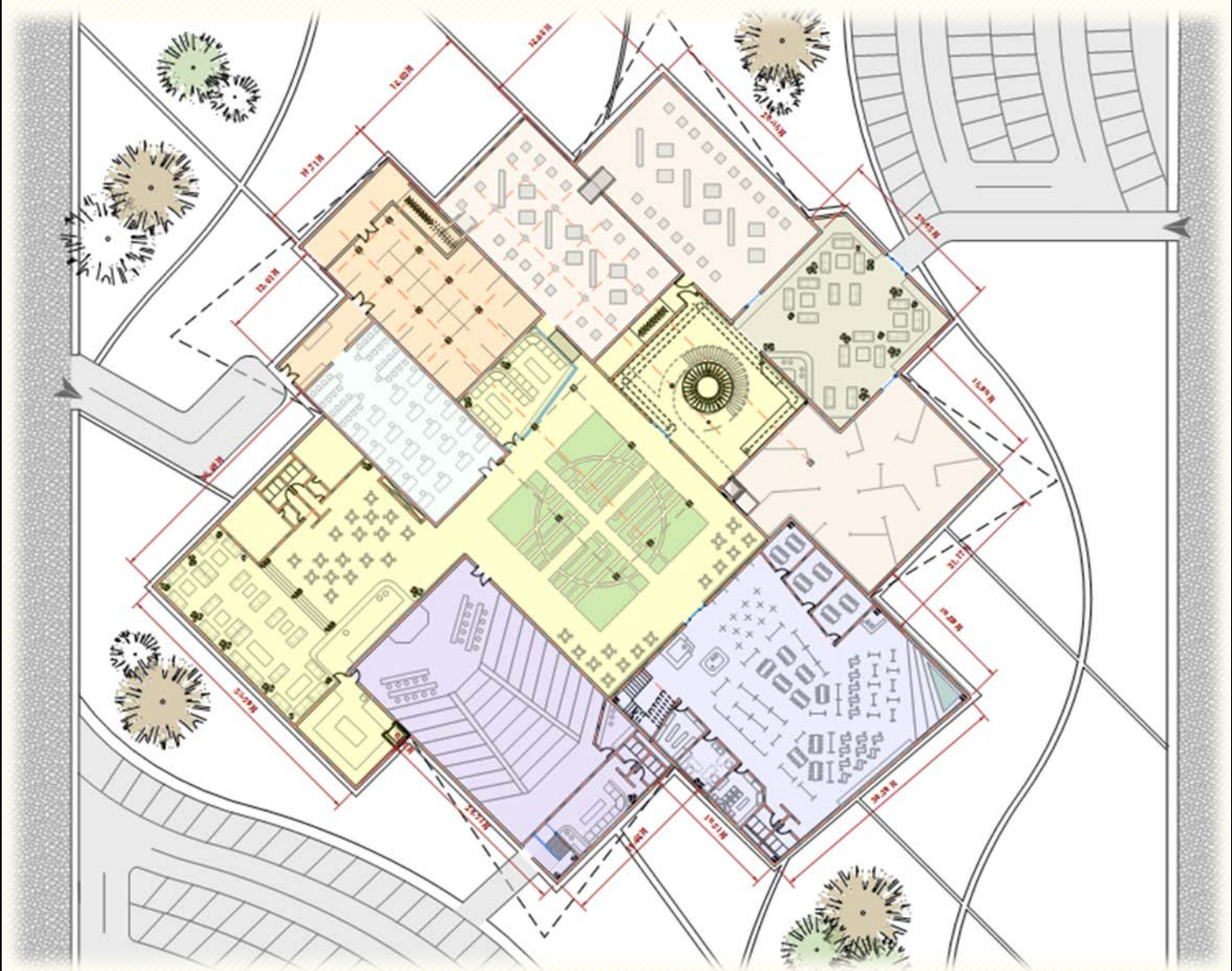
Negative points were taken in consideration for the following final submission stage:

# THE HOUSE OF ARCHITECTURE: SITE PLANS



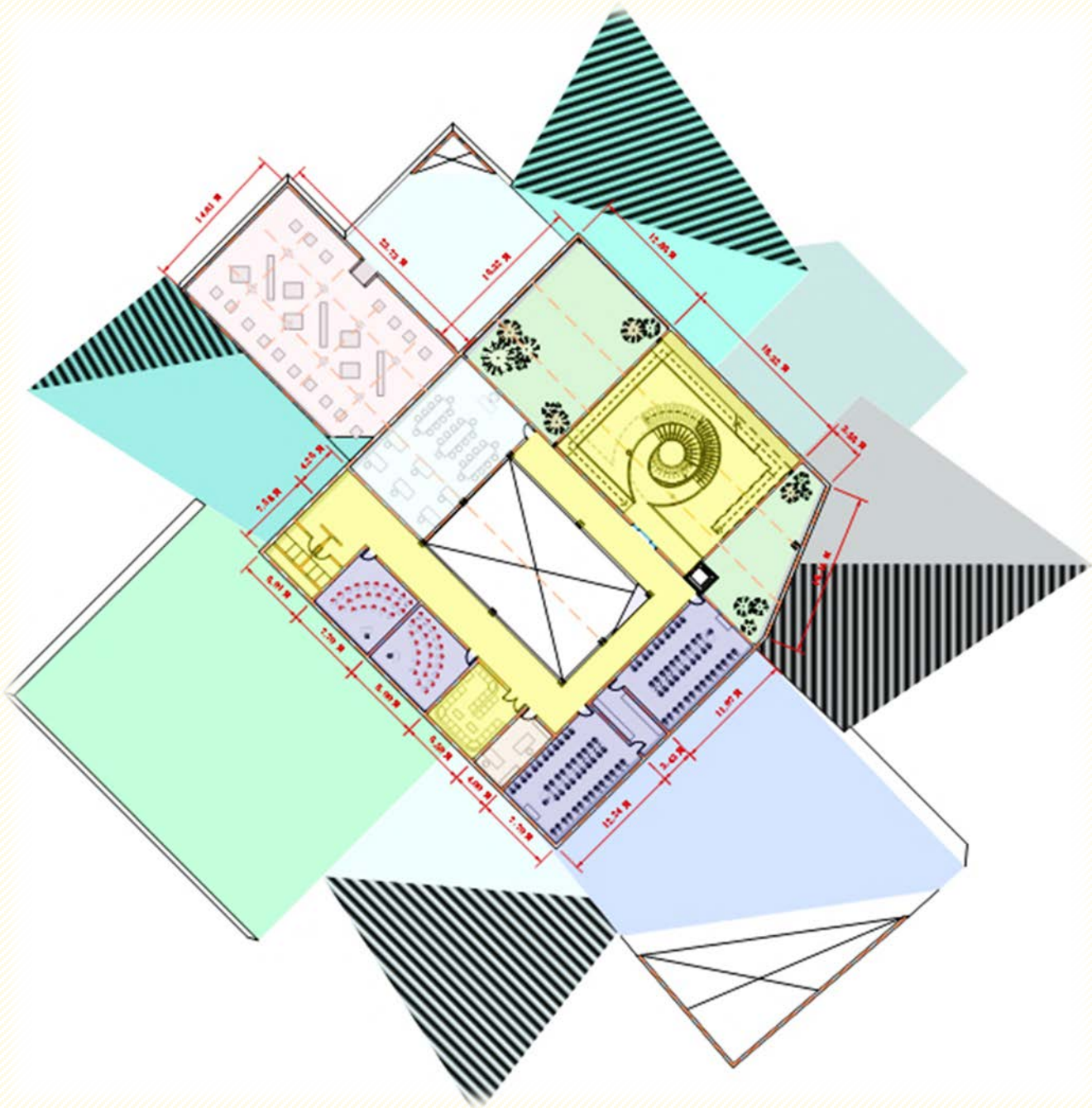


# THE HOUSE OF ARCHITECTURE: GROUND FLOOR PLAN



- Reception
- Store
- Exhibition
- Library
- Workshop
- Conference Hall
- Service area

