

AUTOMOBILE MUSEUM AND ASSEMBLY PLANT

Pragoti Industries Ltd.
Barabkunda, Chittagong

By
Tanzir Taher Chowdhury
07108006

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Abstract

The project is about bringing two different types of functions together in a logical way.

The automobile assembly plant and the automobile museum share the same focus which is automobile, but the approach to meet the focus here are different from each other. One is the process of making an automobile and the other one is about exhibiting that automobile. So it should be made sure that the focus is always on the automobile.

Assembly plant is a very efficient and functional project. It should be maximum efficient and the program should be very functional and rational. Whereas, Museum is totally different from an Plant. In this case, efficiency, functionality can be compromised at a certain level. In a museum, exhibition, presentation is a huge factor; it should be visually soothing at the same time efficient at a certain level. Bringing these two different types of programs together here is the main concern and it should be dealt with importance.

Introduction

Automobile industry is not that successful in our country. But to catch up with the world our country badly needs this kind of industries, which can help us to enter the world industries. In our country Pragoti industries limited is the only industry which is assembling automobiles. It has been active since 1966. But the platform here is the same now as before, which should be upgraded to cope with the world industries. So in this project it is proposed to redesign the existing plant to increase the capacity and to upgrade in case of equipments. There is also a museum proposed which should be integrated with the plant in such manner that it does not harm plant function.

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CHAPTER 01

Background of the project

Pragoti industry ltd is currently the only group which is assembling automobiles and has been assembling since 1966. At first they used to assemble General Motor (UK) cars. But from 1992 they started assembling Mitsubishi Motor's cars and they have been doing it till now. At present they are assembling only Mitsubishi Pajero and chassis of other commercial vehicles. From 2015 they are expecting to start assembling the new sedan Lancer GLS.

1.1 Specification

Project: Automobile Museum and Assembly Plant

Client: Pragoti Industries Limited (An Enterprise of Bangladesh Steel & Engineering Corporation)

Pragati Industries Limited assembles cars and buses. The company assembles cars of the Pajero, Vauxhall, and Mitsubishi brands. Pragati Industries Limited is based in Dhaka, Bangladesh. It is a subsidiary of Bangladesh Steel & Engineering Corporation.

1.2 Site

The site is located at Barabkunda area which is around 30 km away from Port city Chittagong.

Area of the site is around 22 acre.



Figure 01: Site drawing



Figure 02: Site location
Source: Google Earth

1.3 Reasons for choosing the project

Reason for choosing this type of project can be to experience something new. In the developed countries this types of projects are common. But in our country this is quite new. Another reason of this proposal is, almost all the cars are imported from foreign countries like Japan, china, Malaysia etc. So there are issues of foreign import taxes which eventually make the car price unreachable for most of the people of our country. So it can be tried to solve this problem by assembling cars within our country. There is no such museum which is dedicated to automobiles in our country. So this museum can become another milestone for our country.

1.4 Objective of the project

1. To design an automobile museum this will exhibit different types of automobile in chronological order.
2. Also it will exhibite different parts of an automobile and also cars of different eras.

3. To design an assembly plant of Pragoti industries limited.
4. To accommodate two different functions and creating logical and necessary connections between them.

1.5 Program

Assembly plant

1. Administrative block
 - 1.1 Production department
 - 1.2 Quality control department
 - 1.3 Security
2. Factory block
 - 2.1 Body shop
 - 2.2 Paint shop
 - 2.3 Chassis assembly
 - 2.4 Secondary assembly- glass,mirror,interior, stereo,lighting
3. Mechanic shop- commercial assembly
4. Storage
 - 4.1 Handling dock
 - 4.2 Primary storage
 - 4.3 Secondary storage
5. Water leakage test block
6. Parking
 - 6.1 Open to sky
 - 6.2 Shaded
 - 6.3 Ware-house
7. Test drive track

8. Staff/worker area

8.1 Rest room

8.1.1 permanent

8.1.2 temporary

8.2 Dining + entertainment

9. Prayer space- mosque.

CHAPTER 02

Site appraisal

The site of the project is located at Barabkund, Sitakunda area, round 30 km away from the port city Chittagong. Now a day's Sitakunda area has become an important zone, as government has taken initiative to make this area a satellite town to reduce the population pressure on Chittagong.



Figure 03: Site location in the map
Source:
<http://0.tqn.com/d/geography/1/0/t/k/banladesh.jpg>

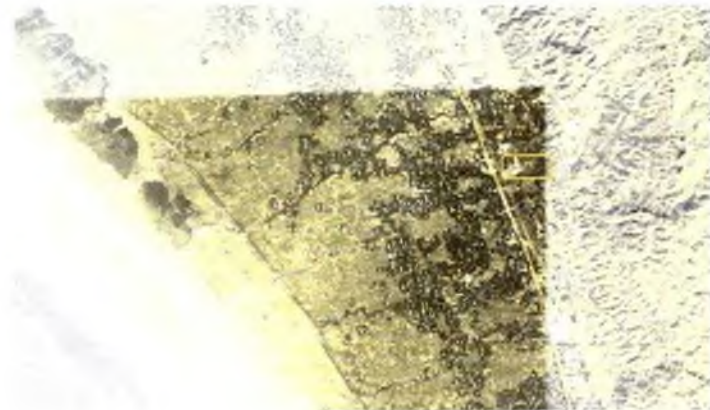


Figure 04: Site location
Source: Google Earth

2.1 Site surrounding

- The coast of the Bay of Bengal is around 4.5 km away from the site at the west.
- There is a jute mill named Galfra Habib jute mill in the north side.
- In the south side there is a chemical industry named Chittagong Chemical Complex.
- In the east there are villages and Sitakunda hill trail.



Figure 05: Site location
Source: Google Earth

2.2 Climatic condition and topography

- It is an area prone to cyclones and storm surges, Sitakunda was affected by cyclones in 1960, 1963, 1970, 1988, 1991, 1994 and 1997; the cyclones of 29 May 1963, 12 November 1970, 29 April 1991 made landfall.
- Annual average temperature is between 32.5 °C (90 °F) and 13.5 °C (56 °F), with an annual rainfall of 2,687 millimetres (106 in).
- Local experts consider the Sitakunda–Teknaf fault to be one of the two most active seismic faults in Bangladesh. After the earthquake of 2 April 1762, which caused a permanent submergence of 155.4 square kilometres (60.0 sq mi) of land near Chittagong, two volcanoes are said to have opened in the Sitakunda hills.



Figure 06: Sitakunda hill track in the east of the site



Figure 07: Dhaka-chittagong highway beside the site.

2.3 SWOT Analysis

Strength

- Less traffic congestion
- Beside Dhaka-Chittagong highway
- Near Sitakunda satellite town.

Weakness

- Distance from the port
- Barrier between the village and the highway

Opportunity

- Job opportunity.
- Community space for the people of the surrounding area.

Threat

- Security
- Chittagong chemical complex in the south.
- Cyclone and landfall prone area.
- Small volcano in the hill trails

CHAPTER 03

Literature review

An assembly line is a manufacturing process in which parts are added to a product in a sequential manner using optimally planned logistics to create a finished product much faster than with handcrafting-type methods. The assembly line developed by Ford Motor Company between 1908 and 1915 made assembly lines famous in the following decade through the social ramifications of mass production, such as the affordability of the Ford Model T and the introduction of high wages for Ford workers. Henry Ford was the first to master the assembly line and was able to improve other aspects of industry by doing so (such as reducing labor hours required to produce a single vehicle, and increased production numbers and parts).

3.1 Concept of assembly line

Assembly lines are designed for a sequential organization of workers, tools or machines, and parts. The motion of workers is minimized to the extent possible. All parts or assemblies are handled either by conveyors or motorized vehicles such as forklifts, or gravity, with no manual trucking. Heavy lifting is done by machines such as overhead cranes or forklifts. Each worker typically performs one simple operation.



Figure 08: Lotus Cars assembly line as of 2008

According to Henry Ford:

"The principles of assembly are these:

- (1) Place the tools and the men in the sequence of the operation so that each component part shall travel the least possible distance while in the process of finishing.
- (2) Use work slides or some other form of carrier so that when a workman completes his operation, he drops the part always in the same place--which place must always be the most convenient place to his hand--and if possible have gravity carry the part to the next workman for his operation.
- (3) Use sliding assembling lines by which the parts to be assembled are delivered at convenient distances.

In traditional production, only one car would be assembled at a time. If engine installation takes 20 minutes, hood installation takes 5 minutes, and wheel installation takes 10 minutes, then a car can be produced every 35 minutes.

In an assembly line, car assembly is split between several stations, all working simultaneously. When one station is finished with a car, it passes it on to the next. By having three stations, a total of three different cars can be operated on at the same time, each one at a different stage of its assembly.

After finishing its work on the first car, the engine installation crew can begin working on the second car. While the engine installation crew works on the second car, the first car can be moved to the hood station and fitted with a hood, then to the wheels station and be fitted with wheels. After the engine has been installed on the second car, the second car moves to the hood assembly. At the same time, the third car moves to the engine assembly. When the third car's engine has been mounted, it then can be moved to the hood station; meanwhile, subsequent cars can be moved to the engine installation station.

Assuming no loss of time when moving a car from one station to another, the longest stage on the assembly line determines the throughput so a car can be produced every 20 minutes, once the first car taking 35 minutes has been produced.



Figure 09: Conveyer system
Source :



Figure 10: Overhead crane
Source :

3.2 Conveyor systems

Steam powered conveyor lifts began being used for loading and unloading ships sometime in the last quarter of the 19th century. Hounshell (1984) shows a ca. 1885 sketch of an electric powered conveyor moving cans through a filling line in a canning factory.

The meatpacking industry of Chicago is believed to be one of the first industrial assembly lines (or dis-assembly lines) to be utilized in the United States starting in 1867. Workers would stand at fixed stations and a pulley system would bring the meat to each worker and they would complete one task. Henry Ford and others have written about the influence of this slaughterhouse practice on the later developments at Ford Motor Company.

