
*Sudan university of science & technology*

***COLLEGE OF ARCHITECTURE &PLANNING***


***FACULTY OF ARCHITECTURE***

***5th bachelor-semester 10***

# *Graduation project report:*

# *Commercial entertaining complex*

# *(in Khartoum)*

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***Supervisor: Najwa Mohammed Al mufti***

***September 2018***

## الآيــة

قال تعالى : {وَعَلَّمَ آدَمَ الْأَسْمَاءَ كُلَّهَا ثُمَّ عَرَضَهُمْ عَلَى الْمَلَائِكَةِ فَقَالَ أَنْبِئُونِي بِأَسْمَاءِ هَؤُلَاءِ إِنْ كُنْتُمْ صَادِقِينَ} صدق الله العظيم

سورة البقرة الآية [30]

## *Abstract*

**This research examines the designing of a commercial entertainment complex project. This research consists of five chapters. Chapter One is an introductory chapter which comprises the research proposal stage through data collection stage then analyzing data and finding the results that concept depends on it, and upgrading it until it reaches it final stage, after that it came the stage of technical and constructional solutions for designed parts of the project, drawings, tables and matrices has been used to help as possible to show the main idea.**

**The project commercial entertaining complex is a modern and sophisticated complex that contains commercial and entertaining activities that has priorities in the project of various types and sizes.**

**The research consists of five chapters: chapter one consists of the definition of the project, reasons of selecting the project, aims of the project. Chapter two consist of information about the project, and similar projects study (local – global). Chapter three consist of project analysis.**

**Chapter four is about architectural design & the fifth chapter is the technical and constructional solutions.**

**In conclusion, the review of references and sources that have been used in this research.**

*dedication*

*To my dear parents*

*I can't thank you enough for all the support and sacrifices you have done for me thank for what coming, I'm grateful to have you by my side, it gave me strength and have guidance. I wouldn't become the person I am today if it wasn't for the both of you. Thank you for believing in me. I promise to never let you down.*

**TO MY SISTERS &MY ONE &ONLY (AHMED)**

**To my teacher &supervisor**

**Dr. NAJWA ALMOFTI**

**(MAMA NAJWA)**

**TO ALL FRIENDS**

**THANK**

**YOU**

**ALL**

## Grateful thanks

**It is our great pleasure to have chance to say thank you to our supervisor: T. NAJWA MOHAMMED ALMOFTI I highly appreciate the help she gives me, for her valuable comments, encouragements, guidance and support. We would like to thank all our friends for their support and information that helped me to conduct this research.**

## Index

# Chapter one

**Project definition:**

A commercial entertainment centre is a demonstration which providing a series of purposeful entertaining activities which increases the level of economic and entertainment in the society and connects it with others

Architectural factors affecting the success of the commercial center:

- Location (site)
- Shading
- General view of the market
- Variations and type of market

**Project Aims:**

- Create a new view regarding the architectural concept in Sudan.
- Achieve a personal goal of making entertainment, relaxation and converging the commercial, entertaining activities.
- Creating job opportunities for the locals.
- Advancing the aesthetics.
- Raising the economical level of the country**.**

**Project dimension:**

**1- functional dimension:**

1- Presenting a project with it is functions and activities in high-class degree.

2- Drawing attention of the entertaining investments.

3- Improving the commercial buildings.

4- Friction with nature and adopting a project goes in a line with it.

**2- Aesthetic dimensions:**

Creating an attractive commercial entertaining spot.

**3- Constructional dimensions:**

1-using modern construction methods which are more durable and least expensive.

2-finding solutions to ensure overlapping the design with the topography.

**Challenges of the project:**

1-the flexibility of the design an easily movement between the spaces with it's different facilities.

2-creating a functional integration between different elements although keeping the privacy of each elements.

2- Spectacular and logical overlap between functions and scene.

4-considering the aesthetic aspect as the main factor for the attracting the investors.

**The need for the project:**

- Increasing the level of cultural awareness and classiness in the Sudanese society while spreading its culture and increasing its ability to cope with the modern societies.
- Defining the various civilizations.
- The great need for a specialized artgalleries.
- Upgrading the individual talents while connecting the new with the old.

# Chapter Two

# Introduction:

-Trade originated with human communication in prehistoric times. Trading was the main facility of prehistoric people, who bartered goods and services from each other before the innovation of modern-day currency. Peter Watson dates the history of long-distance commerce from circa 150,000 years ago.

-A trader is person or entity, in finance, who buys and sells financial instruments such as stocks, bonds, commodities, derivatives, and mutual funds in the capacity of agent.

-Trading is the main life supply in the modern cities, and the commercial center is the nuclei of the economic and social life.

There are three types of commercial activity in any social group:

- Wholesale Activities
- Partial sale Activities
- Piece by piece Activities

**2.1.1 Trading in Sudan:**

Trading in Sudan started from rise of Nubian countries and the rise of this civilization on this earth before 3000 B.C, and the trading between Sudan and

### 2.1.2 Trading Activity:

Trading activity in Khartoum:

Trading places where it centers around (AL Arabi) market and is a big market that have many streets contains different industries, Parking that have general transportations lines.

And there is a local market that serves local areas.

**Types of commercial buildings:**

***1- <u>Commercial complexes:</u>***

Big closed markets usually consist of big building

Called (Mall) contains more than one floor, contains many different activities, entertainment places and restaurants.

***2- <u>Commercial centers:</u>***

Consist of big opened commercial stores combined in one place and can be with one activity or multi activities

### 2.1.3 Textures of commercial buildings:

1-**Linera texture**:

Consist of group of stores along main streets that leads to shopping centers.

2- **(U.L) texture:**

The two shapes (U.L) can be identified as upgrade to the linear texture.

***3- <u>Market grouped on the street borders:</u>***

Consist of paths contained various commercia stores and this type can be found in the main shopping centers and started to spread on world markets because, this type has many commercial activities.

Added to that at the end of it have two big stores called (attracting Galleries).

### 2.1.4 Commercial corridor:

Corridors are elements that defined shopping shape consist of main roads for shoppers surrounded by commercial stores on the borders, add to that the sidewalks leads to point or more of meeting points (spaces) and the main entrances placed on the main commercial corridor or the side walk.

***General conditions for designing commercial corridor:***

-The designer of commercial corridor must provide easier movement flow for shoppers and should be simple and easy to recognize, in general planning, and should be entertaining and provides seats as rest places for shoppers, depends on that" fountains, trees and statues can be considered important elements in corridors design but should not cover the stores.

***Sizes of commercial corridor***:

1-***Width***:

Determined to be suitable for waiting and movement of the shoppers.

2-***length:***

Commercial corridor should not exceed 250 meters otherwise the shoppers would feel bored.

**According to the size and purpose of the entity it can be subdivided into**:

- Regional commercial center
- City commercial center
- Near living areas center
- Infra living areas center

2.2.1 **Entertainment**:

Entertaining types:

1- touristic entertaining:

General parks – Amusement parks – Spas

2- cultural entertaining:

Clubs – Galleries – Fine arts -

3- Commercial entertaining:
Shopping centers – Free markets – International galleries – Products galleries.

4- Sportsman entertaining:
Sports clubs – water sports – touristic ……

Designing specifications of commercial centers:
**Firstly:** since the project is multi activities there are many directions in designing.
Such as:

1- Considering the project is a single architectural mass contains multi entrances (main entrance – sub entrance) from it distribution plaza can be reached this plaza contains vertical circulation elements.
2- Dividing the project into parts according to activities, and possibility of providing green areas as open areas considering the relation between elements of the project.
3- Distribution of project elements on wings from one main distribution center.
4- Distribution of project elements freely in one space.
5- Building heights

G.F.L: 4.5 – 5 m

- F.F.L: 3.75 - 4.5 m
- Last floor: 3 – 4 m

6- Considering the visitors use their cars because of that parking must be provided.

***Secondly:***

**Elevation elements:**

Elevation elements must have power of identifying contained elements, and finishes must be with high quality materials.

***Thirdly:***

**Aesthetic:**

Considered from important attraction elements because of that surrounded textures must resample good view evenly with green areas or roads leads to it.

***Fourthly:***

**Orientation /ventilation /lighting (environmental sides):**

***Fifthly:***

**Building materials and constructional methods:**

There is lot of constructional methods and building materials and there are no defined borders for building activities but usually ruled by two main factors:

A- Architectural theme.
B- Economic factor.

*Sixthly:*

**Security** as an element in commercial building design is highly considered.

***Seventhly:***

**Movement axis:**

From the most important elements and have a big role in project success or failure because of huge number of users, must have great efficiency, using easiness and flexibility, start and end of the axis must be studied because they defined powerful areas to put important elements

## *Architectural elements in commercial center:*

## *Entrances:*

Shopping center entrances must be clear and should represent greatness and luxury because it a moving area from outside to inside.

## Vertical circulation elements.

# Section two:

**Similar projects (local project):**
**Wahat al Khartoum tower**

**Wahat al Khartoum is considered one of the biggest projects that changed the general view of the city centre.**

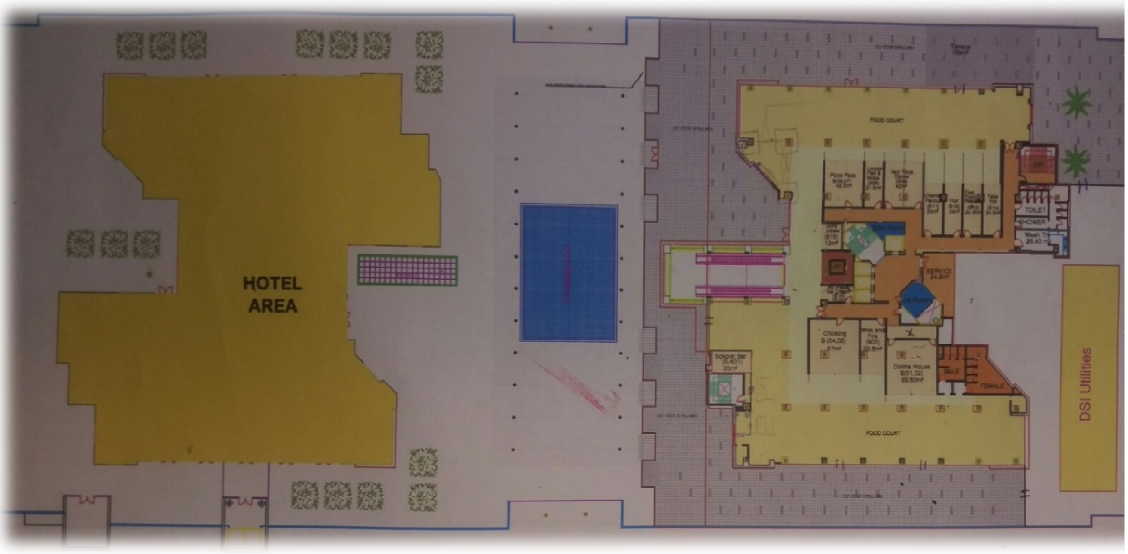
**Project Components:**

**1- commercial centre, consists of: super market, hyper market and restaurants.**

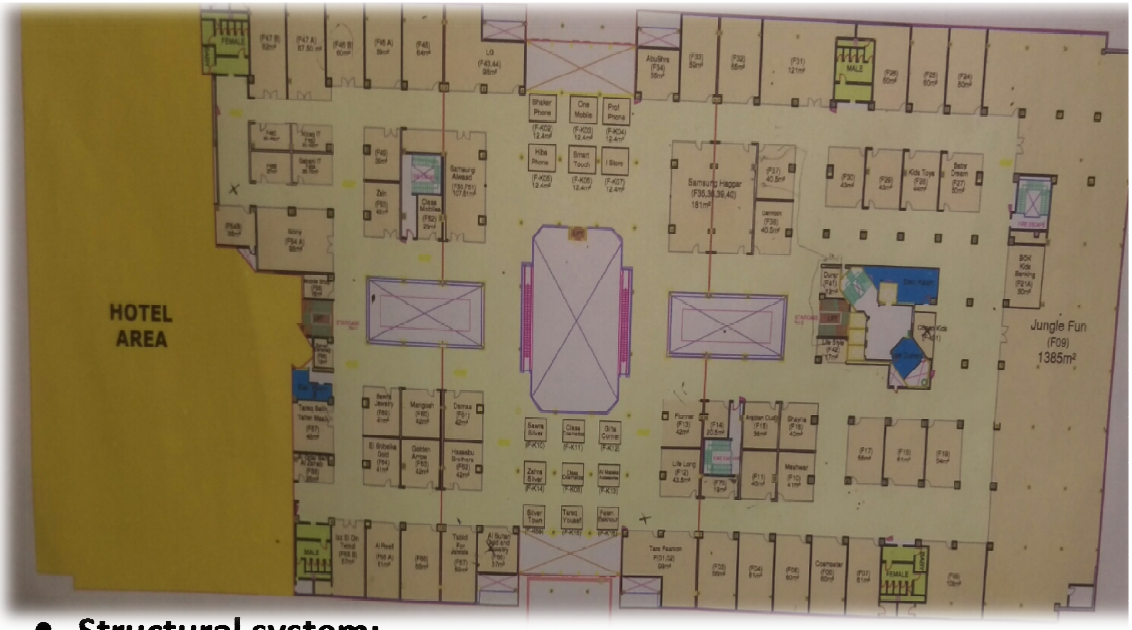
**2- entertainment centre, consists of: children playgrounds.**

**3- managerial centre that consists of two (sixteen-story) buildings.**

**4- residential compound that consists of two (sixteen-story) buildings.**


HOTEL
AREA
FOOD COURT
TOILET
SHOWER
DSI Utilities
FOOD COURT


HOTEL
AREA
Marks Collection
The Judaism Institute
Bank Aviation
Marks Business
Emirates Airlines
Arab Sudanese Bank
Marks Home Textile
MAIN ENTRANCE

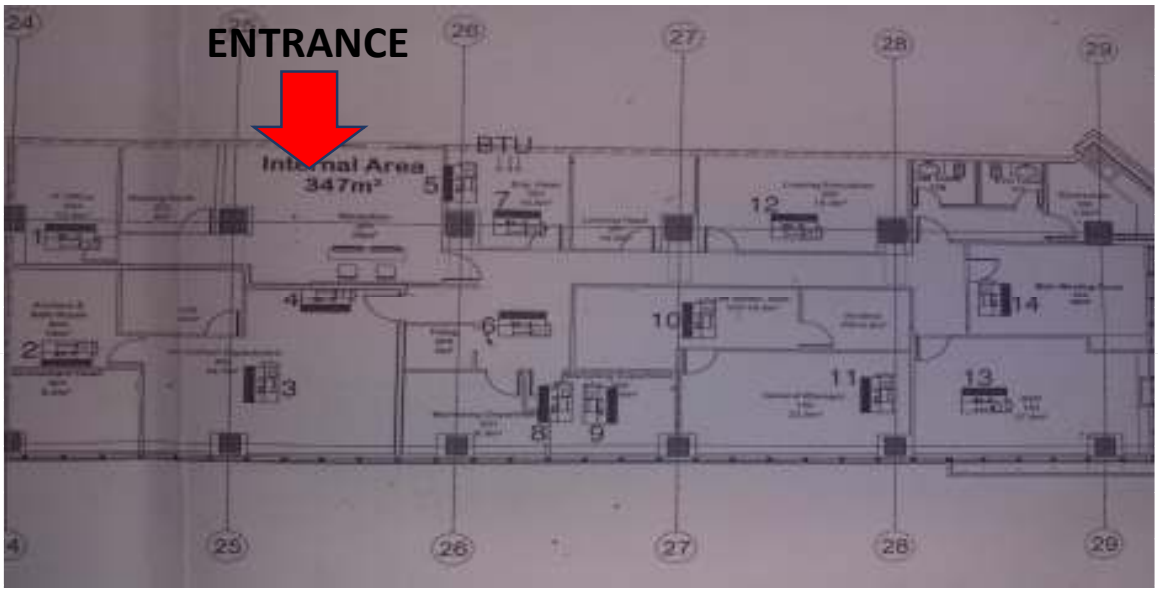



- **Structural system:**

The used structural system is the concrete structural system, whereas all the pillars are concrete with a raft foundation and a concrete slab that goes with a 45 cm width modified by using a pile cap to solve the slab weight problem.

- **Finishing:**

For the frontal side a set of glass and cladding aluminium has been used, as for the internal finishing a granite rocks was used for the main hall finishing and for the shops it was finished using ceramics and a false ceiling.



- Advantages:

1- Simple architectural design.

2- Good internal movement distribution.

3- A dedicated floors for services.

4- The simple construction of the horizontal plan.

5- Easy access to the entrances on the northern and southern sides.

6-The use of internal aesthetic factors which increases the promotion of the institution.

- **Disadvantages:**

1- the conflict between the technical preparation area and the mall floor.

2- the lack of toilets discharging ducts in the hotel tower.

3- there are some structural faults in the slabs and it's size and shape.

**Similar projects (international project)**

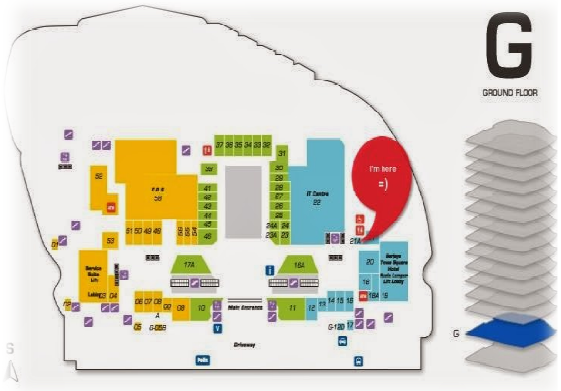
## Time squire tower:

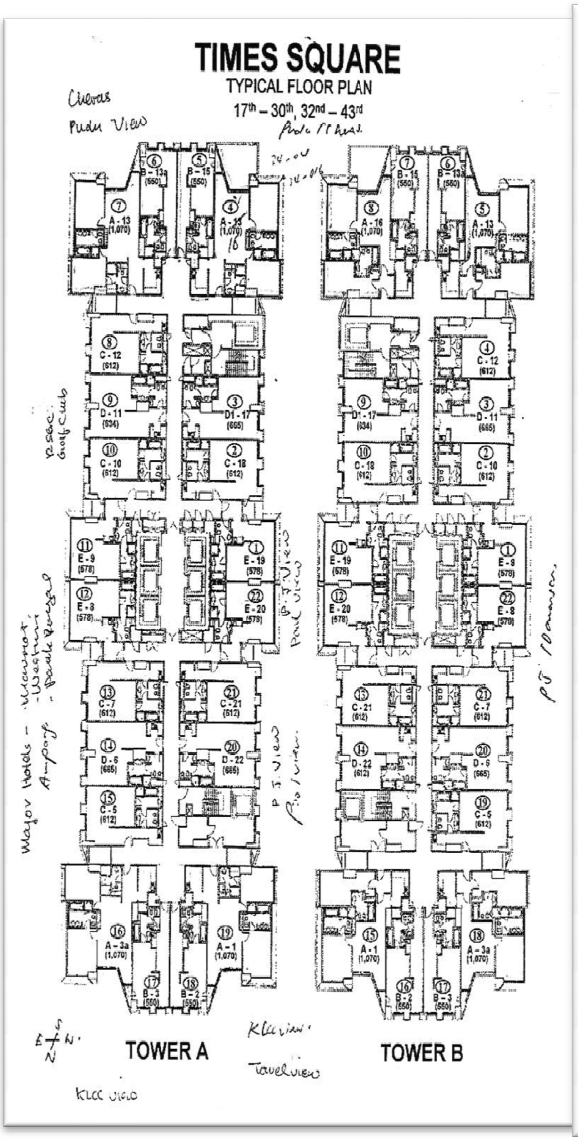
**It's two towers building that consists of commercial centre and a five stars hotel, this building lies in Kuala Lumpur with a 42 floors composition. And with a 700,000 m2 area It's considered the largest building in the world.**

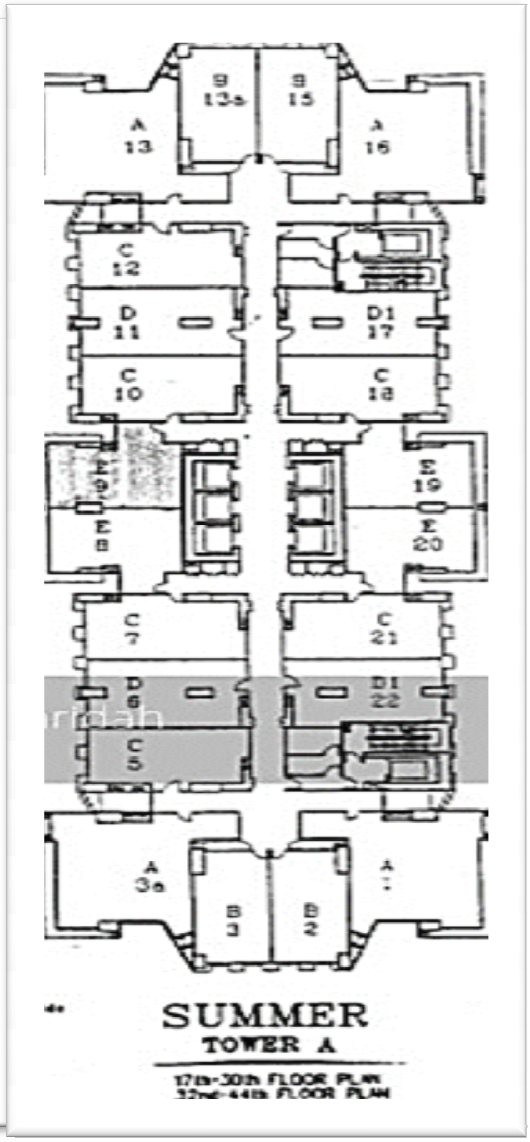
**This huge compound includes shopping parts, cinema, internal garden, hotel, offices and etc…**

**Location: the most targeted area by tourists coming to Kuala Lumpur.**

| | |
|---|---|
| Entertainment | |
| Commercial | |
| Services | |
| Movement corridors | |





TIMES SQUARE
TYPICAL FLOOR PLAN
17th – 30th, 32nd – 43rd
TOWER A
TOWER B


SUMMER
TOWER A

| Advantages | Disadvantages |
| --- | --- |
| Providing sufficient car parking spaces. | The vertical circulation elements is scattered in the commercial center. |
| Various commercial shops. | |
| Several entertaining content and green areas. | |
| Clear entrances and exists. | |
| Beautiful internal decoration which pulls more visitors. | |

# Chapter Three

Data Analysis

## 3.1.1 Project components:

-components.

