



CHAPTER FOUR

Concept & Philosophy

Preliminary idea Design

Developing Design

Technical Solutions (Structural Solutions and Special Solutions)



Planning and Design Philosophy

The philosophy of planning and design was based on several axes:

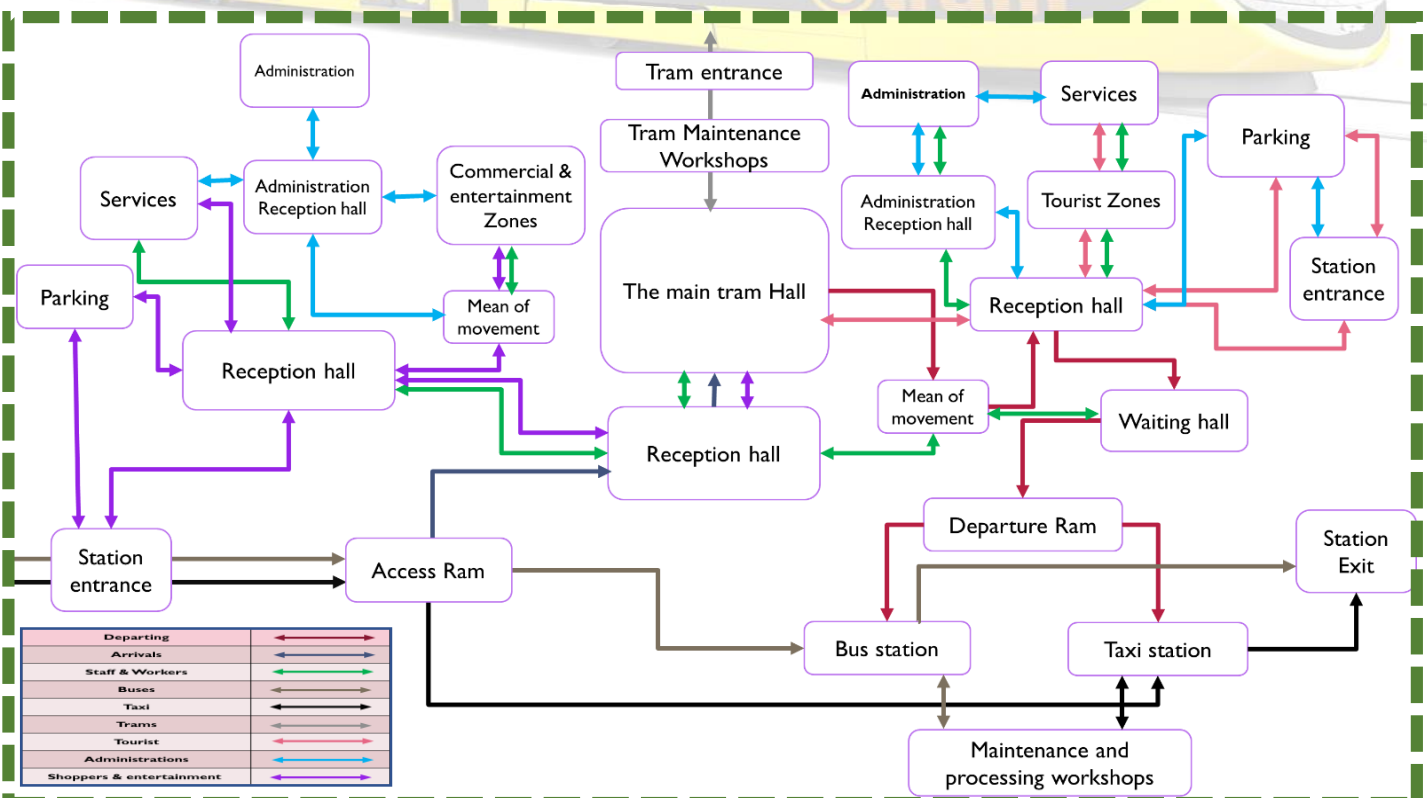
The first axis is the linkage between the various activities in the project (the service activity of the transport - recreational activity - commercial activity - tourism activity - administrative activity - service activity) in a way that addresses the challenges while maintaining:

- Design flexibility.
- Flexibility in motion.
- Maintain the function.
- Maintain economic building.
- Add an aesthetic dimension to the station as a facade of the city.

Axis 2: Design on a wide horizontal area and use of Ramat as a major means of movement for passengers.

Third axis: is to penetrate the trajectory of the tram line to the station site, which is considered according to the location and the track (station end of line).

The fourth axis: is the general motor diagram of the functional spaces of the station where flexibility in movement is one of the most important elements of this type of project.



Preliminary idea Design

The site was planned according to zoning in addition to the previous planning philosophy and design.

The main tram at the heart of the site with the distribution of other blocks around.

The building blocks are divided as follows:

- Commercial Block Southwest Location.
- The tourist block northeast of the site.
- Administrative block south of the site.
- The entertainment cluster was merged with the commercial bloc in relation to the functional relationship.
- The service cluster distributed throughout the site.

External spaces:

The main and commercial entrance from the west

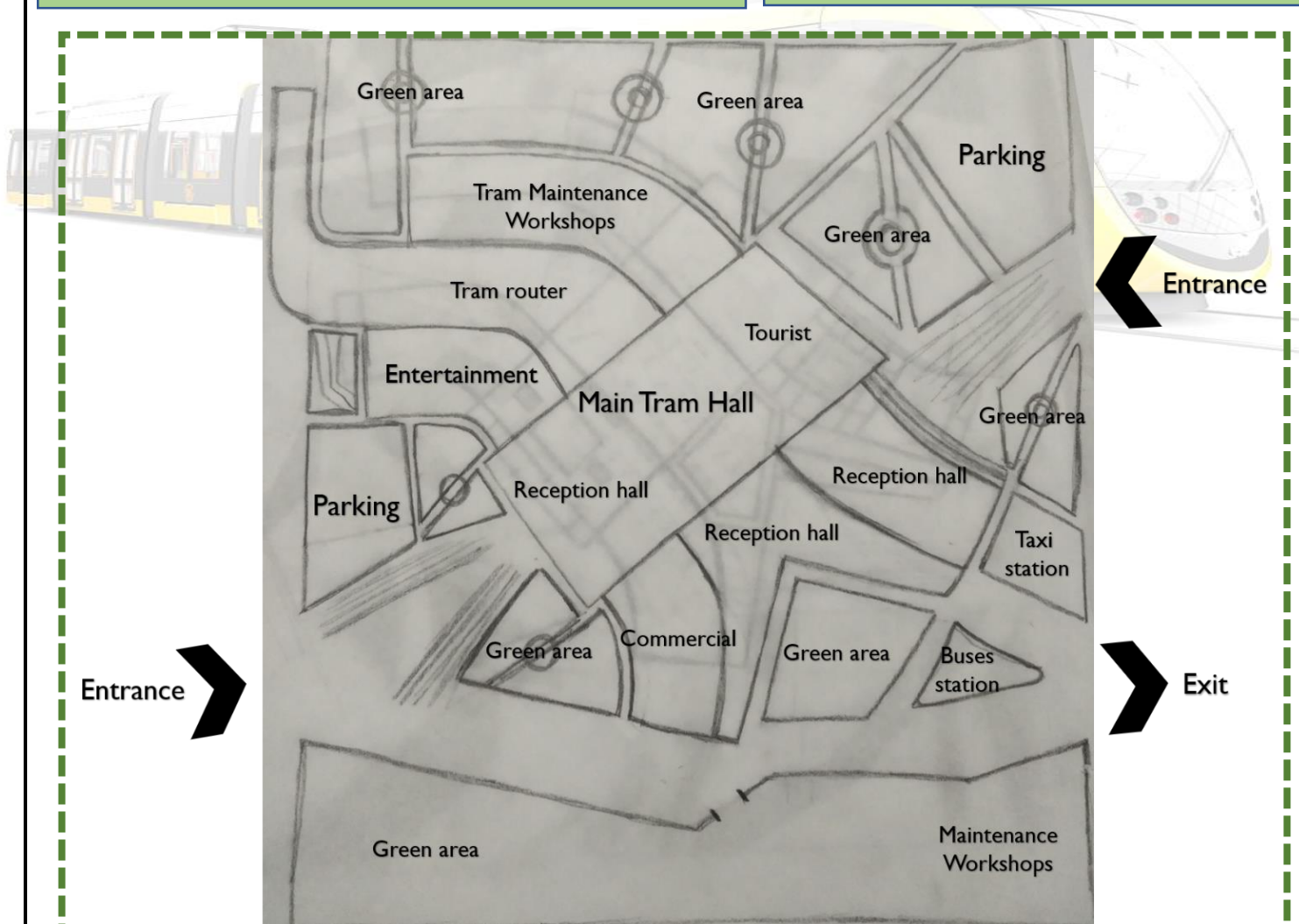
Administrative and tourist entrance from the east.

