

EXPERIENCE CENTER AND INDUSTRIAL TRAINING INSTITUTE FOR ELECTRIC AUTOMOBILES

A THESIS

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Architecture degree

By

JASWANTH SAKTHI S A
(37210017)



DEPARTMENT OF ARCHITECTURE
SCHOOL OF BUILDING AND ENVIRONMENT

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY) Accredited

With Grade "A" by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI,
CHENNAI - 600 119

NOVEMBER 2021



DEPARTMENT OF ARCHITECTURE

BONAFIDE CERTIFICATE

This is to certify that this Thesis Report is the bonafide work of JASWANTH SAKTHI S A (37210017) who carried out the Thesis entitled "Experience center and industrial training institute for electric automobiles" under our supervision from July 2021 to November 2021.

Internal Guide
Ar.Monisha.G

Internal Review Member
Ar.Ramkumar.R

External Guide
Ar.Biswajith Paul

A handwritten signature in blue ink, appearing to read 'Devyani', is centered on the page.

Dean and Head of the Department
Dr. DEVYANI GANGOPADHYAY

Submitted for Viva voce Examination held on 08/12/21

Internal Examiner
AR.Shankar.V

External Examiner
AR.SathishMosses.R

DECLARATION

I, **JASWANTH SAKTHI S A** hereby declare that the Thesis Report entitled "Experience center and industrial training institute for electric automobiles" done by me under the guidance of **Ar.Monisha**(Internal Guide), **Ar.Ramkumar**(Internal Review Member) and **Ar.Biswajith Paul** (External Guide) Sathyabama Institute of Science and Technology is submitted in partial fulfilment of the requirements for the award of Bachelor of Architecture Degree.



DATE: 06/12/21

PLACE: Chennai

SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to Board of Management of **Sathyabama Institute of Science and Technology** for their kind encouragement in doing this Thesis and for completing it successfully. I am grateful to them.

I convey my thanks to **Dr. DevyaniGangopadhyay**, Dean and Head of the Department, School of Building and Environment, Our Design Chair **Dr. Suresh Kuppuswamy**, Thesis Coordinator**Ar.SuryaRajkumar** for providing me necessary support and details at the right time during the progressive reviews.

I would like to express my sincere and deep sense of gratitude to my Thesis Internal guide **Ar.Monisha.G**, Internal Review member **Ar.Ramkumar.R** and External Guide **Ar.Biswajithpaul**their guidance, suggestions and constant encouragement which paved the way for the successful completion of my Thesis work.

I wish to express my thanks to all Teaching and Non-teaching staff members of the **Department of Architecture** who were helpful in many ways for the completion of the Thesis.

JASWANTH SAKTHI S A

THESIS SYNOPSIS

THESIS – November 2021

Batch: 2017-2022

Register No: 37210017

Student Name:JASWANTH SAKTHI S A

Thesis topic with thrust area and location	EXPERIENCE CENTER AND INDUSTRIAL TRAINING INSTITUTE FOR ELECTRIC AUTOMOBILES, KUNDRATHUR
Thesis (Mention is it live proposal / hypothetical)	HYPOTHETICAL
Sponsoring Institute	OLA PVT LTD
Design intent (Thrust Area) in Thesis	TO EMPHASIZE ON THE IMPORTANCE OF ELECTRIC AUTOMOBILES AMONG PEOPLE THROUGH EXPERIENCE CENTER AND TO EDUCATE PEOPLE ON THE HANDLING OF THE SAME.
Challenges in Design	TO INTRODUCE NECESSARY OTS WITH THE INDUSTRIAL BLOCKS IN ORDER TO PROMOTE HUGE AMOUNT OF LIGHT AND VENTILATION TO INTEGRATE INSTITUTE, ADMIN AND THE RESEARCH AND DEVELOPMENT WING
Broad Design Program	EXPERIENCE CENTER : RECEPTION, EXPERIENCE HALL, WORKING MECHANISM, ASSEMBLY/DISASSEMBLY, AUTOMOBILE CHARGING ASSEMBLIES, LOADING BAY, CAFETERIA, WORKSPACE ETC INSTITUTE : ADMIN, CLASSROOMS, WORKSPACE, ASSEMBLING AREA, WORKSHOPS, OAT, TESTING LABS, AUDITORIUM, RECREATIONAL AND OPEN SPACES.
Site location, Site area and Site Context	https://earth.google.com/web/@12.99251321,80.12136925,16.00159387a,717.76760539d,30.00000939y,357.26233284h,0t,0r 17 ACRES LOCATED IN AN INDUSTRIAL AREA WHICH FACILITATES TRANSPORTATION OF VEHICLES AND ALSO HAS SCOPE OF INSTITUTIONAL DEVELOPMENT (NEIGHBOURHOOD – MADHA ENGINEERING COLLEGE)
Identification of Case studies / Literature studies	-> AUTOMOTIVE INTELLIGENCE CENTER, SPAIN -> PORSCHE EXPERIENCE CENTER, ITALY -> NATIONAL INSTITUTE FOR AUTOMOTIVE INSPECTION, ASSAM -> INDUSTRIAL TRAINING INSTITUTE, AMBATTUR