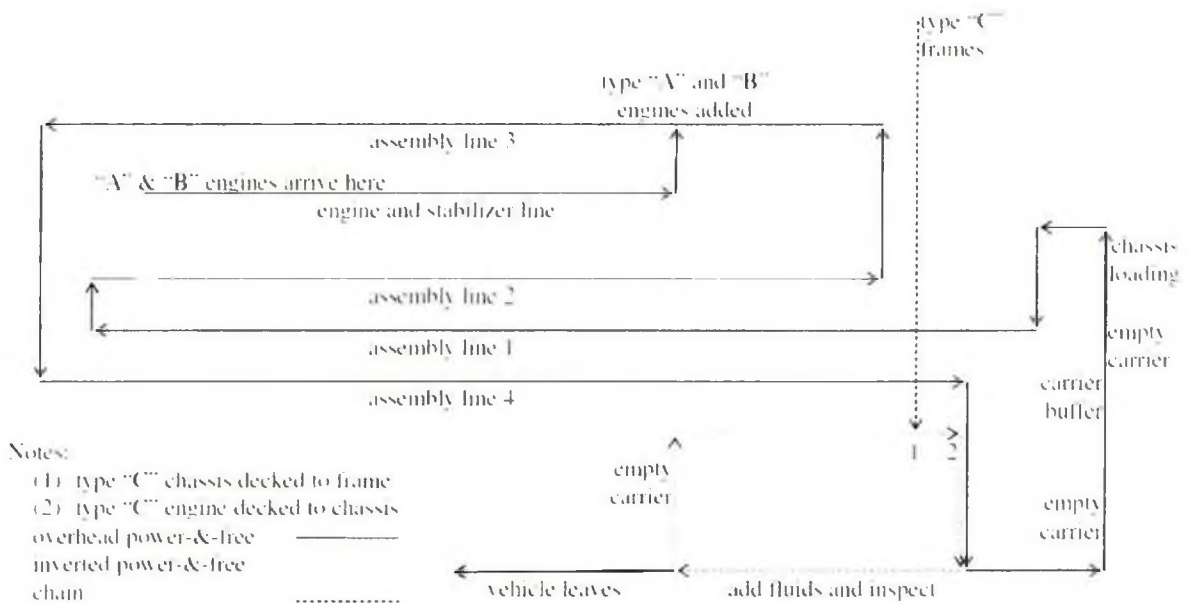


Figure 11: schematic of chassis, engine decking and frame operations
 Source :

3.3 Program flow chart

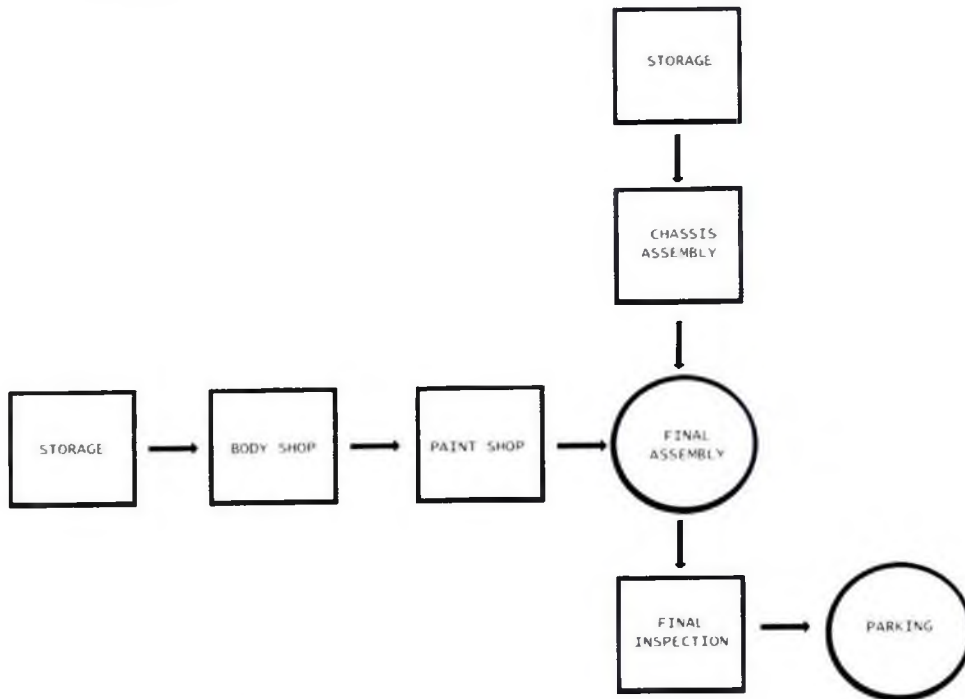


Figure 12: Program flow chart

3.4 Paint shop flow chart

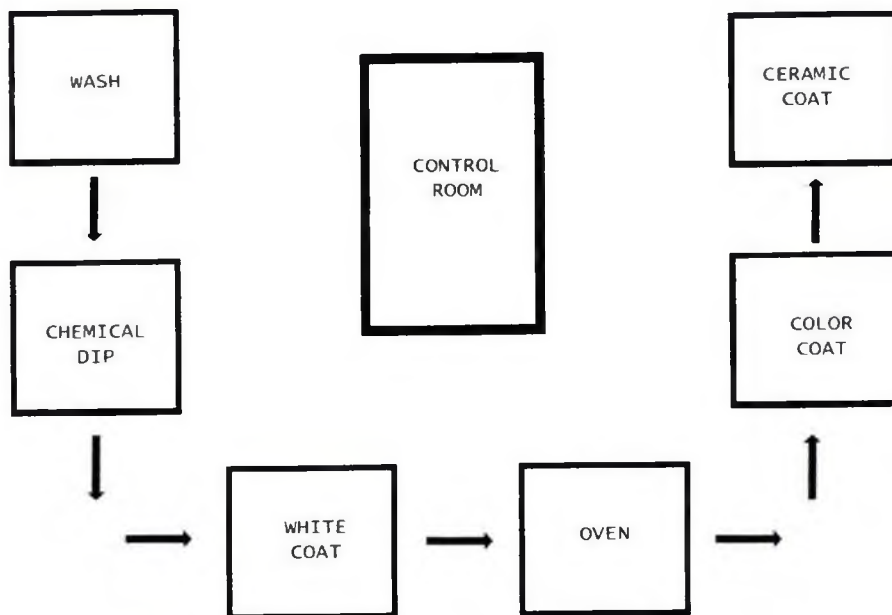


Figure 13: Paint shop flow chart

CHAPTER 04

Case study

Case studies of this project include mainly overseas projects designed by different international architects. Most of the projects are from Europe. There are also some conceptual projects designed mainly for design competitions.

The projects which are selected as case studies are-

- Automobile Museum by 3GATTI Architecture studio
- BMW Museum by Atelier Brückner
- VW's Transparent Factory
- Central Building - BMW Plant by Zaha Hadid

4.1 Automobile Museum by 3GATTI Architecture

3GATTI

Chief architect: Francesco Gatti

Client: Jiangsu Head Investment group CO., LTD

Location: Jiangning area, high-tech zone, Nanjing, China.

3GATTI Architecture Studio of Rome and Shanghai have won a competition to design an automobile museum in Nanjing, China.

An external concentric ramp allows visitors to drive around the exterior of the museum in their own car, past the exhibits to a roof-top car park. Visitors then descend through the museum on foot via an internal ramp.

The museum is articulated in two concentric helicoidally ramps; in the external one the visitor drives up the exhibition area in his own car, an experience that the architect describes as a “safari” because the visitor, as a motorist, is an exhibit himself.

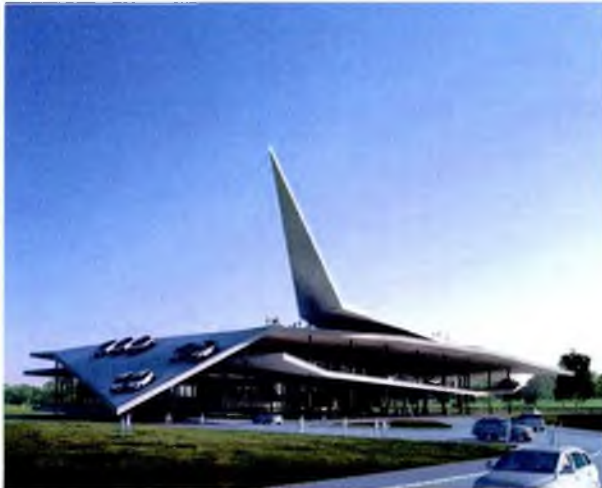


Figure 14: Road side view of the museum
Source: DeZeen Magazine

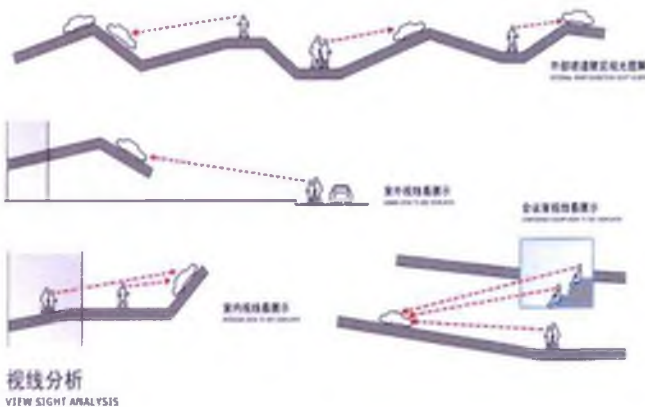


Figure 15: Museum circulation analysis
Source: DeZeen Magazine



Figure 16: view sight analysis
Source: DeZeen Magazine

The moving cars travel upwards diachronically (chronologically) in the folds of the origami from futuristic cars down below to vintage cars above and then up again to

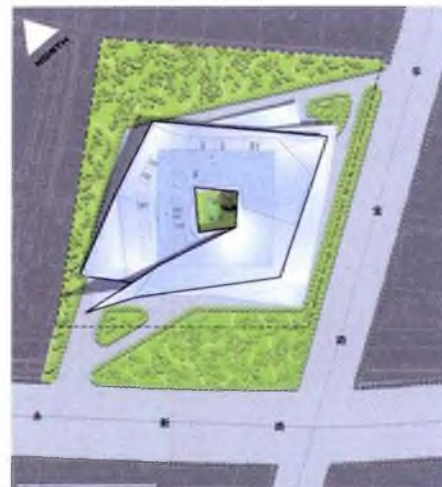
the car park on the roof of the building. Here the visitor leaves his car and does the return journey on foot down the inner spiral ramp. Once on the ground floor the visitor can take a lift and return to his car on the roof, or perhaps he may find it waiting for him down below for as Gatti himself observes “In the China of opposites, those who have the economic means to possess a car also have the means to have a personal chauffeur.”

The architect describes the museum as a “movie sequence in which the principal actor is the car”, a building where two car-related panorama go hand in hand: on the one hand the architect’s conscious attention to motorway aestheticism and urban scale – the structures and materials remind one of a viaduct – and on the other, his transportation into the museum of the ergonomics of the interior of a car.

Program: automobile and car components exhibition, educational installations, design centre, office, workshops laboratories, technical laboratories, conference rooms, space for special events, restaurants, retail, sales office.