Exit bus and taxi from the east.
Bus and taxi stand on the south side.

Parking areas from the east and west.

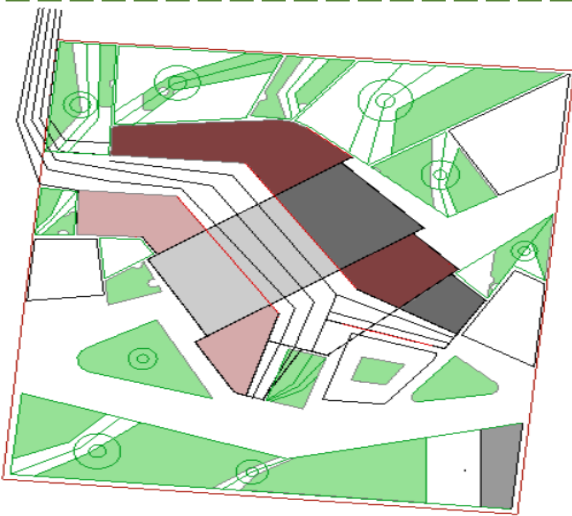
External tourism activities from the north-east.

Green spaces are distributed throughout the site.





Preliminary idea Design Drawing



Site plan

- The site contains two entrances from the east and the west and the exit from the east
- The blocks of the building are designed and connected to each other and divided into three main blocks (the main tram hall - the commercial mall - the tourist exhibition).
- In addition to Bass station and taxi

-The ground floor consists of the main lounge for the tram in addition to the maintenance workshops and the horizontal movement of passengers and the reception hall

-The business section includes a reception hall, an open gallery as well as shops, a main restaurant and a hypermarket

-The tourist section includes a tourist reception hall, a tourist restaurant as well as an exhibition of tourist photos and an outdoor exhibition

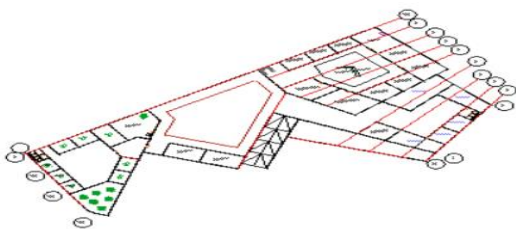


Ground floor plan

-The underground floor contains stores, workshops and workers' rest in the service part

-It also has shops, a chapel and water courses for visitors

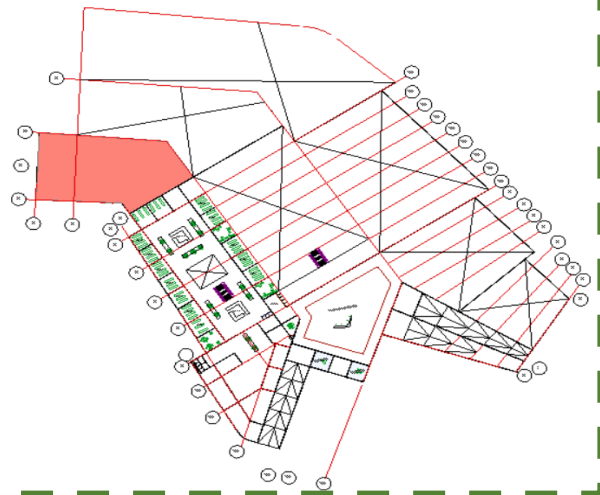
-In addition to the dump and freight area



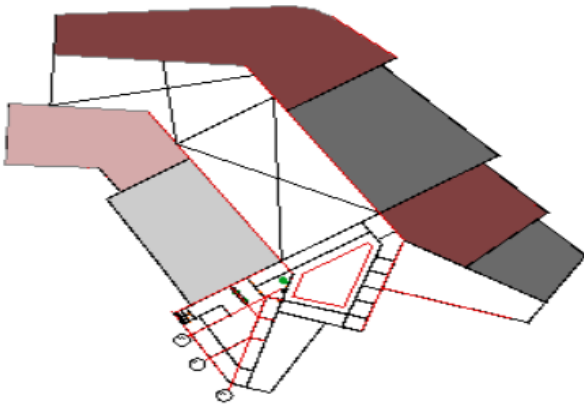
Basement plan



- The first floor contains the commercial and recreational part distributed vertically with the same distribution of the ground floor
- In addition to the reception part of the lounge for departures from the tram
- In addition to the administrative part
- The second floor is repeated from the first floor



First & Second floor plan



Third floor plan

- The third floor contains the rest of the station's departments in addition to its services and reception

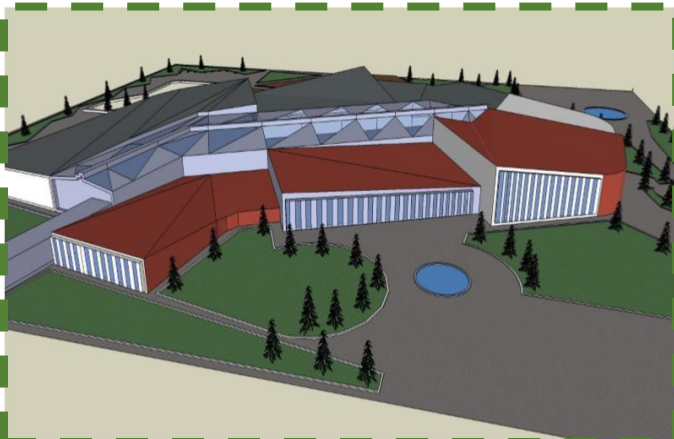
- The building rises three floors on a large horizontal area.
- The main hall height is 7 meters
- The roof is made up of Space Frame
- The foundations are separate rules
- The facades are simple in design with varying heights
- With the addition of breakers for shading the interface



Section & Elevation

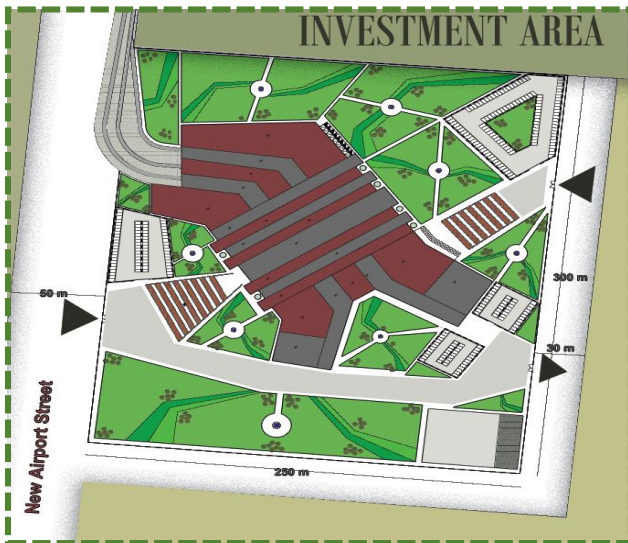
Preliminary Idea Problems:

- Place the bass, taxi and workshops for them.
- Commercial block has been distributed on one side of the station.
- Distribution of administrative cluster.
- Underground floor entrance and distribution of services.