-Space study.

-Matrix.

-Bubble.

-Movement chart.

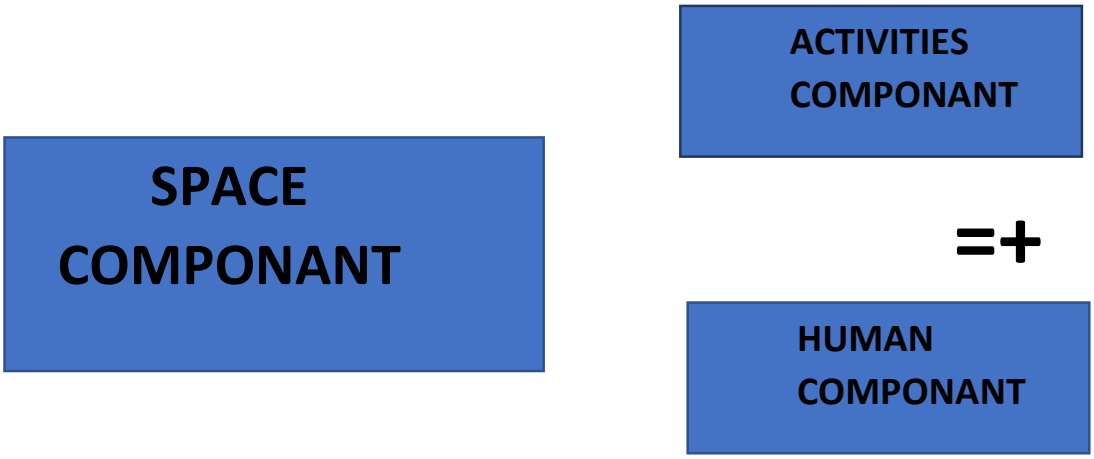
- table of Area.

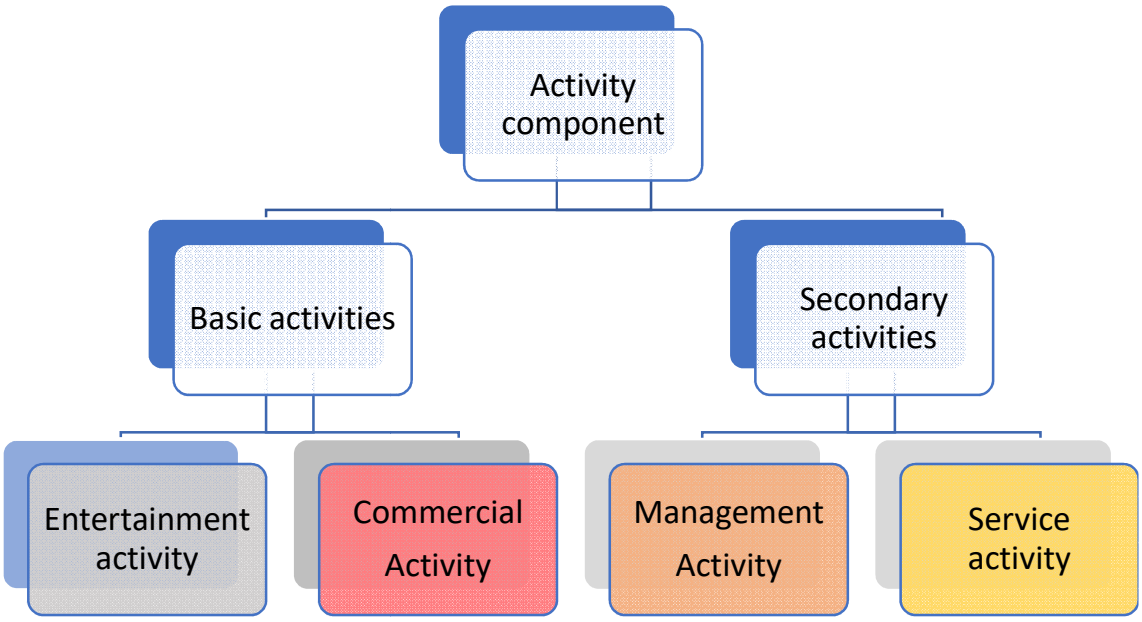
## 3.2.1 Proposal sites:

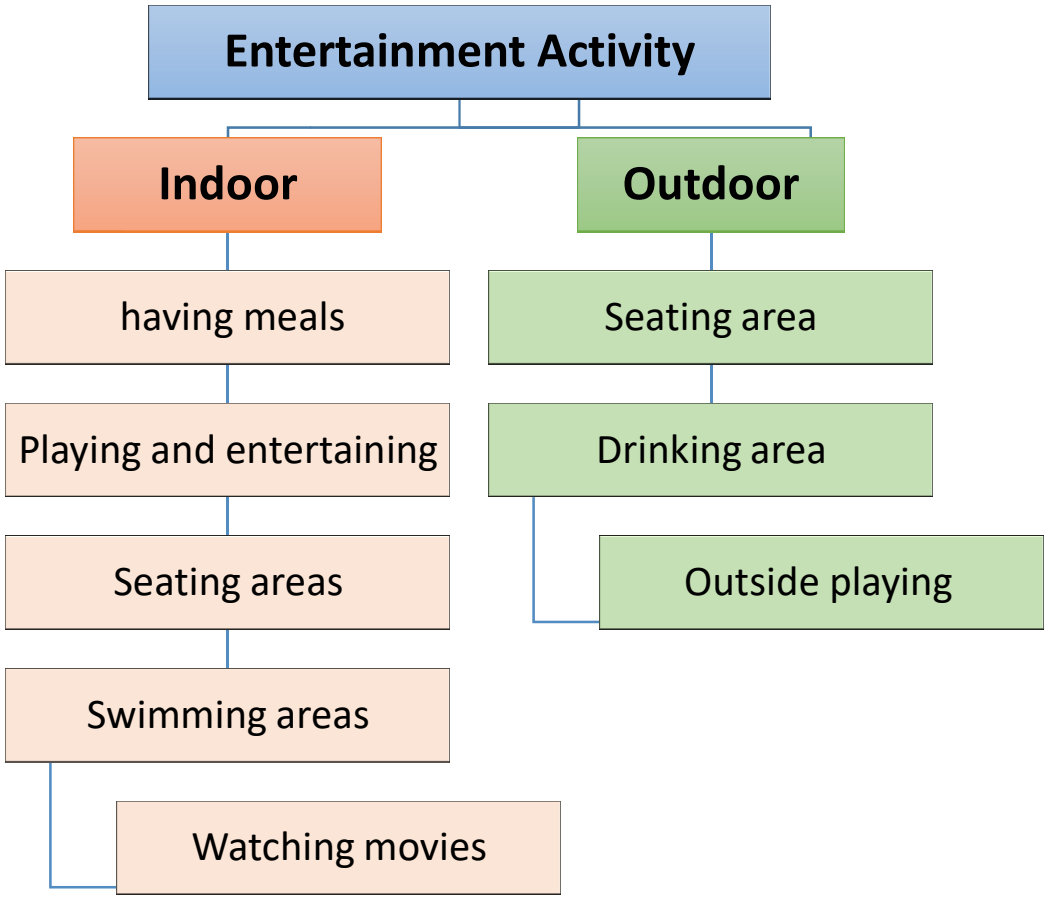
-Location

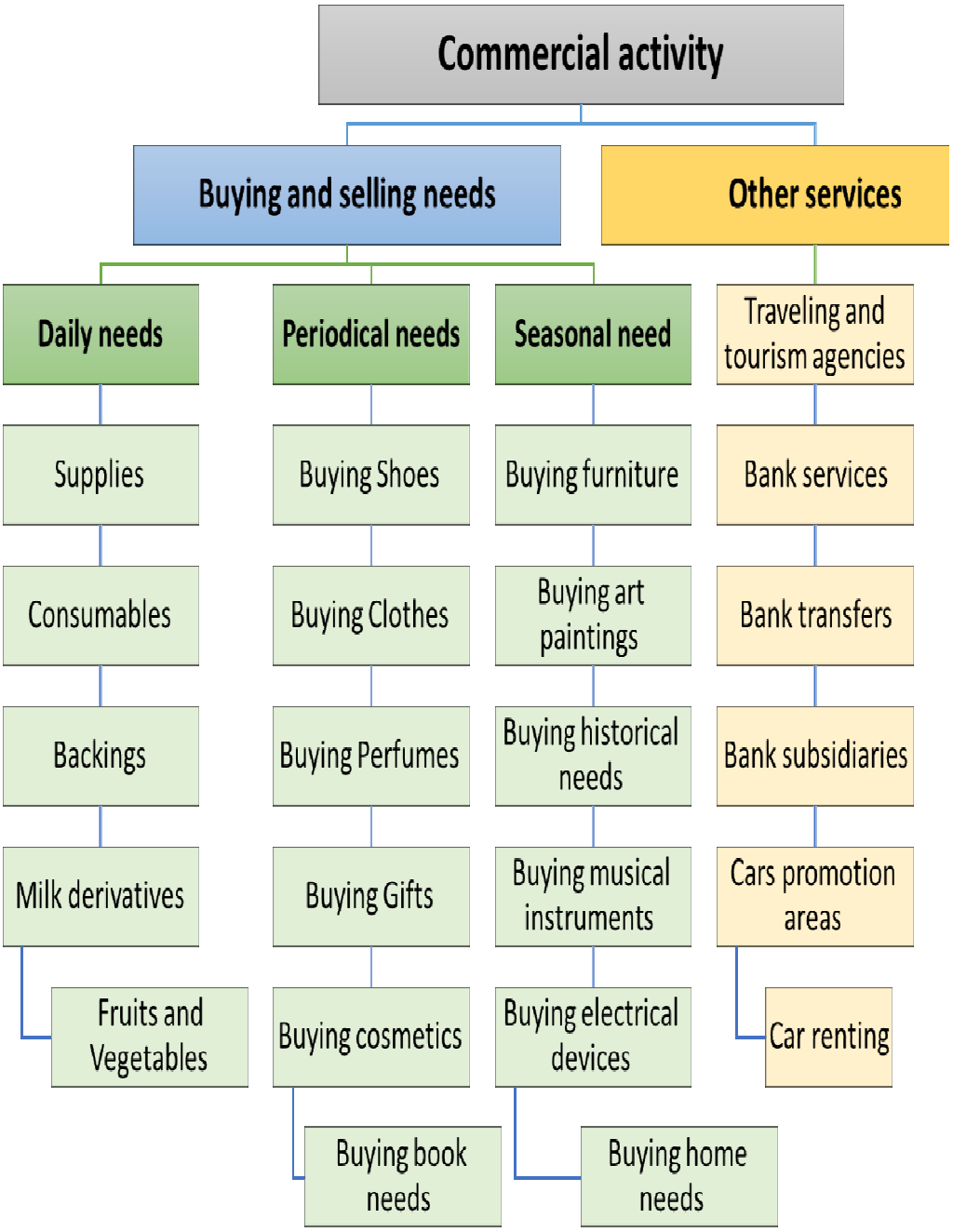
## 3.3.1 selected site:

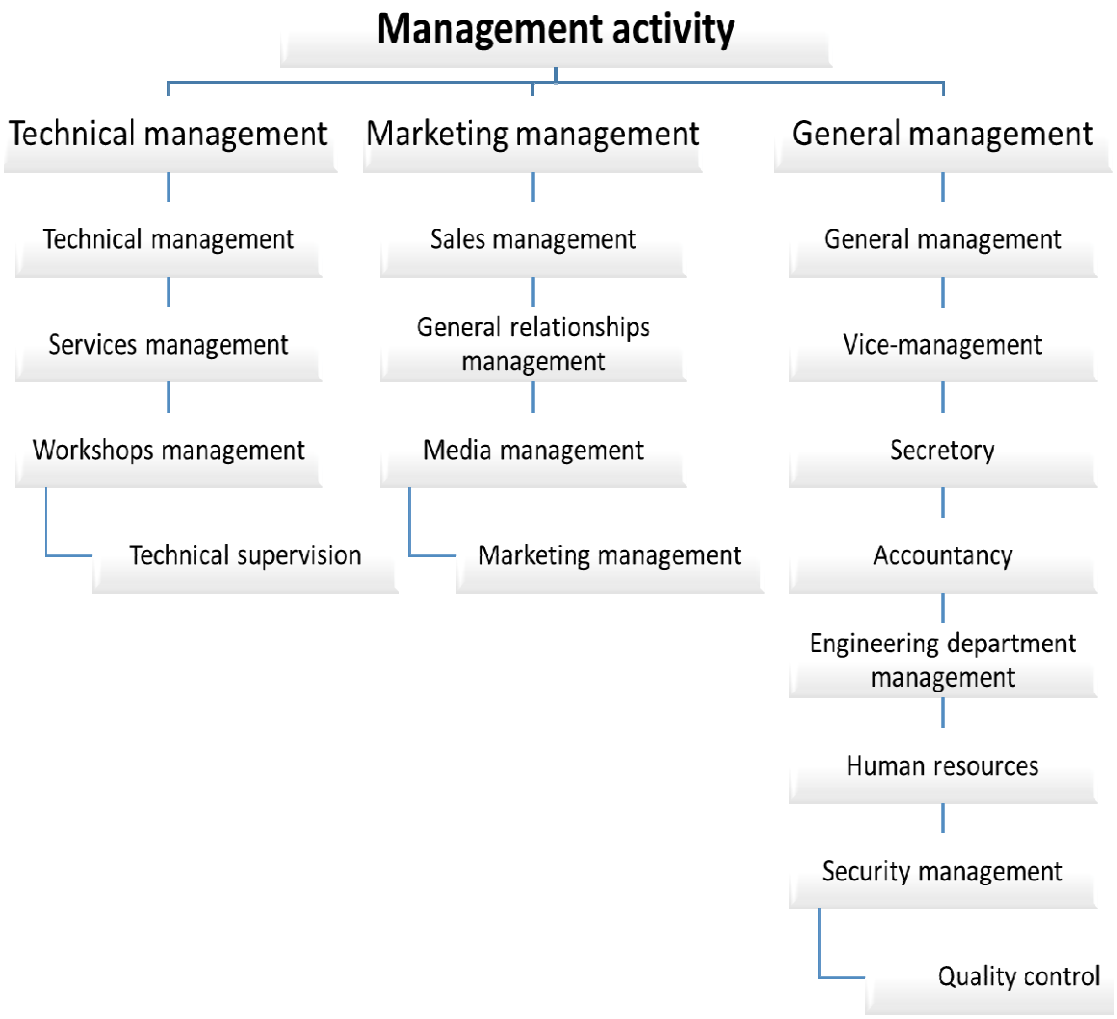
-Analysis


ACTIVITIES COMPONANT
SPACE COMPONANT
=+
HUMAN COMPONANT


Activity component
Basic activities
Secondary activities
Entertainment activity
Commercial Activity
Management Activity
Service activity

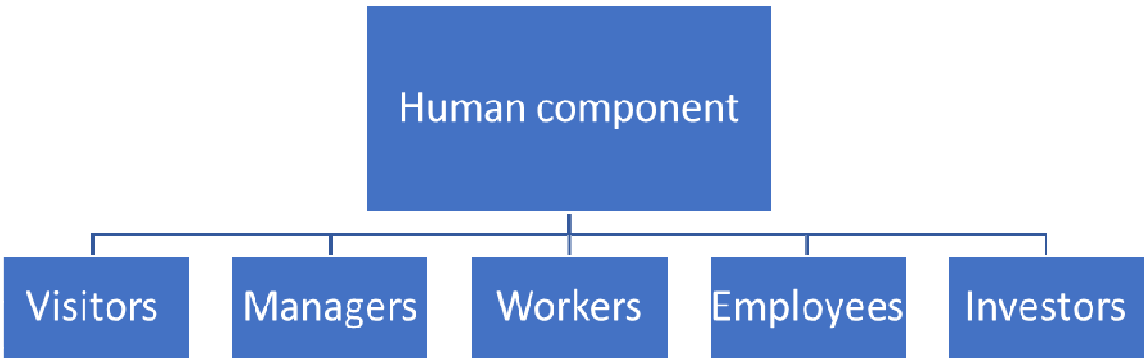

Entertainment Activity
Indoor
Outdoor
having meals
Playing and entertaining
Seating areas
Swimming areas
Watching movies
Seating area
Drinking area
Outside playing

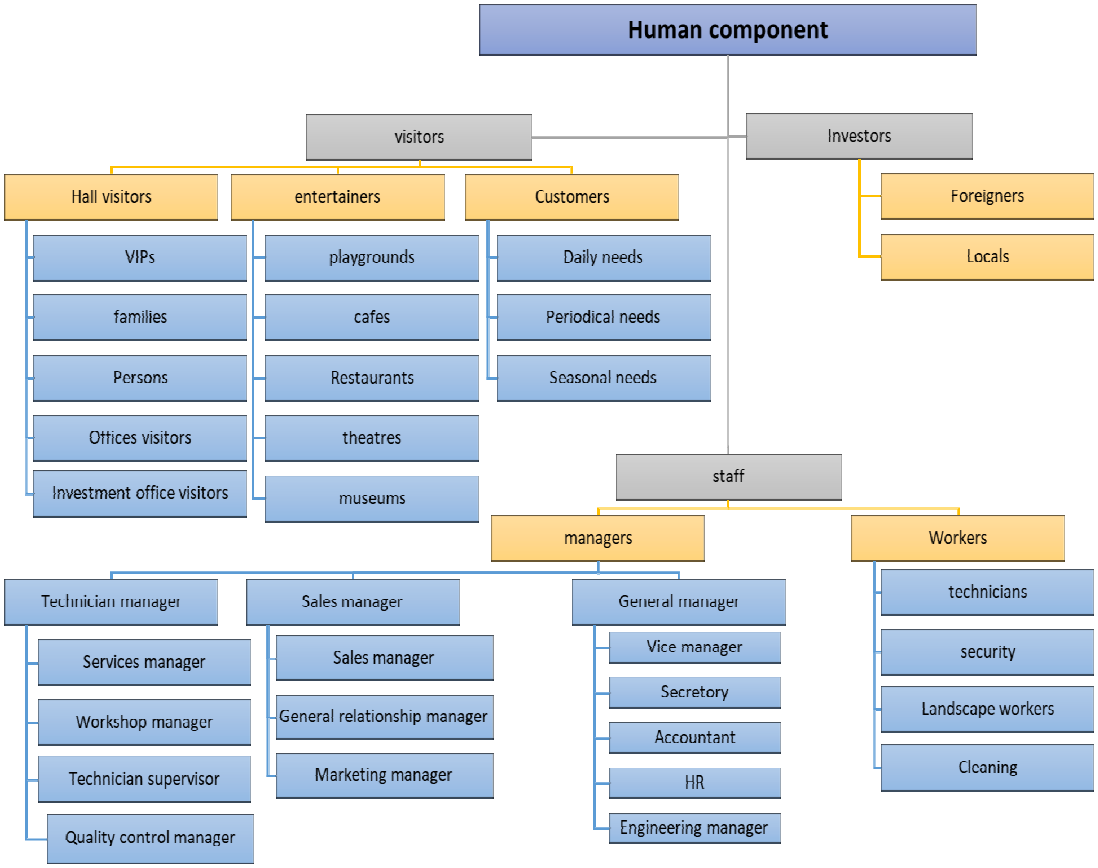

Commercial activity
Buying and selling needs
Other services
Daily needs
Periodical needs
Seasonal need
Traveling and tourism agencies
Supplies
Buying Shoes
Buying furniture
Bank services
Consumables
Buying Clothes
Buying art paintings
Bank transfers
Backings
Buying Perfumes
Buying historical needs
Bank subsidiaries
Milk derivatives
Buying Gifts
Buying musical instruments
Cars promotion areas
Fruits and Vegetables
Buying cosmetics
Buying electrical devices
Car renting
Buying book needs
Buying home needs


Management activity
Technical management
Marketing management
General management
Technical management
Services management
Workshops management
Technical supervision
Sales management
General relationships management
Media management
Marketing management
General management
Vice-management
Secretory
Accountancy
Engineering department management
Human resources
Security management
Quality control

# Services activity

- Storing
- Using W.C
- Praying
- Security
- Car parking
- Maintenance and generating

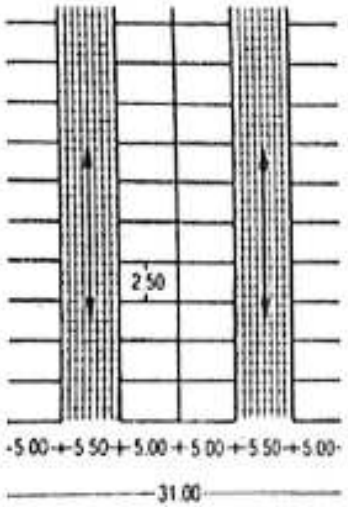

Human component
Visitors
Managers
Workers
Employees
Investors


Human component
visitors
Investors
Hall visitors
entertainers
Customers
Foreigners
Locals
VIPs
families
Persons
Offices visitors
Investment office visitors
playgrounds
cafes
Restaurants
theatres
museums
Daily needs
Periodical needs
Seasonal needs
staff
managers
Workers
Technician manager
Sales manager
General manager
Services manager
Workshop manager
Technician supervisor
Quality control manager
Sales manager
General relationship manager
Marketing manager
Vice manager
Secretory
Accountant
HR
Engineering manager
technicians
security
Landscape workers
Cleaning

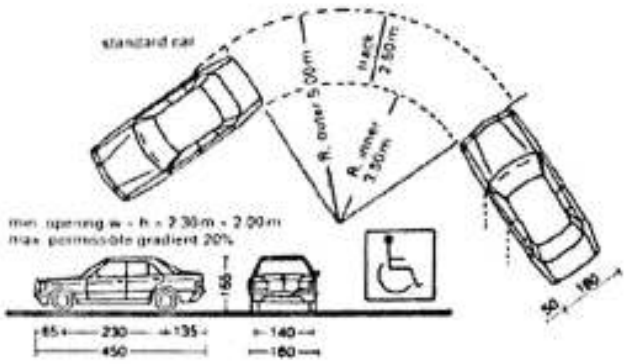
***Space study:***

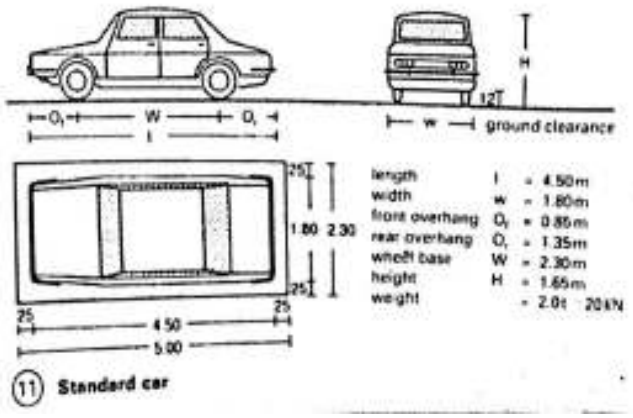
**Vehicle's parking lots: -**

The parking's lot is an area that used for the act of stopping a vehicle and leaving it unoccupied.