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

“In order to have clean air in cities, you have to go electric” - Elon Musk,

It is already high time that we switch to electric vehicles for the purpose of the benefits it has. India and China being the hub for automobile market, 98% of the Indian population still use combustible engines for their commute, therefore a huge amount of mindsets has to be changed in accordance to the quality and the benefits that electric engines give when compared to combustible engines. In such case people would need basic knowledge on the vehicle on how it is going to perform on roads and also to tackle the its service requirements highly trained professionals are required, hence this design would significantly help in resolving the problems that are currently faced.

1.2 AIM

To spread knowledge on the electric automobiles that are soon to be in large numbers in the industry soon, through experience center, and also

To train upcoming students about the field of electric automobiles and their impact on the environment and people through exclusive conventional training programmes associated with UG and PG courses of Automobile engineering.

1.3 SCOPE

There is no significant institution present to educate students on the upcoming generation of E- vehicles and also people would have to really know on how the Engine works and also how it feels like to drive them on the road, for these issues this thesis project would be helpful in satisfying the need of the hour.

1.4 METHODOLOGY

- To detail out various case studies to know the programme for the course that is to be offered on E-vehicles,
- To conduct market surveys as well as gather people's opinion on the E-vehicles (advantages and the disadvantages that they would likely face) and incorporate those ideas in the design
- To understand on the working of the E-vehicles to design the spaces in accordance to it, so that it would be clear on what actually people need to see and understand in the experience center.

CHAPTER 2

LITERATURE CASE STUDIES

2.1 INSTITUTE OF ENGINEERING AND TECHNOLOGY- AHMEDABAD

CASE STUDIES :

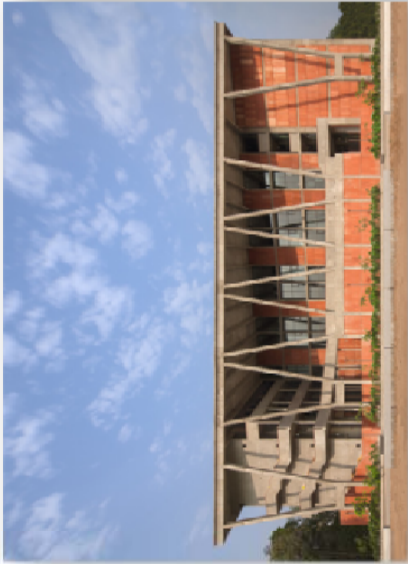
1) Institute of Engineering and Technology – Ahmedabad University

Architects: Vir.Mueller Architects

Area: 252000 ft²

Year: 2015

The architectural design for the Institute of Engineering and Technology at Ahmedabad University exemplifies the typology of an academic quadrangle - a central courtyard garden, flanked by student and faculty rooms