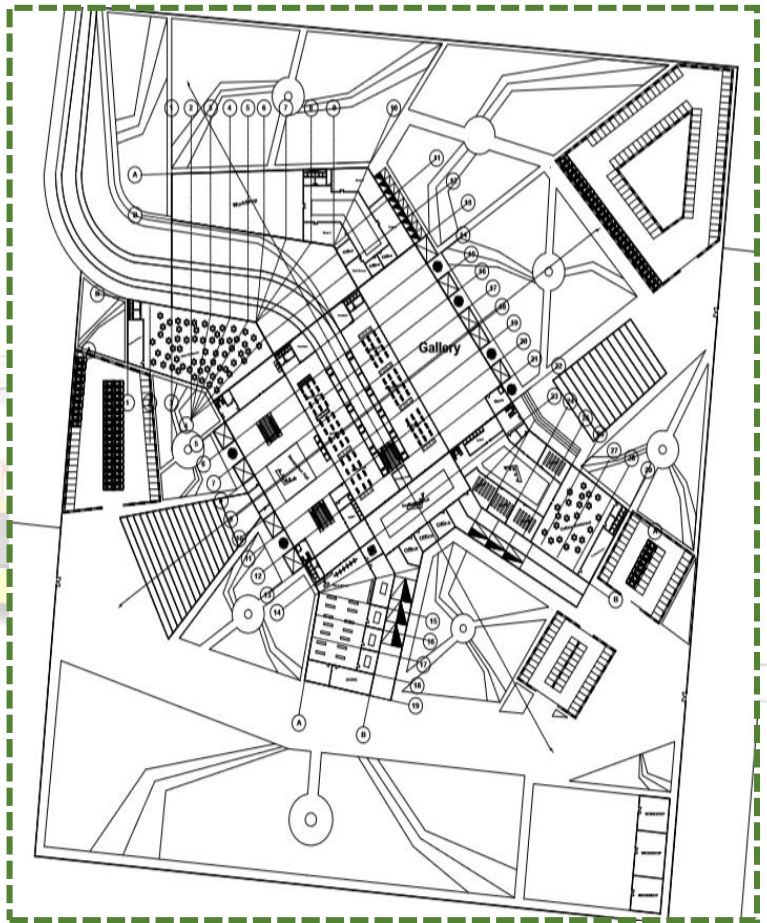
Developing idea Design Drawing



Site plan

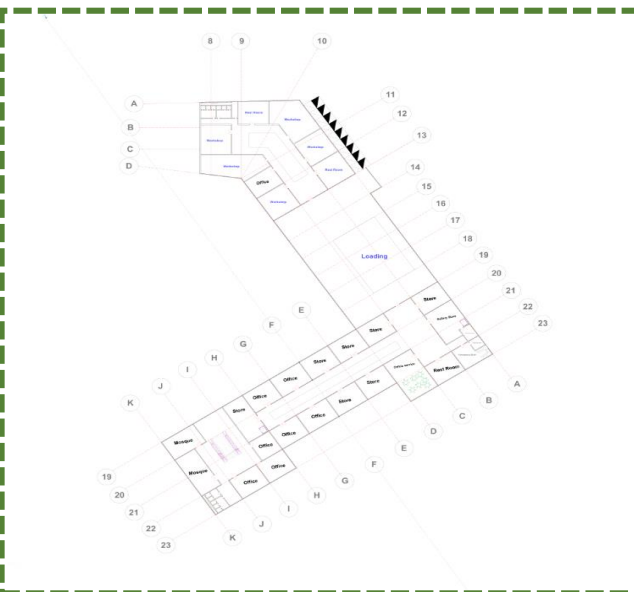
- The ground floor consists of the main lounge for the tram and the means of horizontal movement of passengers.
- The bass and taxi station is designed to be easy to access and move.
- The commercial part was emptied on the ground floor and replaced by means of traffic and exhibition open and reception.

- The initial idea problems were solved by making the entrance of the subterranean floor in the eastern sub-entrance
- Business activities are distributed in all directions so that they serve the passengers well
- The administrative blanks were redistributed on both sides of the station.



Ground floor plan

- On the underground floor, the entrance to the floor was changed so that it was out of sight and close to the east entrance of the station.
- Trams maintenance offices and workshops have been added
- Means of movement and escape stairs have been added.



Basement plan



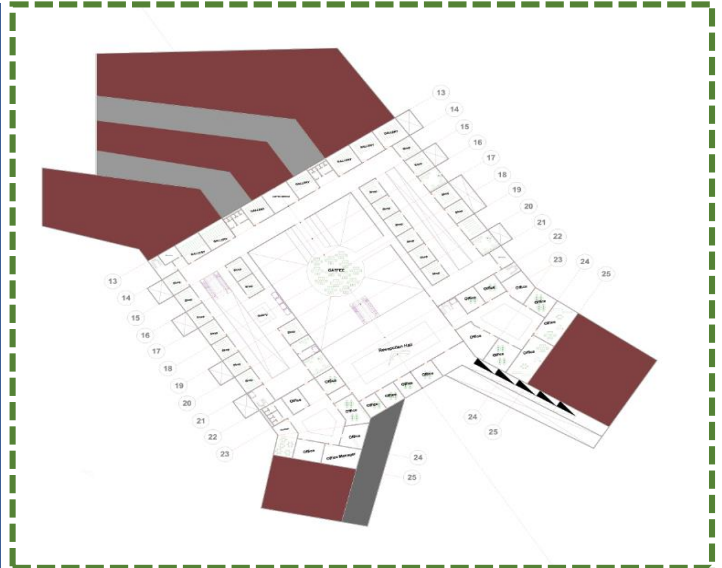
The first floor has become a number of more shops

In addition to an open café overlooking the main tram

In addition to the reception hall departing from the tram

In addition to the bass and taxi lounge

The second floor is repeated for the first floor with the addition of administrative part

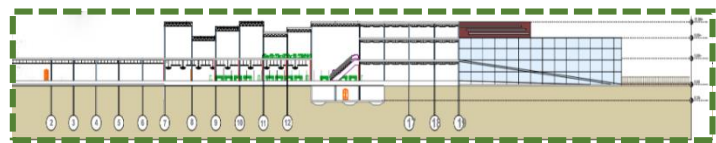
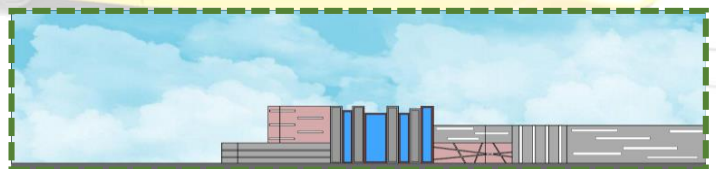


First & second floor plan

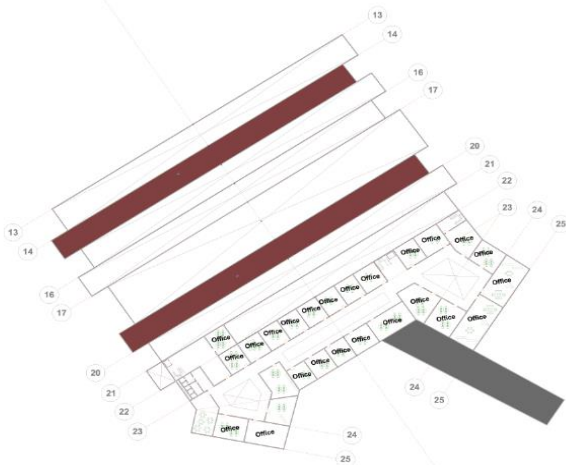
The facades and the dashboard were developed and the portal system was used in the main halls of the station

The development of the façade by the use of different heights in the ceiling link between the main hall, the exhibition and the commercial center