(10) **90° parking, 5.5 m wide road**
**Parking spaces 2.5 m wide**




(11) **Standard car**

## Restaurant: -

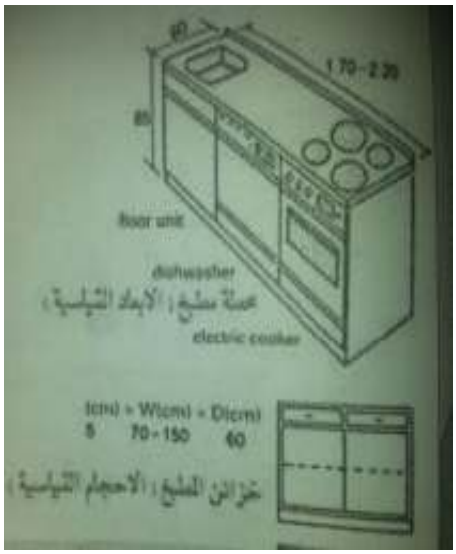
Restaurant is a business which prepares and serves food and drinks for customers in exchange of money, restaurants are various according to the purpose.

## The component of the restaurant:

### a- main kitchen:

-Cooking tables

- dish washers and sinks
- stoves and ovens
- cupboards

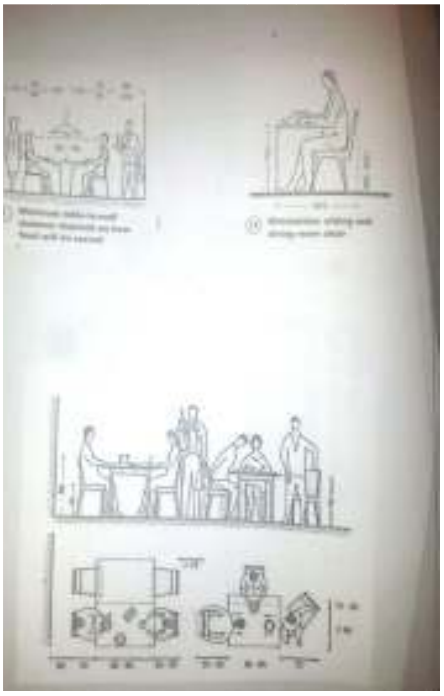


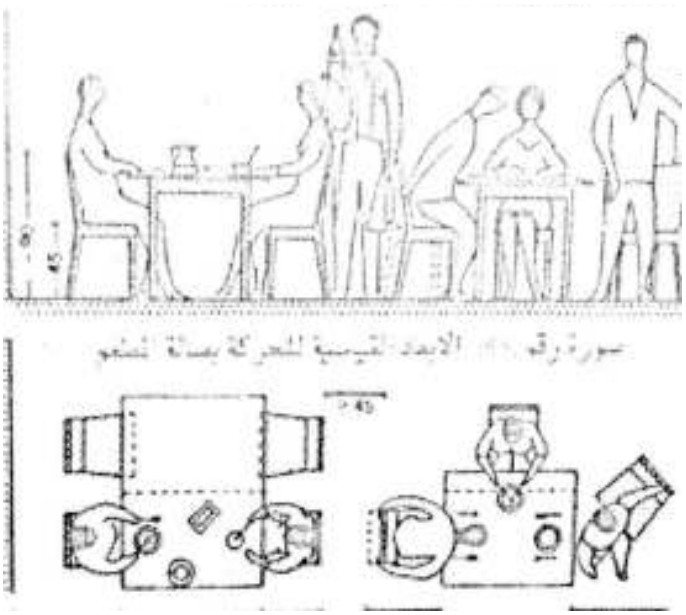

### b-stores:

- Dry store
- Wet store (refrigerators)

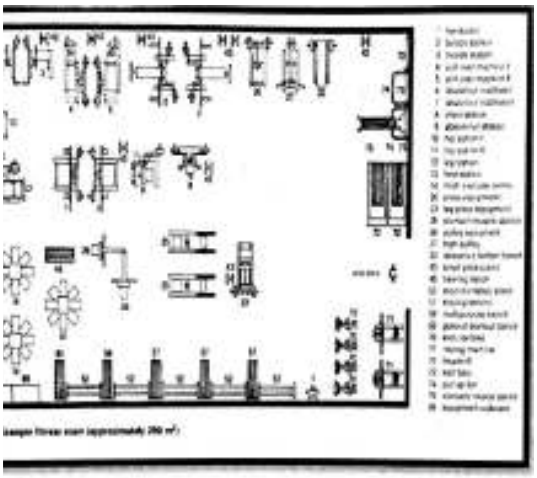
### c- water cycles:

- Laddies room
- Gentlemen's room



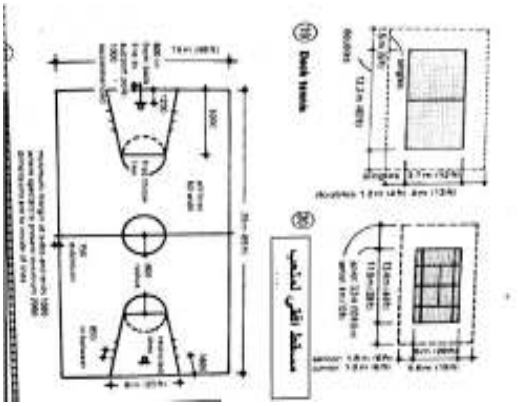


## D-GYM



صورة مسقط افقي لصالة رياضية

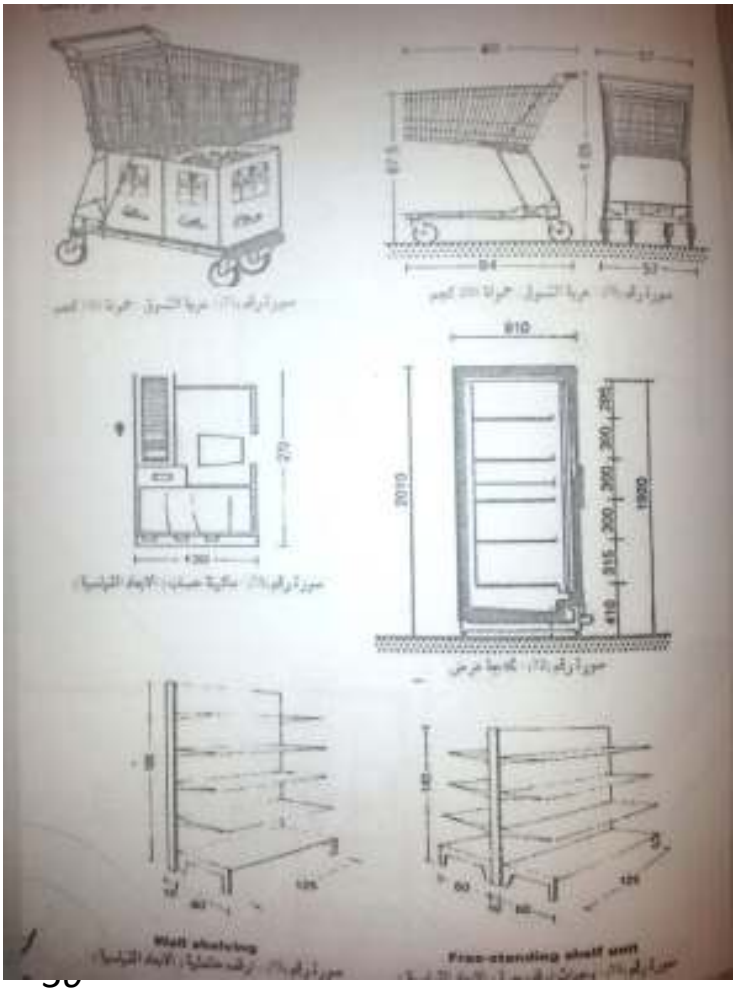
## E-PLAY GROUND



## Hypermarket: -

it contains different sections that sells communions, seasonal products ,partial products ,…etc.

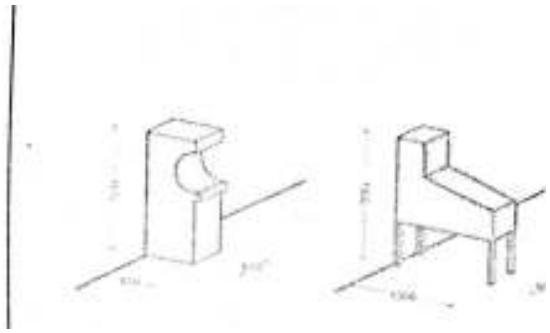
- Butchery
- Bakery
- Vegetables and fruits
- Clothes
- Detergent
- Furnitures



## GAMES HALLS:

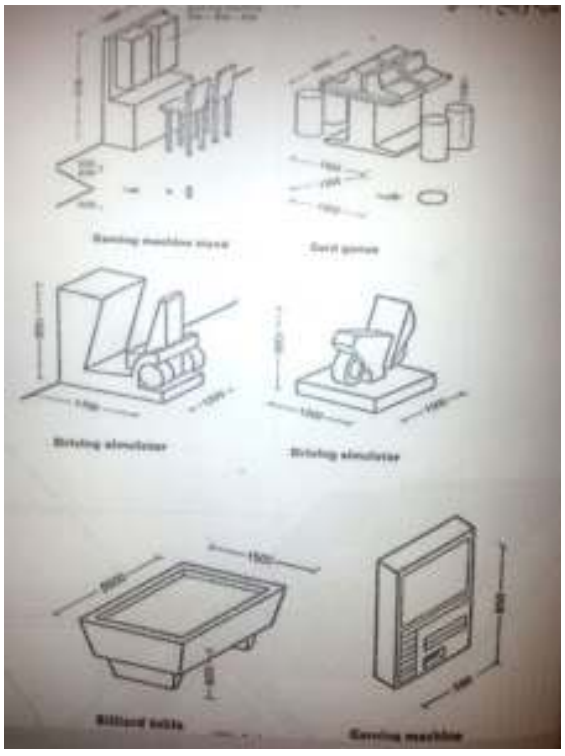
## ELECTRONIC GAMES HALL:

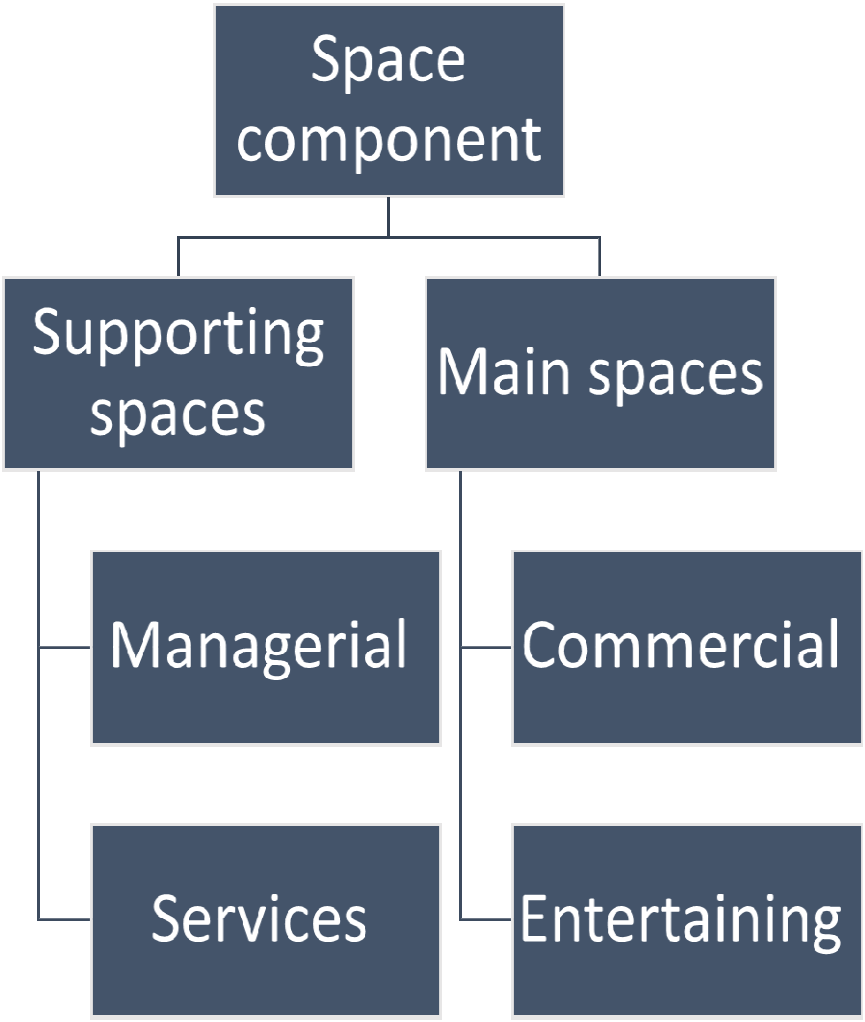
Contains electronic devices that have control elements in 300SQ M area.

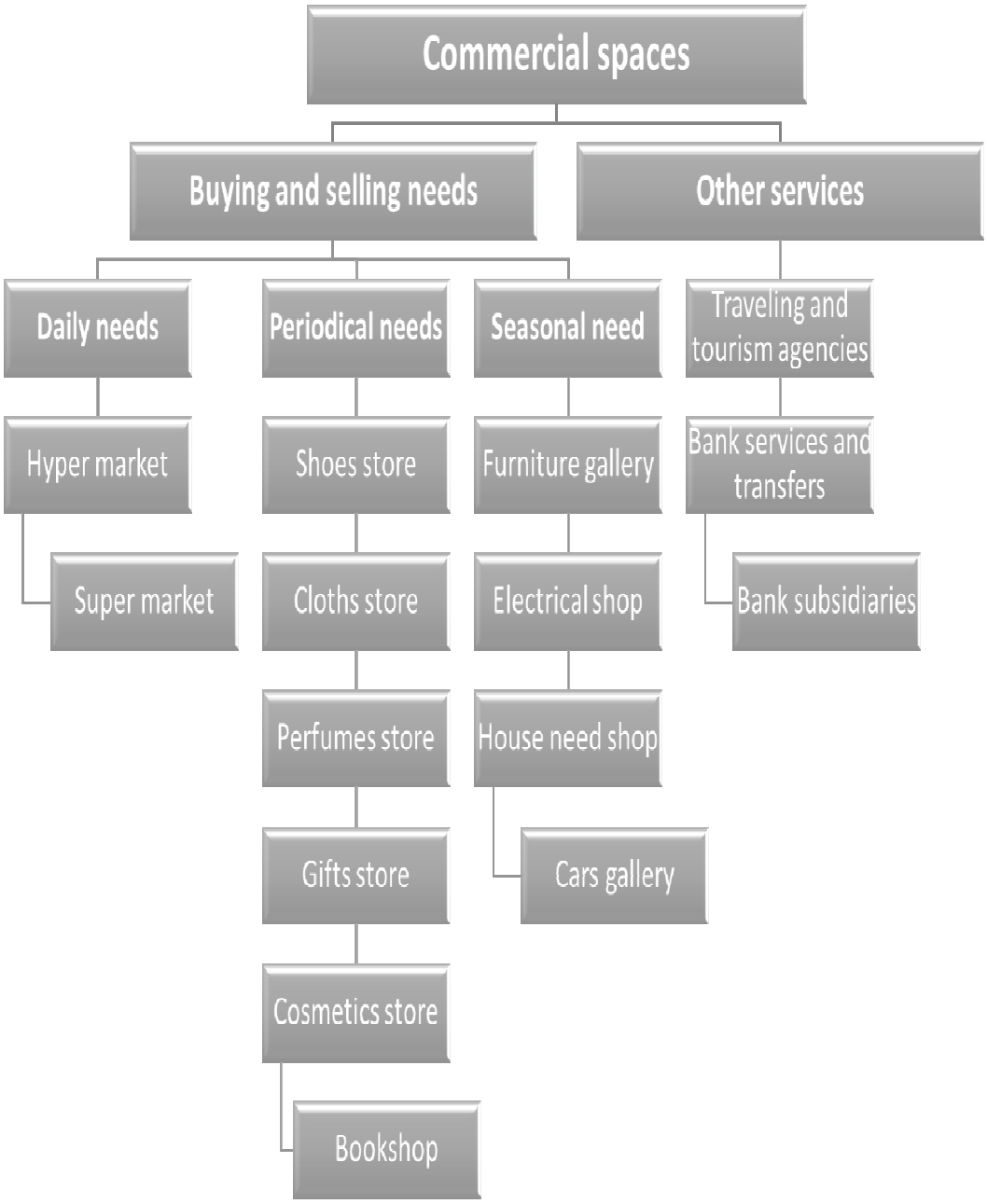


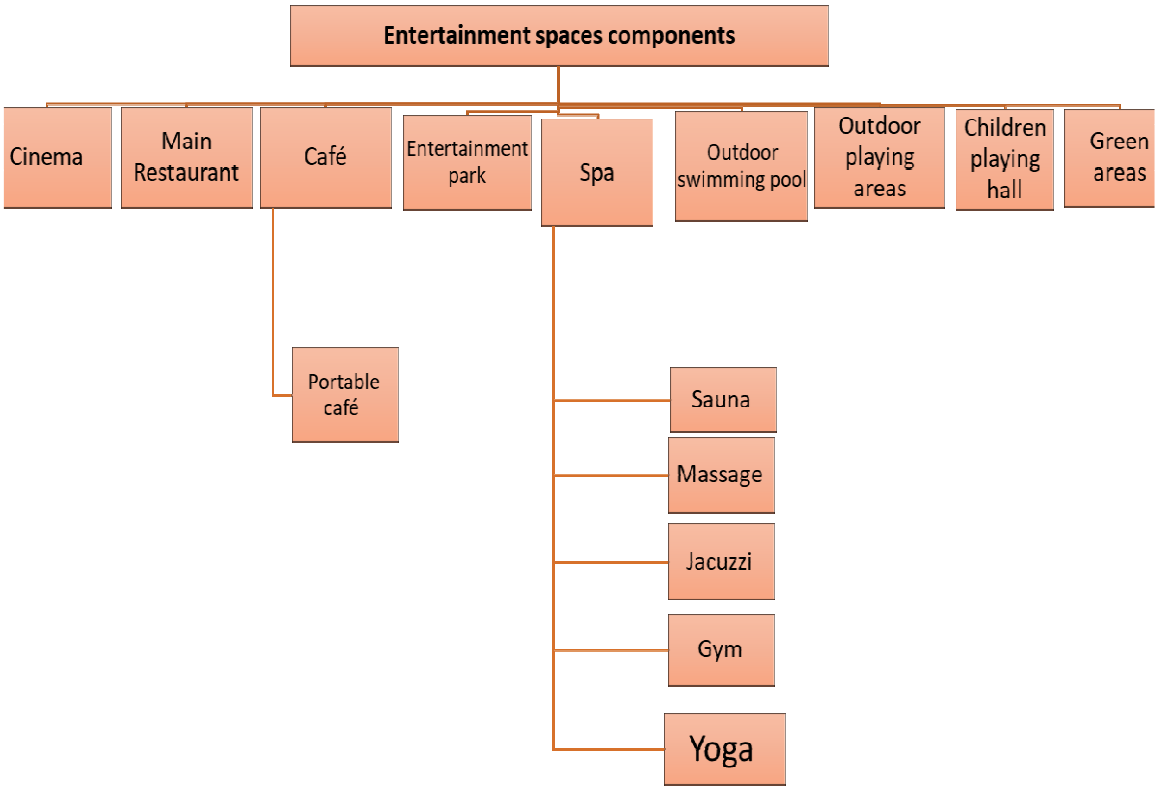
## Kid's games hall

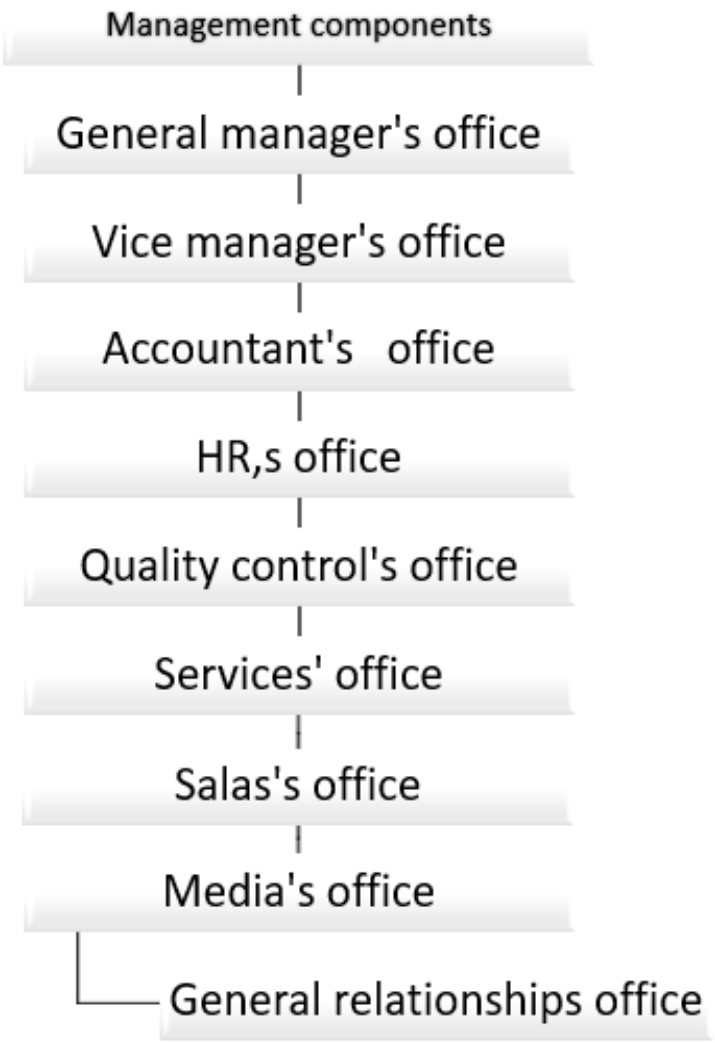
Consist of entertaining hall that contain kid's games, movable games and also mind skill developing games in area of 600SQ M.