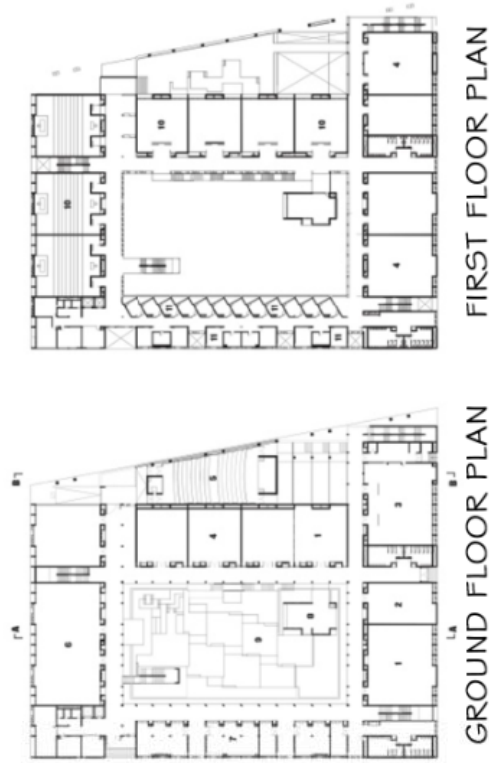
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Plate 2.1

1) Institute of Engineering and Technology – Ahmedabad University :

‘The main thrust of the design is the quad and colonnade, which the architect says is a recall of the timeless image of cloisters and their accompanying solemnity’



SITE ->

The northern, short edge of the site abuts a central piazza, the western side has a pedestrian path and the southern a road. The eastern boundary adjoins a site to be built on in future. Entrances sit at the western, eastern and southern sides. Of these, the eastern would logically have provided a direct, eye-catching entrance for students and visitors.

CIRCULATION ->

The building circulation - in the form of cantilevered stairs and screened galleries - weaves alongside the courtyard, creating a dynamic relationship between landscape and architecture.

The galleries and corridors are designed to facilitate seamless movement, while offering repose with a line of sandstone benches oriented towards views of the garden.



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Plate 2.1



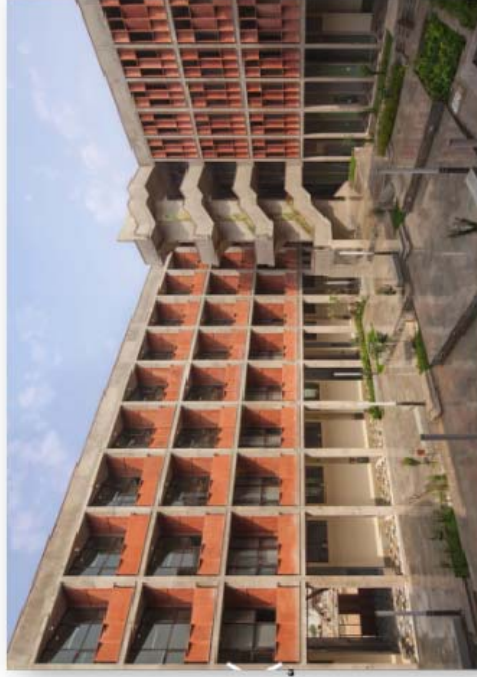
ROOMS->

Rooms accessed from the galleries through very tall doors are substantial, with depths of 12-15 metres. Most are lecture halls for large numbers of students. Their size and proportion rule out uniform natural daylighting and ventilation, so all are artificially lit and air conditioned. Accessed via cut-off lobbies, their seats face windows in the external walls. The glare compels the use of blinds that shut out the view, making the large windows redundant.

CANTILEVERED STAIRS

MICRO CLIMATE->

The landscape design evokes micro-climates within the building: a sunken garden "kund" is situated between the canteen and the auditorium, creating an informal gathering space for students; the roof of the auditorium is designed as a shaded terrace "maidaan" – a paved garden – offering views of the Ahmedabad University plaza. Red sandstone screens weave a kinetic sculpture within the central courtyard, filtering light by day and emitting a soft glow at dusk.