Use a fleur-dick in the tiles

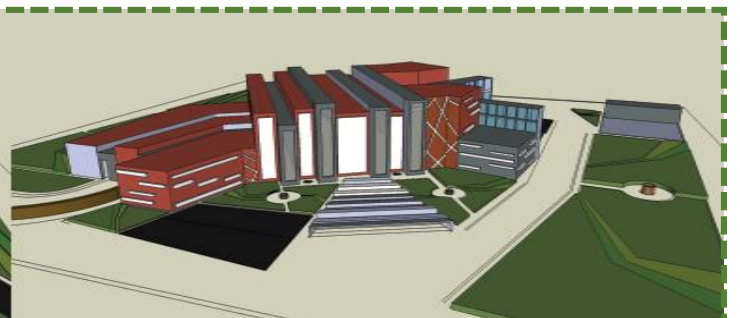


Section & Elevation



Third floor plan

On the third floor there is administrative part is divided into two parts station with the connection between them in addition to the presence of services and reception



Technical Solutions (Structural Solutions and Special Solutions)

First: the structural system

Are the systems used to establish the building and make it a fixed block on the ground and was chosen very carefully based on:

- Its ability to withstand soil
- Relevance to the nature of the project
- Economic cost

It consists of several elements (columns - foundations - Slabs).

the structural system

The Structure Of the building it compounds between Reinforced Concrete slab (Deck slab) & Portal frame Systems, Floors and Network Constructions Will be Designed to fit all Spaces and Needs.

The Slab: Steel Deck Slab

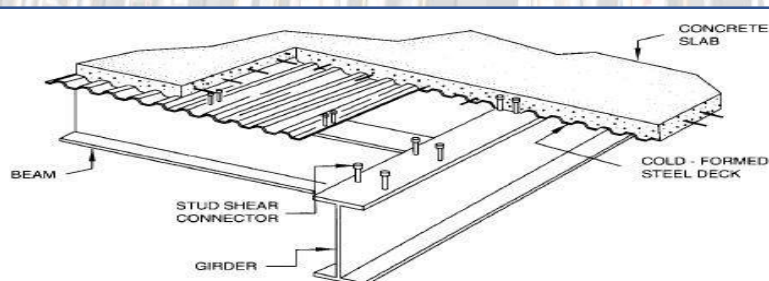
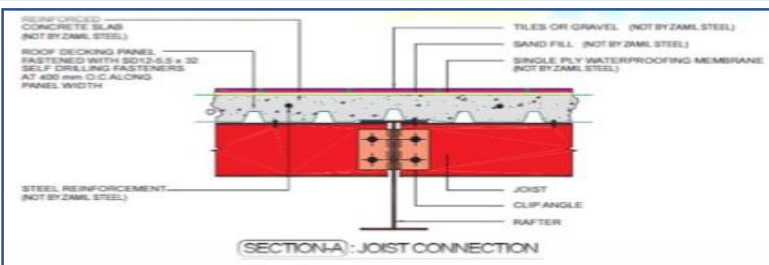


FIGURE 8.16 Beam and girder with shear connectors for composite action with concrete slab.

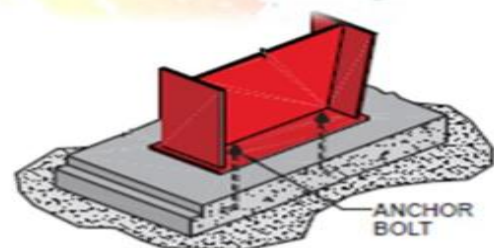


It was used in the administrative and commercial part.

Advantages:

- Protection against corrosion
- Stronger and lighter
- Fast and safe construction
- More flexible in design

The Foundations: Isolated footing



The soil of Omdurman is a stable rocky soil. From experience, the foundations of separate bases are best suited for this type of soil. They consist of a concrete base of suitable dimensions with the size of the plant and the soil type.

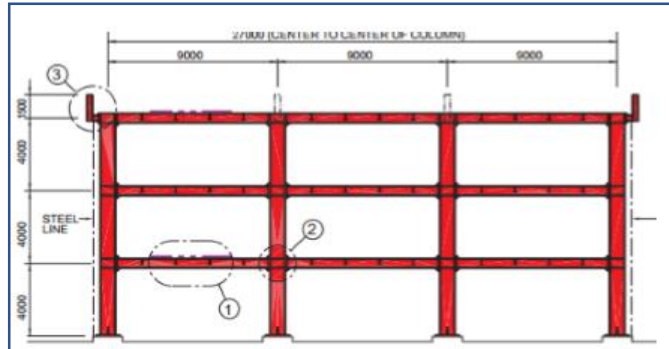
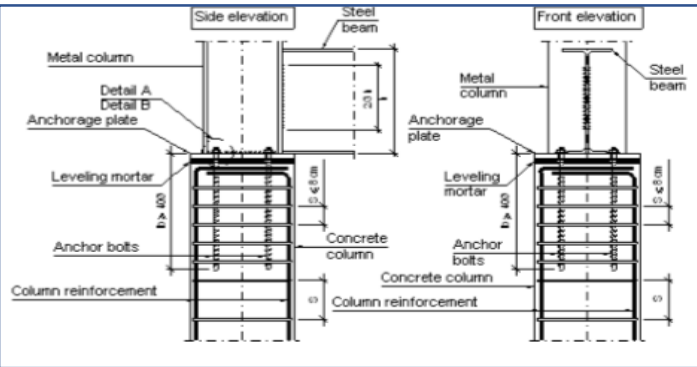
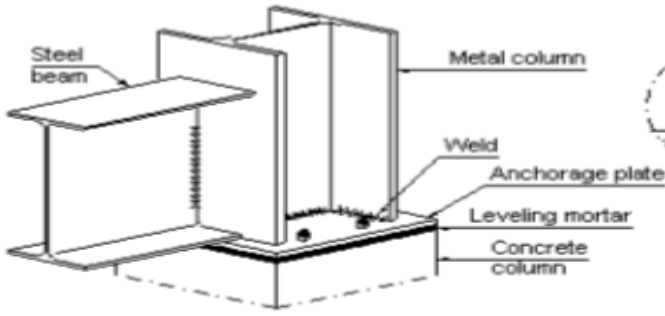




The Columns: I section columns

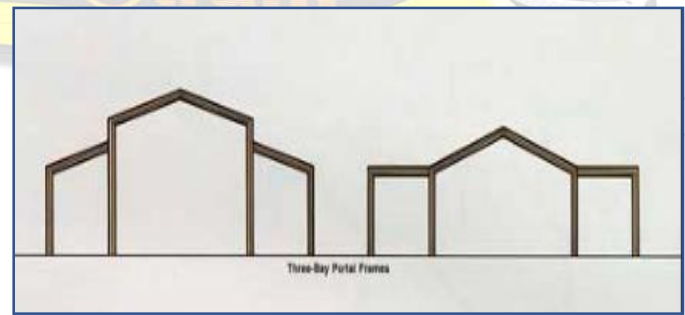
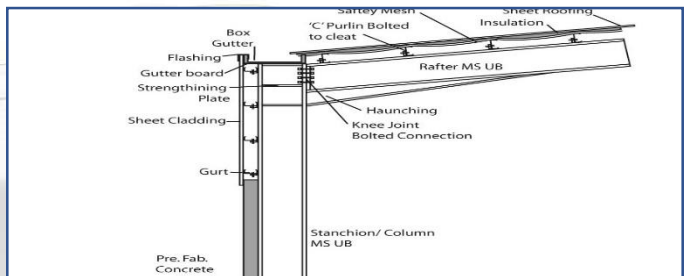
Columns (I section) will be used throughout the building as they provide wide swims and ease of movement in lounges.

On the underground floor, concrete columns were used.