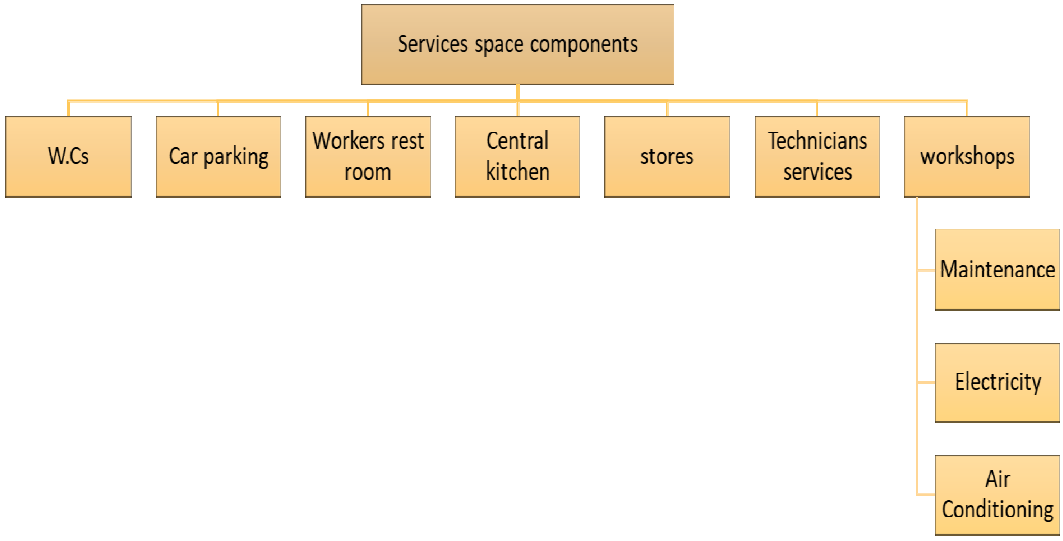



Space component
Supporting spaces
Main spaces
Managerial
Commercial
Services
Entertaining

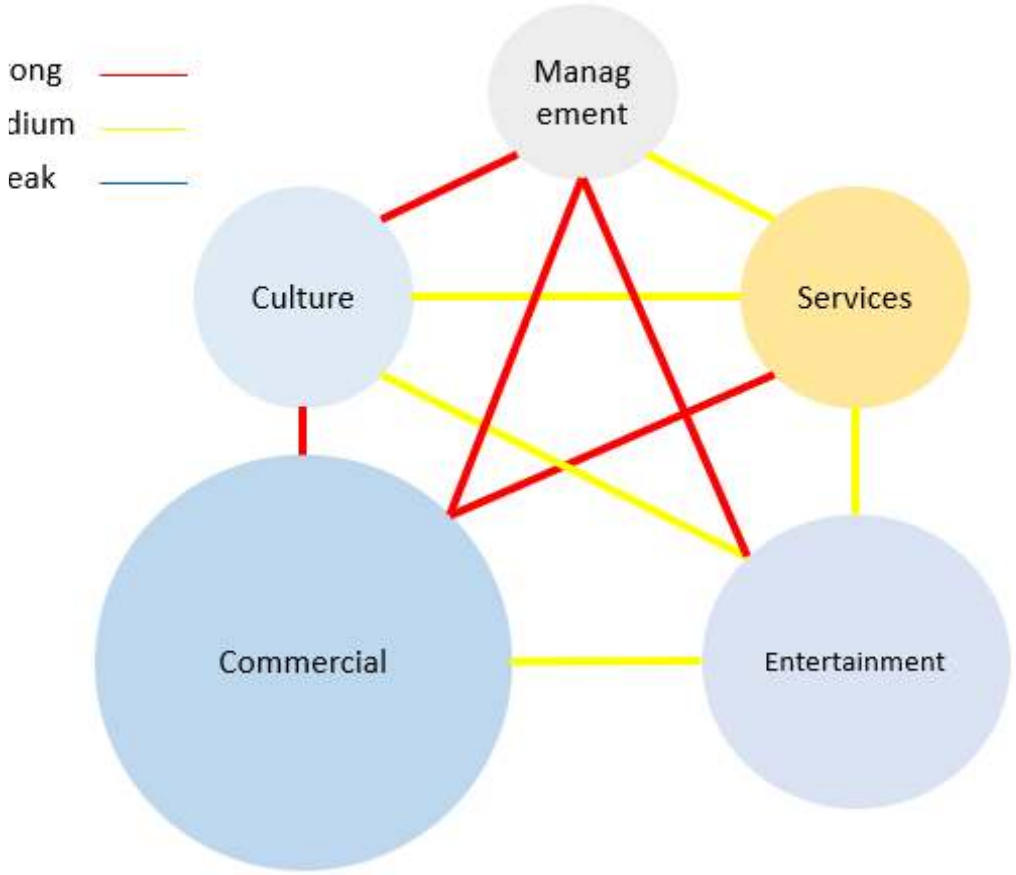

Commercial spaces
Buying and selling needs
Other services
Daily needs
Periodical needs
Seasonal need
Traveling and tourism agencies
Hyper market
Shoes store
Furniture gallery
Bank services and transfers
Super market
Cloths store
Electrical shop
Bank subsidiaries
Perfumes store
House need shop
Gifts store
Cars gallery
Cosmetics store
Bookshop


Entertainment spaces components
Cinema
Main Restaurant
Café
Entertainment park
Spa
Outdoor swimming pool
Outdoor playing areas
Children playing hall
Green areas
Portable café
Sauna
Massage
Jacuzzi
Gym
Yoga

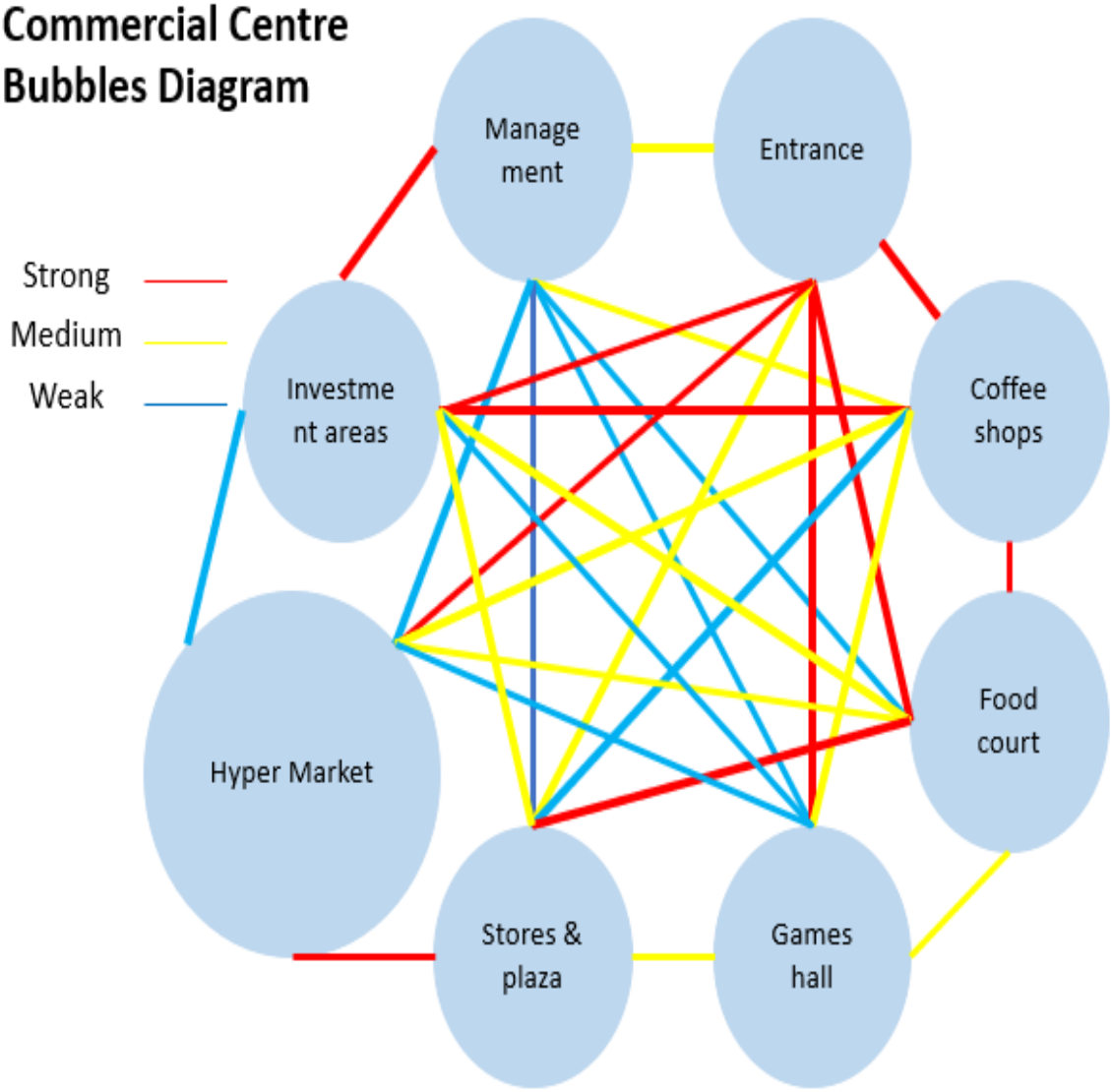

Management components
General manager's office
Vice manager's office
Accountant's office
HR,s office
Quality control's office
Services' office
Salas's office
Media's office
General relationships office


Services space components
W.Cs
Car parking
Workers rest room
Central kitchen
stores
Technicians services
workshops
Maintenance
Electricity
Air Conditioning