总平面图 1:1000
GROUND FLOOR PLAN 1:1000



总平面图 1:1000
GROUND FLOOR PLAN 1:1000

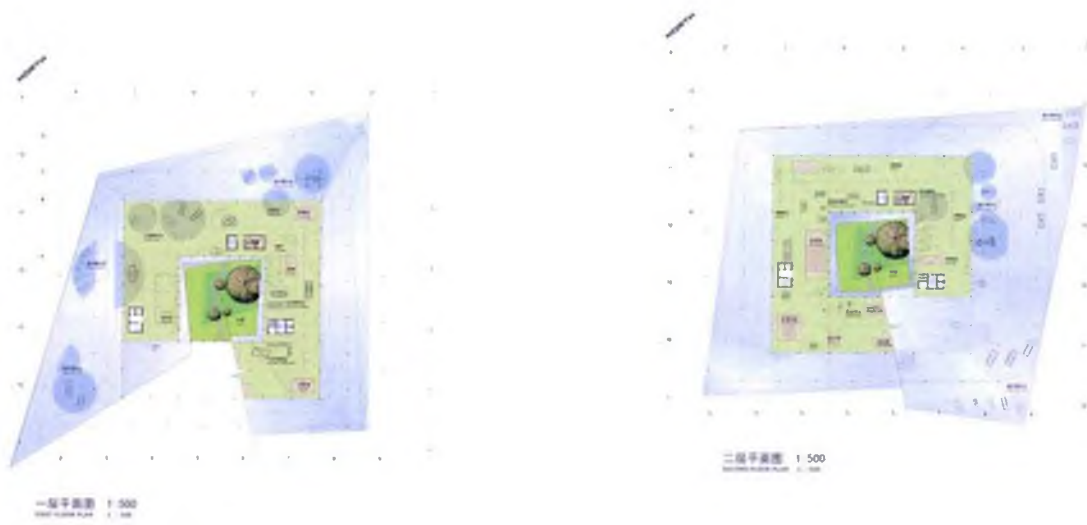


Figure 17: view sight analysis
Source: DeZeen Magazine

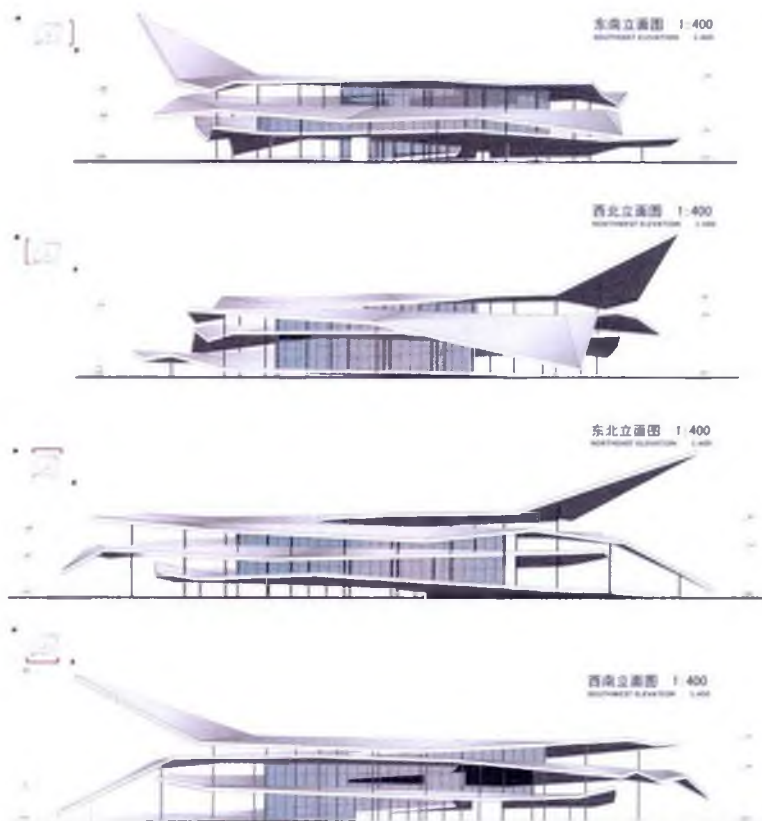


Figure 18: Elevations
Source: DeZeen Magazine

4.2 BMW Museum by Atelier Brückner

Architects Atelier Brückner of Stuttgart have designed the new BMW Museum, which opened in Munich last month. The project involved renovating the existing Museum Bowl (on the left in the photo above) – designed by Karl Schwanzer in 1973 – on the site of BMW's headquarters and adding a further 4000 square metres of exhibition space.

A kilometre-long ramp leads visitors through seven permanent exhibitions in the new three-storey building and temporary exhibitions held in the 5-storey Museum Bowl.



Figure 19: BMW MUuseum
Source: DeZeen Magazine



Figure 20: Interior ramp, BMW Museum

The museum has 125 exhibits on show, including cars, motorcycles, and aircraft engines and racing engines. The new BMW Museum in Munich has a modern, dynamic language: the language of the automotive world. Opened on June 21st, 2008, it sets a new standard in the realm of brand-focused museums. Along with the BMW Welt, opened in October 2007, and the BMW factory tour, the museum is the final component of the BMW Triad, where two million visitors are expected annually.

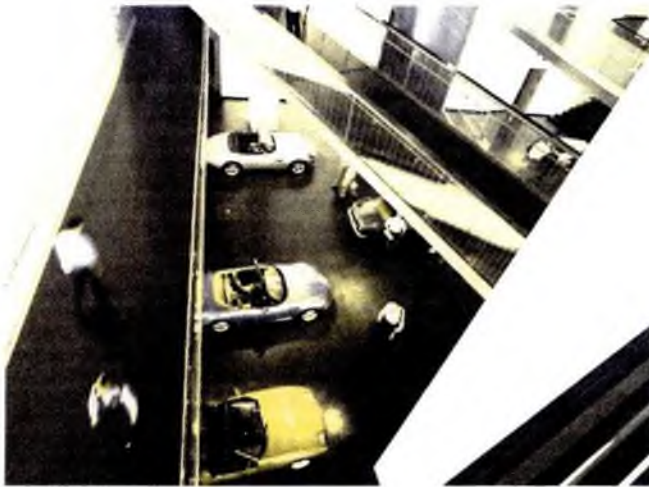


Figure 21: Interior ramp, BMW Museum
Source: DeZeen Magazine

Schwanzer's basic idea for the museum building was the "continuation of the street in altered space". The futuristic silver construction, which outwardly is very closed, looks light and generous inside. Via a rising spiral ramp, the visitor enters five seemingly free-floating platforms that serve as exhibition areas. The nearly circular base of the museum widens from approximately 20 metres to 40 metres in diameter. On platforms four and five, the wide airspace and building expansion becomes possible to experience.

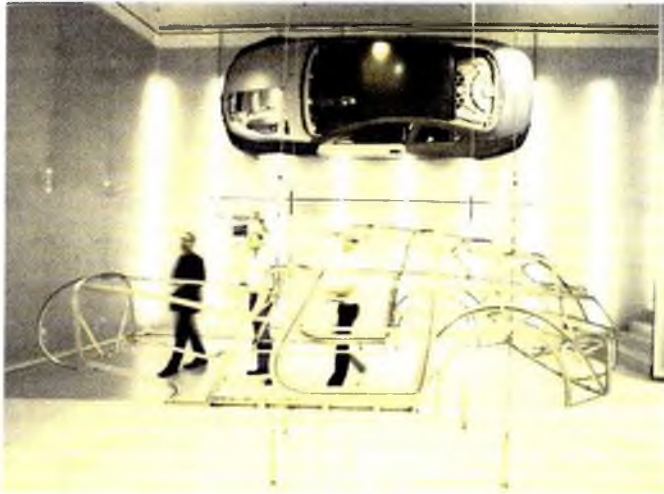
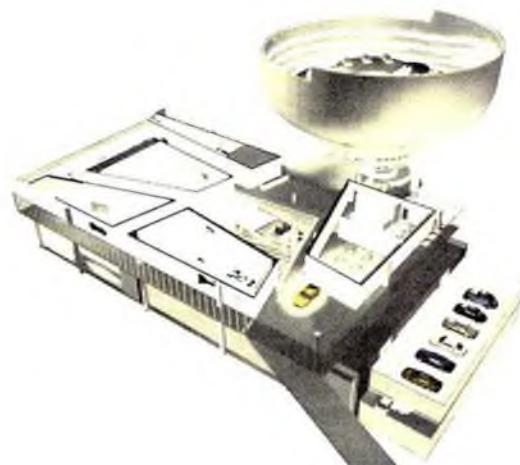


Figure 22: Museum exhibit
Source: DeZeen Magazine

From the existing idea of Karl Schwanzer, the “street in altered space”, studio ATELIER BRÜCKNER developed a ramp system as a central motif for the architecture and exhibition. The ramp became the dynamic concept of the new architecture. As both a formed and forming element, the ramp takes on a key function. It leads the visitor through the museum and connects the new long-term exhibition with the “Museum Bowl”, now used for special exhibitions. In the end, a diverse perspective on vehicles, company history, and company philosophy is allowed by the ramp system. The experience of the fluent space leaves a lasting impression, drawing from the visual narrative of many single perspectives throughout the space.



Figure 23: Aerial view of interior
Source: DeZeen Magazine



Upon the ramp, made to resemble a street-like path of polished asphalt, the visitor dives into the BMW brand. The uninterrupted walkway of about one kilometer length leads the visitor through the permanent exhibition and "Museum Bowl" spaces.

Refined automobile-inspired architectural scenery with places and bridges surrounds the visitor. Additionally, the ramp system resembles a three-dimensional road, where one receives access to the exhibition houses on different floors.

An original, authentic object stands in the centre of each exhibition and acts as a starting point for every single area. A reasonable thematic differentiation of the exhibition areas originates from it. The focus lies either on the object as the highlight of the area or the object groups are presented as direct lines of development from it. From this central space the aura unfolds undisturbed. Because of the common design base within each exhibition house every object or object group is emphasized according to a theme. Thus the spatial experience is developed and generated from the specific contents of the exhibition.