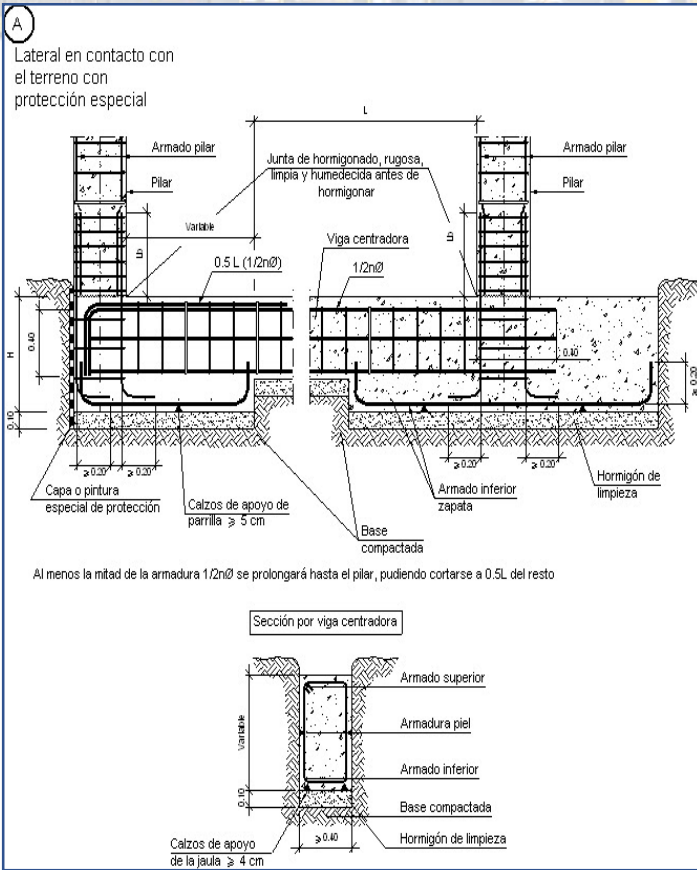
The Roofs: Portal Frame

Use in the terminal buildings and the tourist galleries

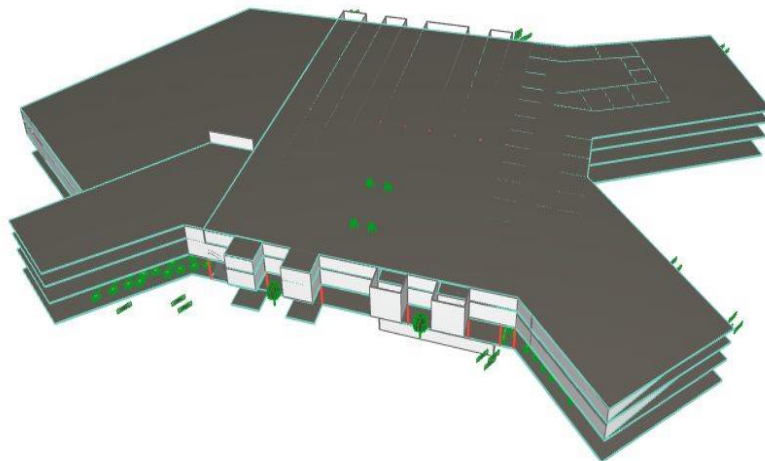


Expansion and Drop joints

Expansion joints resist changes in the volume of concrete due to weather factors. drop joints when different soil type and height variation.

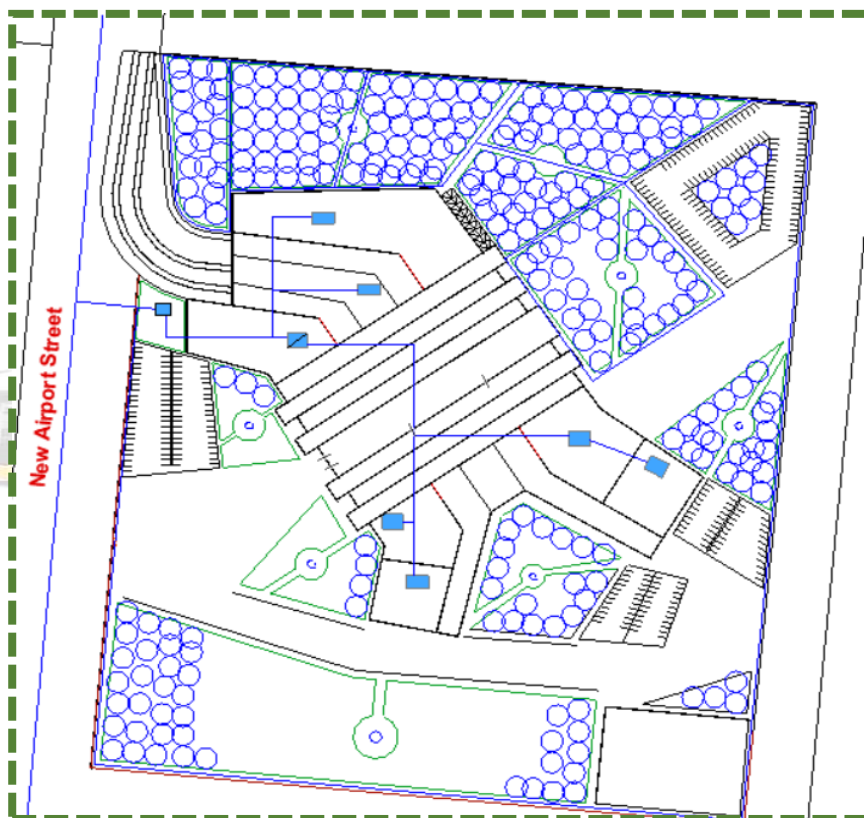
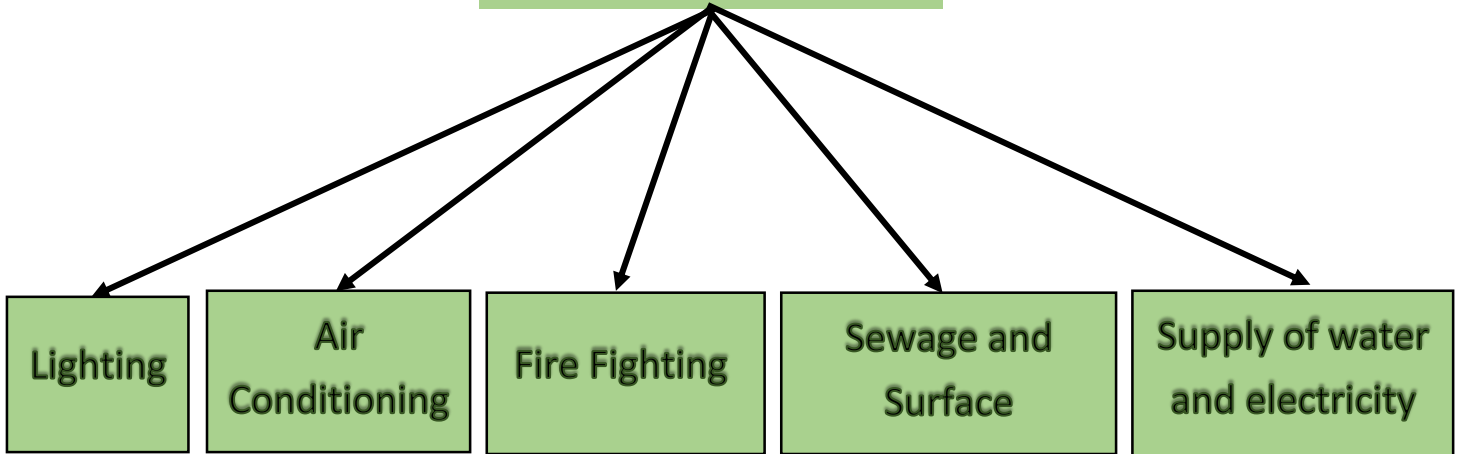


Distribution of columns on the ground floor



General perspectives of the structural

Building Services



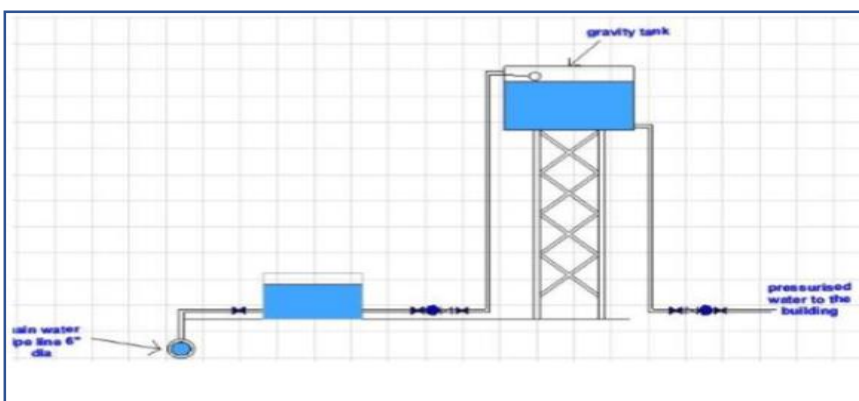
Supply of water

The water is connected to the site through the public network of the airport where the water is stored in ground tanks in the basement and then the water is pumped through the pumps to an upper tank where it is distributed to the sub-tanks

Reservoir size and depreciation calculation
 Tank size = height * width * height

Consumption rate% = per capita consumption * Number of users * 25.
 Average per capita consumption of service buildings = 80 liters per day and the number of users 2200

Consumption rate = $80 * 2200 * 5\% = 4400$ liters.