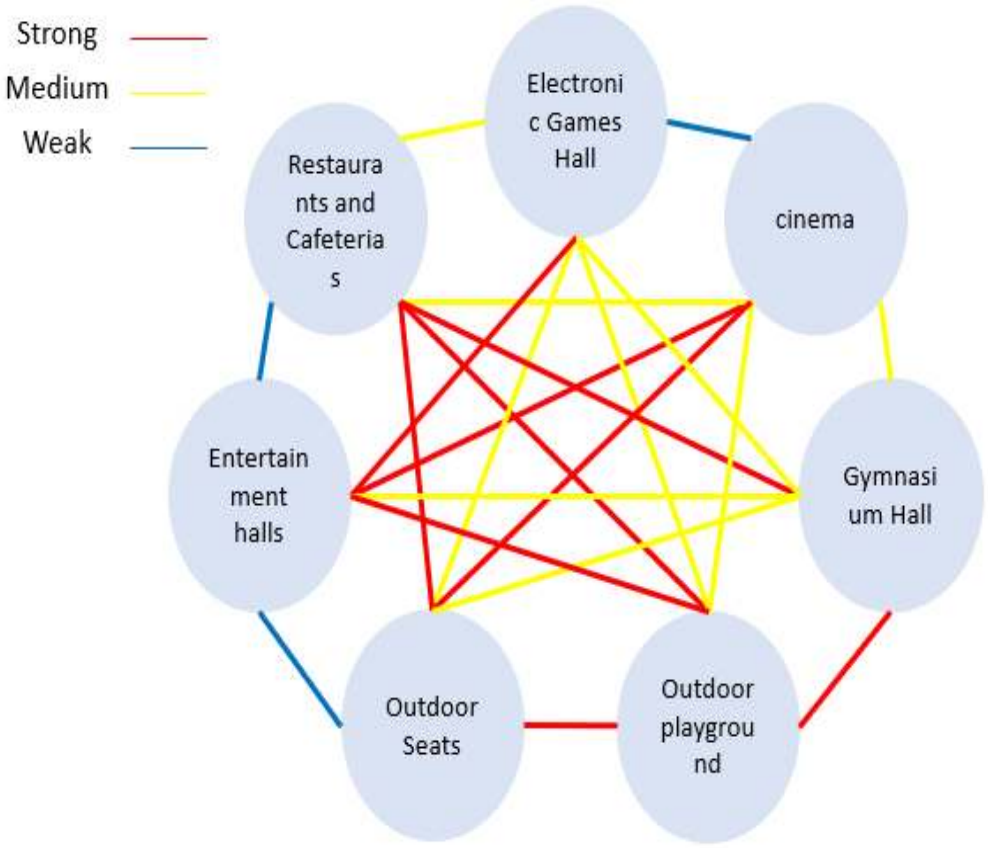
# General Bubbles Diagram

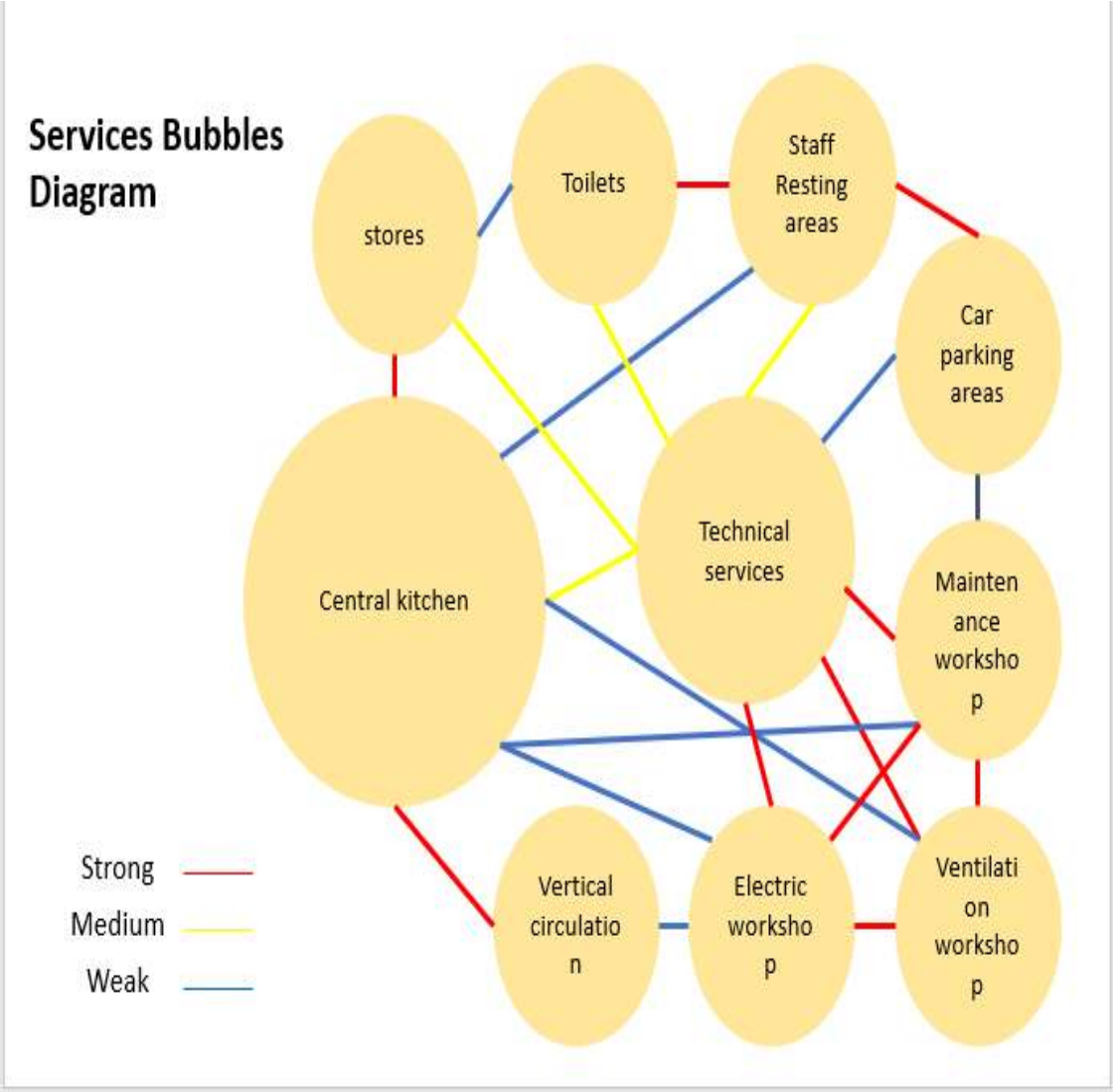


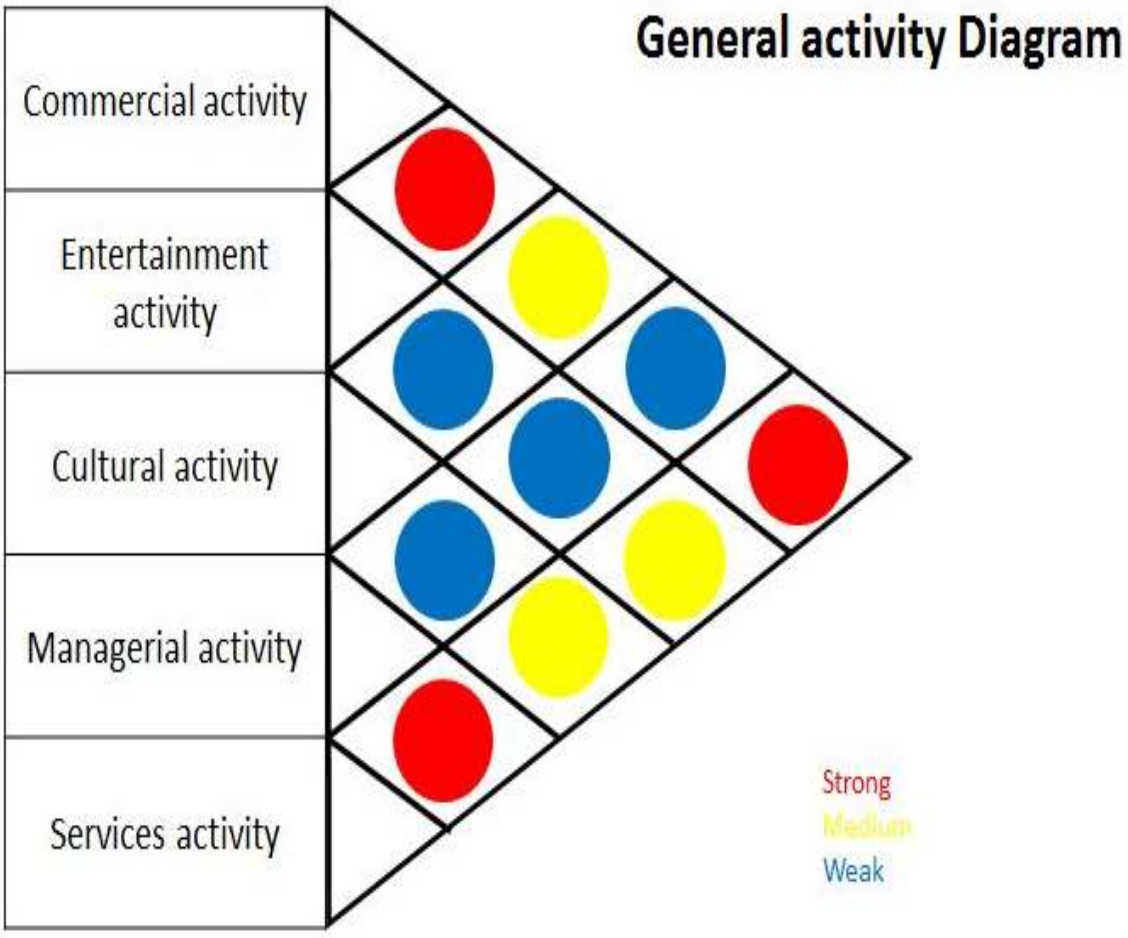
## Commercial Centre Bubbles Diagram

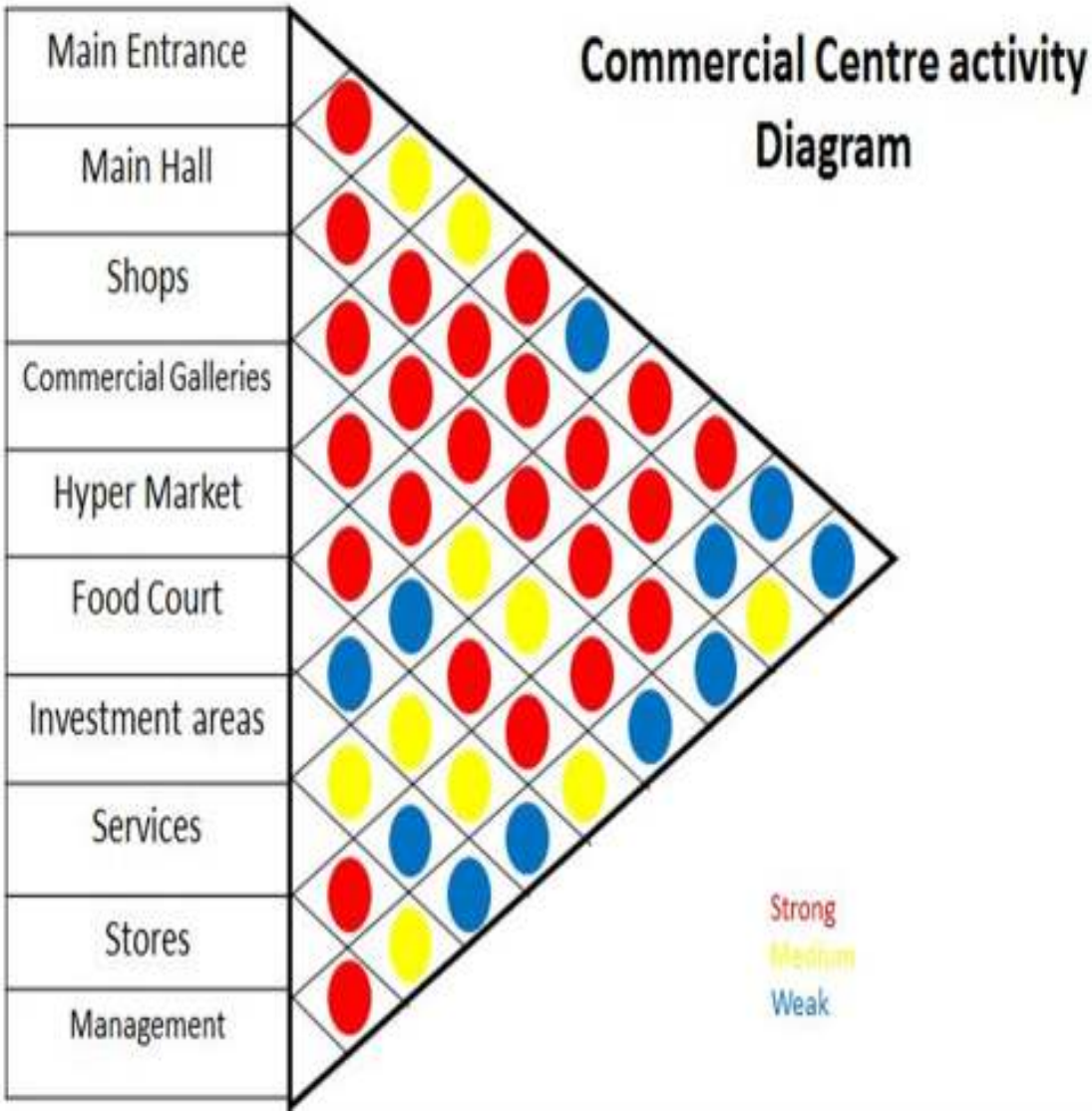


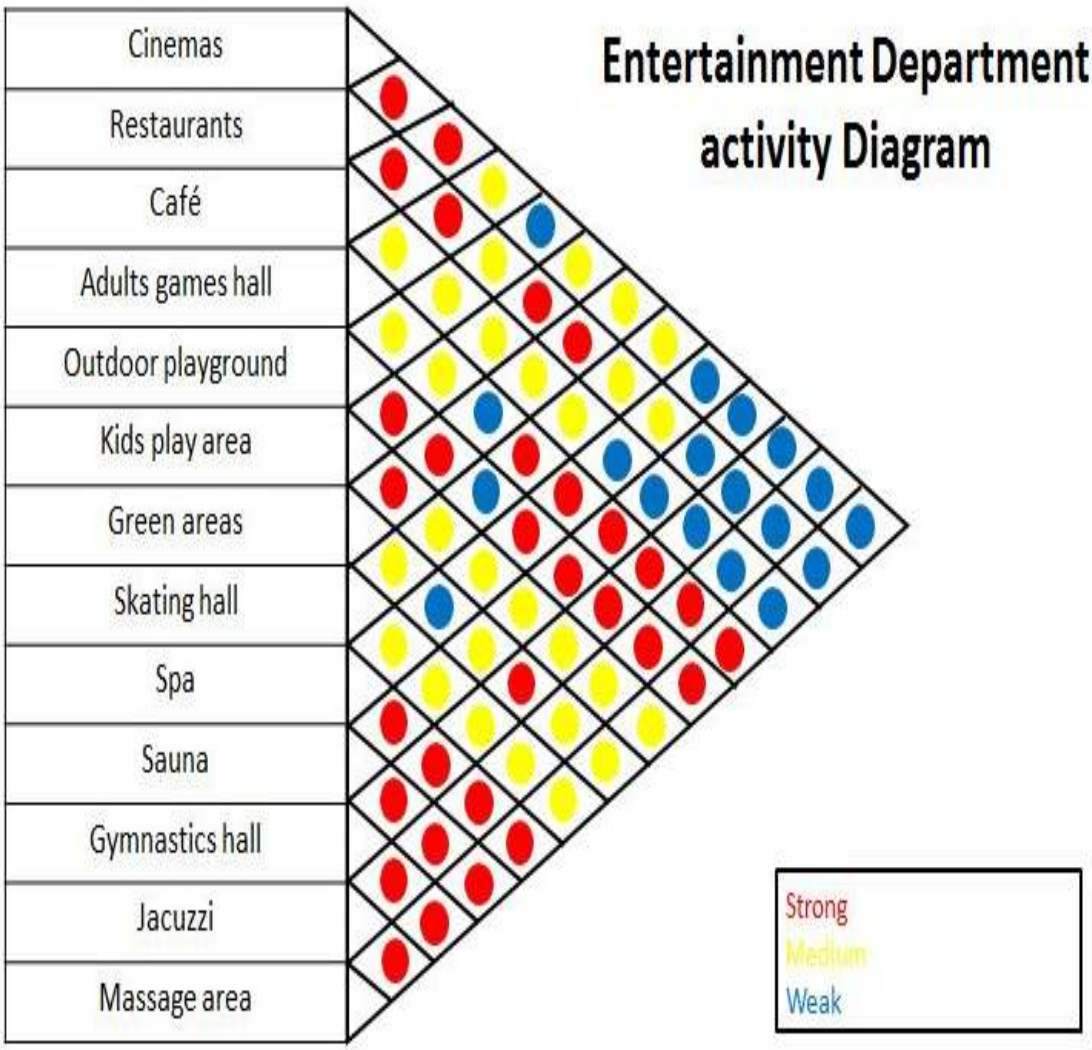
# Entertainment Department Bubbles Diagram



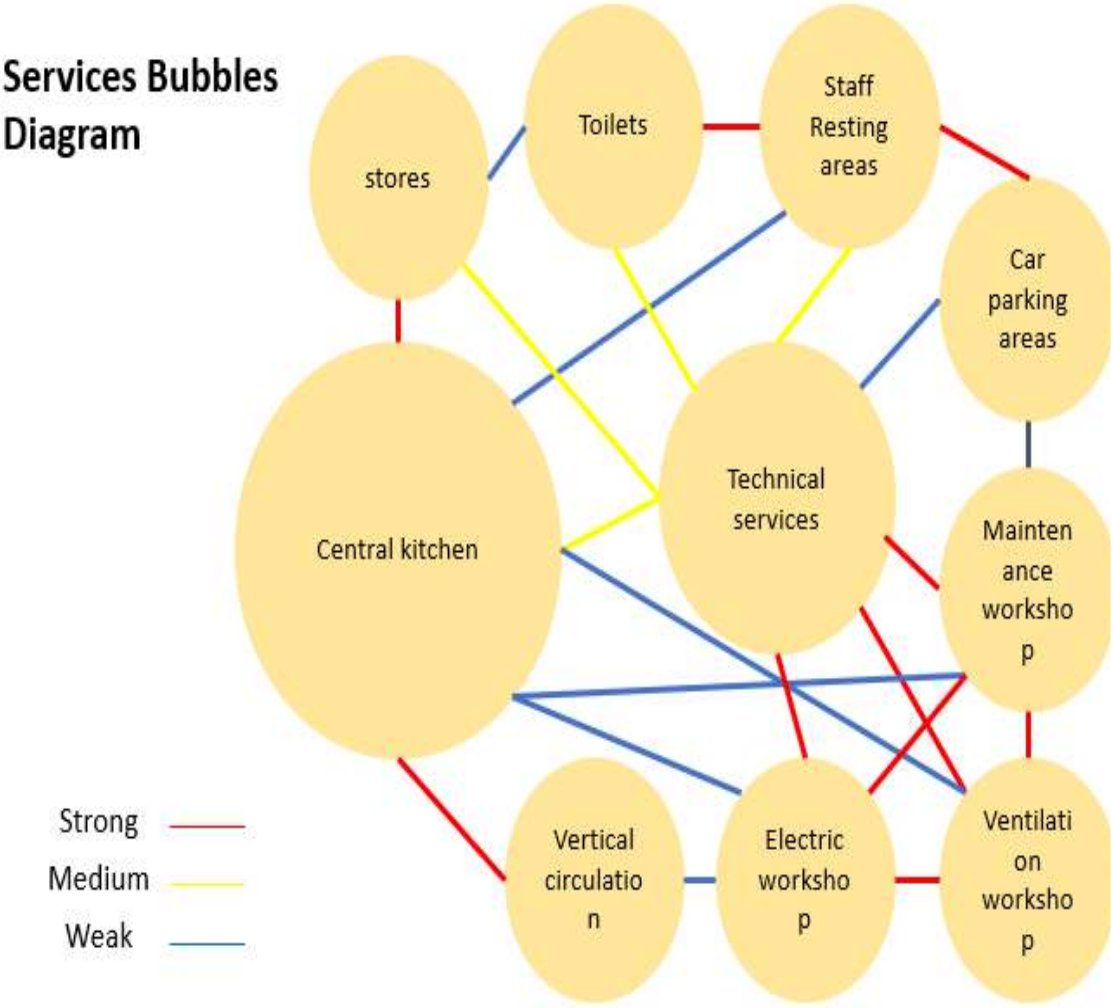

Services Bubbles Diagram
stores
Toilets
Staff Resting areas
Car parking areas
Central kitchen
Technical services
Mainten ance worksho p
Vertical circulatio n
Electric worksho p
Ventilati on worksho p
Strong
Medium
Weak


General activity Diagram
Commercial activity
Entertainment activity
Cultural activity
Managerial activity
Services activity
Strong
Medium
Weak


Commercial Centre activity Diagram
Main Entrance
Main Hall
Shops
Commercial Galleries
Hyper Market
Food Court
Investment areas
Services
Stores
Management
Strong
Medium
Weak


Entertainment Department activity Diagram
Cinemas
Restaurants
Café
Adults games hall
Outdoor playground
Kids play area
Green areas
Skating hall
Spa
Sauna
Gymnastics hall
Jacuzzi
Massage area
Strong
Medium
Weak

## Services Bubbles Diagram



| | Name | Space | No of spaces | Total space |
|---|---|---|---|---|
| Commercial space | Hyper market | 1500 m2 | 1 | 1500 m2 |
| | Gifts shops | 30 m2 | 5 | 150 m2 |
| | Cloths shops | 50 m2 | 10 | 500 m2 |
| | Cosmetics shops | 50 m2 | 10 | 500 m2 |
| | Perfumes shops | 50 m2 | 10 | 500 m2 |
| | Shoes shop | 50 m2 | 10 | 500 m2 |
| | Jewelry shops | 56 m2 | 3 | 168 m2 |
| | Accessories shops | 32 m2 | 2 | 64 m2 |
| | Musical equipment shops | 80 m2 | 2 | 160 m2 |
| | Bookshop | 32 m2 | 2 | 64 m2 |
| | Arts shop | 80 m2 | 2 | 160 m2 |
| | External small shops | 9 m2 | 15 | 135 m2 |

| | Name | Space | No of spaces | Total space |
|---|---|---|---|---|
| Administration space | General manager office | 42 m2 | 1 | 42 m2 |
| | Sector manager office | 36 m2 | 4 | 144 m2 |
| | Secretary office | 25 m2 | 4 | 100 m2 |
| | Employees | 20 m2 | 8 | 160 m2 |
| | Archives | 16 m2 | 4 | 64 m2 |
| | Reception | 56 m2 | 1 | 56 m2 |
| | Total indoor area = 566 m2<br>Total outdoor area = 0 m2<br>Total area = 566 m2 | | | |

| | Name | Space | No of spaces | Total space |
|---|---|---|---|---|
| Services space | Mosque | 57.6 m2 | 6 | 345.6 m2 |
| | Technical services | 100 m2 | 1 | 100 m2 |
| | Employee restaurant | 50 m2 | 4 | 200 m2 |
| | Workers restroom | 50 m2 | 2 | 100 m2 |
| | W.C | 3 m2 | 30 | 90 m2 |
| | Parking | 17.5 m2 | 150 | 2625 m2 |
| | Maintenance workshop | 72 m2 | 2 | 144 m2 |
| | Control room | 16 m2 | 4 | 64 m2 |
| | Stores | 40 m2 | 10 | 400 m2 |
| | Electricity station | 25 m2 | 2 | 50 m2 |
| | Central kitchen | 550 m2 | 1 | 550 m2 |
| | Air conditioning workshop | 80 m2 | 2 | 160 m2 |
| | Total indoor area = 1653 m2<br>Total outdoor area = 2625 m2<br>Total area = 4278.6 m2 | | | |

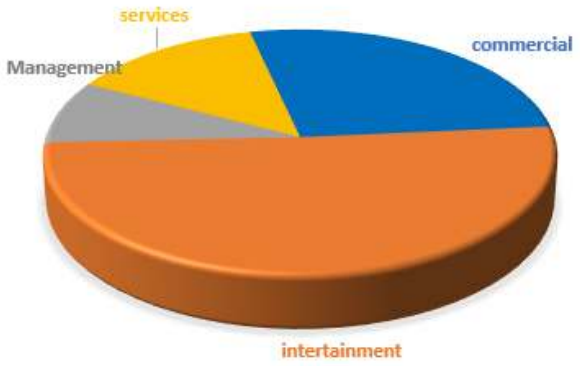
| | Name | Space | No of spaces | Total space |
|---|---|---|---|---|
| Entertainment space | Indoor swimming pool | 1230 m2 | 1 | 1230 m2 |
| | Gym | 300 m2 | 2 | 600 m2 |
| | Sauna | 484 m2 | 2 | 968 m2 |
| | Yoga | 120 m2 | 2 | 240 m2 |
| | | | | |
| | Massage room | 15 m2 | 20 | 300 m2 |
| | Training space | 405 m2 | 2 | 810 m2 |
| | Main restaurant | 850 m2 | 2 | 1700 m2 |
| | Café | 225 m2 | 3 | 675 m2 |
| | Portable café | 94.5 m2 | 4 | 378 m2 |
| | Cinema | 300 m2 | 2 | 600 m2 |
| | Outdoor playground(basketball) | 240 m2 | 2 | 480 m2 |
| | Outdoor playground (football) | 7700 m2 | 1 | 7700 m2 |
| | | | | |

Total indoor area = 9300 m2
Total outdoor area = 6020 m2
Total area = 15320 m2

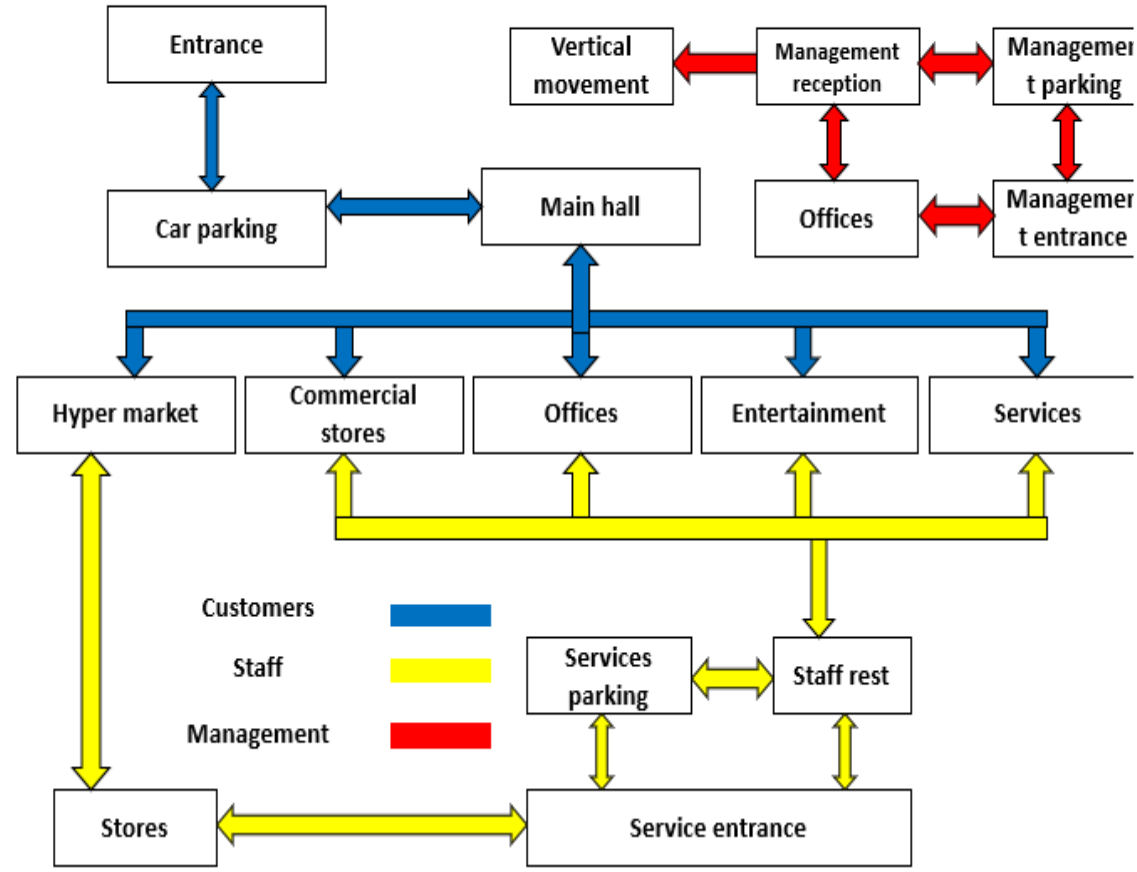
# General spaces

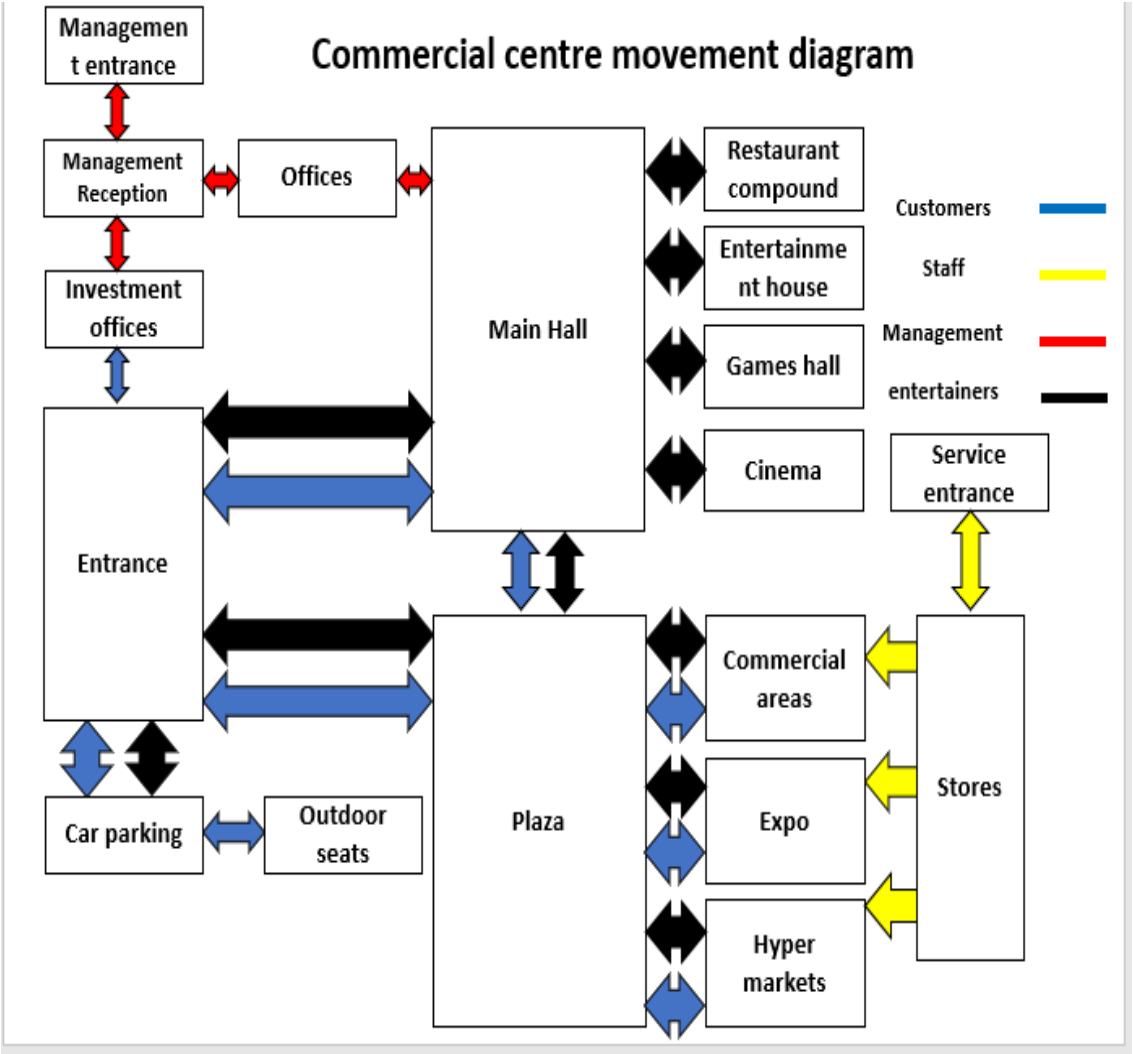
| Activity | Space |
|---|---|
| Commercial | 7350 m2 |
| Entertainment | 15320 m2 |
| Management | 566m2 |
| Services | 4278 m2 |