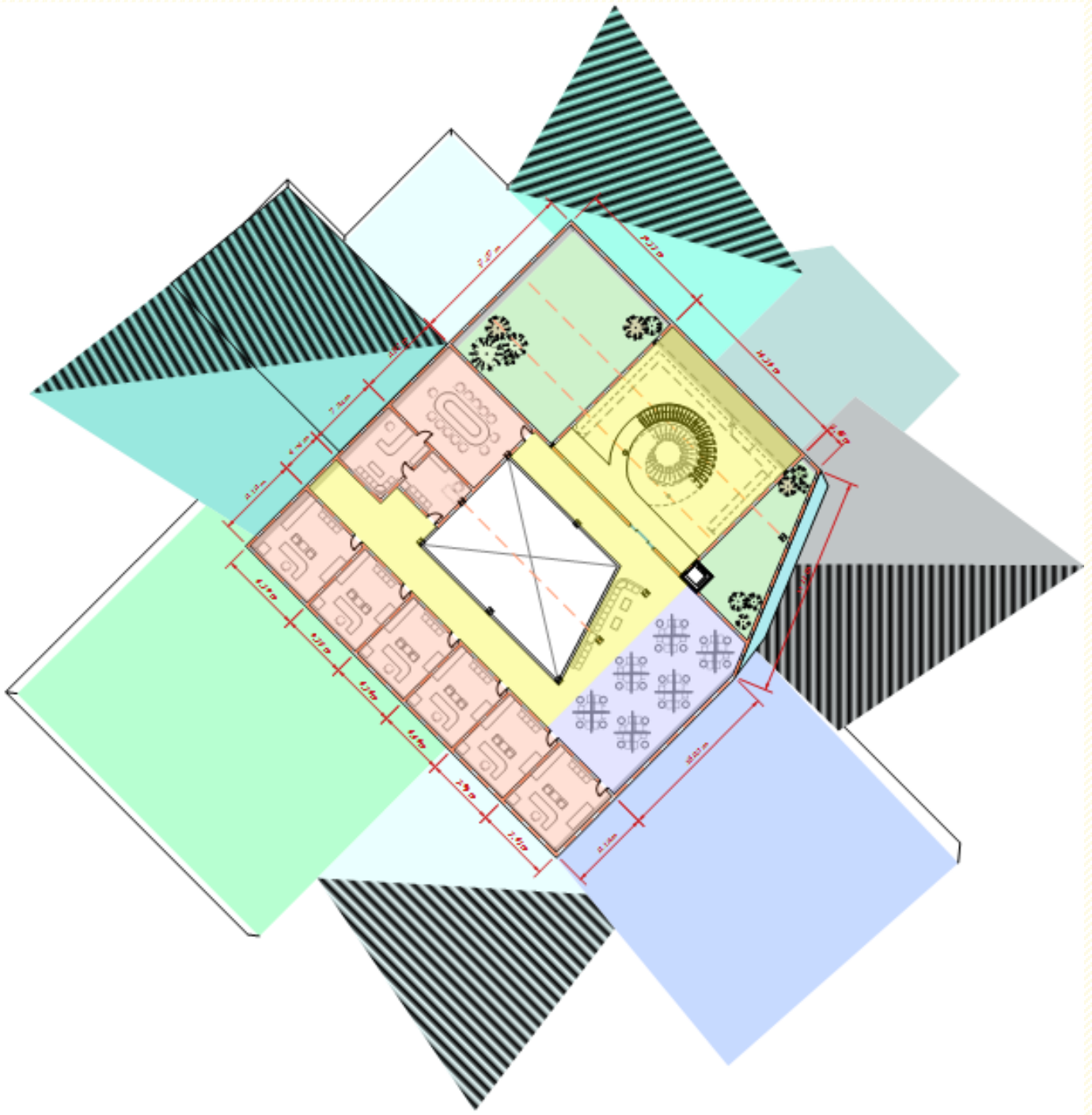
# THE HOUSE OF ARCHITECTURE: FIRST FLOOR PLAN



- Service area
- Office
- Exhibition
- Labs and Classes
- Workshop



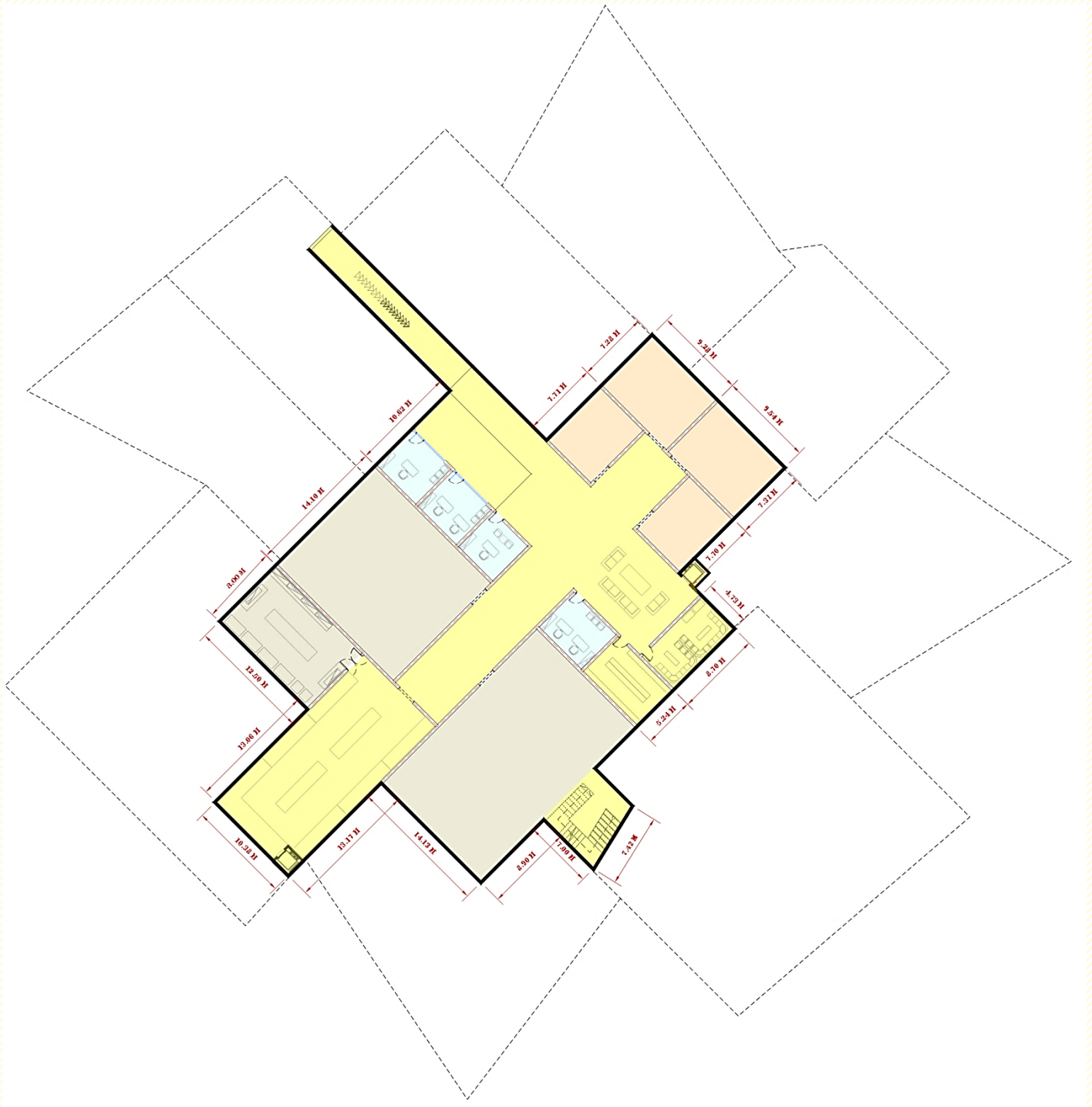
# THE HOUSE OF ARCHITECTURE: SECOND FLOOR PLAN



- Service area
- Office
- Architectural Offices



# THE HOUSE OF ARCHITECTURE: BASEMENT FLOOR PLAN



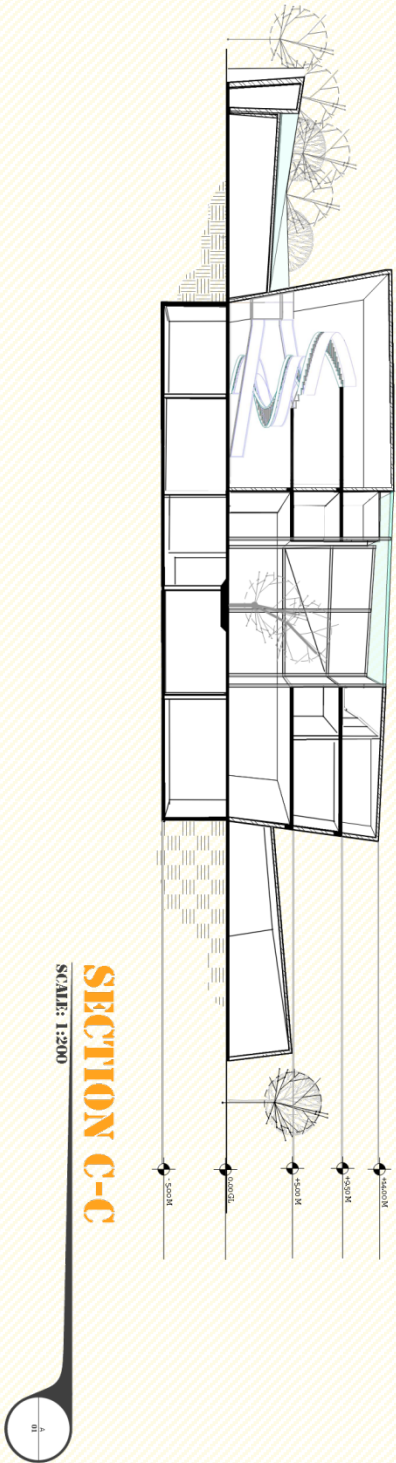
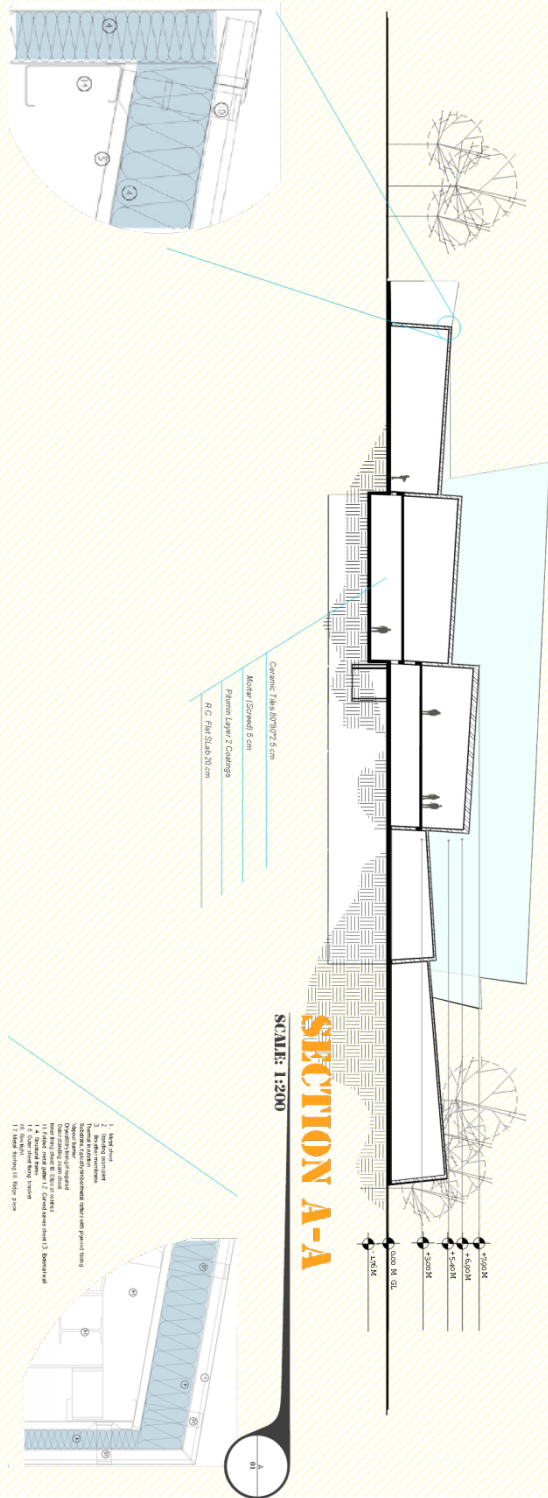
 Service Area