Water supply from the Tank



The system for the irrigation of



Drip irrigation systems



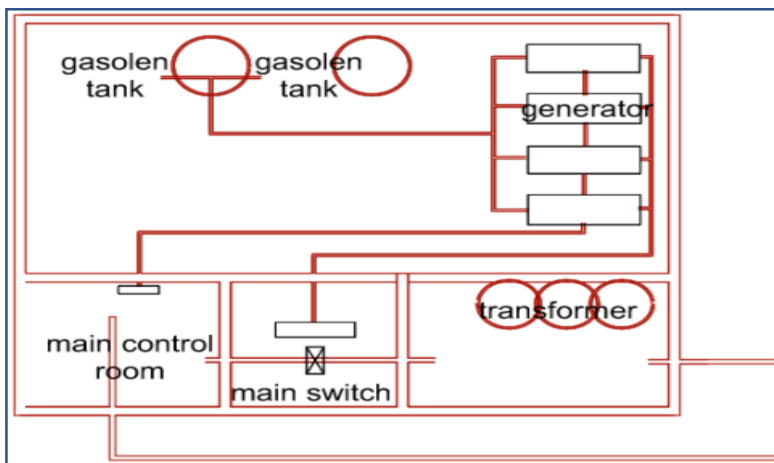
Supply of electricity



In any large building, if the power exceeds 50 amps, it needs a special transformer in an external room with a backup generator where the generator works in the event of an outage.

This transformer reduces the current from 11 kV to 415 V and then to the main panel or the building's electrical workshop and then distributes it to distribution panels.

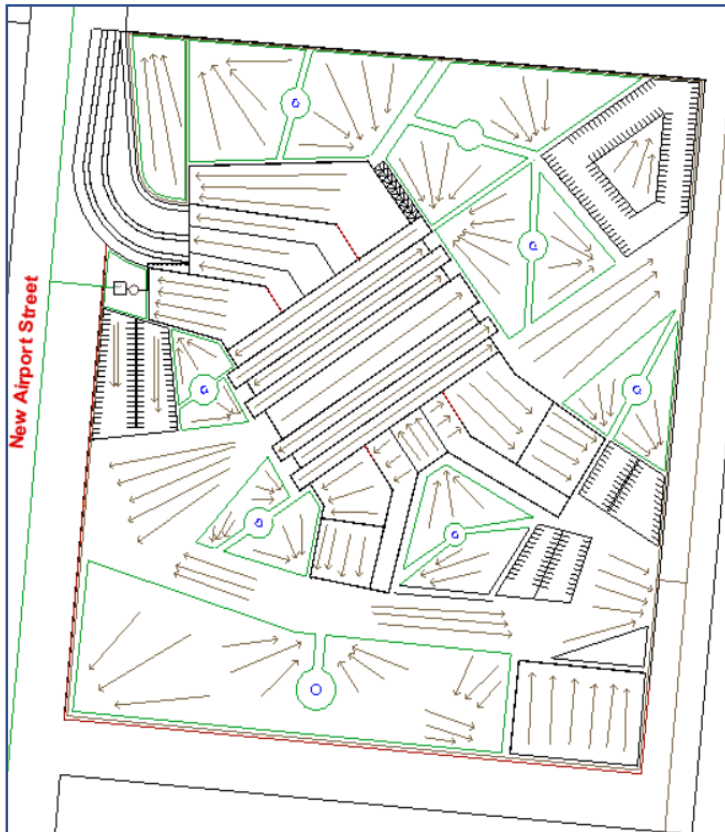
Two main lines were supplied to feed the different distribution boards



Electricity Room



Sewage and Surface



Surface drainage:

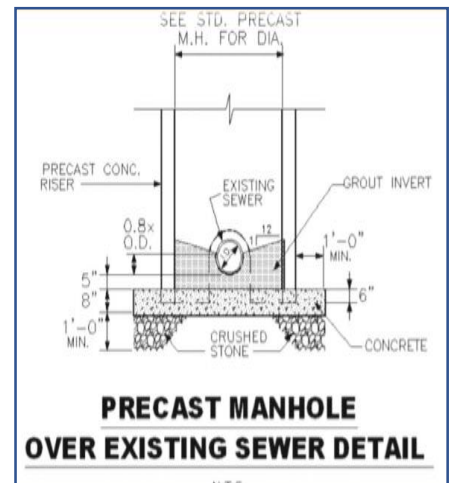
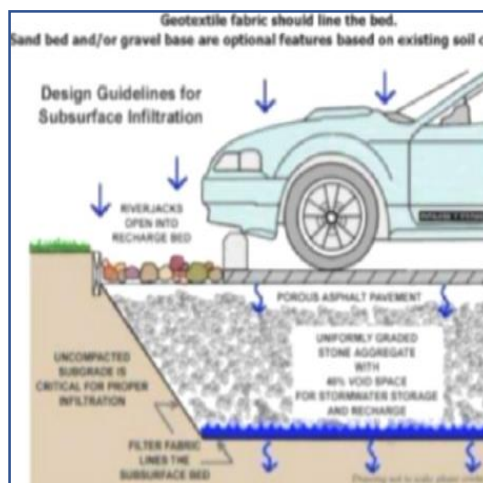
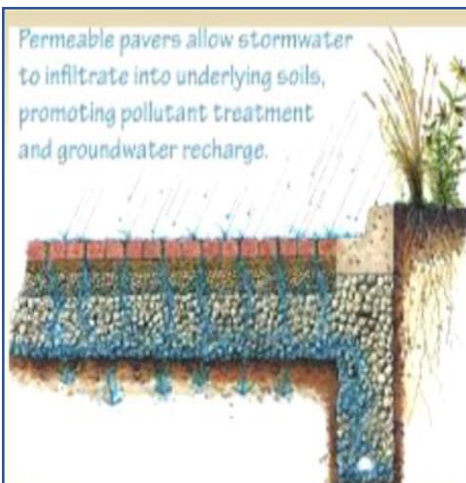
Suitable slopes are applied to the building surfaces and the system used is the separate system where rainwater drainage is separated from the building's drainage.