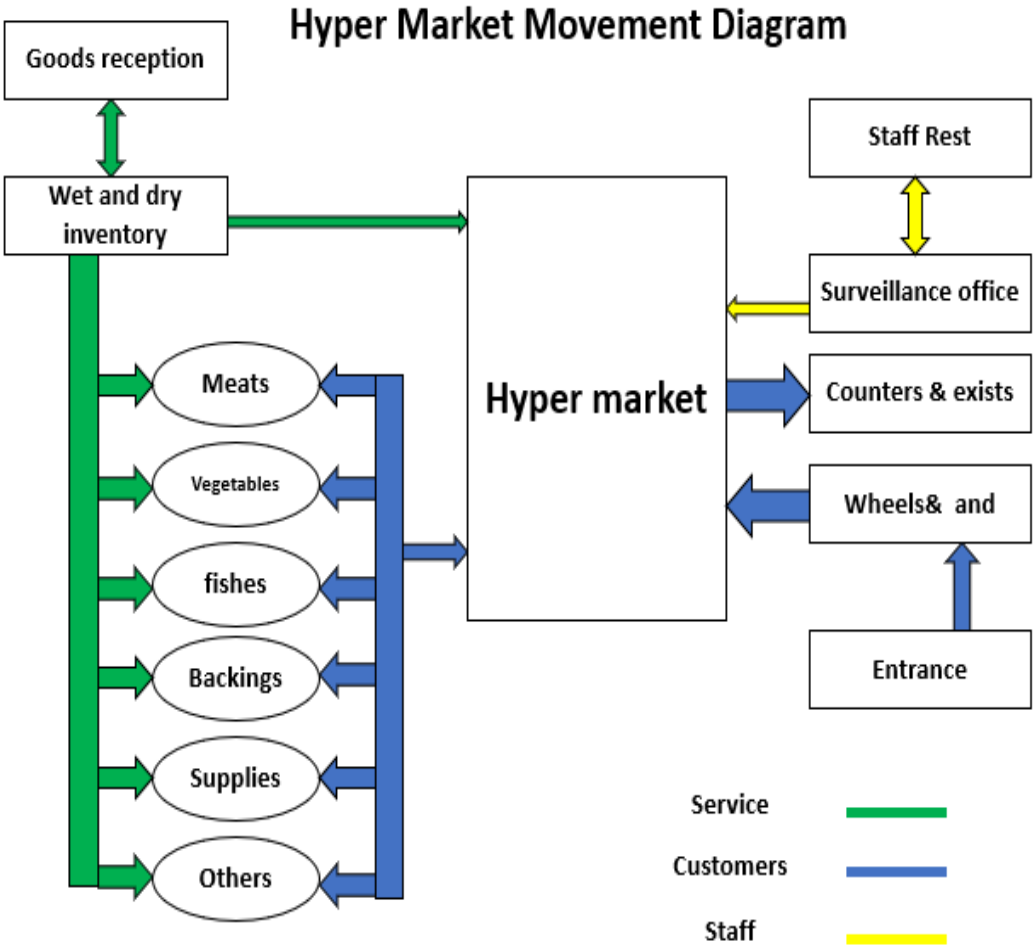
| Activity | Space |
|---|---|
| Indoor | 17000m2 |
| Outdoor | 11438 m2 |



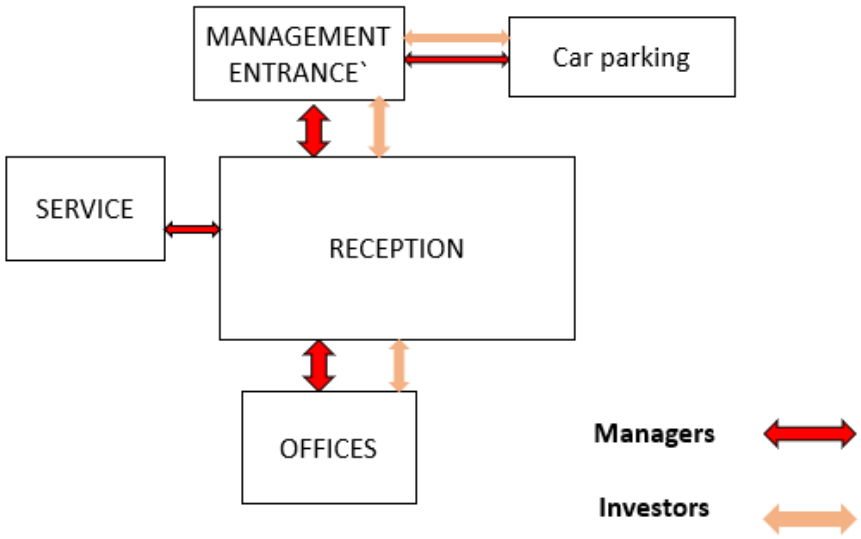
# General Movement Diagram



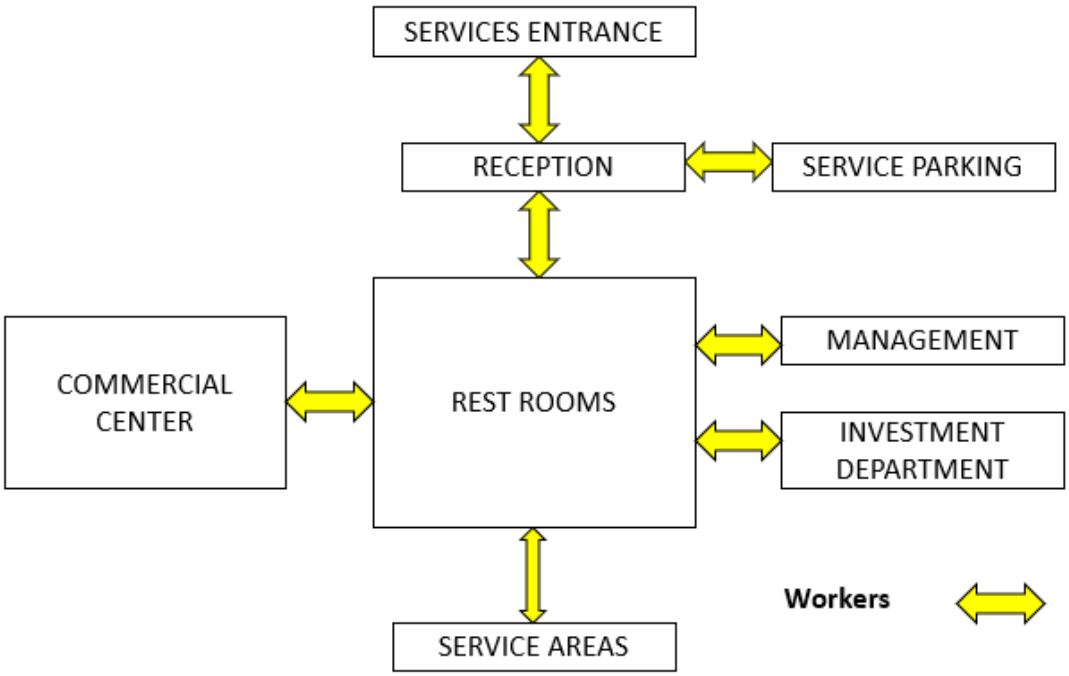

Commercial centre movement diagram
Managemen t entrance
Management Reception
Offices
Main Hall
Restaurant compound
Entertainme nt house
Games hall
Cinema
Customers
Staff
Management
entertainers
Investment offices
Entrance
Service entrance
Commercial areas
Stores
Expo
Hyper markets
Plaza
Car parking
Outdoor seats


Hyper Market Movement Diagram
Goods reception
Wet and dry inventory
Staff Rest
Surveillance office
Hyper market
Counters & exists
Wheels& and
Entrance
Meats
Vegetables
fishes
Backings
Supplies
Others
Service
Customers
Staff

# Management department
# Movement Diagram




# Services area Movement Diagram



***First Suggested Site:**

- Total area 3 Ha
- **Surroundings:**

West side: Africa street

East side: church compound

North side: investment buildings

South side: Sudan heart institute

- **How to reach it:**

Bahri: Kober bridge then Africa street.

ShargElneel: Almanshia bridge then Africa street.

Omdurman: ElneelAlabyad bridge then Africa street.

**Advantages:**

Near to the investment buildings.

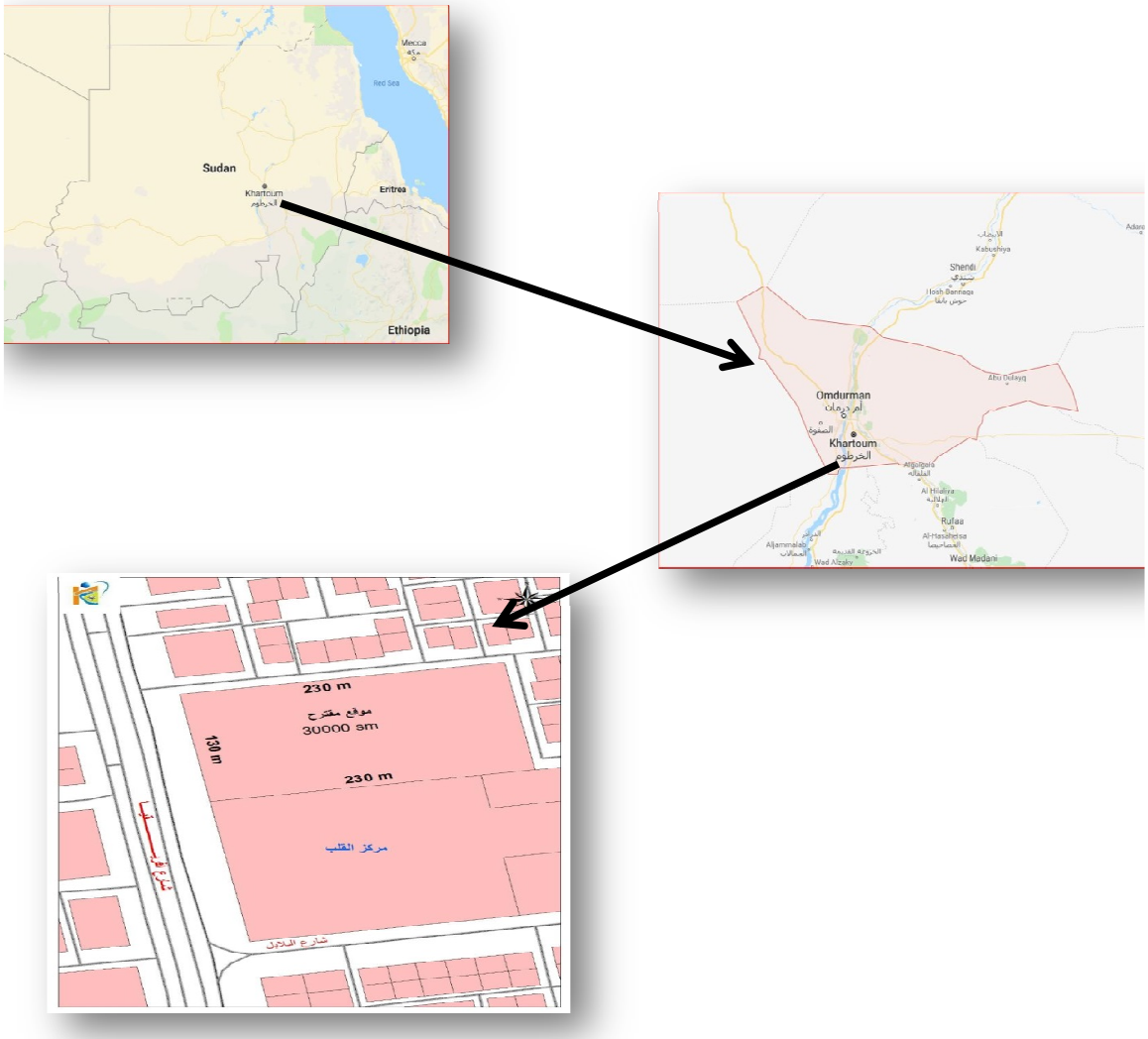
General services and infra-structure.

Easy to reach.

- **Disadvantages:**

No general view.

Hospital noise from the western side.



## Second Suggested Site

- Total area 5.9 Ha
- **Surroundings:**

West side: Side street 10 meters then presidential villas.

East side: Side street 10 meters then residential areas.

North side: Nile street.

South side: Side street 10 meters then residential areas.

- **How to reach it:**

Bahri: ElneelAlazrag bridge then Nile street.

Khartoum: Africa street then Nile street.

Omdurman: Alfetihab bridge then Nile street.

**Advantages:**

Near residential areas which helps in gathering more customers and flourish the area.

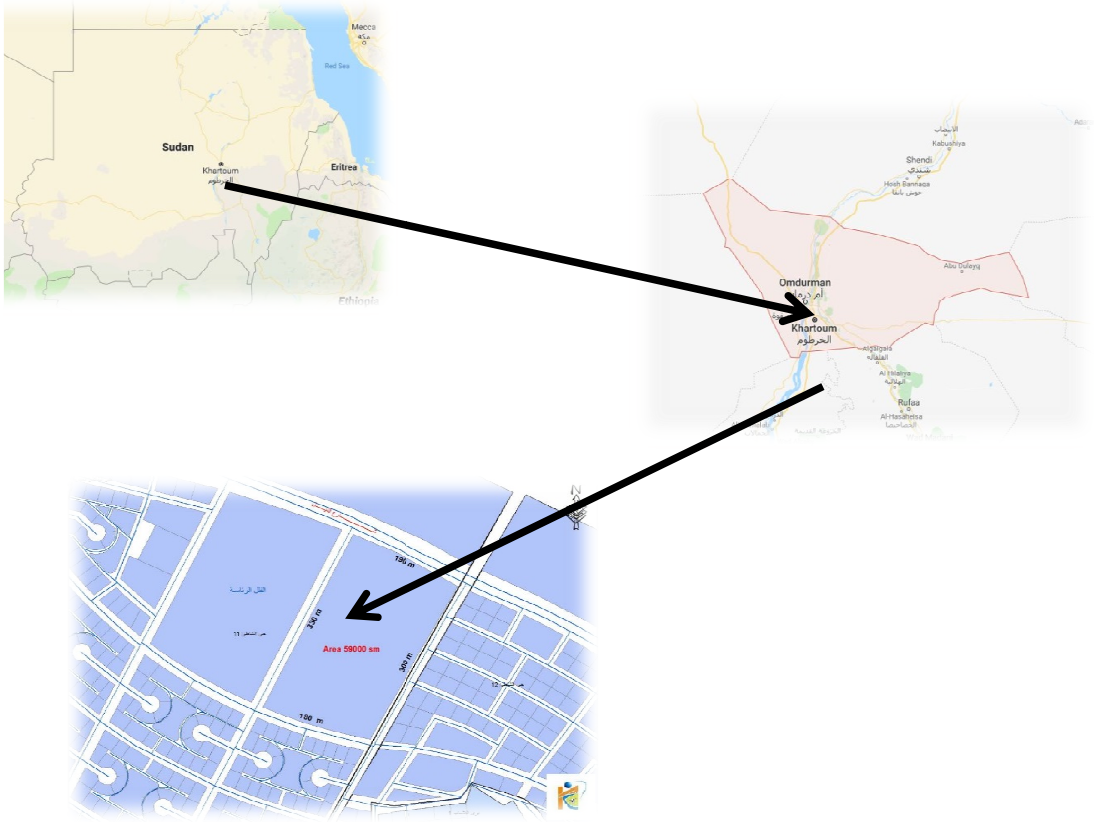
Relies in a good presentation area

Good frontal view added by Nile street.

- **Disadvantages:**

The site is too large for the project.

Noise from the Nile street.



| Standards | Basics | Standards weight | 1st | 2nd |
|---|---|---|---|---|
| Functional | - Reachability.<br>- Correlation with surroundings.<br>- Future expanding . | 16% | 11.5 | 10 |
| Environmental | Topography, the lack of obstacles and green shielding . | 10% | 9 | 7 |
| Technical | Soil integrity, and the possibility of increasing services and construction. | 15% | 13 | 13 |
| Aesthetic | View points. | 18% | 10 | 17 |
| Area | - Sufficient available space. | 10% | 9 | 7 |
| Economical | The location worth. | 17% | 17 | 10 |
| Security | The security of the location. | 14% | 10 | 9 |
| Total | | 100% | 79.5 | 73 |

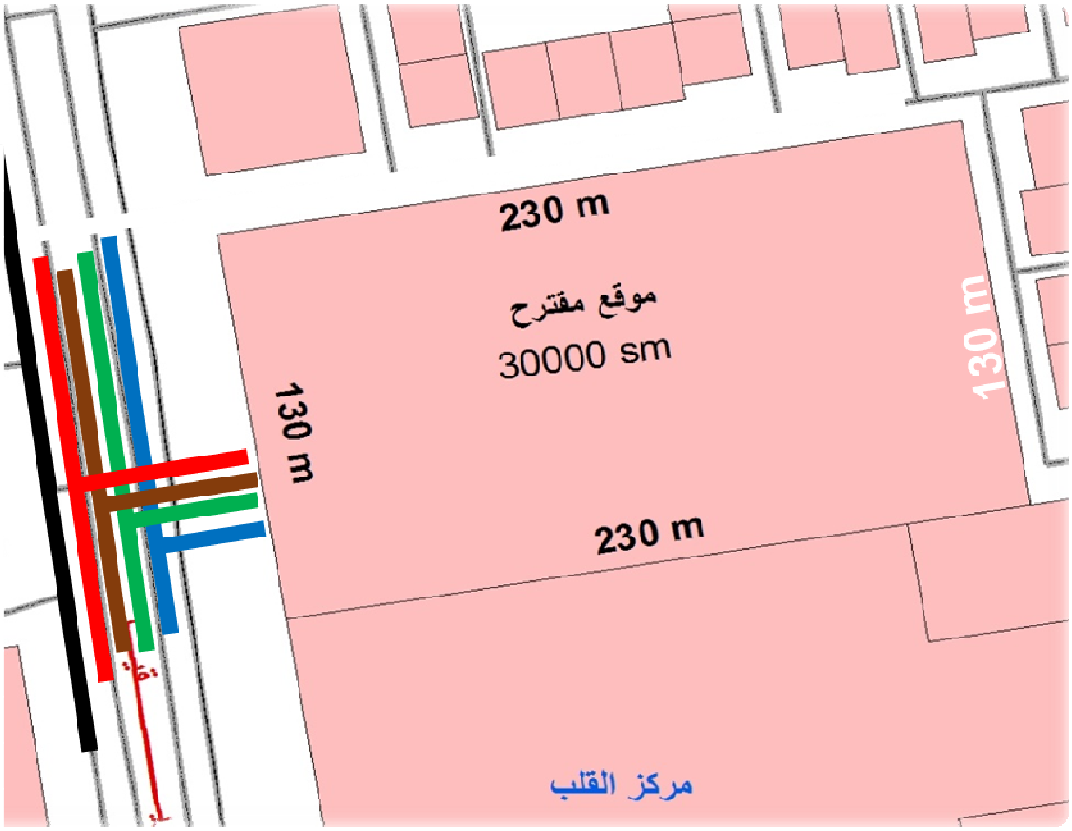
## Result

- Based on the previous analysis the most suitable location is the first suggested site; because of a total area of 3 Ha, Sudan heart institute on its southern, a main street on its western side, the bank of algazeera on its north and a residential areas east of it.