Figure 24: Aerial view
Source: DeZeen Magazine

4.3 Central Building - BMW Plant by Zaha Hadid

Client: BMW AG

Architect: Zaha Hadid Architects

Design: Zaha Hadid with Patrik Schumacher

Project Architects: Jim Heverin/Lars Teichmann

PROGRAM:

Offices and technical spaces for car manufacturing plant

CLIENT:

BMW AG

SIZE:

25000 m²

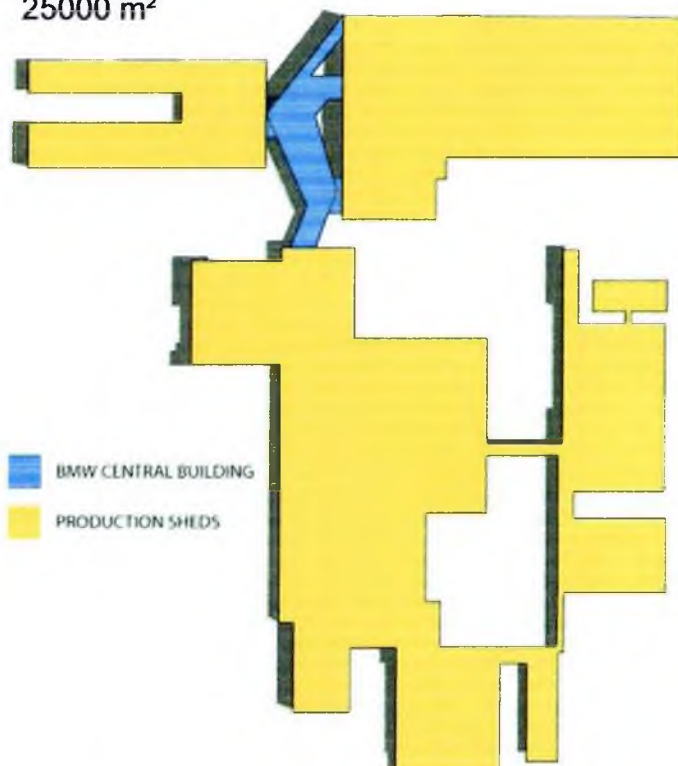


Figure 25: Production Plant masterplan
Source: DeZeen Magazine

The BMW Central Building Located in Leipzig, Germany was the winning design submitted for competition by Pritzker Prize winning architect, Zaha Hadid. The central building is the nerve center¹ for BMW's new \$1.55 billion complex built to manufacture the BMW 3 Series Vehicle.

The Central Building of the BMW plant is the active nerve-centre or brain of the whole factory complex. All threads of the building's activities gather together and branch out again from here. This dynamic focal point of the enterprise is made visually evident in the proposed dynamic spatial system that encompasses the whole northern front of the factory and articulates the central building as the point of confluence and culmination of the various converging flows. It seems as if the whole of the expanse on this side of the factory is oriented and animated by a force field emanating from the central building. All movement converging on the site is funnelled through this compression chamber squeezed in-between the three main segments of production: Body in White, Paint Shop and Assembly.



Figure 26: Plant Images
Source: Thomas Mayer

The organisation of the building exploits the obvious sequence of front to back for the phasing of public/busy to more withdrawn/quiet activities. The façade envelope is

pulled in under a large diagonally projecting top floor. Here the car drop-off swoops underneath letting off visitors into the glazed public lobby.

The primary organising strategy is the scissor-section that connects ground floor and first floor into a continuous field. Two sequences of terraced plates – like giant staircases – step up from north to south and from south to north. One commences close to the public lobby passing by/overlooking the forum to reach the first floor in the middle of the building.

The other cascade starts with the cafeteria at the south end moving up to meet the first cascade then moving all the way up to the space projecting over the entrance. The two cascading sequences capture a long connective void between them. At the bottom of this void is the auditing area as a central focus of everybody's attention. Above the void the half-finished cars are moving along their tracks between the various surrounding productions units open to view.

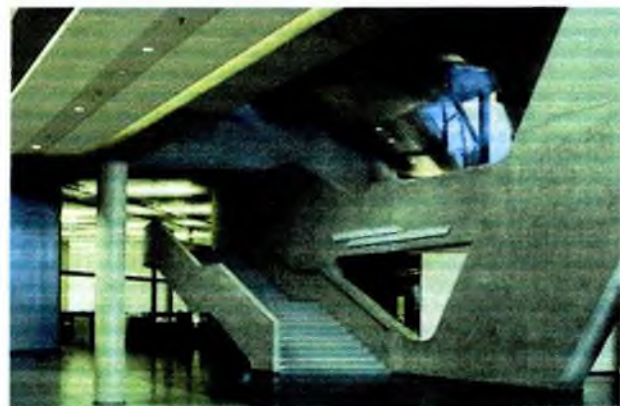
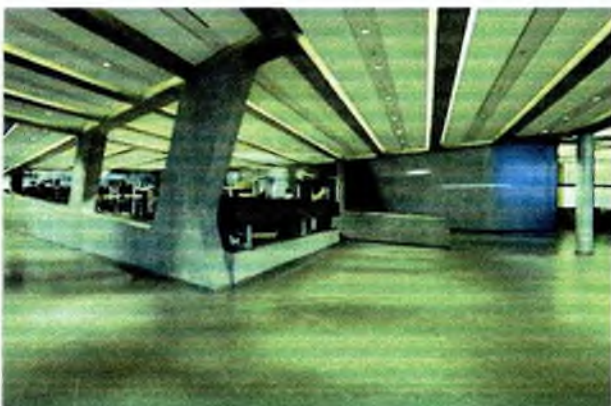


Figure 27: Plant Images
Source: Thomas Mayer

From a pool of 25 international architects, the BMW jury chose the very innovative design of Zaha Hadid for the final piece of the BMW plant in Leipzig Germany. With no real precedent for her design, Zaha Hadid's Central Building can only be related to

the revolutionary and monumental industrial designs of the past including Fiat Lingotto Factory by G. Mattéi Trucco and the AEG Turbine Factory in Berlin by Peter Behrens. The BMW Central building is a 270,000 square feet (25,000 m²) foot facility that makes up only 250,000 square feet (23,000 m²) of the 540-acre (2.2 km²) campus. Serving 5,500 employees, the building functions as the most

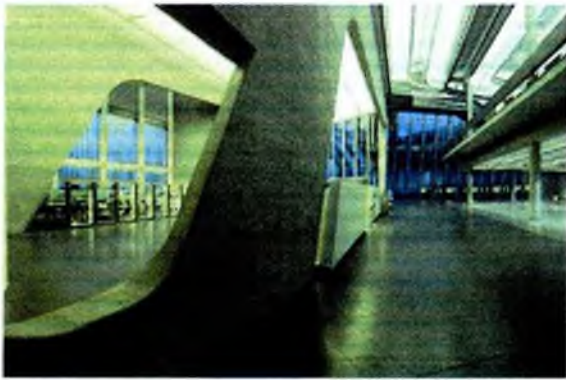


Figure 28: Plant Images
Source: Thomas Mayer

important piece of the factory as it connects the three production sheds. Each day, 650 BMW 3 Series sedans pass through the Central Building on an elevated conveyor as they move from one of the three production sheds to the next. Dim blue LED lights up light the vehicles as they become more and more complete each time they exit one of the sheds. These conveyors not only take the vehicles from one production shed to another, but do so directly through all of the functional spaces of the Central Building. The offices, meeting rooms, and public relations facilities are all inhabited by these elevated conveyors, which creates an interesting relationship between the employees, the cars and the public. Not only is the Central Building an office building and public relations epicenter for the factory, it is also a very important piece of the production process at the factory. All of the load bearing walls, floors, and office levels are of cast-in-place concrete while

the roof structure is of a structural steel beam and space frame construction. The facade is clad in the simple materials of corrugated metal, channel glass, and glass curtain walls.

4.4 Findings

1. The test drive track can be blended with the super structure.
2. The circulation of the museum can be designed with single or multiple ramps to create more interesting spaces.
3. The interior of the museum can be accessible also for the visitor's cars.
4. The minimum interior height of the museum should be such that a person can see the exhibits from the top also from a comfortable viewing distance.
5. The functions of the museum and the plant should not hamper each other.
6. The function flow of the plant should be according to international standard.
7. The paint shop of the plant should be air-sealed.
8. The marriage point should be between the chassis assembly and the paint shop.

9. The storages should be adjacent to the body shop and the chassis assembly Point.

10. The multipurpose hall of the museum should be able to hold a car launch program.

The locker/changing room of the plant workers should not be far away from their respective work point.

CHAPTER 05

Program and development : area/sft

5.1 Assembly plant

5.1.1 Existing programs

Administrative block

1. General manager
2. Assisting manager
3. Quality control department
4. Production department
5. Plant security
6. Storage control
7. Trainee room
8. Staff area – dining+lounge
9. Changing room- locker room+ toilet

5.1.2 Existing program area

- | | |
|--------------------------|----------|
| 1. Administrative office | 8000 sft |
| 2. Gate office | 900 sft |
| 3. Security | 300 sft |
| 4. Time keeping office | 500 sft |
| 5. Medical | 1500 sft |

6. Storage	10000 sft
7. Vehicle parking	40000 sft
8. Service shed	8500 sft
9. Water body	37700 sft

Total Plant area 785000 sft

5.2 Automobile museum

5.2.1 Proposed programs

1. Lobby / reception
2. Lounge
3. Multi-purpose hall
4. Restaurant
5. Museum admin
6. Museum workshop
7. Exhibition space

5.2.2 Proposed programs area

1. Reception/lobby 2500 sft
2. Restaurant – sitting arrangement 1600 sft
Kitchen+store 800 sft
Total 2400 sft
3. Lounge – for 60 people 1200 sft

4. Multi-purpose- which can be used as a launching area for the cars also. With sitting arrangement for 200 people total area is 4000 sft and for stage+backstage, area is 2000 sft.

So the total area – 6000 sft

5. Museum administration –

Manager 200 sft

Control room 200 sft

Curator 200 sft

Admin toilet 165 sft

Total area 835 sft

6. Museum workshop

Chief mechanic 200 sft

Storage 100 sft

Workshop 1600 sft- for 2 cars(800 sft for each car)