Rainwater is discharged by dividing the roofs into sections not exceeding 15 meters long and with a tendency to the specified drainage points. These pipes are 4 inches in diameter every 15 meters and accumulate in the ground at the pipe and then outside. The green areas have a collection pipe

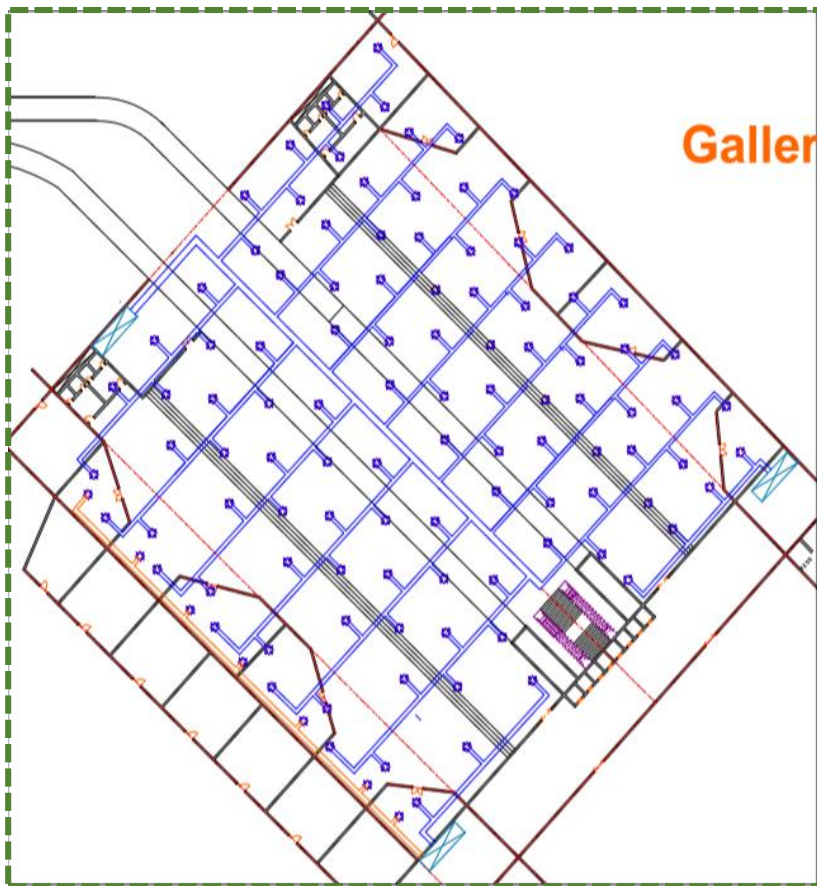
Sewage:

6-inch pipes are used with a slope of 1: 60 and the length of the pipe is 12 meters with loops distributed every 12 meters 45 45 * 45 meters and the depth is 15 cm every 6 meters and these pipes end at the public network of the airport.

Due to the break-up of drainage lines and bathrooms, two internal networks are used to connect to the public network



Drainage of corridors, green spaces and parking lots



Air Conditioning

The All air system has been used because the building has large spaces with high altitudes that allow passage of the airways and has large numbers of users.

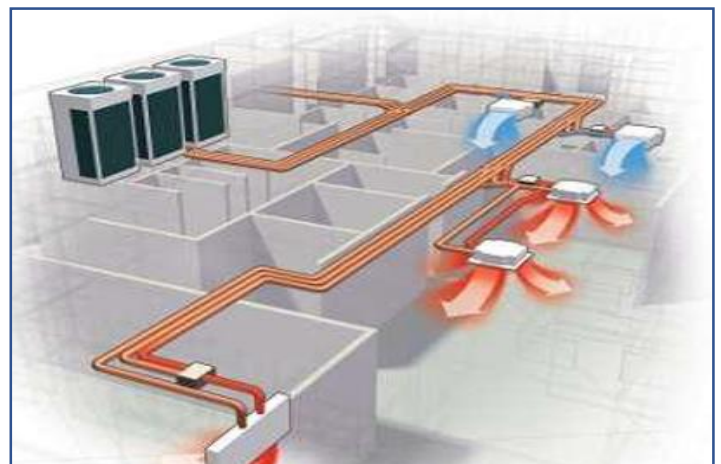
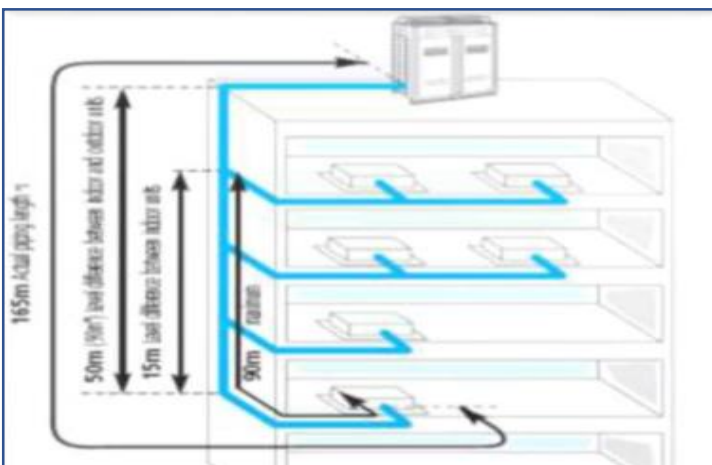
System parts:

The air handling device is placed outside

Air-conditioned air diffusers are placed in the most common places for people

Air intake outlets are placed in the outlets away from the diffusers.

The airways are the parts that connect the parts.



Charts show the overall air system



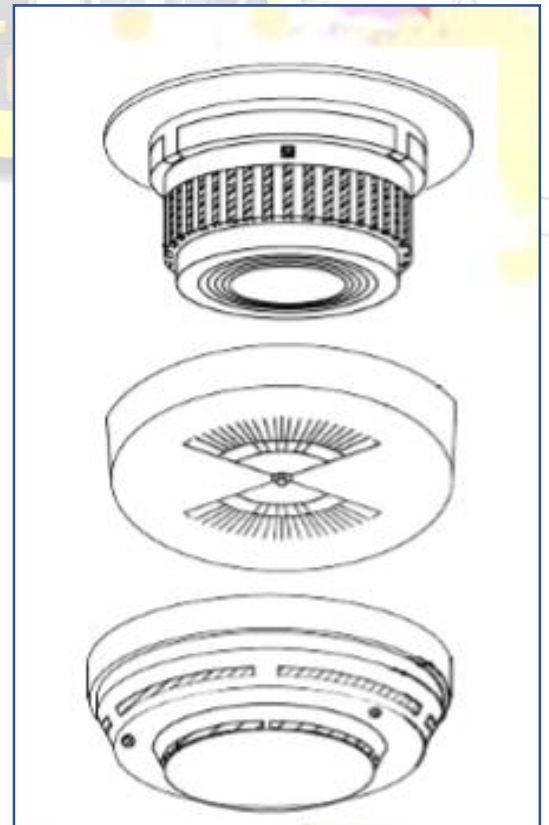
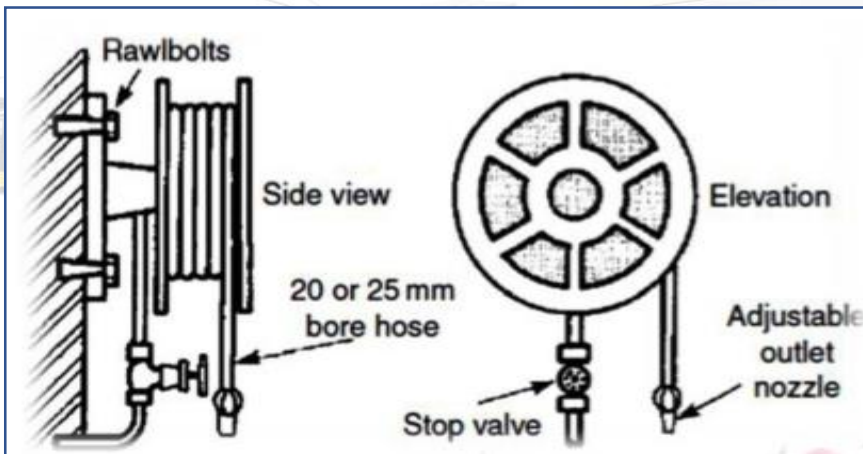
Fire Fighting

Fire is detected by devices called excess heat alarms. Where it activates at a temperature of 57 - 92 degrees Celsius, where this device gives a direct signal to the network of sprinklers, which in turn extinguish the fire.