## Urban analysis:

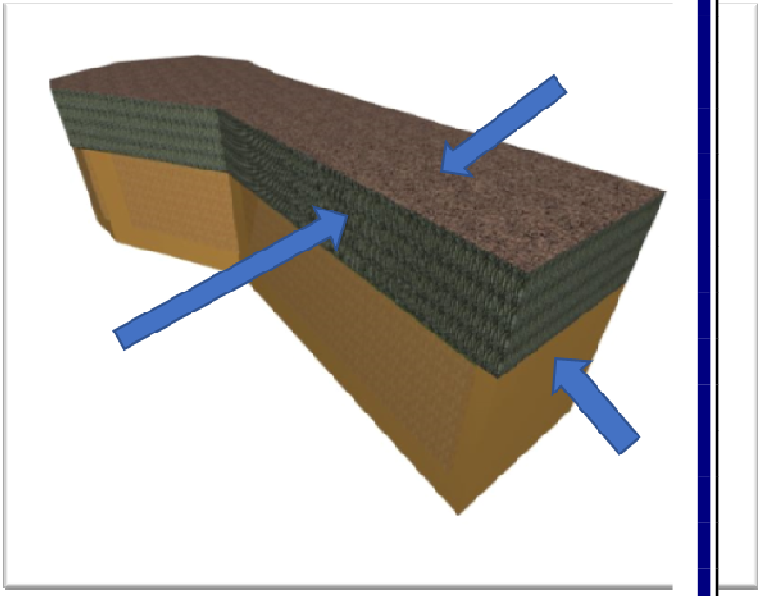

• The site relies on Africa main street shortly before Sudan heart institute when heading south.

## Services in location:




- Water supply
- Drain
- Surface drain
- Electricity supply

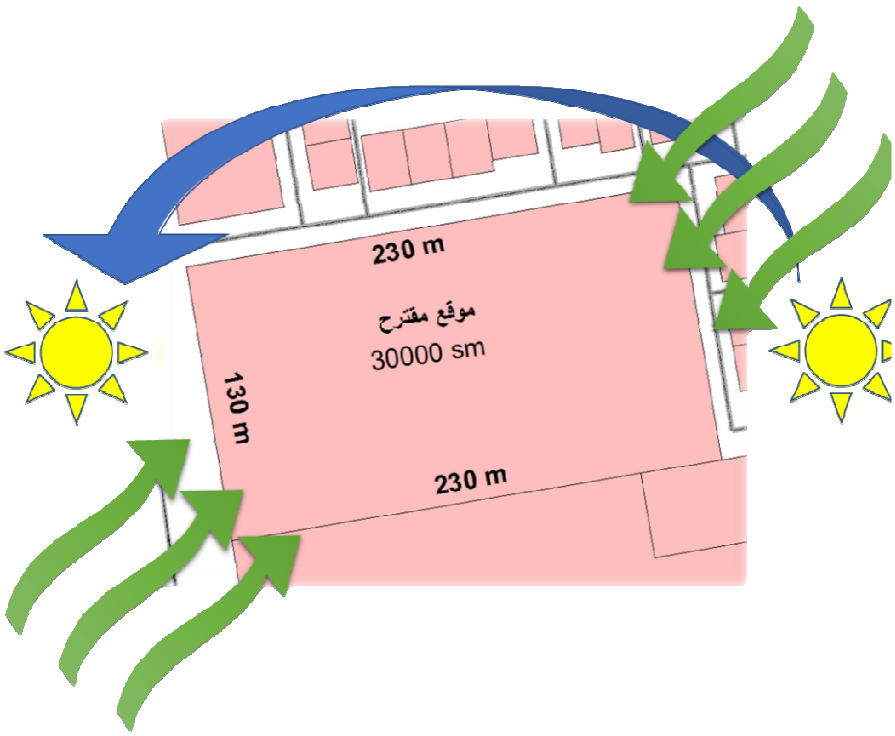
# Environmental analysis:



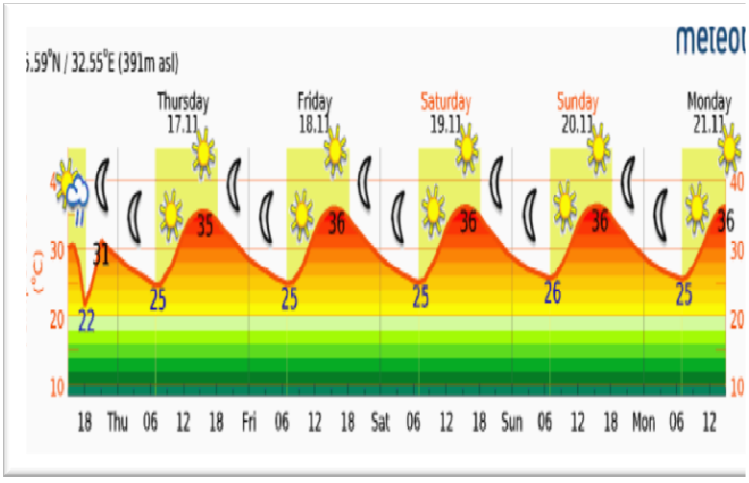
***Environmental specifications of Khartoum:***

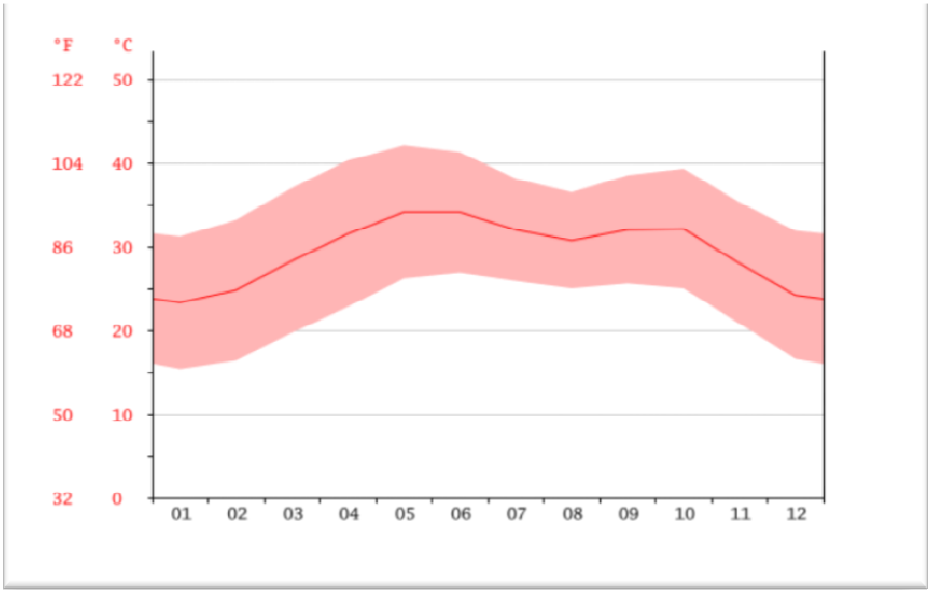
* geological structure of Khartoum:
- earth is covered with surface deposits and stones.
- the southern part of the city is covered with silt and limestone.
* topography of Khartoum:
- most of Khartoum is levelled ground.
- 70 km from the two Niles forum in the direction of the water declining there is Alsabaloga waterfalls.
- there is Tooty island in the heart of the city.

## Illustration of Environmental Factors Affecting the Suggested Site




## Temperature Diagram:

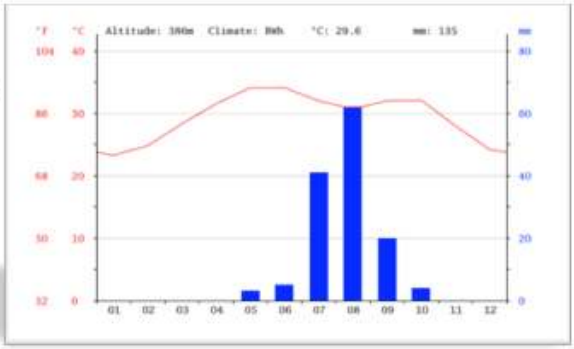





May is the warmest month during the year; the temperature average is 42c, while January is the coldest month during the year, with temperature average 20c.

## Rainfall Table And Diagram

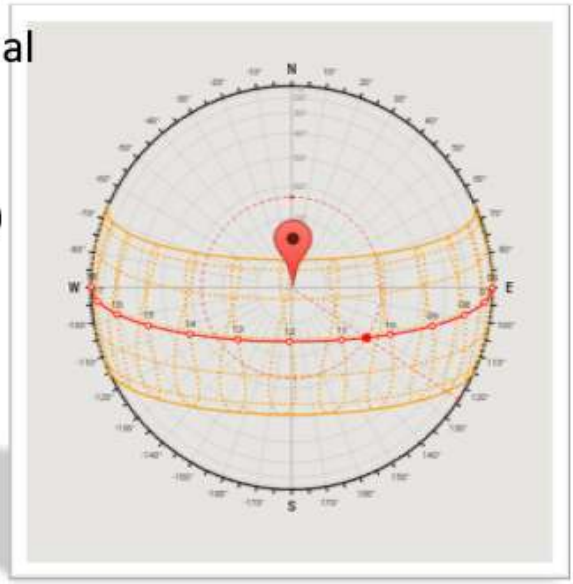
The driest month during the year is January with 0.5 mm rain, while the most rain average is in august which is about 62.0 mm.



| month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 0 | 0 | 0 | 0 | 3 | 5 | 41 | 62 | 20 | 4 | 0 | 0 |
| °C | 23.3 | 24.8 | 28.3 | 31.5 | 34.1 | 34.1 | 32.0 | 30.7 | 32.0 | 32.1 | 28.0 | 24.2 |
| °C (min) | 15.4 | 16.4 | 19.7 | 22.8 | 26.2 | 26.9 | 25.9 | 25.0 | 25.6 | 25.0 | 20.8 | 16.6 |
| °C (max) | 31.2 | 33.2 | 37.0 | 40.3 | 42.1 | 41.3 | 38.1 | 36.5 | 38.5 | 39.3 | 35.3 | 31.9 |
| °F | 73.9 | 76.6 | 82.9 | 88.7 | 93.4 | 93.4 | 89.6 | 87.3 | 89.6 | 89.8 | 82.4 | 75.6 |
| °F (min) | 59.7 | 61.5 | 67.5 | 73.0 | 79.2 | 80.4 | 78.6 | 77.0 | 78.1 | 77.0 | 69.4 | 61.9 |
| °F (max) | 88.2 | 91.8 | 98.6 | 104.5 | 107.8 | 106.3 | 100.6 | 97.7 | 101.3 | 102.7 | 95.5 | 89.4 |

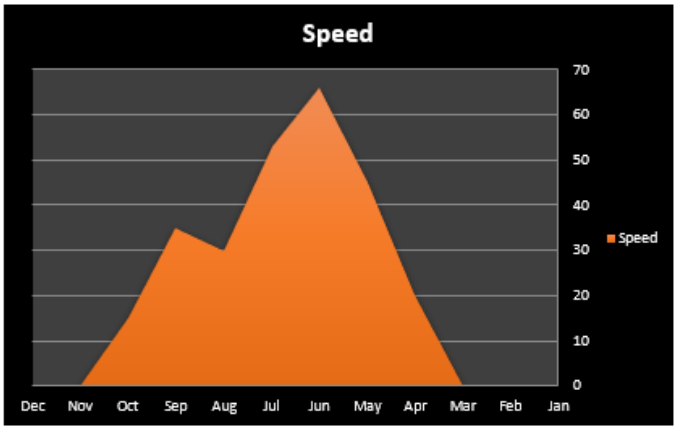
## Sun Diagram

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

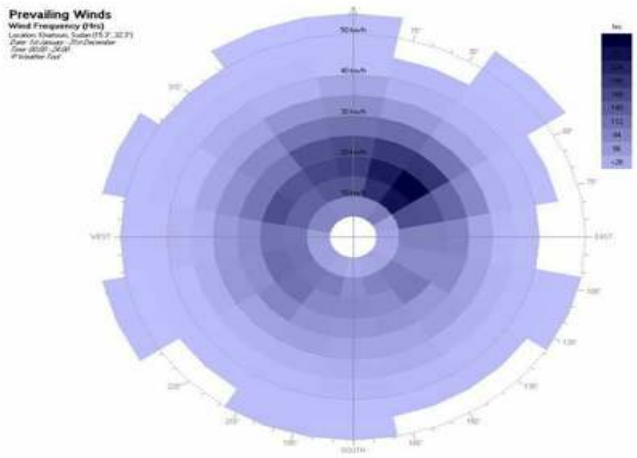



## Wind diagram:

There is a phenomenon in Sudan which is an active sand storm that happens in the middle area including Khartoum city when the wet southern wind blow in May and July.



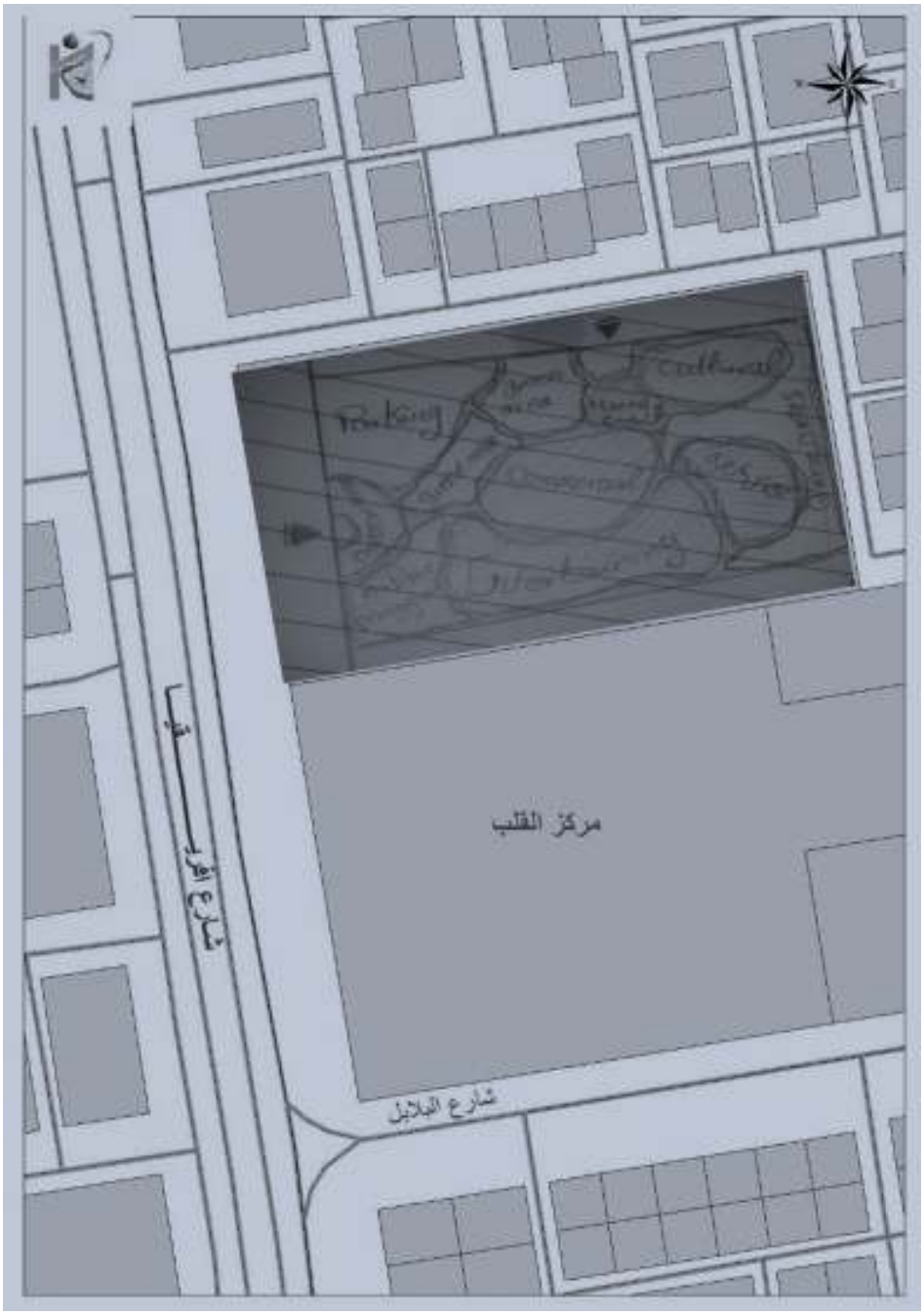
## Wind flower diagram




# iuides & indicators :-

| Indicators | Guides |
|---|---|
| Noise in the main street | - Green shielding to the western side<br>- Putting the spaces that requires calmness away from the main street side. |
| Entrance facing the main street | - The main entrance should face the main street.<br>- The commercial space should be near the entrance. |
| The lack of a good view in the location | - Green areas.<br>- Water pools.<br>- Outdoor playground. |
| Residential areas near the location | - Not very high building to expose the neighbors. |

# ZONING



## *Suggestions, substitutes for the infrastructure and structural systems:*

*Applying some sustainability principles in the building.

# Chapter Four

**(architectural designing)**

-Design philosophy

-Concept

-Idea developing

## 4.1.1 Introduction:

This project philosophy directing at new direction

(modern architecture) the main purposes is collecting different activities in one complex by new international styles in designing.

### 4.2.1 Idea's concept:

Is collecting next activities:

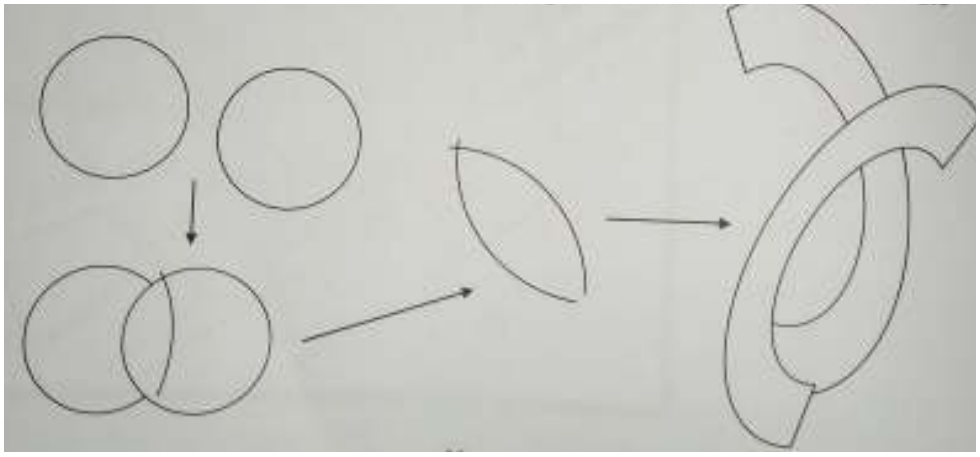
1-commercial activity

2-entertaining activity

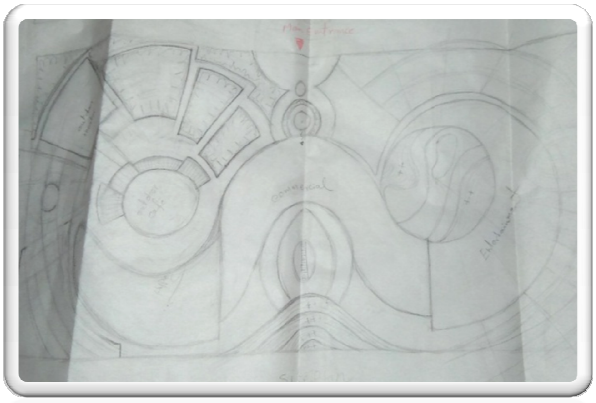
3-sport activity

### 4.2.2 Architectural forming:

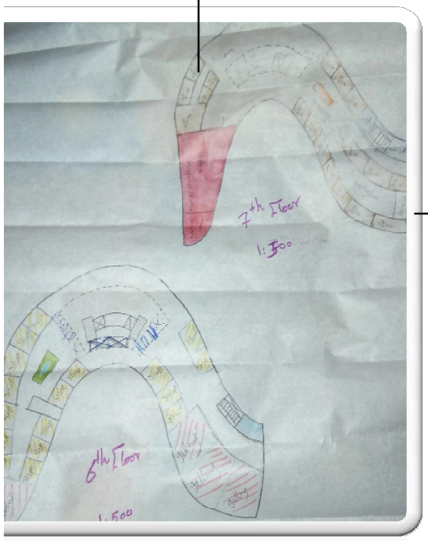
The dependence was on simple shapes and based on the movement axes and the corridor's styles in commercial buildings as a sample of new beginning.



Then transformed the circulation chart to circulation corridors.



Site plan



Floor plans

Typical floors

### 4.2.3 conceptual design comments:

- The circulation was not clear.

