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.
Tram Station of New Khartoum Airport

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.
- 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**

- 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.

**Third floor plan**

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

**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.
-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.

- 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.

- 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.
Tram Station of New Khartoum Airport

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**

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**

- 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 sways 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.
Building Finishes

Finishing floors:
The floors were finished with passenger lounges using 60 * 60 * 2 marble to withstand the large number of passengers while giving some kind of luxury to the vacuum.
In situ concrete slabs were used in public corridors. Use asphalt in parking lots, buses and streets. Porcelain floors were used in commercial, entertainment and administrative.

Finishing Walls:
Will Use Brick Concrete Block & Gibson board for all Building But the Elevators Walls Will be built from Reinforced Mix 1:2:4.

Finishing Paints:
All the interiors of all building will be painted on the Basis of Human Psychological needs of different Colors.

Windows and openings:
The shaded glass is used to insulate the sun and often the vents are rebound as a form of treatment to reduce solar radiation.

Finishing Roofs:
The roof(Portal Frame) has been finished with an aluminum coated layer for thermal insulation and internal roof finish by the roof ceiling to give an aesthetic touch.

The Roofs: False Ceilings
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.
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.
**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 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**
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 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.
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.
CHAPTER FIVE

Final Design
Final Design
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