 Offices

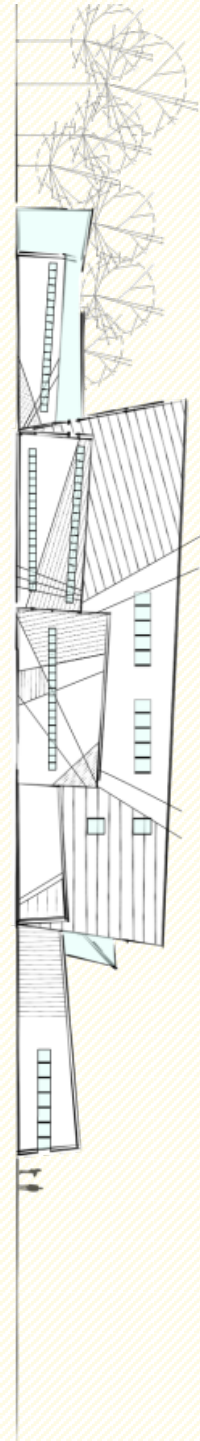
 Electrical and Mechanical rooms

 Stores

# THE HOUSE OF ARCHITECTURE: SECTIONS

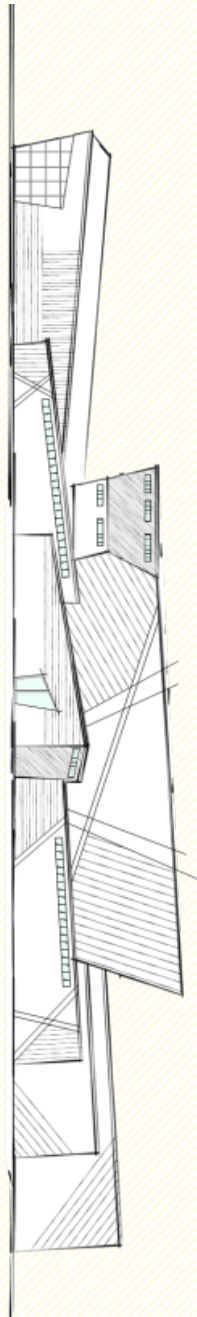


# THE HOUSE OF ARCHITECTURE: ELEVATIONS



**EAST ELEVATION**

SCALE: 1:200



**NORTH ELEVATION**

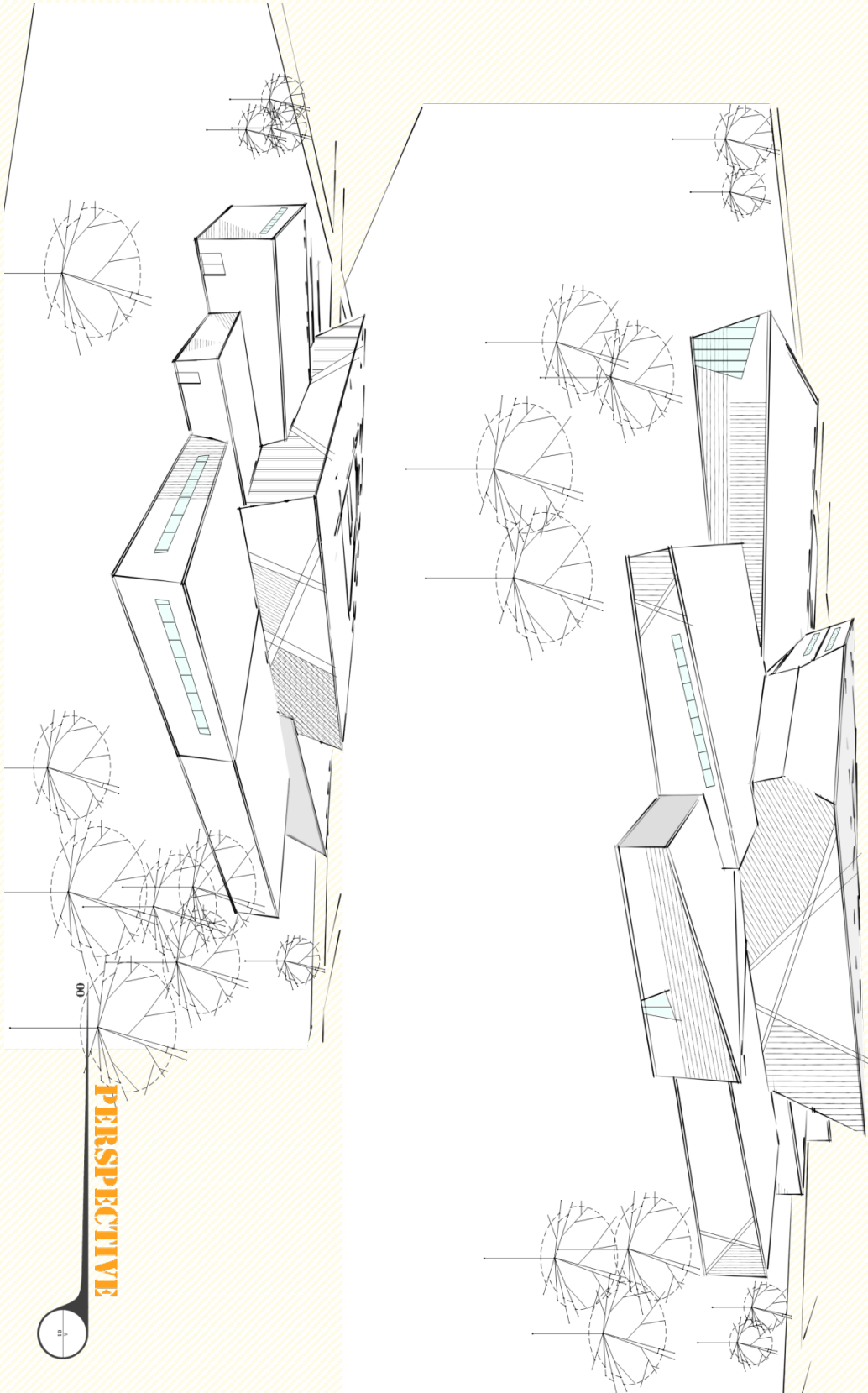
SCALE: 1:200





THE HOUSE OF ARCHITECTURE: PERSPECTIVE

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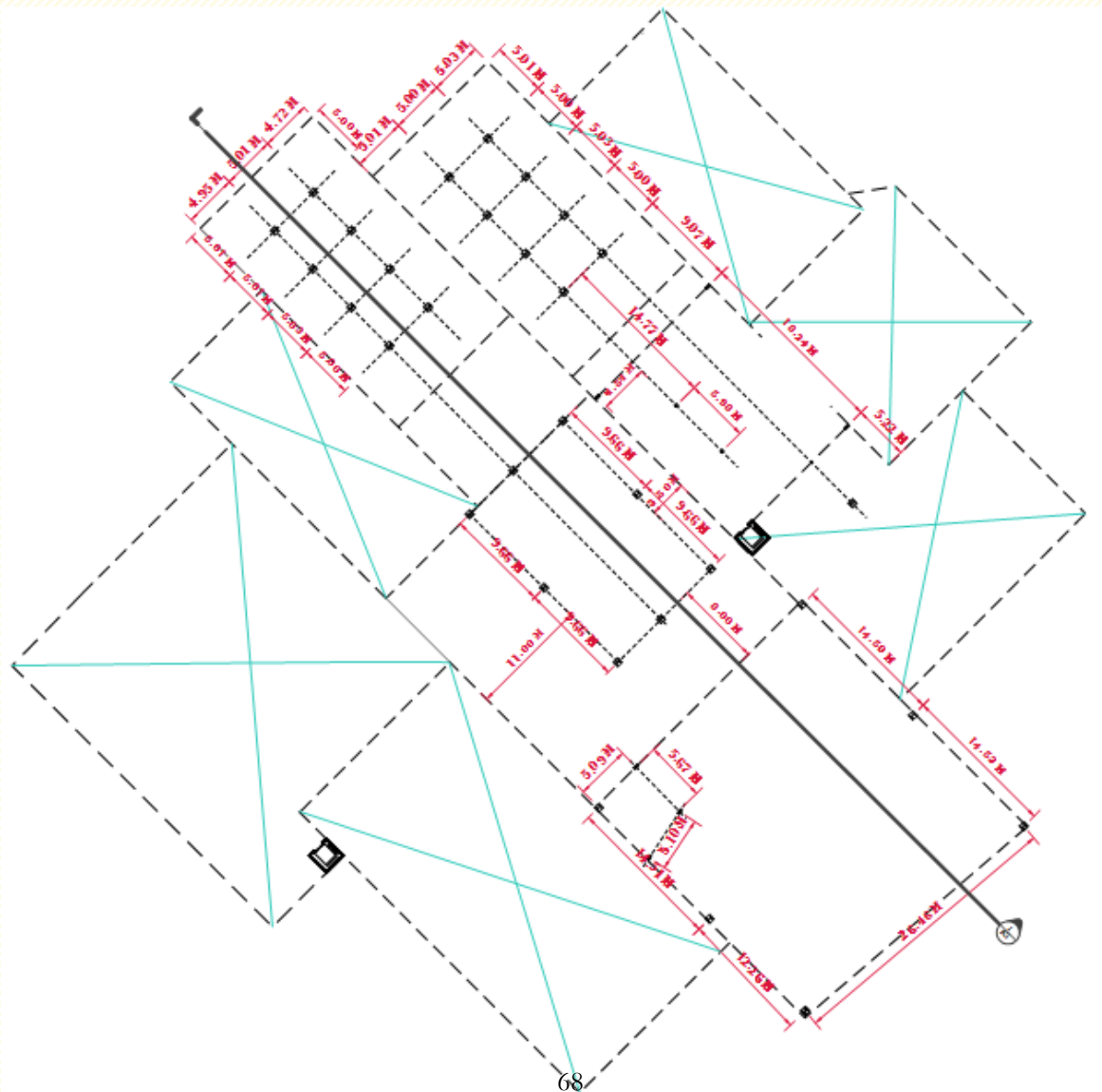


## CHAPTER FIVE

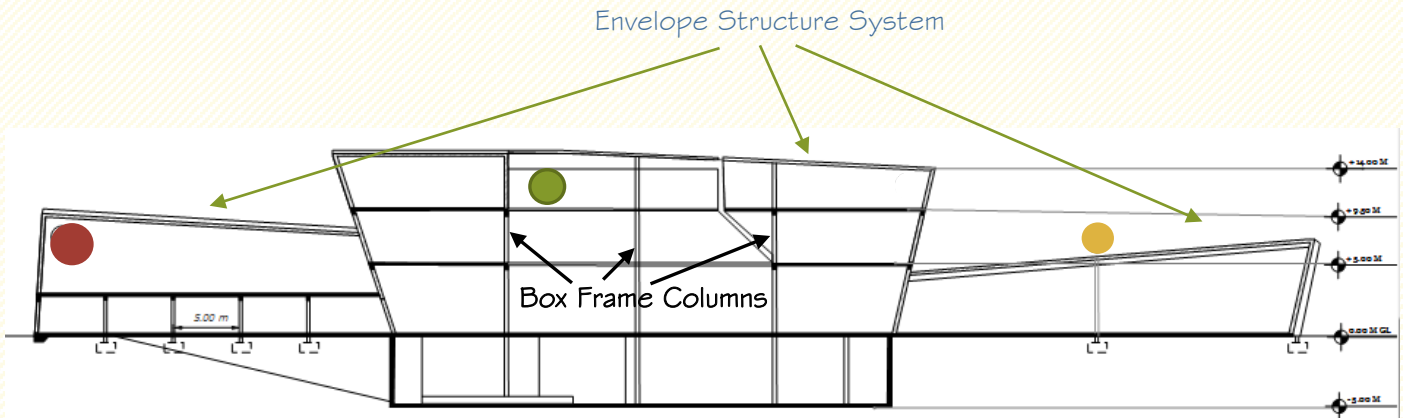
### Technical Solution, Structure System, Building detail, Site Treatment, Part Plans and Part Sections

- **Structure System:** Envelope Structure System, Portal Frame and Box Frame Structure System.

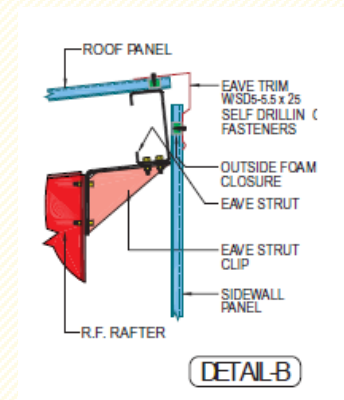
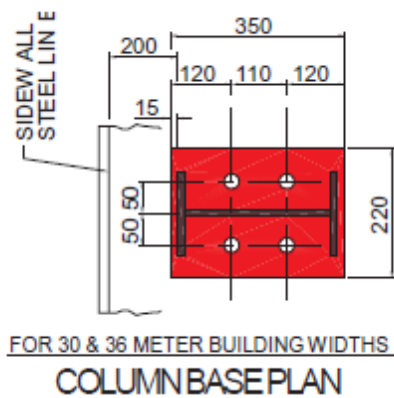
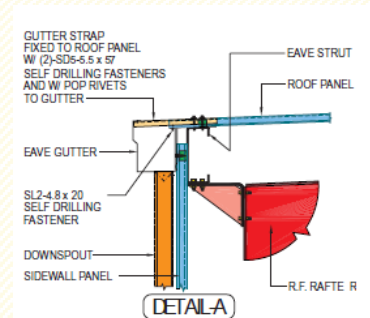
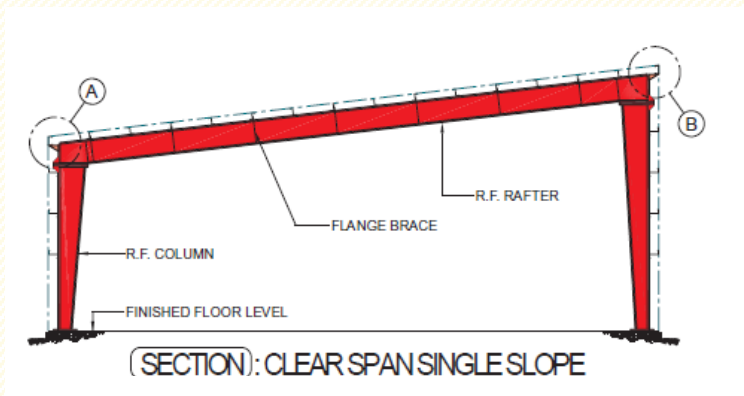
**Deconstructivism** is a development of postmodern architecture that began in the late 1980s. It is influenced by the theory of "Deconstruction", which is a form of semiotic analysis. It is characterized by fragmentation, an interest in manipulating a structure's surface, skin, non-rectilinear shapes which appear to distort and dislocate elements of architecture, such as structure and envelope. Drawing below shows grid plan of the building.



● In some spaces like the exhibitions, columns can hinder the circulation path of visitors or might limit the layout theme of the exhibitions. Therefore I've used the envelope structure system on most ground leveled masses to ensure maximum use of all spaces. The envelope structure is usually fixed to slabs. Columns were used in the store rooms to carry the slab load of both the exhibition's floors, as shown in the sectional drawing below.