Total area 2300 sft

7. Exhibition area – per sedan car space 700 sft

Total no. of cars – 50

Total area 35000 sft

Primary storage 10000 sft

Parking/shed 40000 sft

Total plant area 78500 sft

Total museum area 47280 sft

Total proposed built area 180980 sft

CHAPTER 06

Conceptual stage and design development

6.1 Concept development

Conceptual sketches-

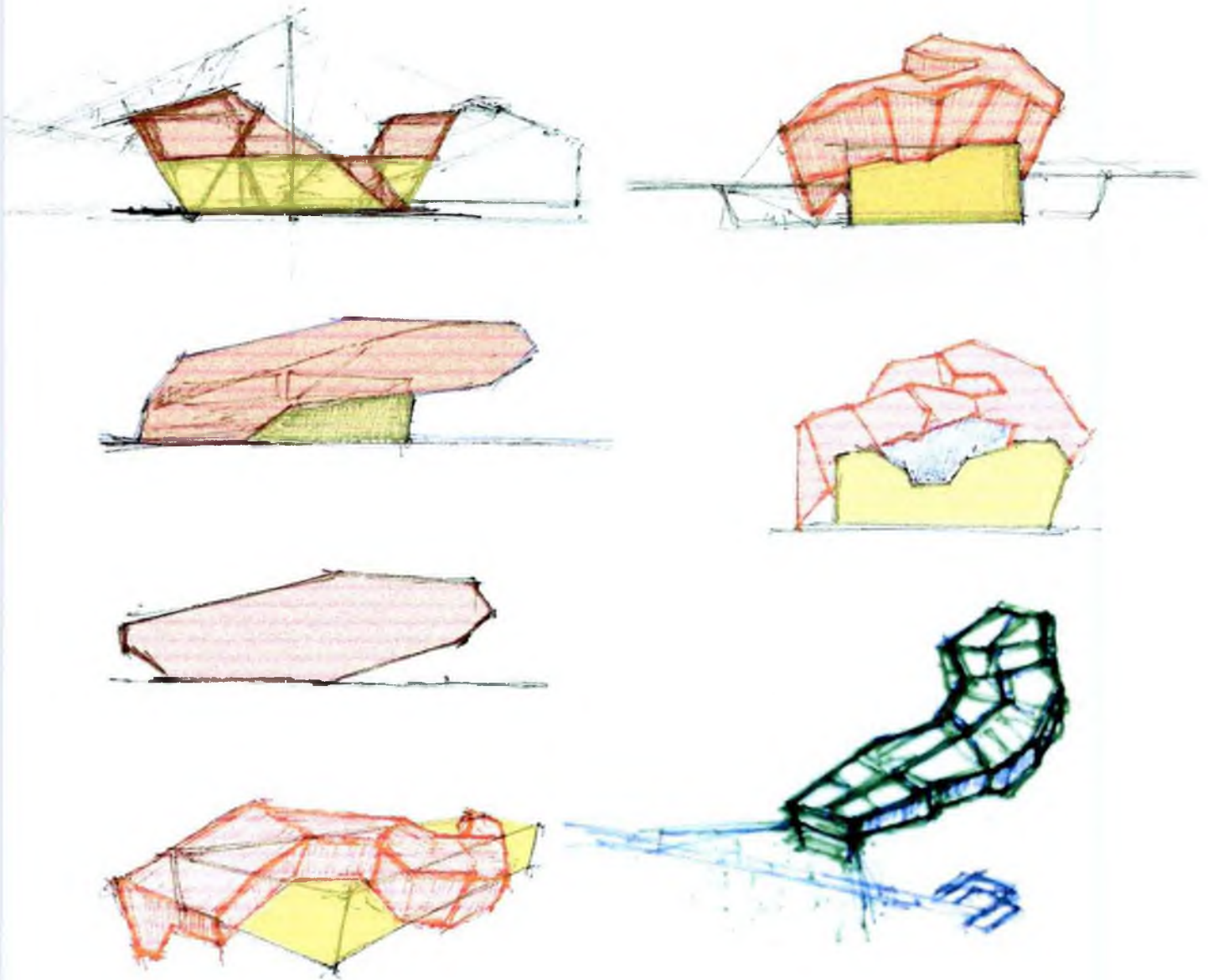


Figure 29: conceptual sketches

Assembly plant zoning study-

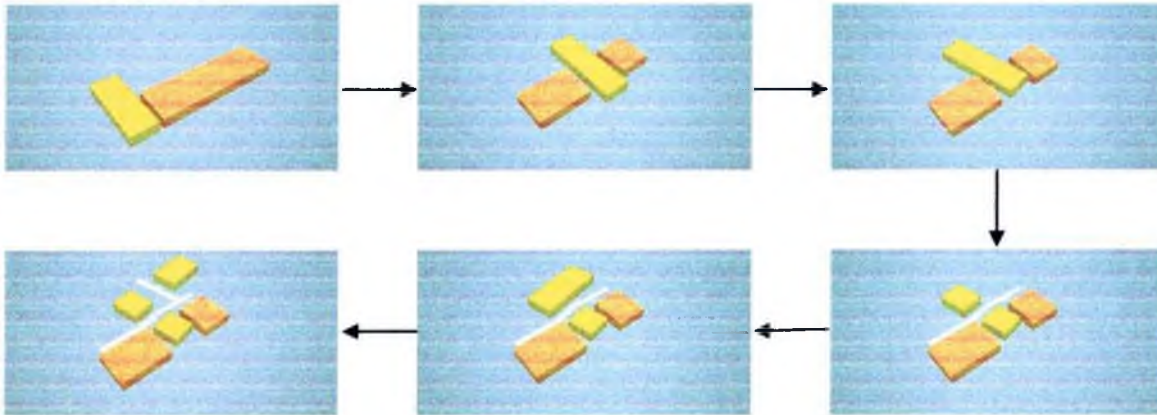


Figure 30: plant zoning

CONCEPT WAS TO MERGE THE PLANT WITH THE MUSEUM TO PROVIDE THE ESSENCE OF A TYPICAL AUTOMOBILE. HERE, THE MECHANICAL PART- THE ENGINE AND DRIVE SHAFTS OF THE AUTOMOBILE REPRESENTS THE PLANT AND THE OUTER SKIN- THE BODY OF THE AUTOMOBILE REPRESENTS THE MUSEUM.

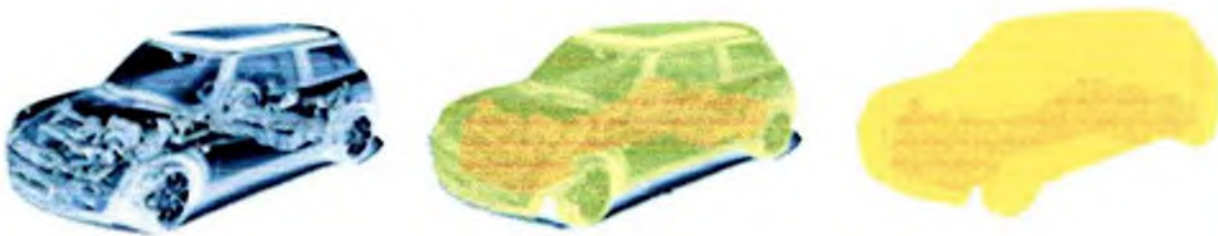


Figure 31: Concept diagram

6.2 Master plan development:



Figure 32: Phase 1

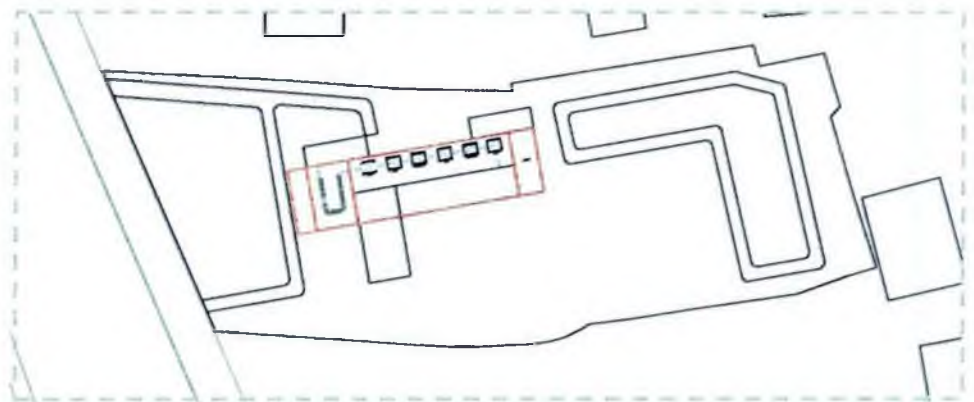


Figure 33: Phase 2

In the phase 2 and 3, focus was to arrange the test drive track and the plant section in a functional way. It was tried to arrange the plant activity in a rectangular box. It was also tried to create useful spaces in that box by de-constructing it.



Figure 34: Phase 3



Figure 35: Phase 4

In the phase 4, an attempt was taken to divide the body, paint shop and chassis assembly line with the staff and admin block. It was tried to reduce the traveling distance of the staffs to their respective work spaces.