COURTYARD



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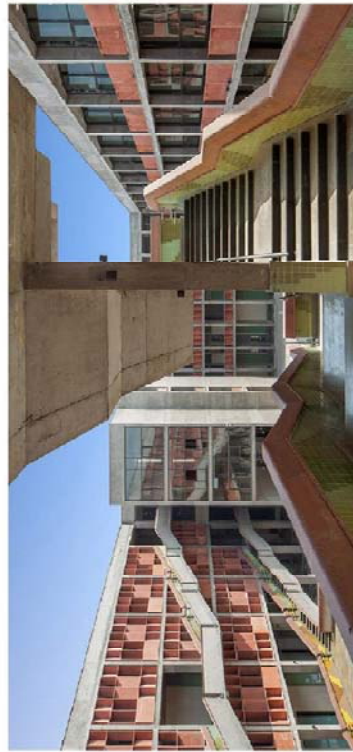
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Plate 2.1



INTERIORS

SECTIONS



VIEWS



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Plate 2.1

2.2 AUTOMOTIVE INTELLIGENCE CENTER, SPAIN

2) AUTOMOTIVE INTELLIGENCE CENTER - SPAIN :



Architects: IDOM

Area: 19000sq.m

This Building Has A Complex Of 3 Buildings, Two Of The Buildings Are Intended For UseAs Development Units (Halls) With Laboratories And Small-scale Production.

The Third, The Main Building, Houses Research Units Of Various Companies In The Automotive Sector, A Laboratory And The Social Block Of The Complex, Comprising: Main Lobby, Auditorium, Training Classrooms, Classrooms For Projects In Cooperation With Universities, And The Offices Of The Centre's Management.

Plate 2.2



EXPERIENCE CENTER AND INSTITUTE
FOR ELECTRIC AUTOMOBILES

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2) AUTOMOTIVE INTELLIGENCE CENTER - SPAIN :

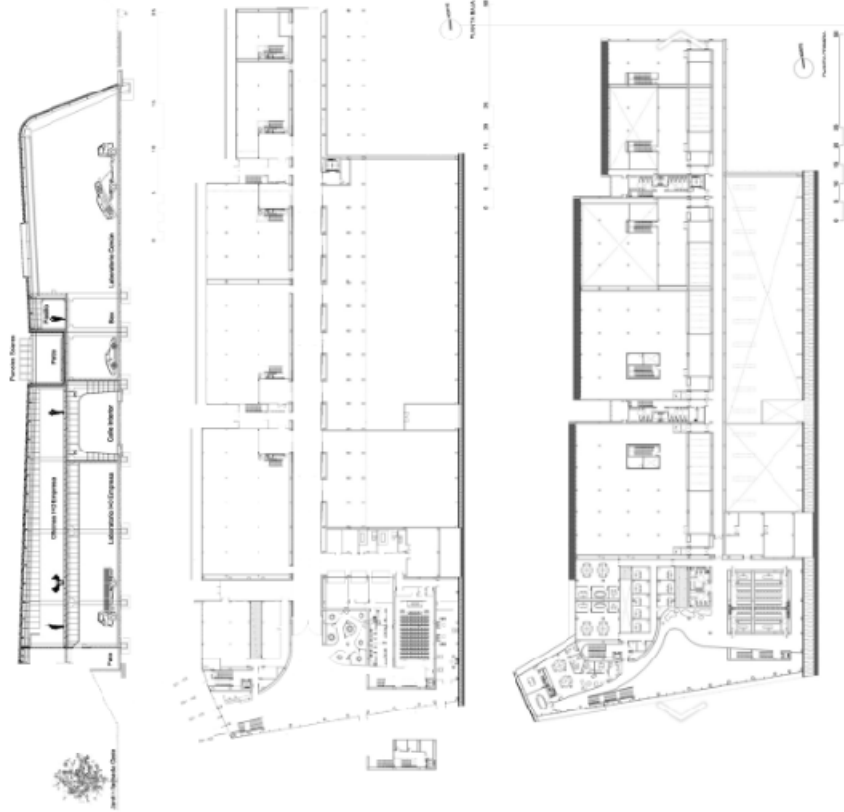


Plate 2.2

Continuing at the ground floor level, an internal access "street" Above it, at the first floor level, a passageway fulfils the same service for people to access the offices of the companies. The lower parts of the roof are reserved for future "units" of the shared projects.