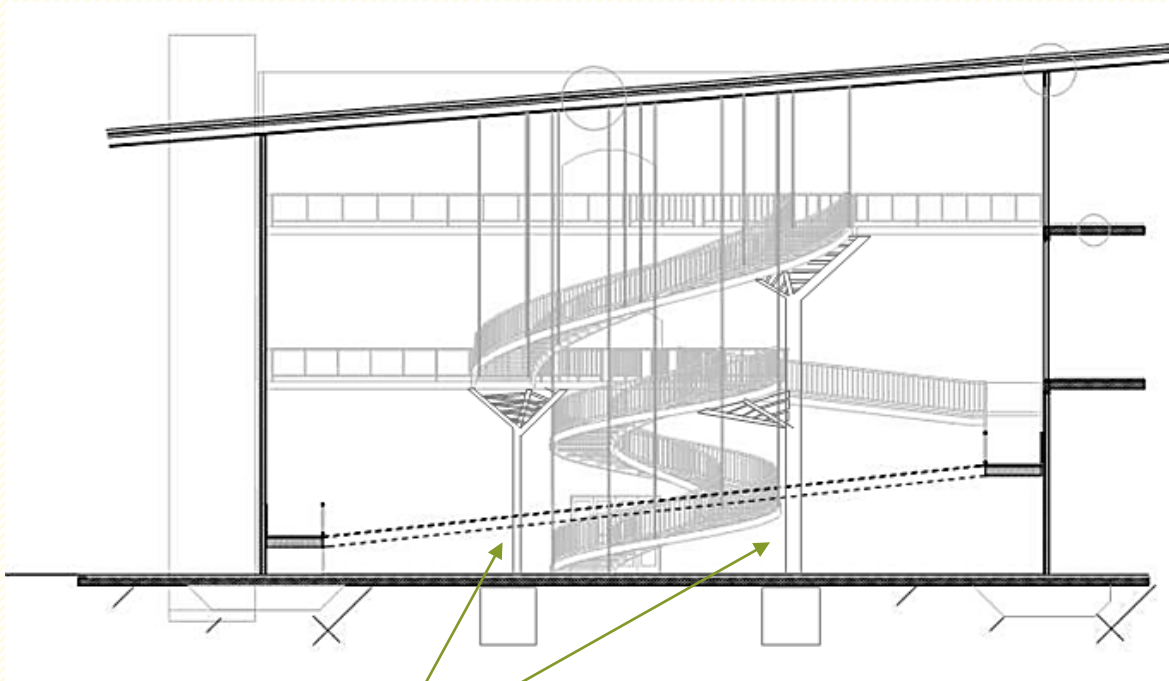


● The library is 8 meters tall at its highest point and 30 meters long. 3 primary steel frames were used to cover the mass with the total amount of 6 columns, each 220 mmx350 mm.



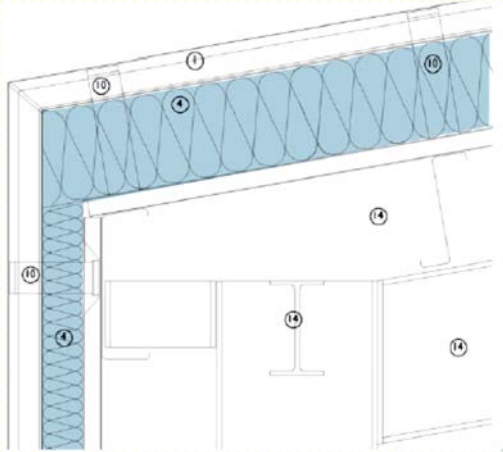


-Both the steel Floating Staircases and the reinforced concrete ramp were held out by 4 Reinforced concrete columns with hidden beams inside the roof. The cantilever slabs on each floor are carried by 2 tree columns. Each of the masses were constructed on suspended floors slabs.



Tree Column Steel Structure

● The main mass contains two floors and a basement with a void located in the center. Box Frame structure system was used to carry all floors load, containing 6 steel columns situated around the void with less than 12 meters cantilever slabs around the box. Raft foundation was used in the main mass. It also has the advantages of light-weighted materials, easy to install, maintain, and clean, etc. It diversifies building's appearance, which is incomparable by other materials.



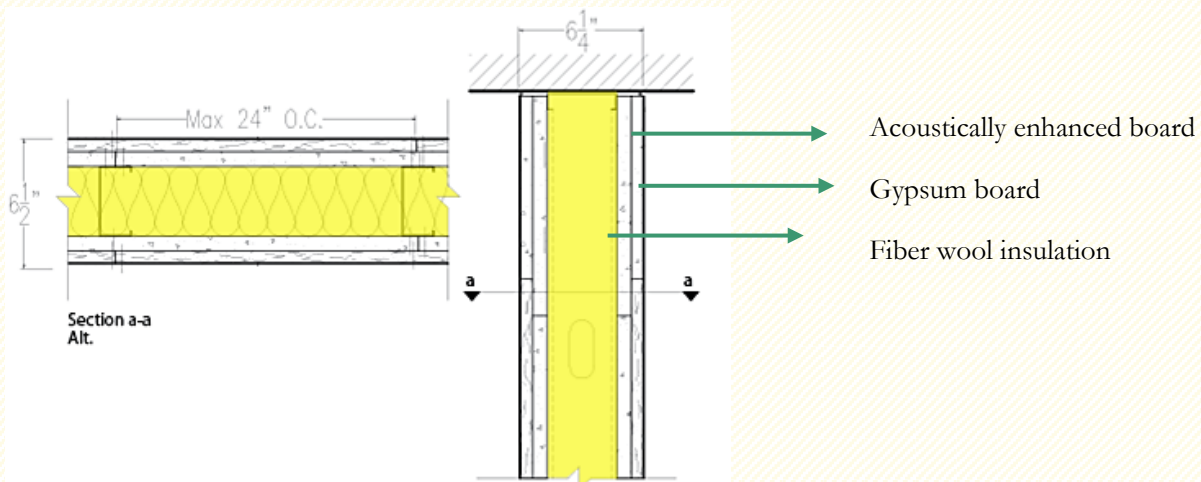
1. Metal sheet
2. Standing seam joint
3. Breather membrane
4. Thermal insulation
5. Substrate, typically timber/metal rafters with plywood facing
6. Vapour barrier
7. Drywall/dry lining if required
8. Outer standing seam sheet
9. Inner lining sheet
10. Clips at centres
11. Folded metal gutter
12. Curved eaves sheet
13. External wall
14. Structural frame
15. Outer sheet fixing bracket
16. Rooflight
17. Metal flashing
18. Ridge piece



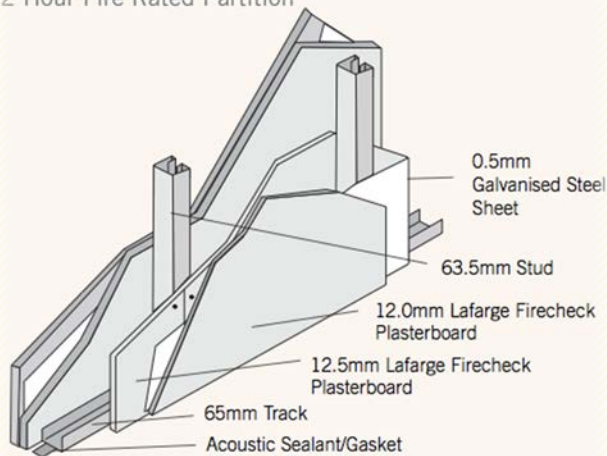
1-D detail view of rib profiled metal sheet roof

## EXTERIOR AND INTERIOR FINISHES:

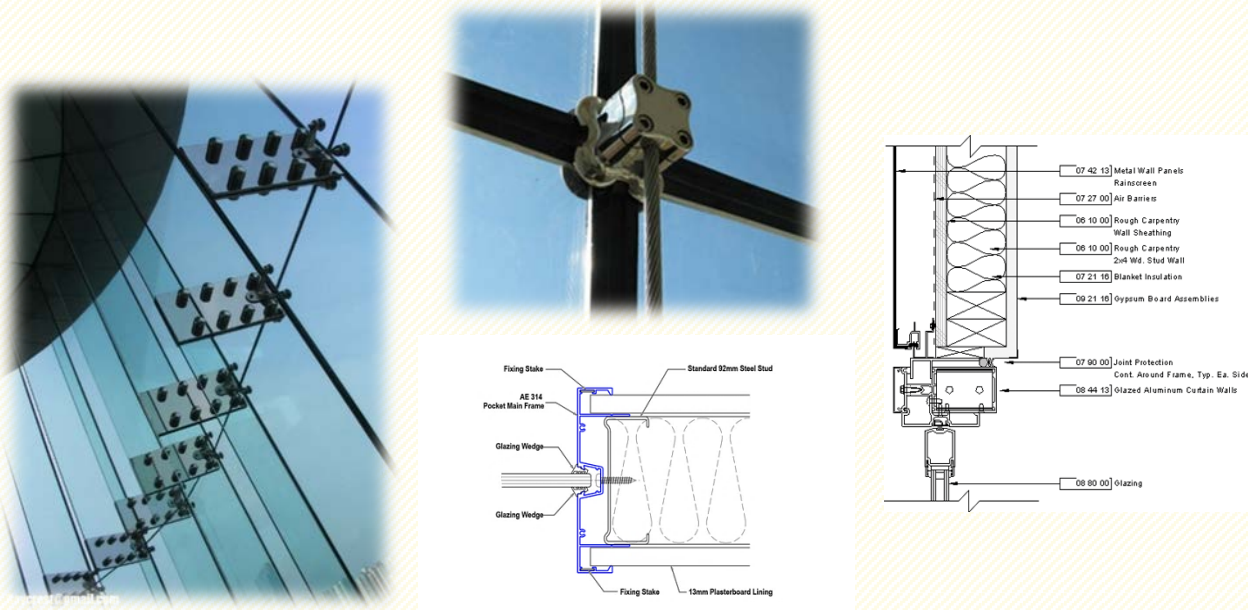
-Internal walls were constructed from acoustically enhanced steel stud partitions also insulated with fiber wool in between two gypsum boards.



### 2 Hour Fire Rated Partition

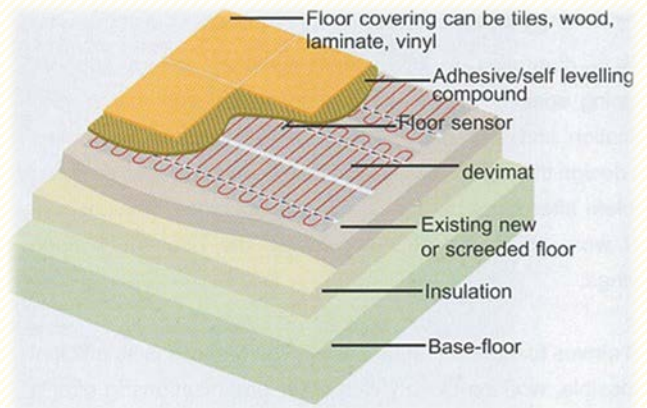
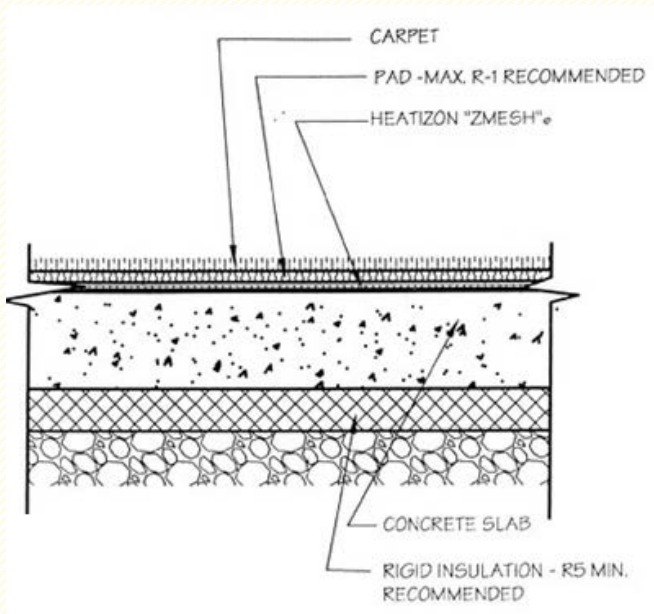
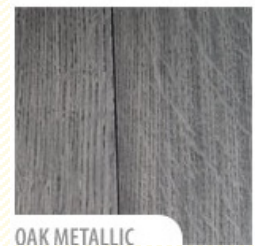


-floors: glazed curtain walls were used in the library to allow sunlight to enter the space. Cable spider fully glass curtain wall is the flexible supporting structures instead of rigid truss structures. It is usually Symmetrical because the curtain wall has to bear the positive and negative wind pressure.