Figure 36: Phase 5

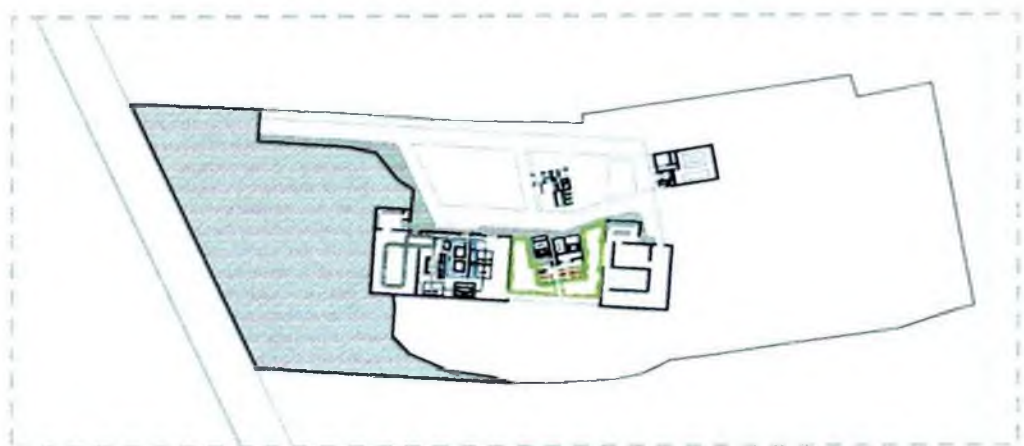


Figure 37: Phase 6

6.2 Form development

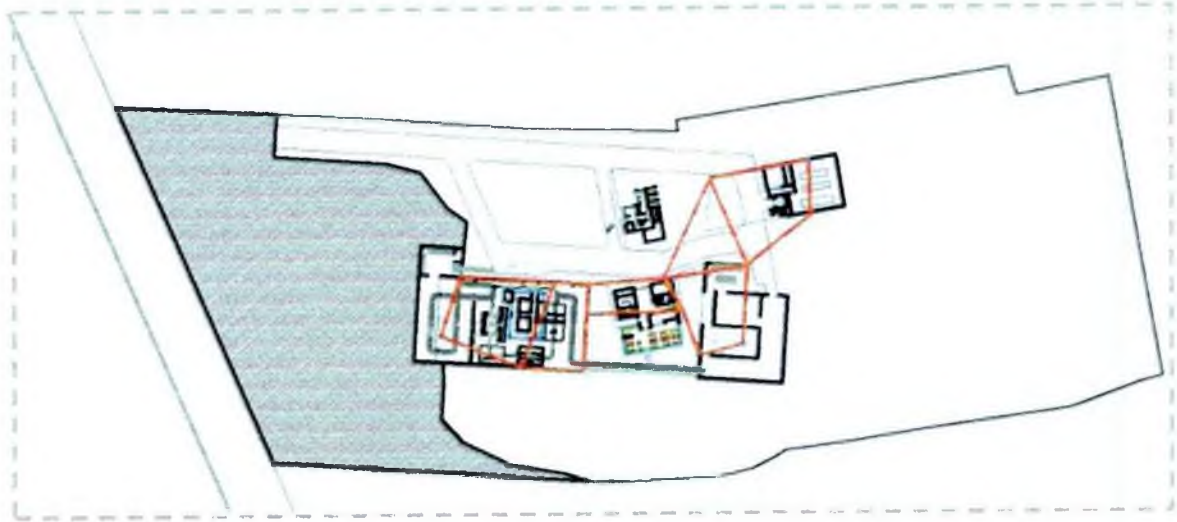


Figure 38: Museum and plant relation

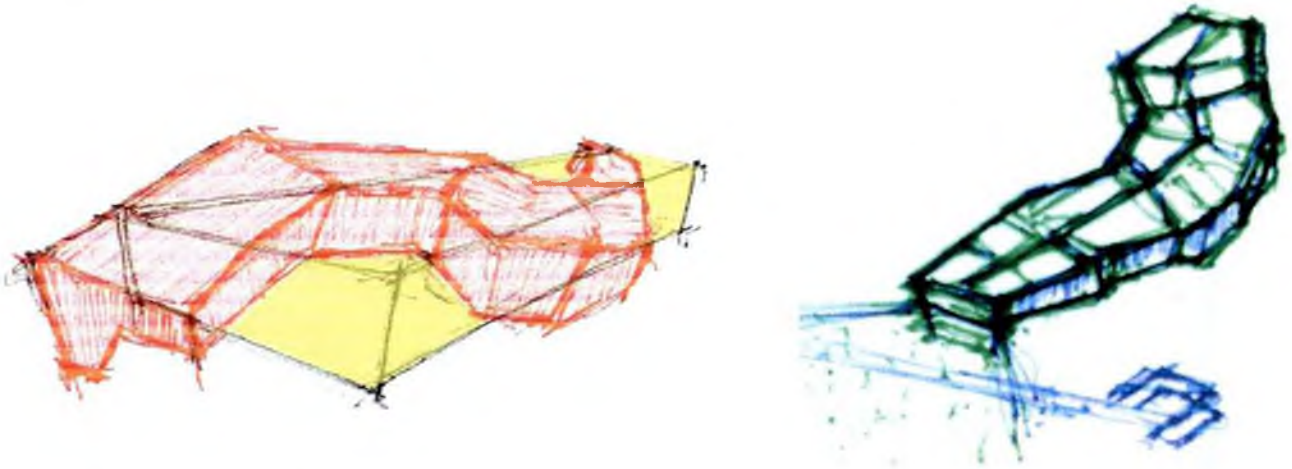


Figure 39: Museum form study

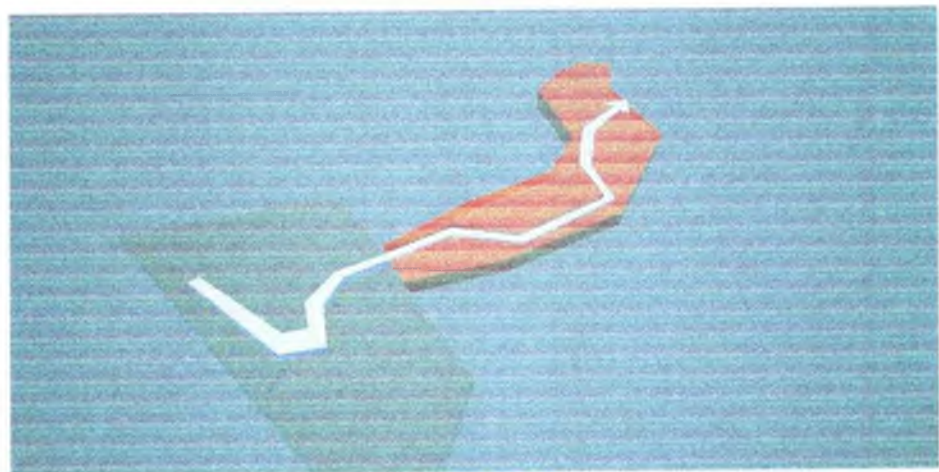


Figure 40: Street continues inside the museum as a secondary display of cars.

6.3 Final drawings

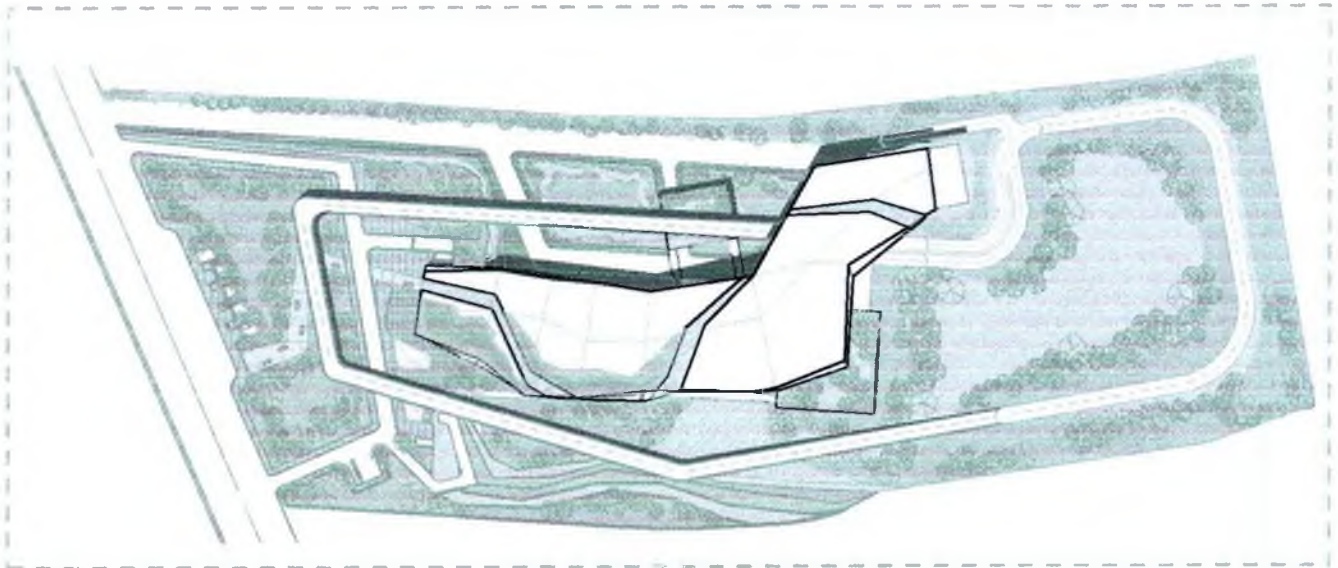


Figure 41: Roof plan

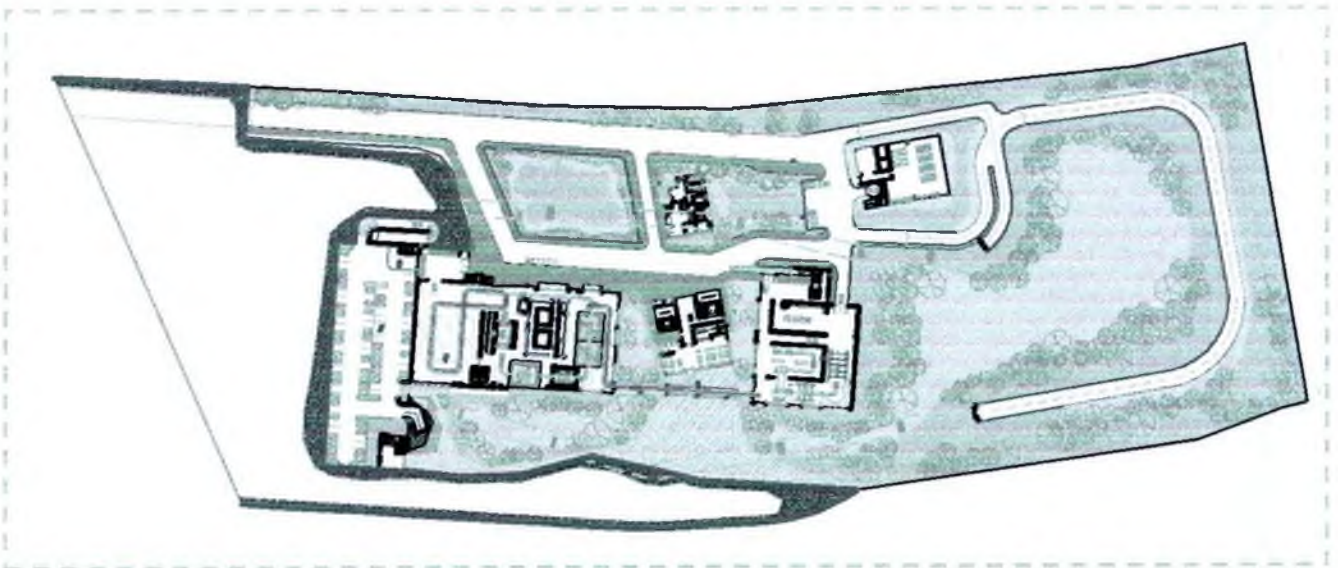


Figure 42: Ground level plan
Plant level plan

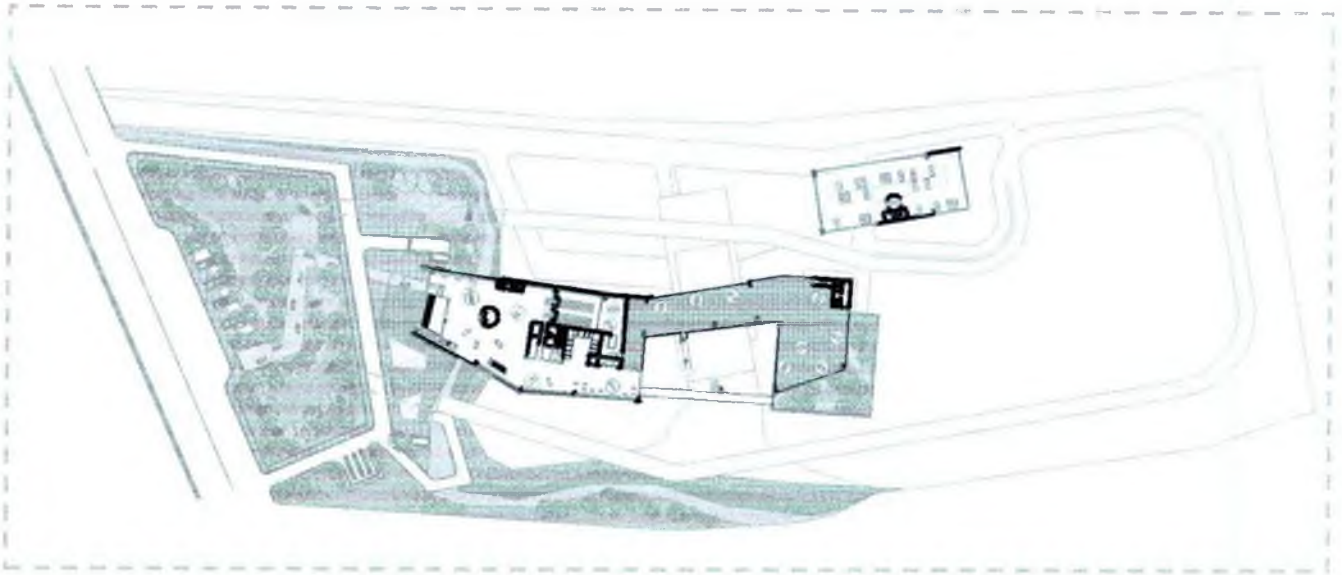


Figure 43: 38' level plan
Museum level plan

In the first level of the museum it was proposed to display all the vehicles assembled by PRAGOTI Industries limited till now. In the second level it was proposed to accommodate classic, vintage, pre-modern cars. And in the third level there are displays of post modern, concept cars. There is also an interactive space for the visitors in the concept car section where they can get information's about concept cars, do interactive works, such as, painting, sketch, model making etc. there is also an observation area from where the visitors can watch the newly made cars taking test drive in the test track which is integrated with the whole structure.