-The concept was weak.

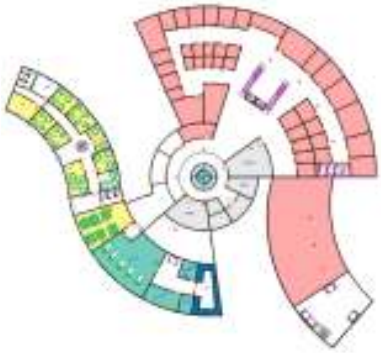
- The out-door activities were not linked with the in-door activities.

## 4.2.4 Preliminary design

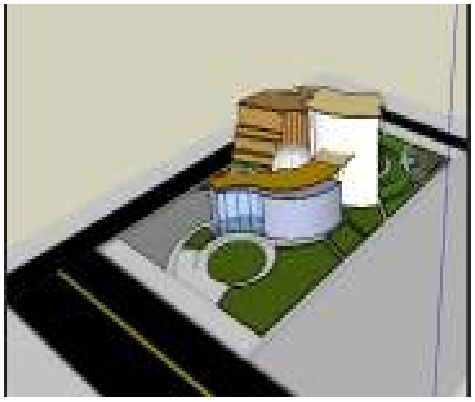
design has a lack of flow movement and the exterior spaces were not efficiently exploited.

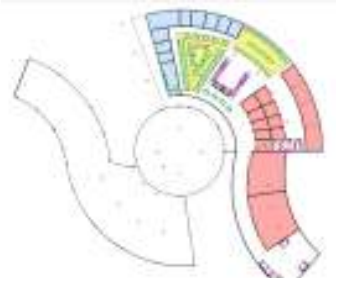
Ground Floor Plan:

Floor plans:



3D



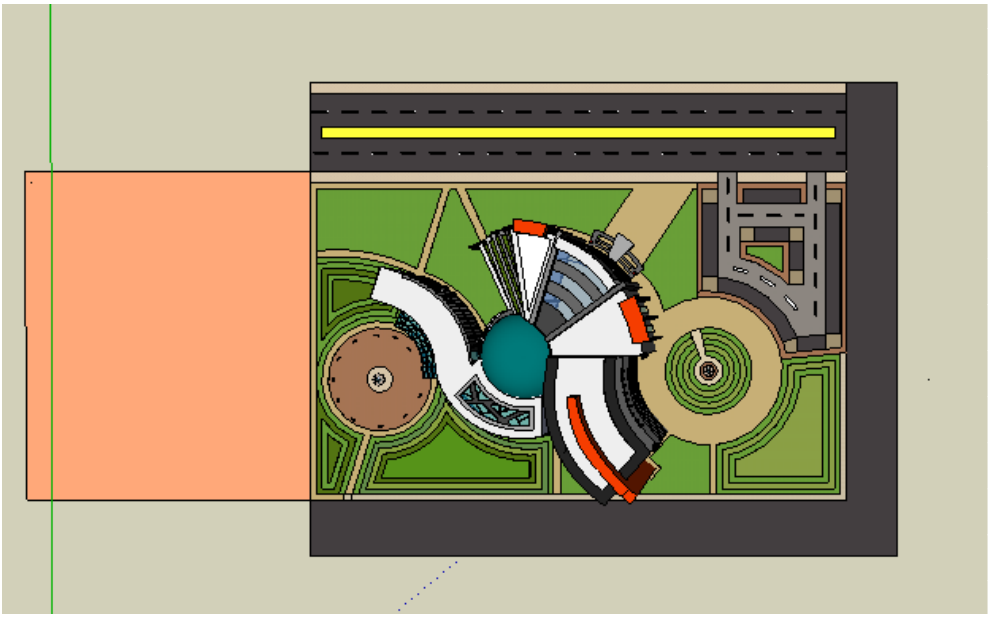


Typical floor

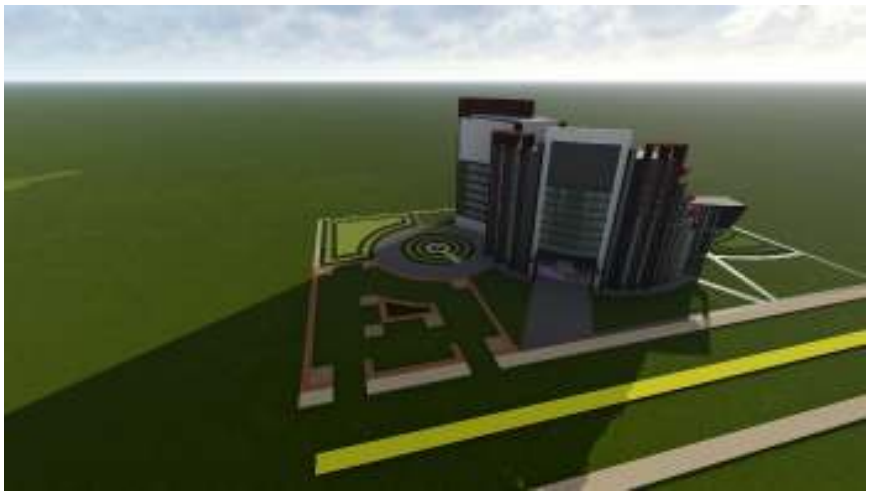
### 4.2.5 Developed design

In this stage the design was developed, and the mentioned problem were successfully fixed.

**Site plan**



**3D**



# Chapter five

**technical solution**

# Structural system:

## ***The foundations:***

Considered to be the basic support for the building, in this project raft foundation was selected

And it depends on many reasons:

1. under ground floors (basement).

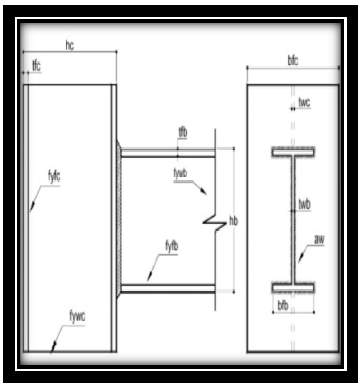
2.suitable for distributing loads efficiently (as the loads increase, the surface increase).

Stress=load/area

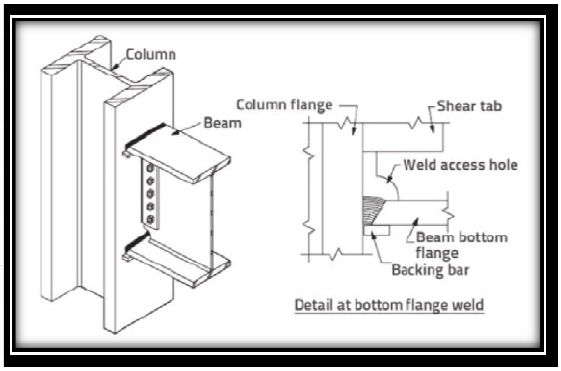
## ***The columns:***

*Its job to carry loads from building to foundations and fixing different levels and it resists letteral loads and **I section universalcolumns** were selected.

*The size differs depending on the column place and the size gets smaller whenever it gets higher**.**



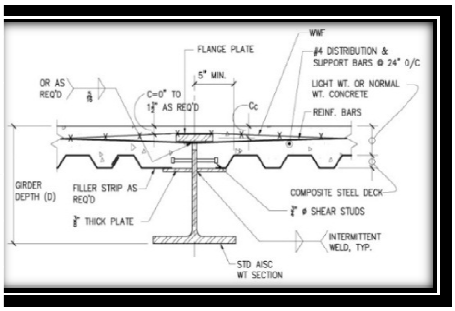
*Columns are compression members and **Isection universal column** is perfect to resist moment of inertia.

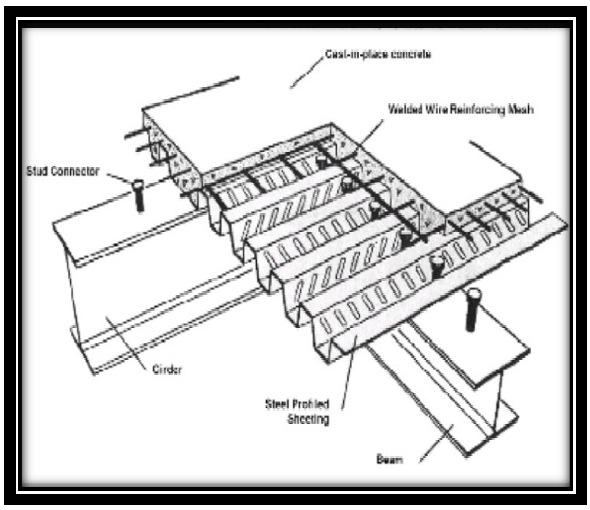


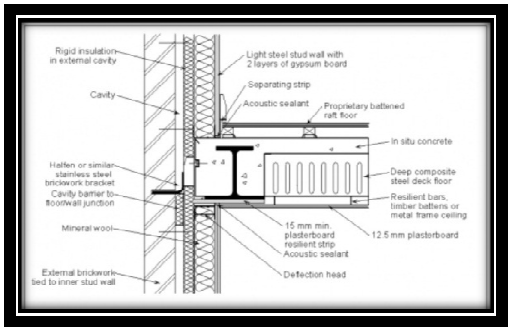

*

## ***Slabs:***

- Steel structuredeck system was selected (composite)




## • ***Finishes:***

- The floors are considered in most projects to be an important aesthetic factor and it can be a main supporter for services also it can be an effective medium to carry most types of supplies.

- ***Roofs and internal treatments.***
- ***Partitions and windows.***
- Gypsum boards partitions were used between offices because of its aesthetic and economical benefits and its quickly installed and costs less.
- And in the windows double glassing layers were used to reduce the sunshine that's entering the building also to increase the effectivity of the air conditioning system.
- ***Site treatment:***
- We mean by this decorating the gardens and green areas and outdoor areas and that's for create a connection between the building and outdoor with having some entertaining places and we must consider the following:
- 1.landscapes and trees
- 2.the ground nature and Kantor lines
- 3.the car roads and the parking's
- 4.walk lines
- 5.water pools
- Walk lines are cement roads made of the following layers:
  1. cement blocks
- 2. alight layers of rocks
- 3.the ground basic layer
- And its mostly flat or semi-flat, the steps are used when the slope angle is more than 30degree, and when the surface needs to be completely flat we must make steps to move between different levels.

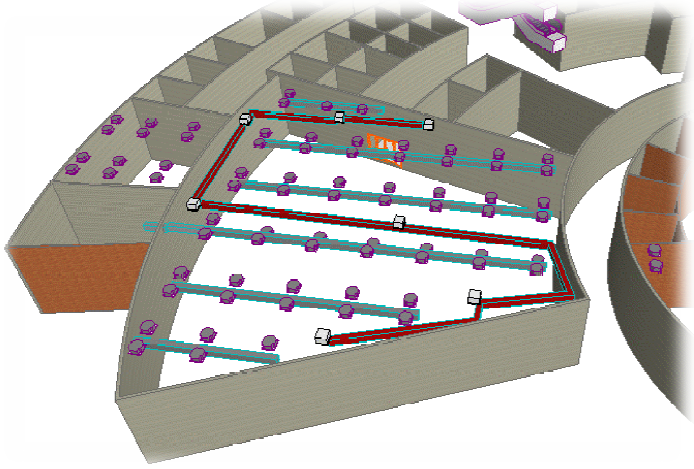
# Air conditioning system:

## (Variable Refrigerating Volume System)

**-consist of five main components:**

**1- outdoor unit**

**3- Indoor unit**
**4- Ducts**
**5- Return diffuser grill**
**6- Supply diffuser grill**



# Fire fighting system:

Fire fighting system selection depends on building specifications.

## Fire fighting elements:

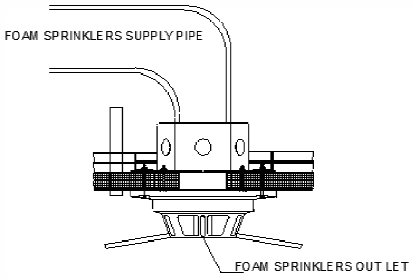
1-sprinkler (foam sprinkler).

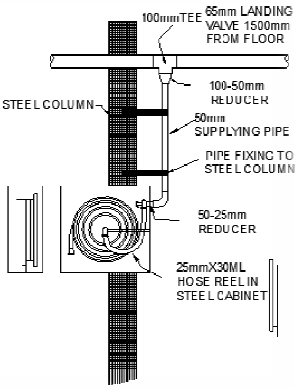
2-smoke detectors.

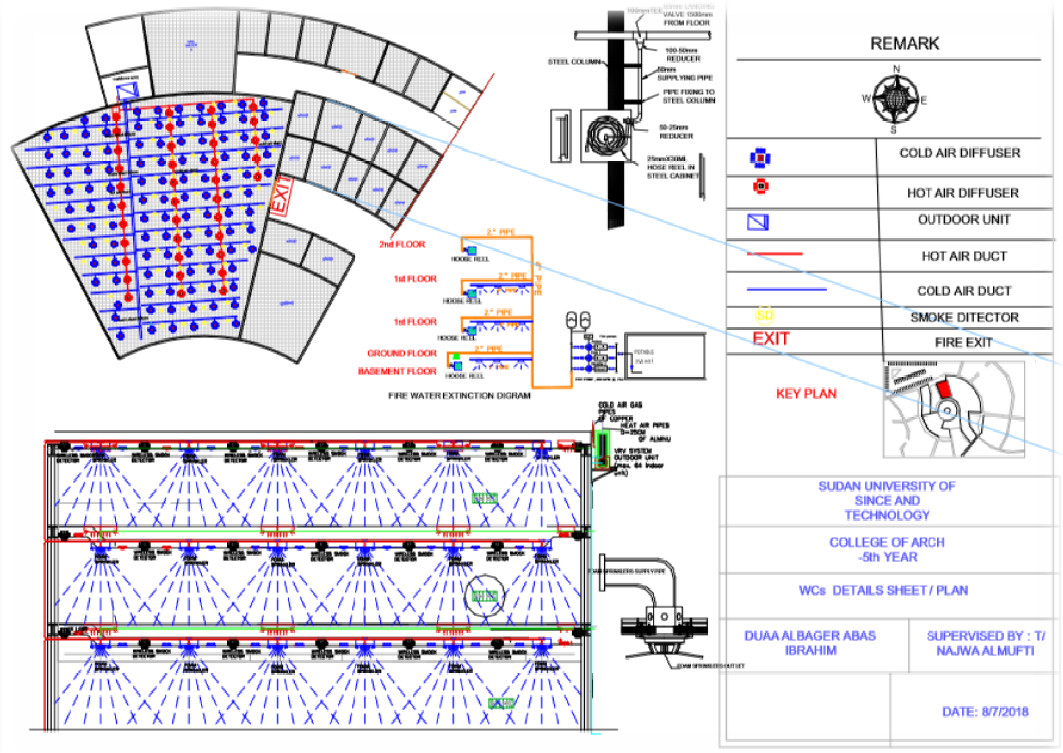
3-hose reels.

4-fire alarms.

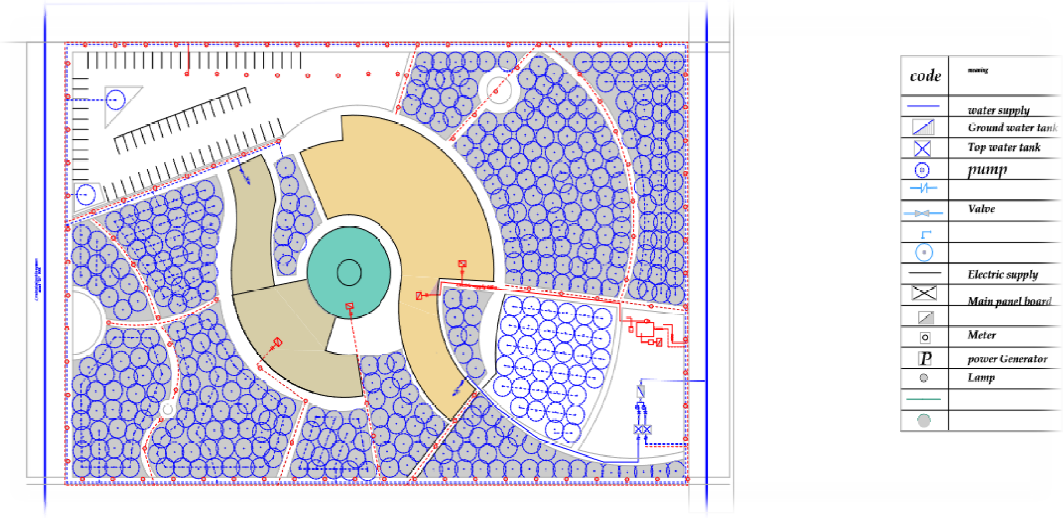
5-Emergency exits. (lighted)




REMARK
COLD AIR DIFFUSER
HOT AIR DIFFUSER
OUTDOOR UNIT
HOT AIR DUCT
COLD AIR DUCT
SMOKE DITECTOR
FIRE EXIT
KEY PLAN
EXIT
2nd FLOOR
1st FLOOR
1st FLOOR
GROUND FLOOR
BASEMENT FLOOR
FIRE WATER EXTINCTION DIGRAM
SUDAN UNIVERSITY OF SINCE AND TECHNOLOGY
COLLEGE OF ARCH -5th YEAR
WCs DETAILS SHEET / PLAN
DUAA ALBAGER ABAS IBRAHIM
SUPERVISED BY : T/ NAJWA ALMUFTI
DATE: 8/7/2018

# Water &electricity supply:




# 1-Electricity supply:

## 1-site supply:

The complex electricity supply is the main line from the eastern side street, the voltage was adjusted from 11kv to 3kv and then transformed in to a three-phase system which is connected directly to building control room.

## 2-distribution panel:

Consist of panels that contain automatic keys to control connecting &disconnecting the stream and it divided to:

1-public distribution panel.

2-main distribution panel.

3-partial distribution panel.

**3-connections and cables:**

# 2-Water supply:

Site supply: the site is supplied with water from the main line running through the main street, and it's purified through the site's purification chamber(FILTER)and then to the tanks of the buildings which are distributed to the rest of the floors by pumps (crane pumps) through PVC pipes because of it's advantages which are :

**1-levity -easy to installation.**

**2-Bear pressure &shocks.**

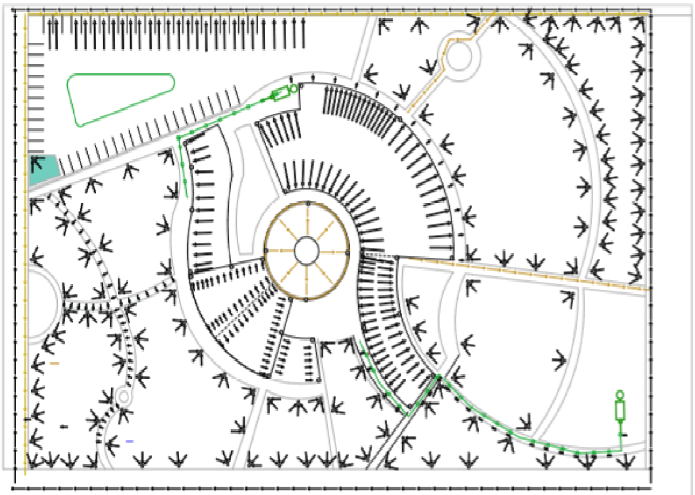
**3-Softness of inner surface.**

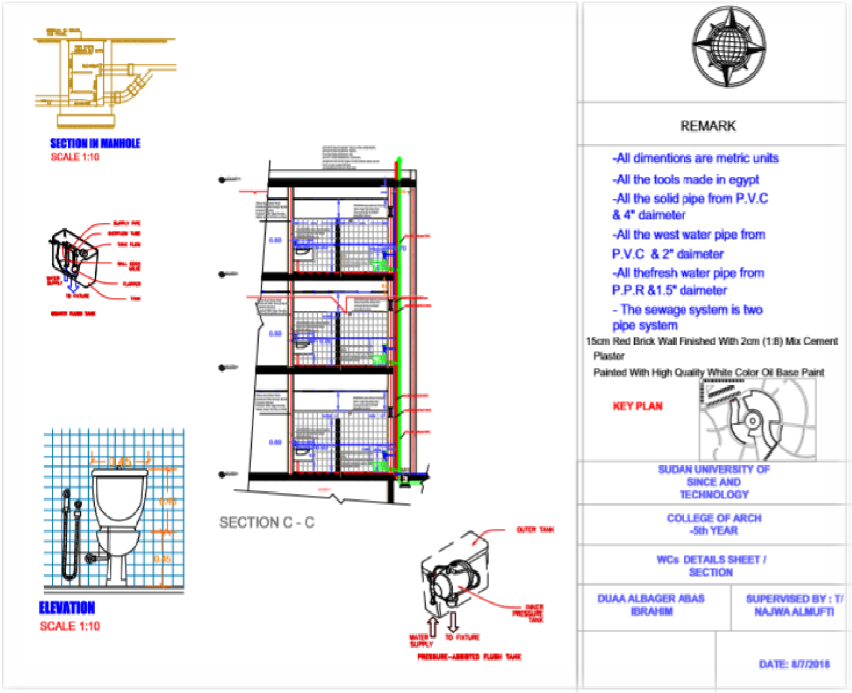
**4-heat installation.**

**5-rust resistance compared to metal pipes.**

# Drain and sanitary:

the drainage system depends on surface manner and its tilt, it's used to prevent the rain water and any other water from staying at specific place. The roofs tilted by 1:100slop among down pipes installed on the edges of the building.





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