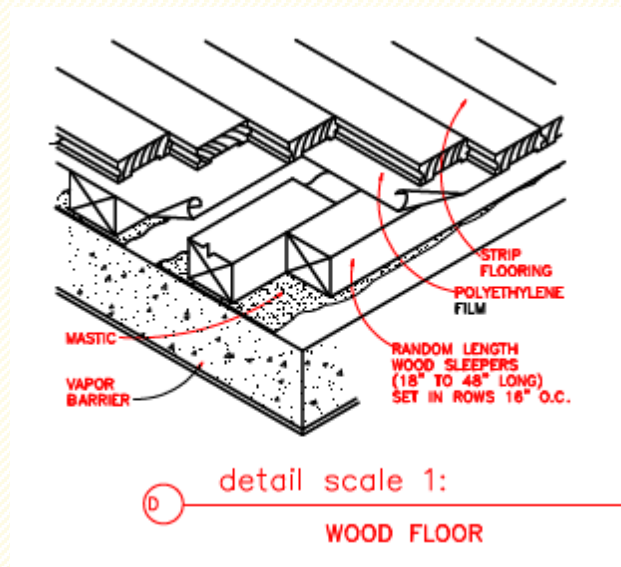


-Floor Finishing: choosing bright and colorful colors for exhibitions might overshadow the displayed products and the general exhibition theme and since the first exhibition is a temporary exhibition which changes every event, I've chosen pale grey colors on the walls, floors and ceiling. Floors are covered with vinyl carpet (metallic oak).

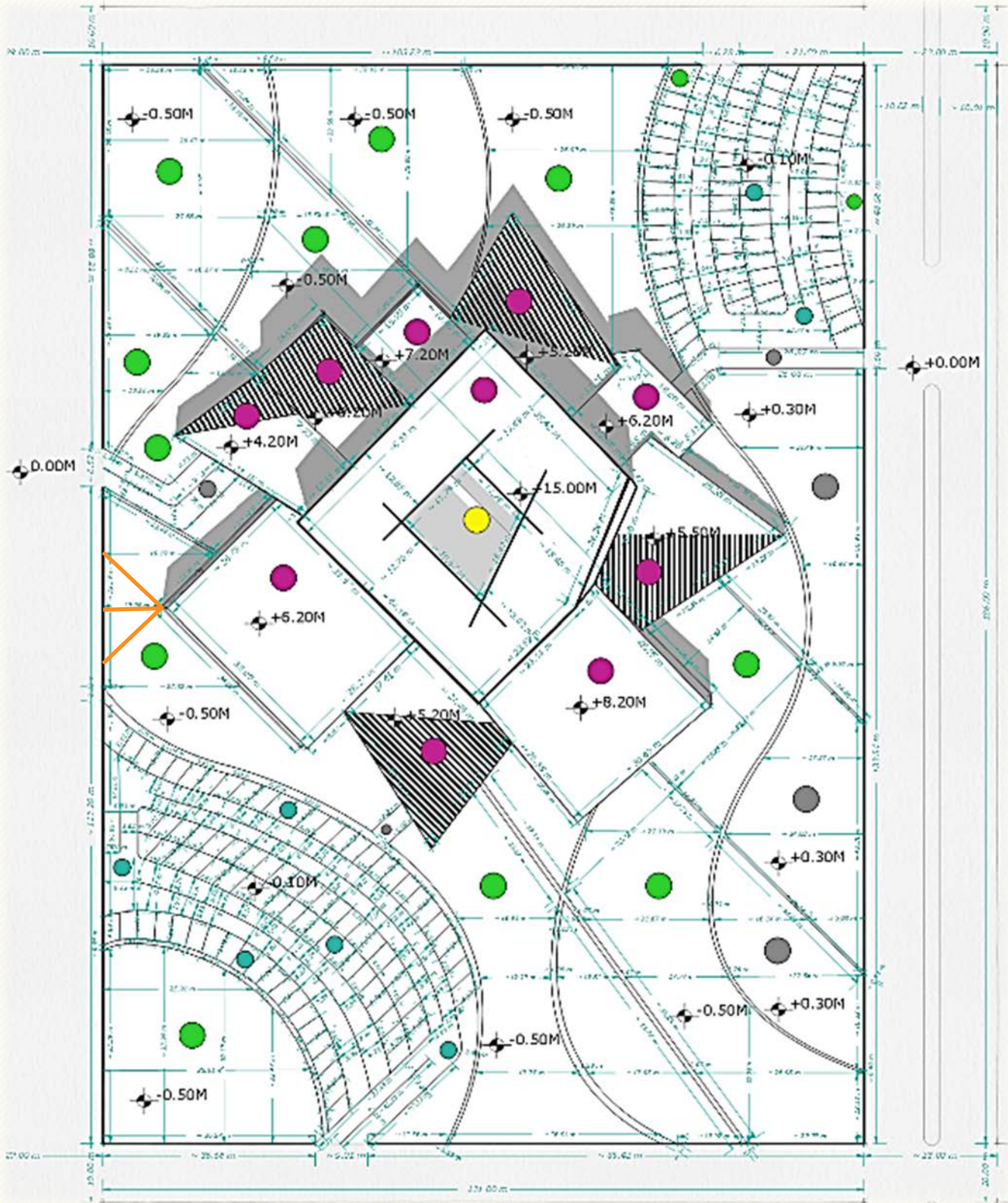




-Wooden floors are used in spaces such as the Library, Café and Cafeteria and the Workshop and percaline grey ceramic tiles are used on the rest of spaces.

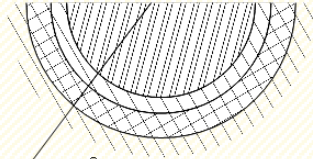


SITE TREATMENT: DIMENSIONS AND HATCHING:





**BUILDING ROOF**

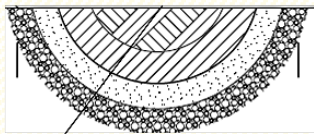


Metal sheet 2 cm  
 Thermal insulation 20 cm + breather Membrane  
 Inner lining sheet 2 cm  
 Structural Steel Frame 40 cm  
 Gypsum Board False Ceiling

**-Skylight panels sheeting**



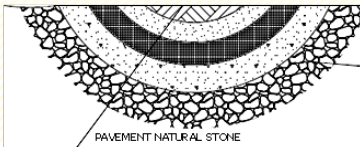
**PARKING FLOOR**



3 LAYERS OF ASPHALT  
 5 CM THICK SAND SCREED LAYING COURSE  
 COMPACTED GRANULAR SUB-BASE 15cm THICK  
 HARD COMPACTED SOIL



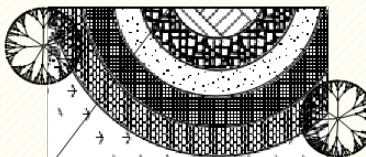
**PAVEMENT**



PAVEMENT NATURAL STONE  
 2 CM MORTAR  
 5 CM THICK SAND SCREED LAYING COURSE  
 P.V.C 3 FACES  
 HARD COMPACTED SOIL



**GREEN AREA**

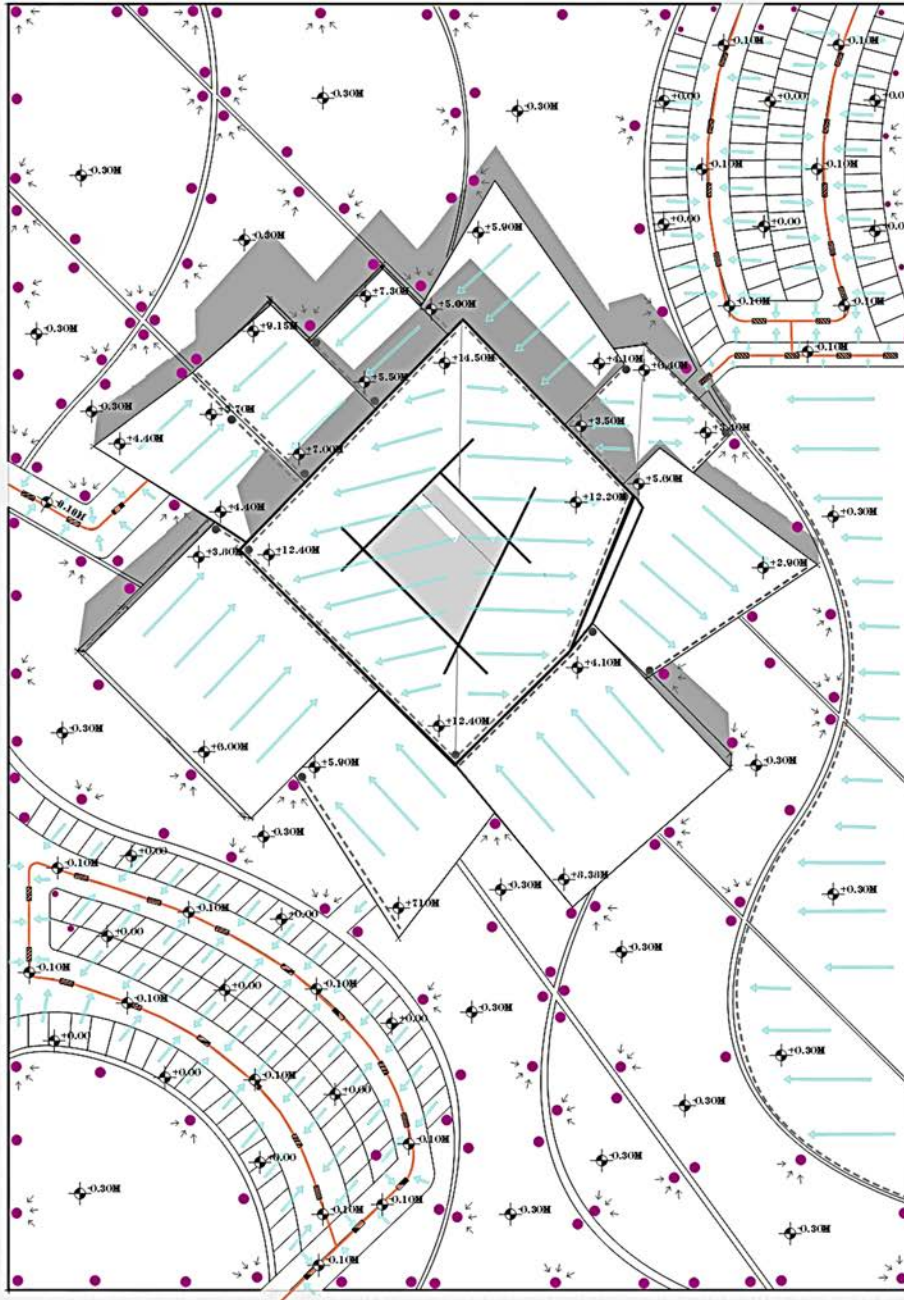


GRASS  
 5 CM THICK SAND SCREED LAYING COURSE  
 WATER PROOF MEMBRAIN  
 10 CM AGREGATE  
 FLATTERY LAYRE 10 CM  
 HARD COMPACTED SOIL