The whole structure is basically supported by huge steel truss columns and beams. And these structural system is covered by thin shell concrete with punches on the roof and also on the side walls. These punches are with the reference of the displays inside.

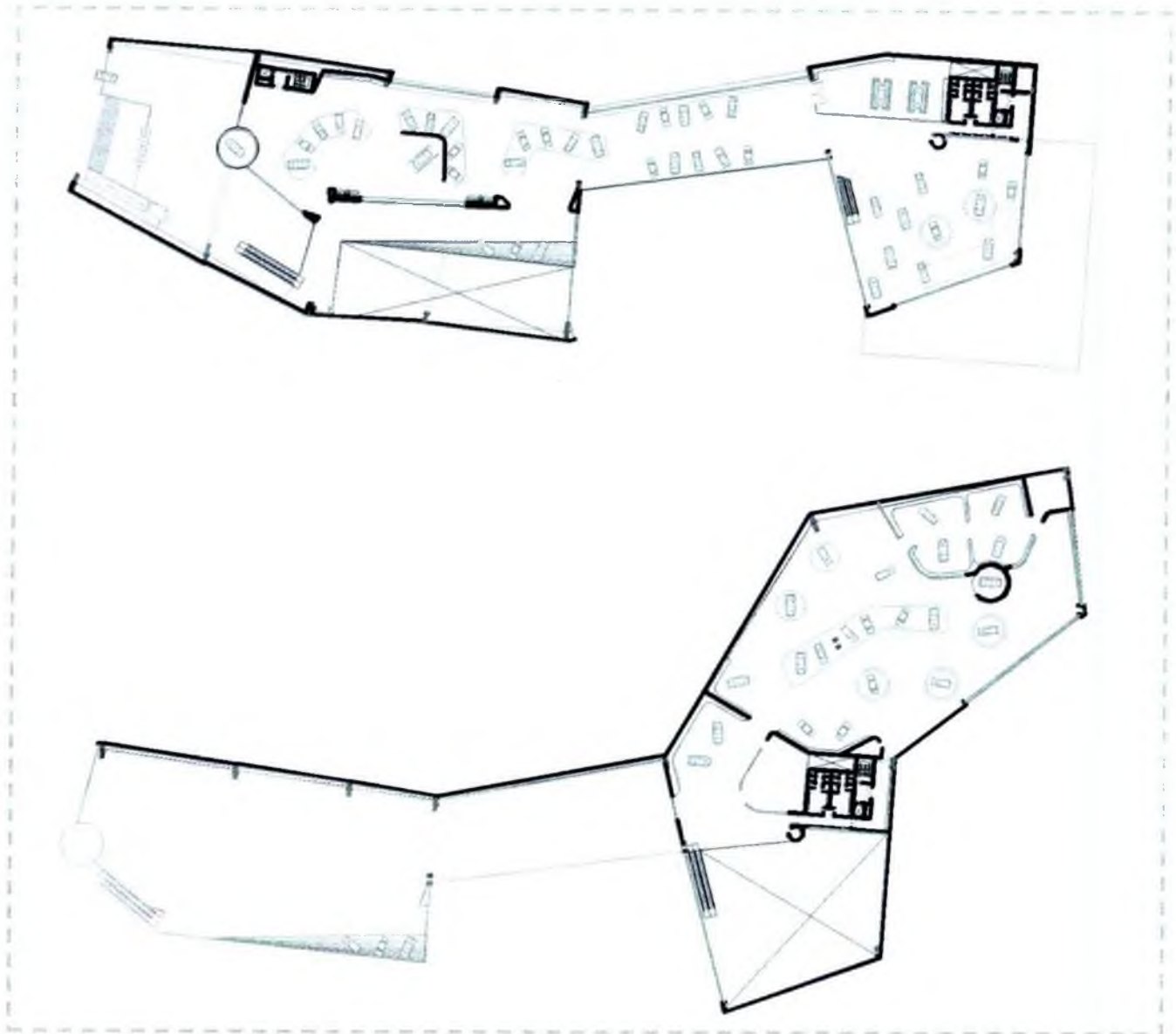


Figure 44: Museum second level plan
Third level plan

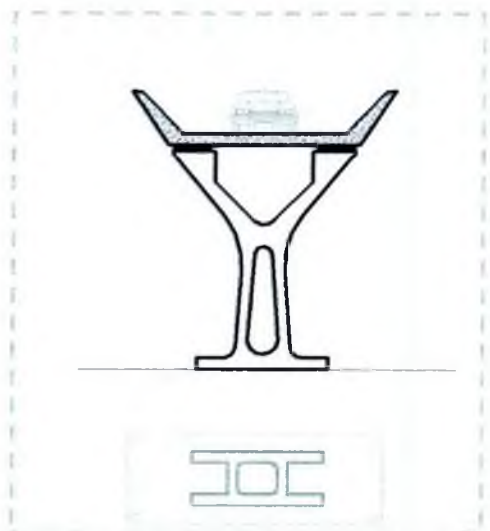


Figure 45: Structure to support the elevated test drive track

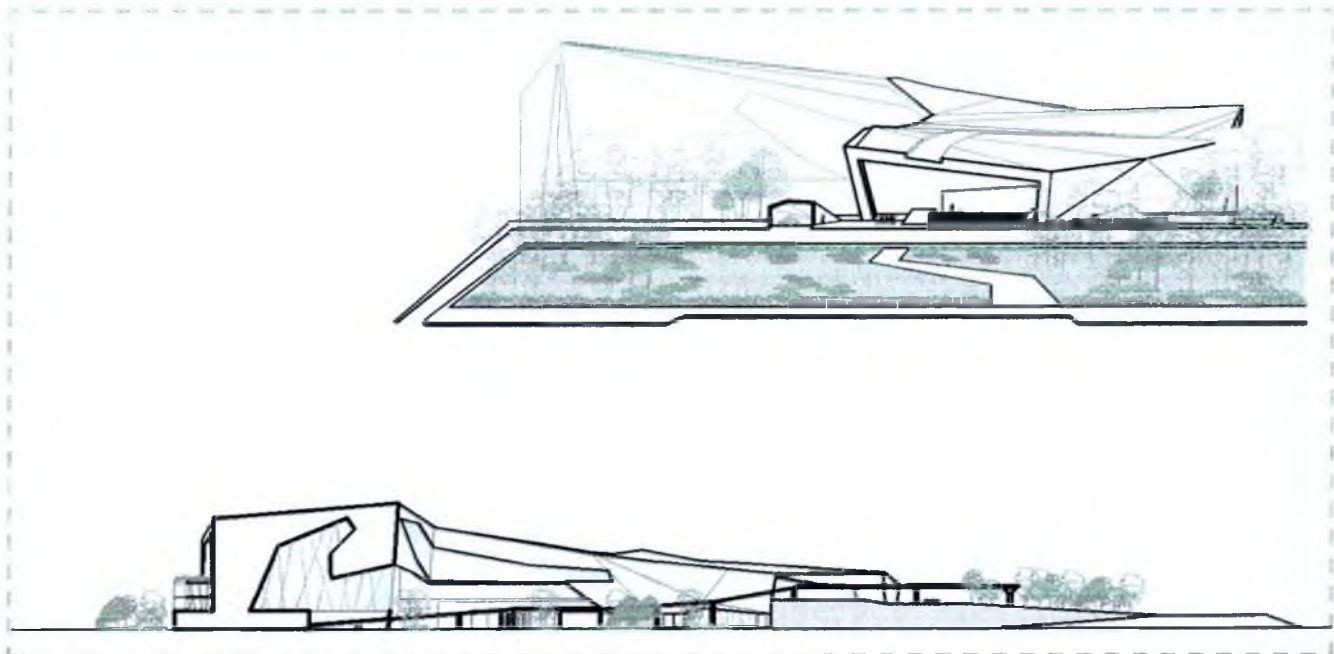


Figure 46: Elevations

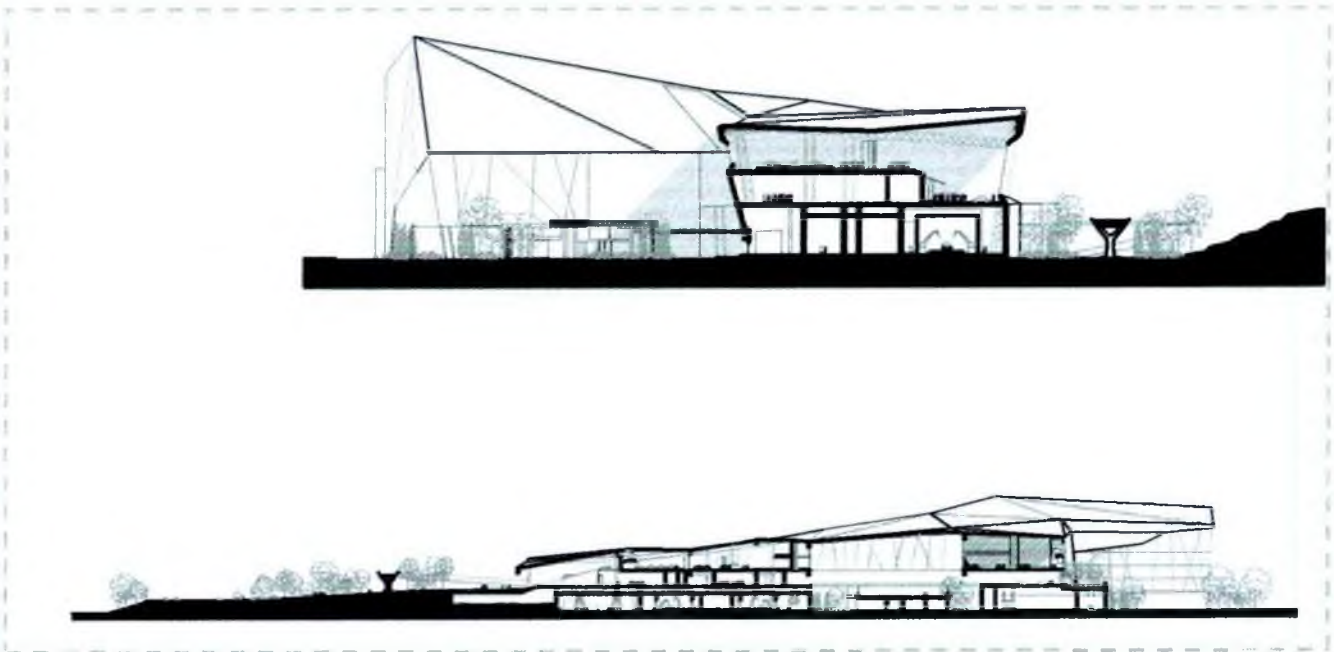


Figure 47: Sections

6.3 Structural diagram and details



Figure 48: Structural diagram

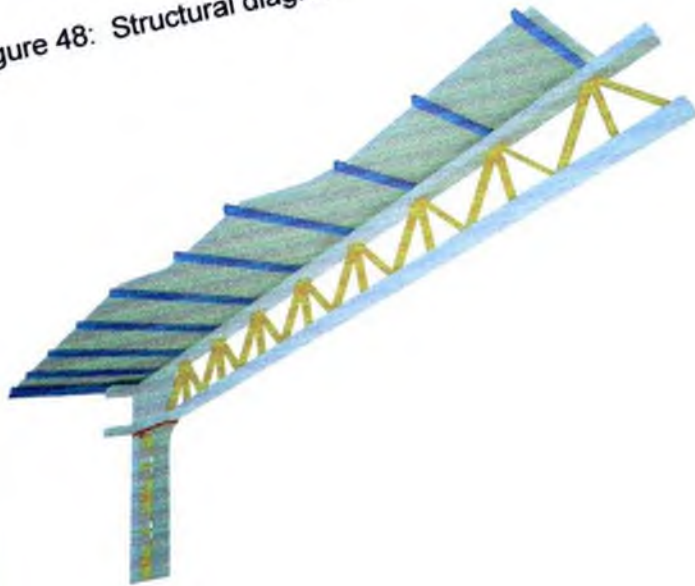


Figure 49: Steel truss column detail

6.4 Render views

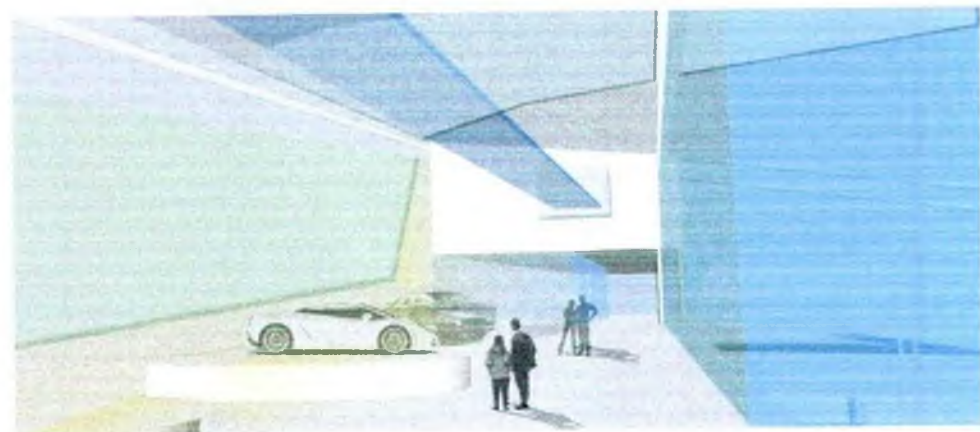
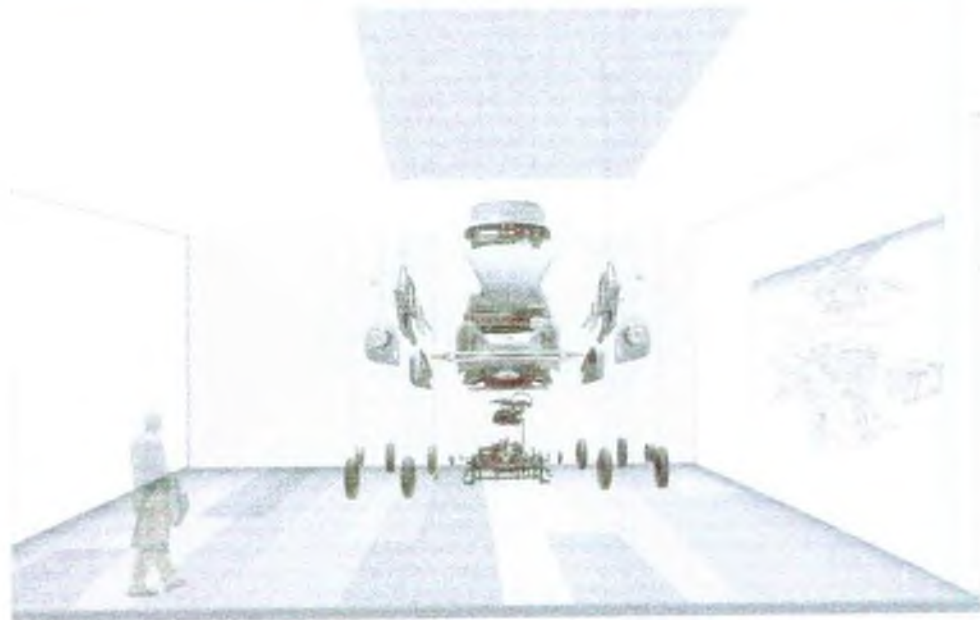
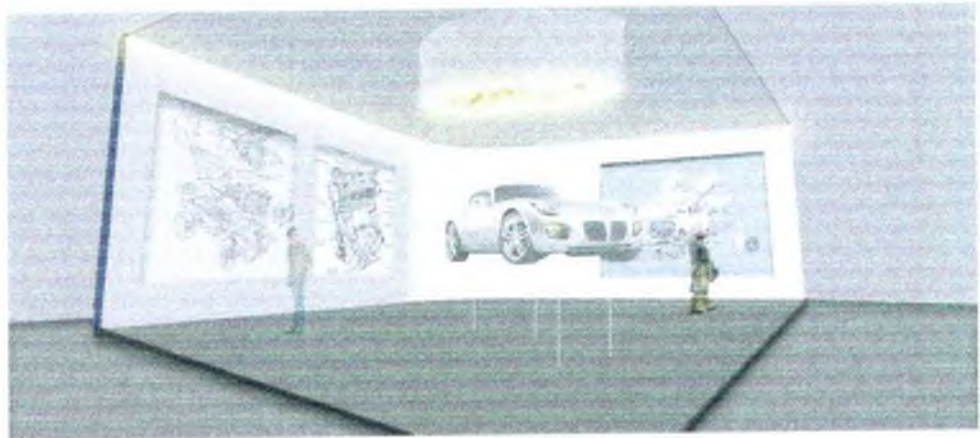
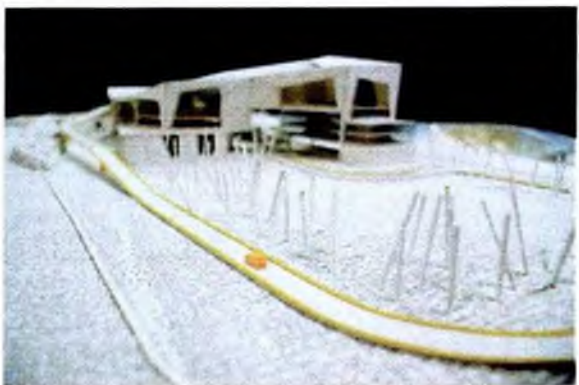
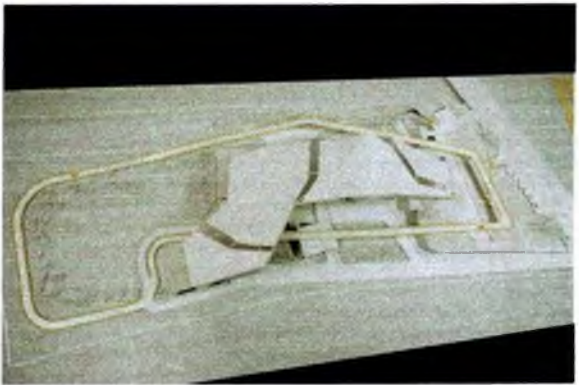
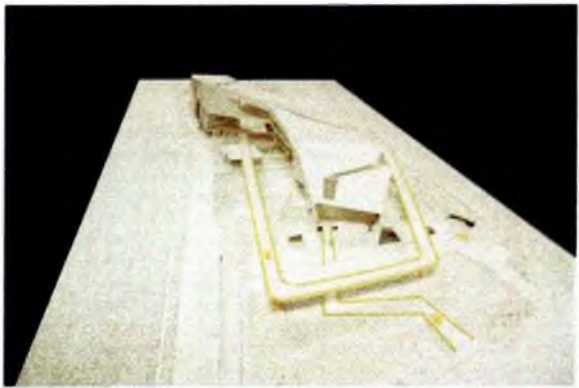


Figure 50: Interior view renders

6.5 Model images



References

1. Mr. Kutubuddin Ahmad Khan, Dy. General Manager, Pragoti Industries Limited.
2. Eng. Saiful Islam, Plant General Manager, Pragoti Industries Limited.
3. A review of assembly line balancing and Sequencing including line layouts, *Johan Håkansson, Emil Skoog och Kristina Eriksson, University West, Department of Engineering Science*
4. CONTINUOUS IMPROVEMENT APPLICATION IN VEHICLE ASSEMBLY PLANT, ANMAR MILYANI ABDULLAH ABU-TAYLI SULTAN BIN-TAYYASH, King Saud University College of Engineering Department of Industrial Engineering.
5. Automobile assembly line,
6. History of the automobile,

Conclusion

If the assembly plant upgrades as the proposal mentioned, it would surely do good for our country. With such an international standard automobile assembly plant and a museum for cars, our country will surely catch up with the other developing countries in this particular industry. But it will be small step to a bright future of our country. With such a museum based on history of automobiles, which is currently a very popular topic of research, technology, exhibition, social aspects etc. there would only be positive outcome. Overall , it has been tried in this project to design such a functional, efficient spaces for the plant and at the same time a platform for international automobile expo, gathering of all sorts of people and cars.