The sensors cover an area of 90 m²

The machine guns cover an area of 12 meters²

Fire extinguishing process:
Fire extinguishing system with sprinklers that connect directly to the network of pipes from the fire tank



Firefighting equipment



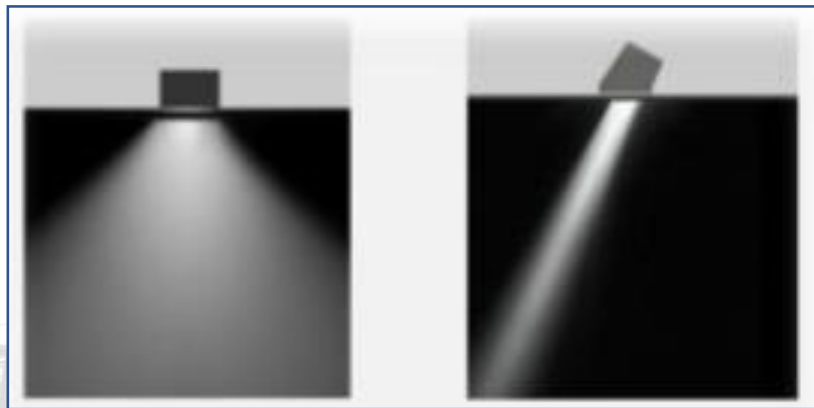
Lighting

Lighting is very important in the building especially in the Tourist photo gallery.

The light of the day was used through the glass face.

Industrial Lighting

LED lighting is highly efficient and homogeneous.



How Solar Yard Lights Work

©2006 HowStuffWorks



CHARGING

During daylight, the solar panels produce enough power to charge the battery.



LIGHTING

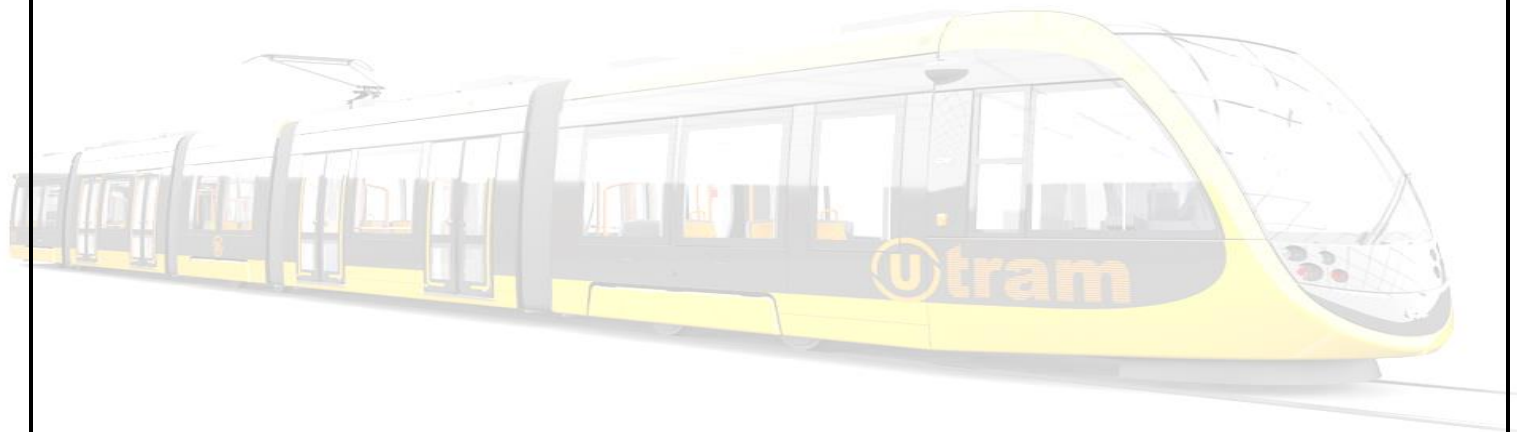
When the photoresistor detects little or no light it activates the battery and the light switches on.

Lighting Shapes



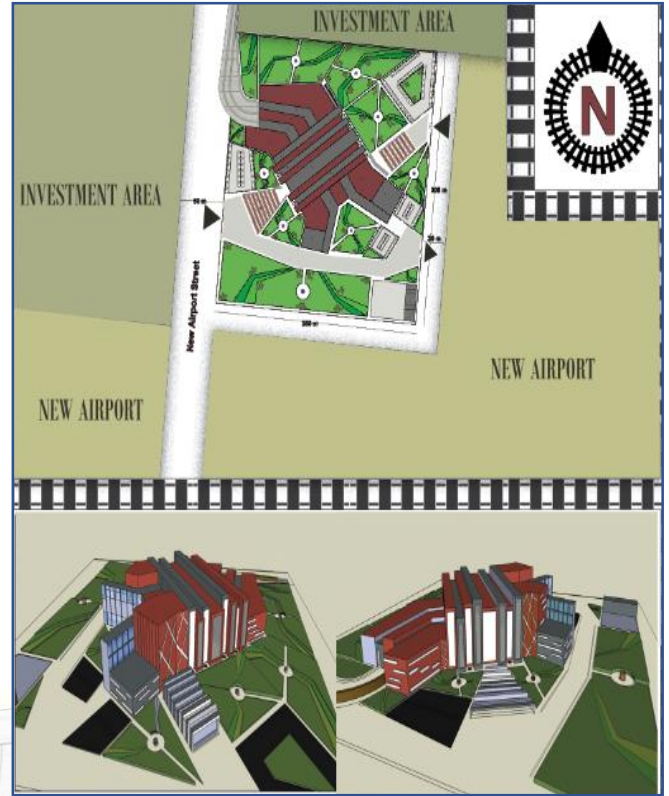
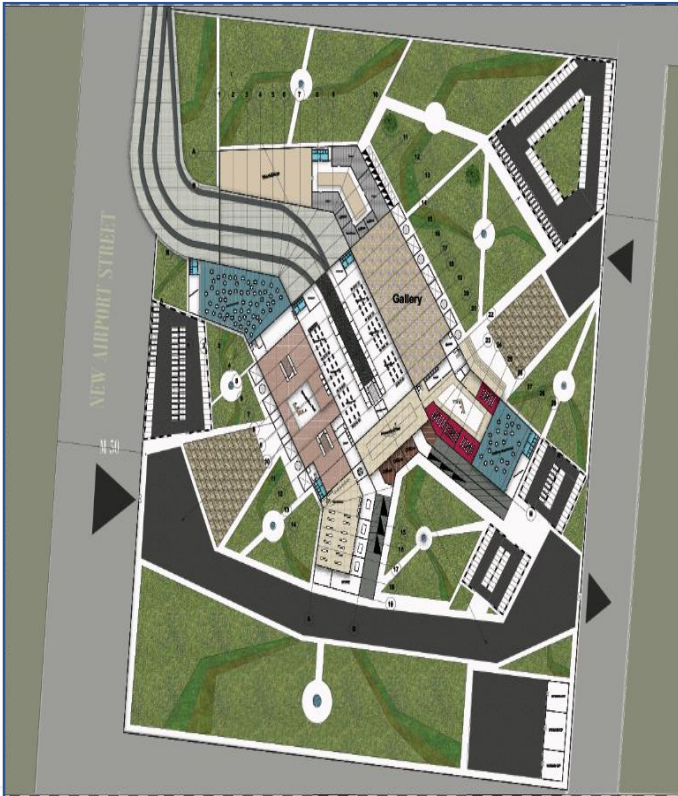
CHAPTER FIVE

Final Design





Final Design



References:

Books:

Neufert Ernst and Peter -Architects Data 3rd ed 2000.

Metric Handbook Planning and Design Data.

Time-saver Standards for Building Types.

transport terminals and model interchanges.

Guide to station planning and Design.

Manual for stander & Specification for railway station.

Sudan Railway future projects.

building construction handbook.

Intermodal concept in railway station design.

Internet Website:

WWW. Archdaily.com

WWW.Wikipedia.org

Information:

The Ministry of physical planning Khartoum.

Ministry of Urban planning Omdurman.

Railway station Bahri.

Director of the Khartoum tram project (Yusuf Mohammed Al-Norabi).

Ministry of Infrastructure and Transport.