# SITE TREATMENT: DRAINAGE SYSTEM



● Landscape drainage pipe  
(Over flow unit)

● Down Pipe (building)

--- Gutters

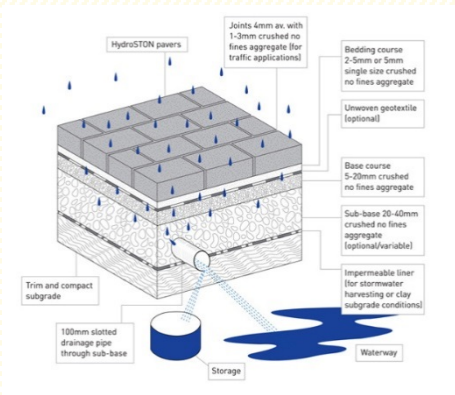
▨ trench

↘ Gutters

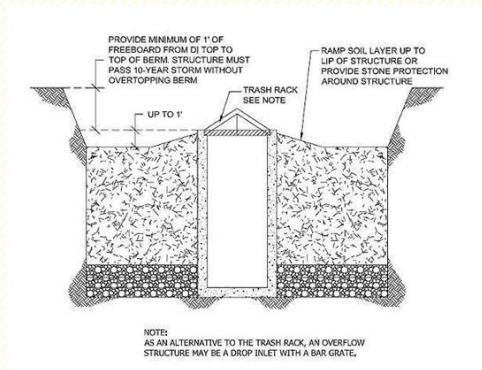
↘ Slope direction

### Drainage details:

#### -PAVEMENT DRAINAGE DETAIL:



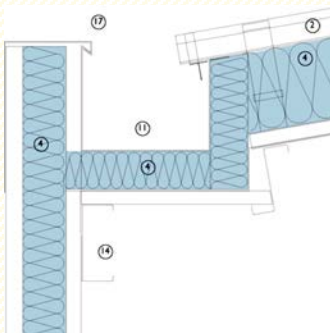
#### -LANDSCAPE DRAINAGE DETAIL:



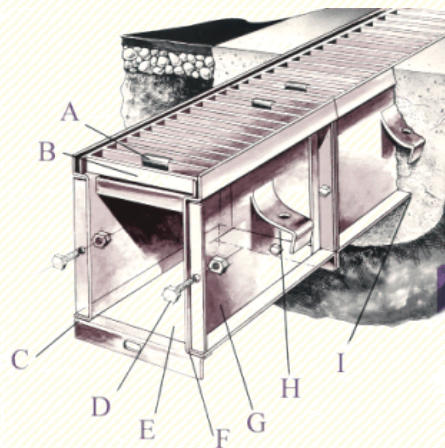
- Both indoor landscaped area and roof gardens are drained by the over flow unit, the drained water flows down through pipes, gets filtered and stored in basement tanks for reuse later on.

#### -ROOF DRAINAGE DETAIL:

Metal sheet used as rain screen  
Panels which allow smooth water flow.

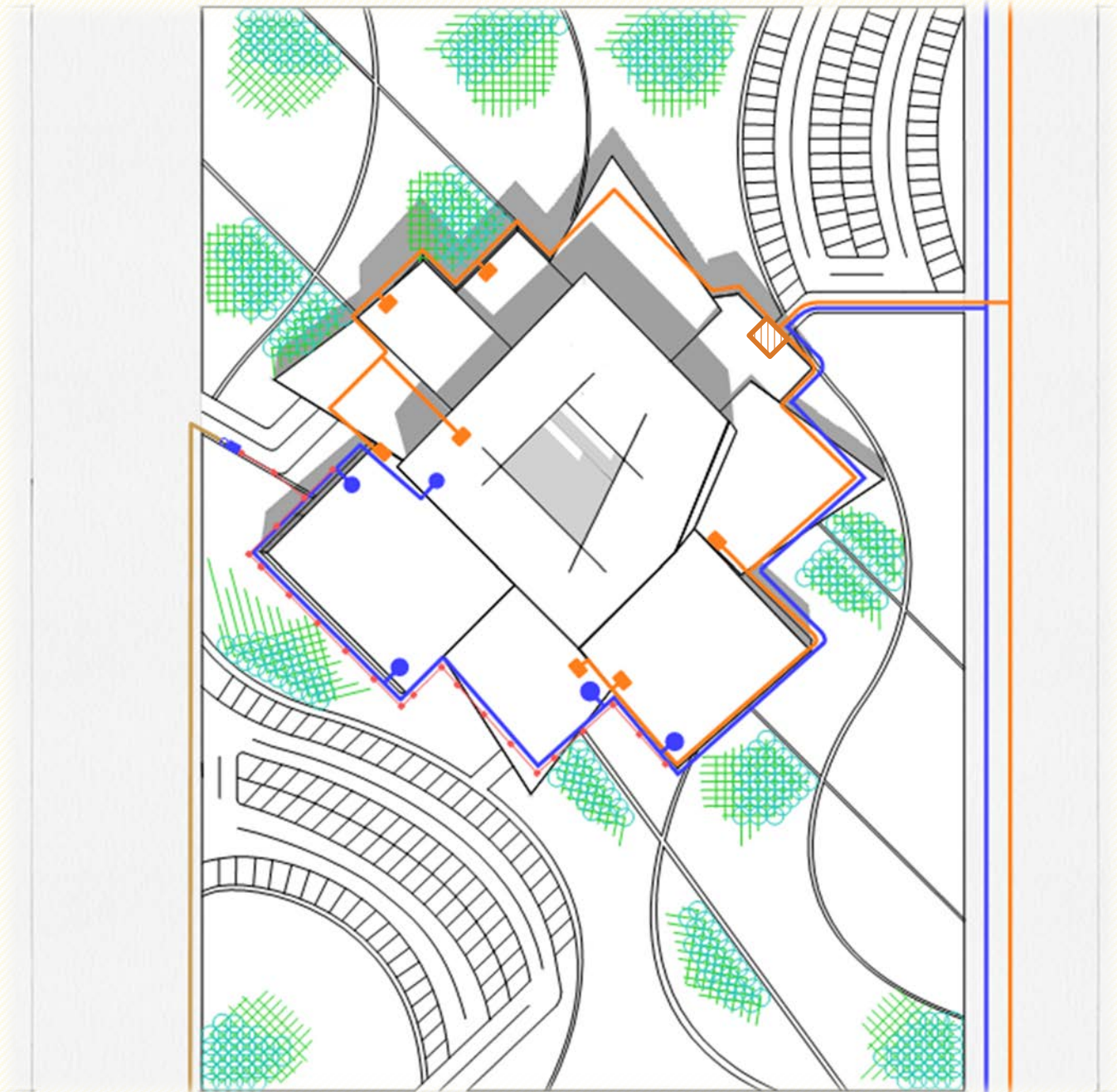


#### -PARKING DRAINAGE DETAIL:





# SITE TREATMENT: SEWAGE, WATER AND ELECTRICITY SUPPLY SYSTEM

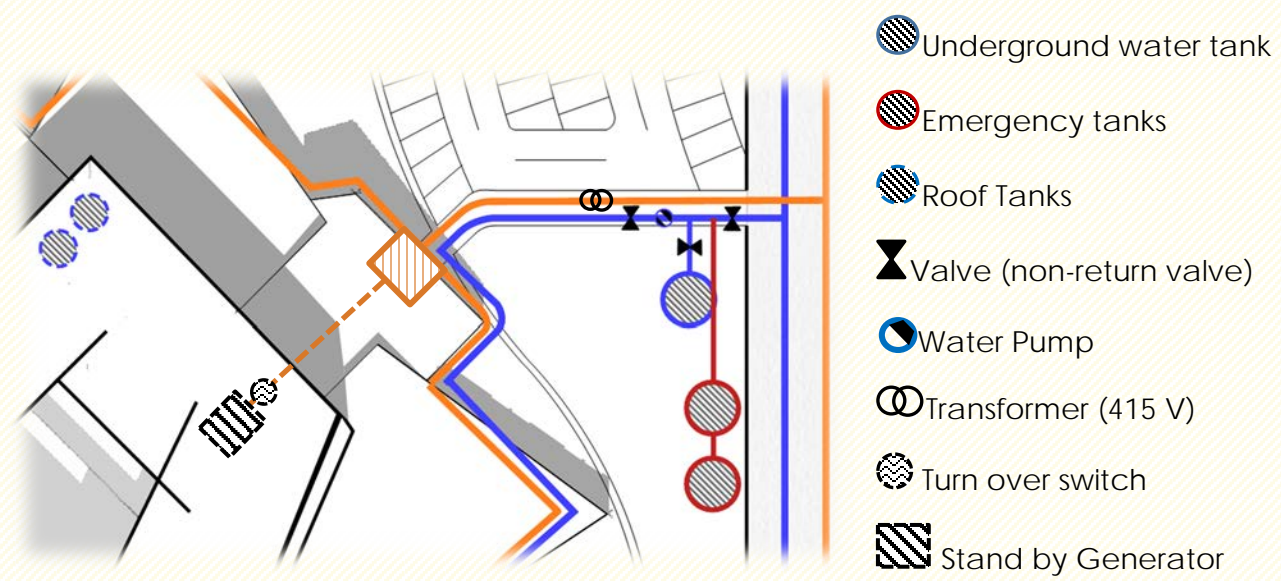










- Water Supply Pipe
- Electricity Supply cable
- Sewage main pipe
- Sewage pipe line
- Manholes
- water distribution point



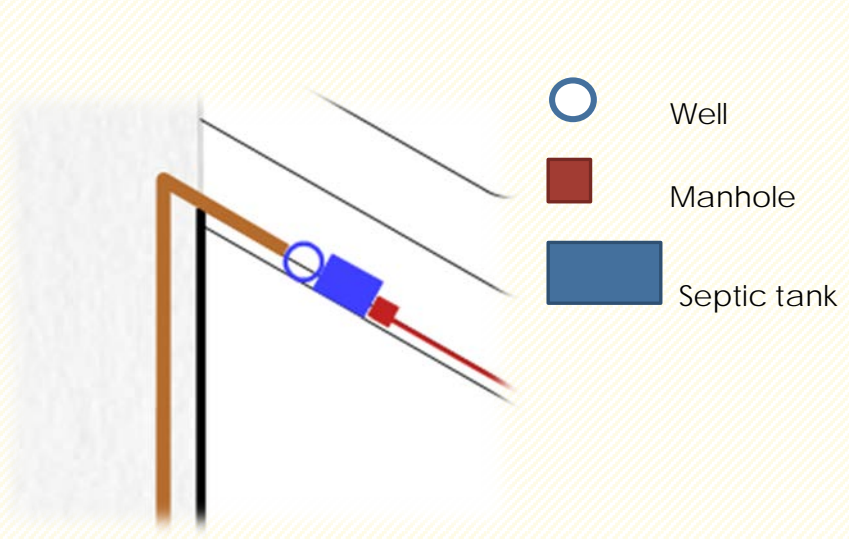
-  Secondary Switch boards
-  Irrigation Pipes
-  sprinklers 3 m Range
-  Main switch board




**-Electricity and Water Details:**



-  Underground water tank
-  Emergency tanks
-  Roof Tanks
-  Valve (non-return valve)
-  Water Pump
-  Transformer (415 V)
-  Turn over switch
-  Stand by Generator