The Complex Is Located On An Industrial Estate Away From The Urban Nucleus. The Design Strategies Have Been Geared, On The One Hand, To Making The Building Visible From The Bordering Motorway (The Aspect Of The South Facing Lobby)



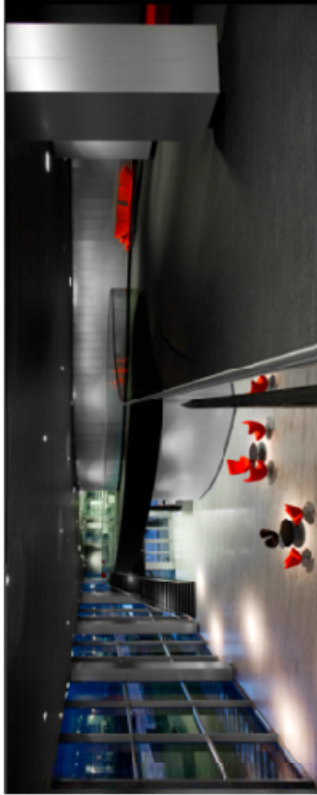
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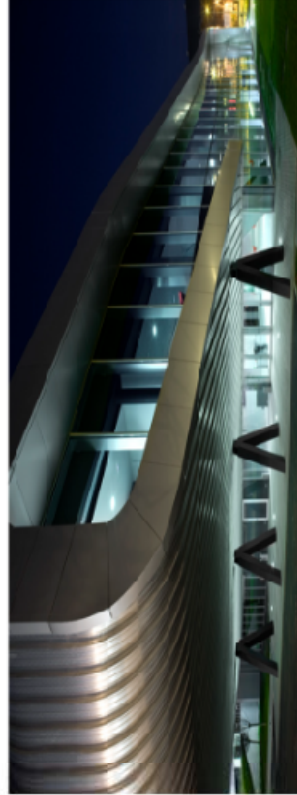
2) AUTOMOTIVE INTELLIGENCE CENTER - SPAIN :



Special Care Has Been Paid So That The Necessarily Elevated Number Of Outdoor Machines And Equipment That A Centre Of This Type Needs, Have The Least Visual And Acoustic Impact. To That End Various Patios Have Been Planned, .The Solar Panels Are Installed Over The Roof Patios, Contributing To That Idea Of Concealment.



The Structure Is Of Steel At The Head (Social Area) And Prefabricated Concrete In The Rest. The Facades Are Of Kalzip And Curtain Walling



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Plate 2.2

2.3 NATIONAL INSTITUTE FOR AUTOMOTIVE INSPECTION AND TRAINING Plate 2.3

3) NATIONAL INSTITUTE FOR AUTOMOTIVE INSPECTION, MAINTENANCE AND TRAINING, ASSAM



National institute for automotive inspection, maintenance and training (NIAIMT) Provide State-of-the-art Training And Testing Facility In The Automotive Sector And Be A Model Center For The Services.

This Campus Has 3 Sub Divisions

- > INSPECTION AND MAINTENANCE STATION
- > MECHANIC TRAINING INSTITUTE AND
- > DRIVER TRAINING INSTITUTE

INSPECTION AND MAINTENANCE :

A) Fixed Inspection Lane:

The Workshop Has Two Automated Fixed Lanes, One Is Used For Light Motor Vehicle (Lmv) And Other Is For Heavy Commercial Vehicle (Hcv).

The Station Has Vehicle Data Entry Facility And Control Room To Monitor The Activities Of The Ims Workshop.



FIXED INSPECTION LANE



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3) NATIONAL INSTITUTE FOR AUTOMOTIVE INSPECTION, MAINTENANCE AND TRAINING, ASSAM



Plate 2.3

MECHANICAL TRAINING INSTITUTE :

Mti Has 6 Numbers Of Well-equipped Labs As Mentioned Below:-

1. Diesel Engine Lab
2. Welding Lab
3. Auto Electric And System Lab
4. Diagnostic And Repair Lab
5. Gasoline Engine Lab
6. E-learning Lab

Apart From Labs, Mti Has Audio-visual Classrooms, Library And E-learning Facility, Drawing And Drafting Classrooms Including Plotter, Other Training Aids.