**-Sewage Details:**



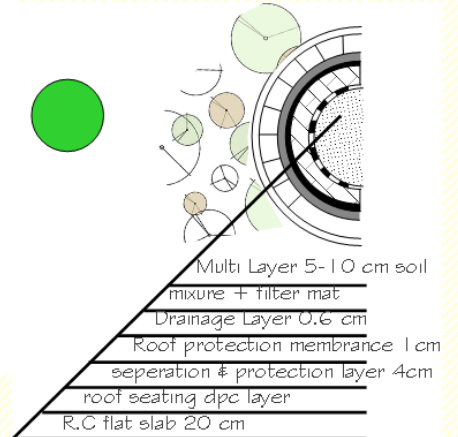
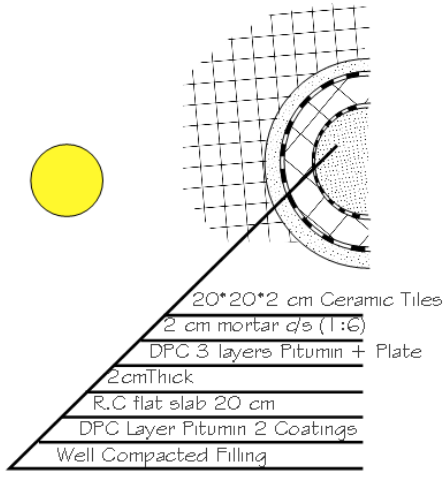
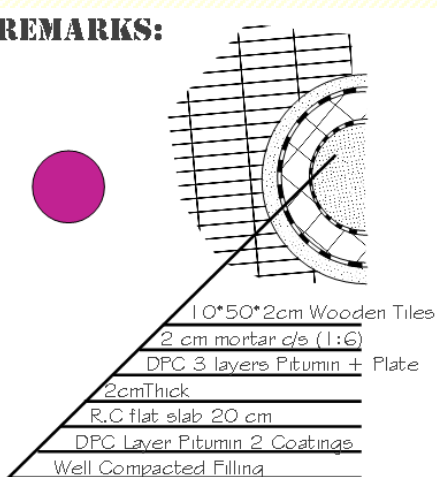
-  Well
-  Manhole
-  Septic tank

M.H no.	DOWN-PIPE		
	DEPTH (m)	WIDTH (m)	HEIGHT (m)
1.1".1"	0.45	0.45	0.45
2.2".2"	0.50	0.50	0.60
3.3".3"	0.55	0.55	0.75
4.4".4"	0.60	0.60	0.90
5.5".5"	0.70	0.65	1.05
6.6".6"	0.75	0.70	1.20
7.7".7"	0.80	0.75	1.35
8.8".8"	0.80	0.80	1.50
9.9".9"	0.80	0.80	1.65
10.10".10"	0.80	0.80	1.80
11.11".11"	0.80	0.80	1.95
12.12".12"	0.80	0.80	2.10
13.13".13"	0.80	0.90	2.25
14.14".14"	0.80	0.90	2.40
15.15".15"	0.90	0.90	2.55
16.16".16"	0.90	0.90	2.55
17.17"	0.90	0.90	2.65
18.18"	1.00	1.00	2.75
19.19"	1.00	1.00	2.85

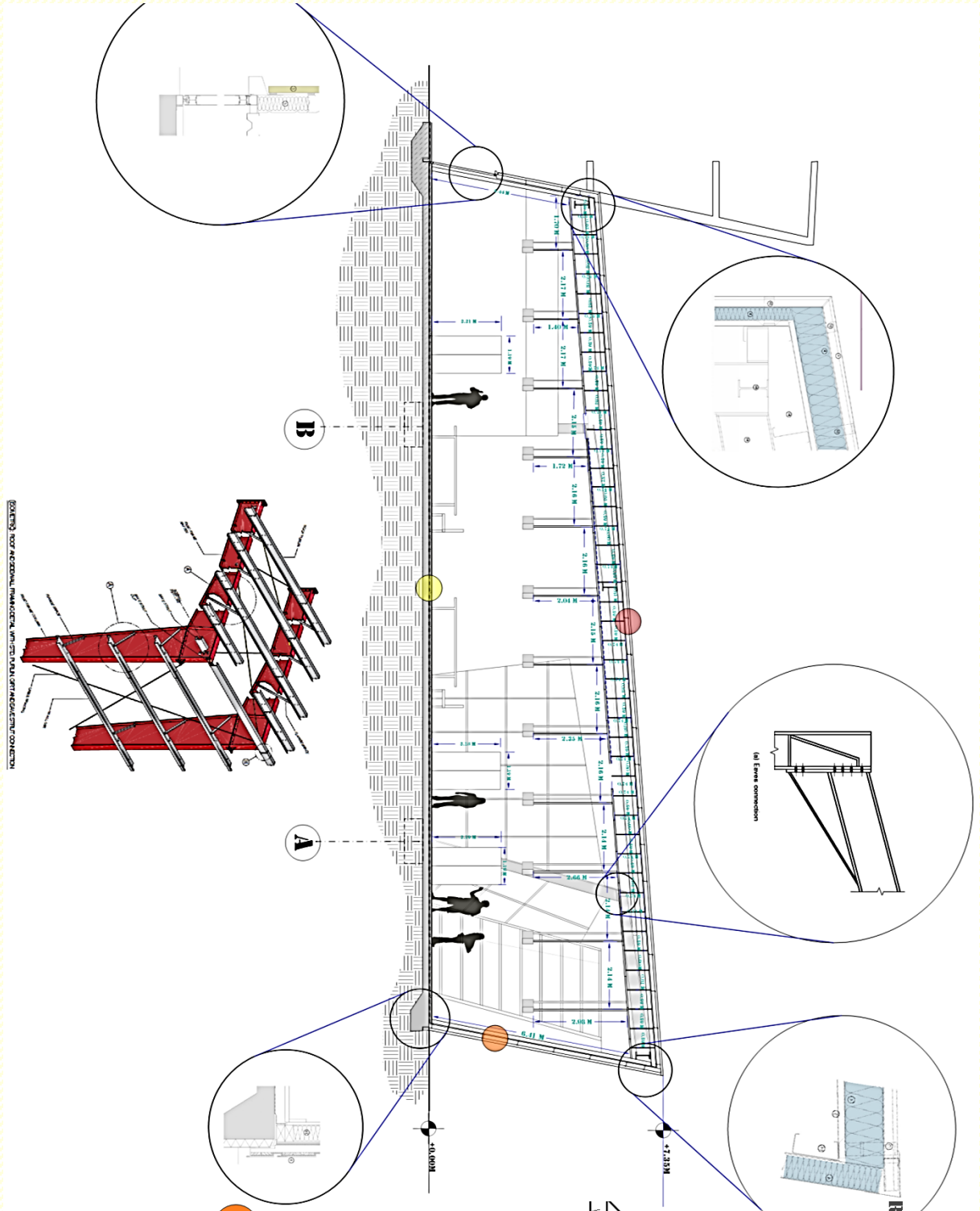
# PART PLAN: LIBRARY




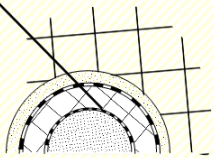
## REMARKS:


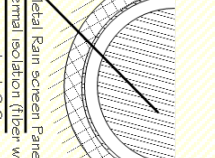



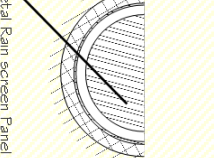
# PART SECTION: LIBRARY





**REMARKS:**

- 


50\*50\*0.8cm Porcelain Grey tiles  
2 cm mortar ds. (1:3)  
DPC 3 layers: Plenum + Plate  
2cm thick  
R/C slab 20 cm  
DPC Layer Plenum 2 Coatings  
Well Compacted Filling
- 


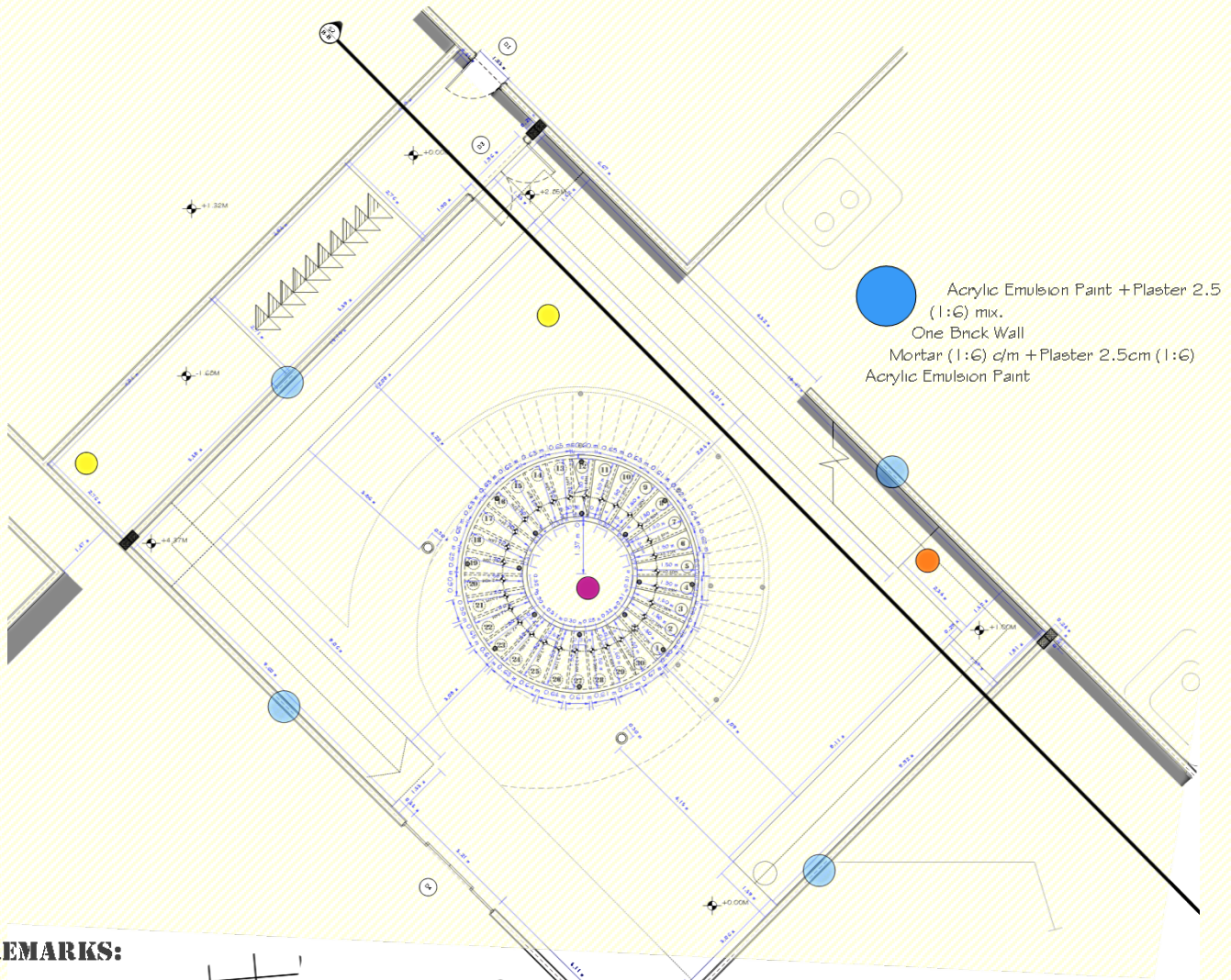
Metal Rain screen Panel 0.2cm thick  
Thermal isolation (fiber wool) 2.5 cm  
Inner lining sheet 0.2 cm
- 


Metal Rain screen Panel 0.2cm thick  
Thermal isolation (fiber wool) 2.5 cm  
+ supporting side rail  
Inner lining sheet 0.2 cm
- 


False Gypsum Ceiling 50\*50\*2 cm  
Structural beam

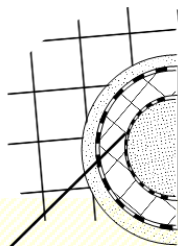


# PART PLAN: STAIRS AND RAMPS



● Acrylic Emulsion Paint + Plaster 2.5 (1:6) mix.  
 One Brick Wall  
 Mortar (1:6) c/m + Plaster 2.5cm (1:6)  
 Acrylic Emulsion Paint

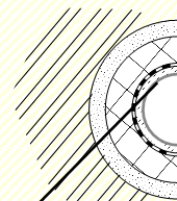
## REMARKS:



50\*50\*0.8cm Porcelaine Grey ti  
 2 cm mortar c/s (1:6)  
 DPC 3 layers Pitumin + Plate  
 2cmThick  
 R.C flat slab 20 cm  
 DPC Layer Pitumin 2 Coatings  
 Well Compacted Filling



floating stairs  
 Suspended on wire cables fixed to the beam.  
 Spiral stair steps and handrails made of steel  
 1st spiral stair is 360+ 180 degrees  
 2nd Spiral stair is 180 degrees



Marble Tiles 1.45\*0.3\*0.5cm  
 Mortar 1:3:6 2cm  
 DPC layer Pitumin 2 coatings  
 R.C flat slab 20cm + DPC + Plaster  
 0.5 cm + Paint layer

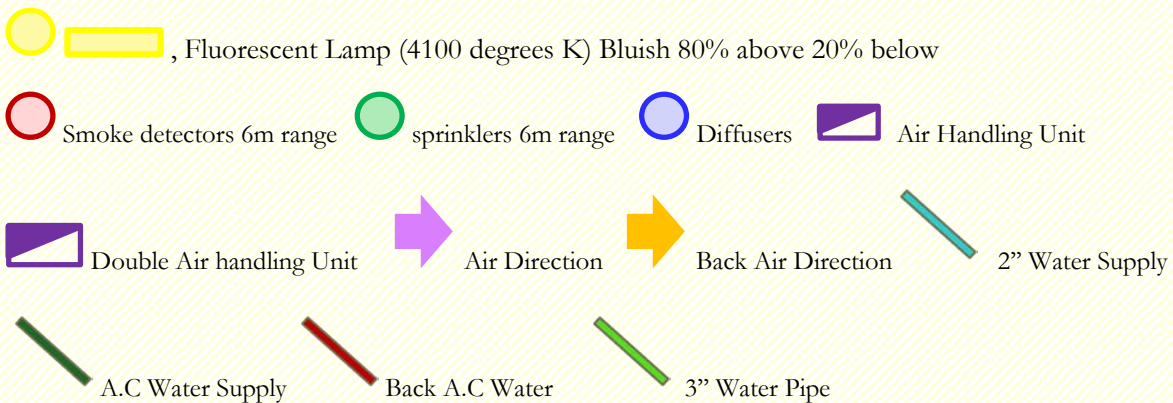
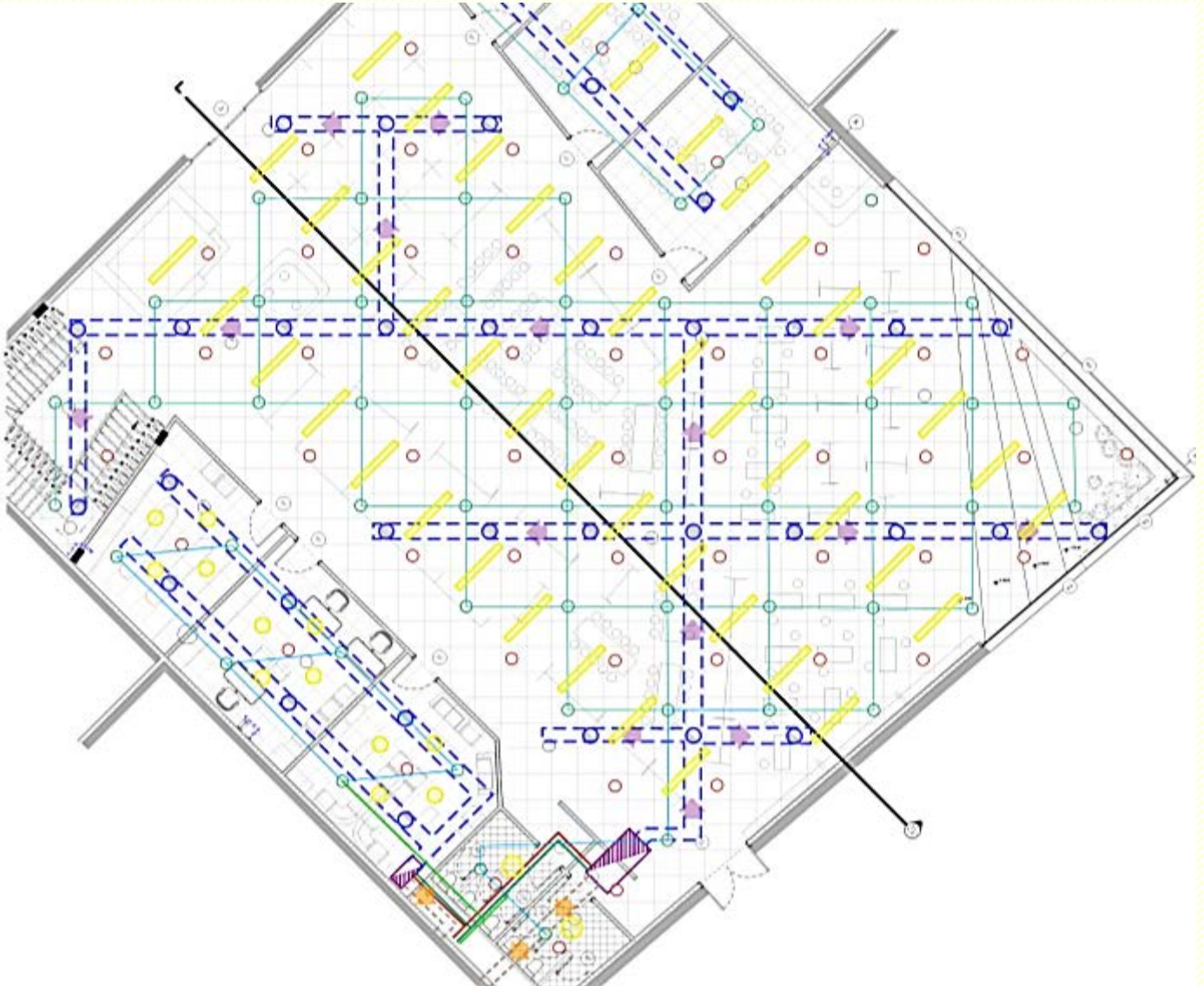




## AIR CONDITIONING AND FIRE FIGHTING SYSTEM: LIBRARY

Air conditioning system: Indoor units, outdoor unit, Water supply pipes, and back water pipes, air ducts and back air ducts.

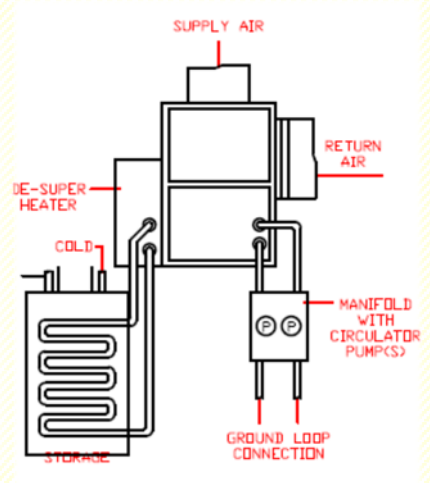
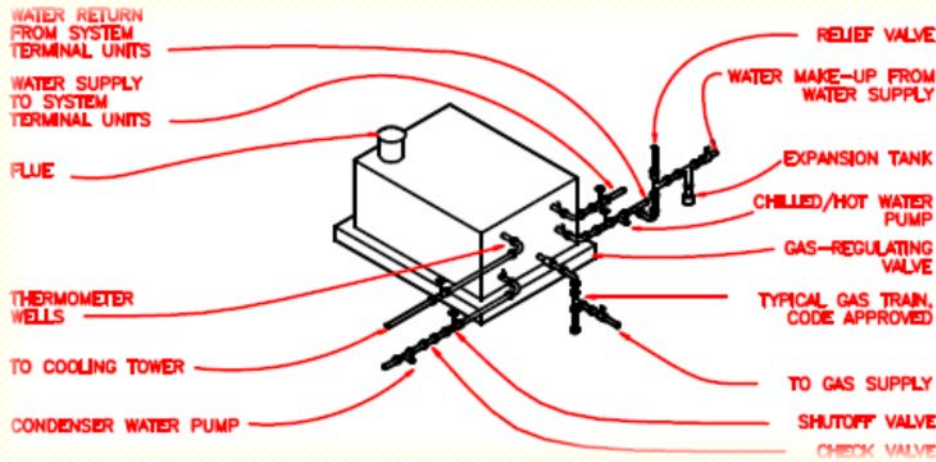
Fire Fighting System: Smoke Detectors, Water Sprinkles, Fire Hoses, Alarms and Store pressure fire extinguishers.



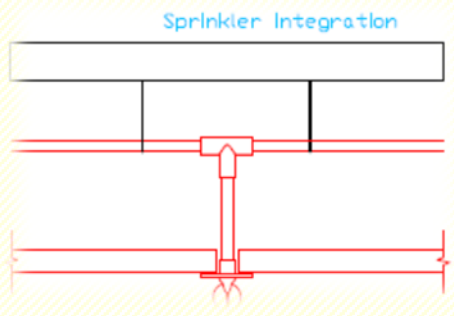
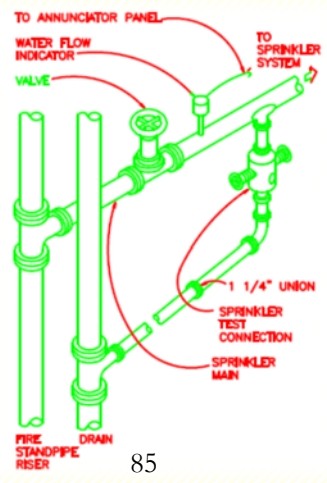
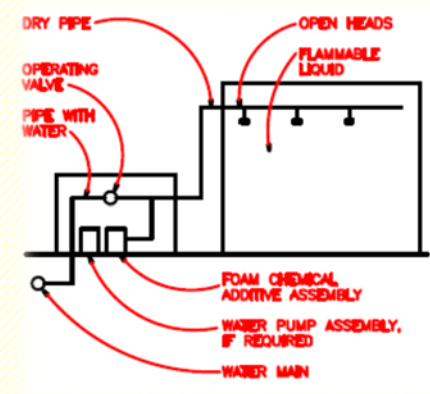
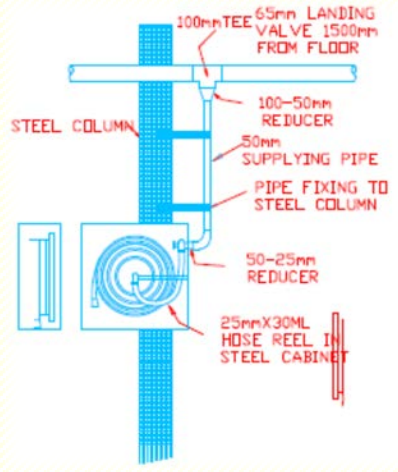
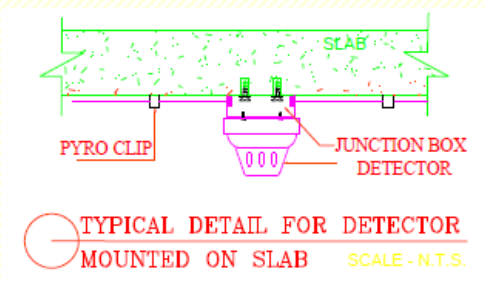


**AIR HANDLING UNIT EQUIPMENT DETAILS:**

This type of system consists of a number of air handling units (possibly up to 48) connected to a modeler external condensing unit. The refrigerant flow is varied using either an inverter controlled variable speed compressor, or multiple compressors of varying capacity in response to changes in the cooling or heating requirement within the air condition space.



**FIRE FIGHTING EQUIPMENT DETAILS:**



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