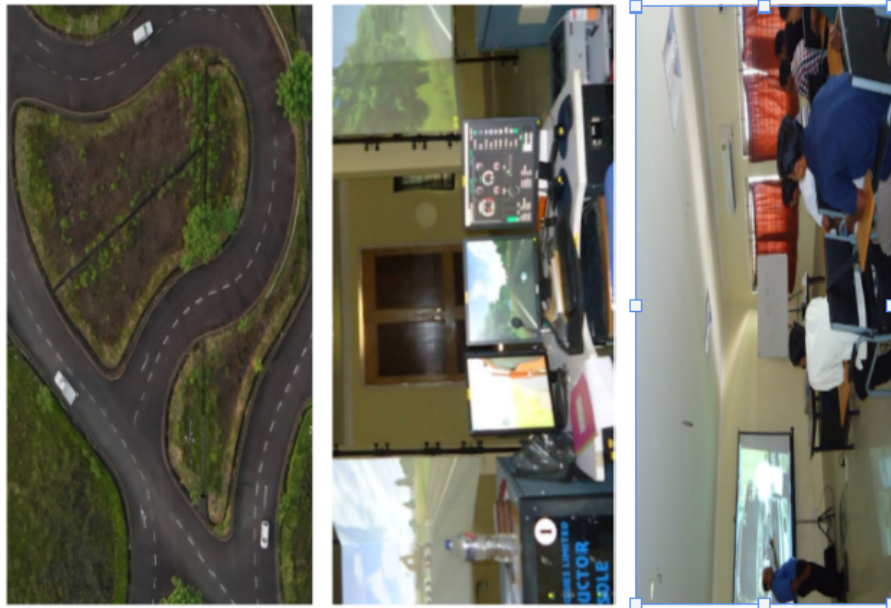
There Are Also Hostel, Canteen And Sports Facility.



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3) NATIONAL INSTITUTE FOR AUTOMOTIVE INSPECTION, MAINTENANCE AND TRAINING, ASSAM



DRIVERS TRAINING INSTITUTE :

1) Tracks:

The Driving Training Institute Has A Plain Track Of 1.2 Km Length At Its Jaffirbond Campus.

The Track Includes Sections With Curves Of Different Radius, Braking Area, Slalom

Section, T Section Etc. Niamt Has A Hill

Driving Training Track Of 1.1 km At Its

Dholchera Campus Dedicated For Specialized Hill Terrain Driving Training.

2) Driving Simulators:

The Institute Has Advance Driving Simulators For Heavy Motor Vehicle And Light Moving Vehicle. This System Includes Hmv/Hcv Driving Simulator 2 Stations And Lmv Simulator 1 Station.

3) Class Room And Other Facilities:

The Class Rooms Are Fully Equipped With Audio-visual Equipments, Air-conditioned And Having E-learning Lab For Students.

Plate 2.3

2.4 PORSCHE EXPERIENCE CENTER, SPAIN

CASE STUDIES:

1) PORSCHE EXPERIENCE CENTER :



The design of Porsche's new North American Experience Center and Headquarters combines office, training and driving functions into one sleek, high-performance facility



The LEED Gold-certified building's east-west exposures eliminate glare while the north-south curtain walls maximize natural light and minimize solar heat gain.



By integrating a 1.6-mile driver track into the lower levels of the office building and weaving in subtle motor-sport-related cues, the design immerses visitors in the Porsche experience while demonstrating the unique capabilities of its sports cars.



INTERIORS



A green roof links the building to the landscape while providing insulation and reducing stormwater runoff and the parking area includes charging stations for Porsche's electric vehicles.



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Plate 2.4

CHAPTER 3

DATA COLLECTIONS AND STANDARDS

3.1 STANDARDS

- MINIMUM ROAD WIDTH - 7.2m
- MAXIMUM HEIGHT - 18.3m
- FSI - 2.0
- SETBACKS - 6m (every side)
- OSR - 10%
- MINIMUM CORRIDOR WIDTH - 2.0m
- STRUCTURES IN SETBACK SPACES
 - Sun-shades not exceeding 0.6m
 - Motor room of area not exceeding 2 sq.m. each and height not exceeding 1.8m,
 - A compound wall of height not exceeding 2.0m
 - Watchman booth not exceeding 2.5m.x 2.5m. height not exceeding 3m.
 - Vehicular entry or exits to site - 2 no.s
(i.e. one entry or one exit); provided that an additional gate for every 50 metres frontage.

Source - TNCDRBR, NBC

3.1.2 PARKING

- 1 car space for every 100sq.m and 1 two-wheeler space for every 30sqm of floor area
- 50% of the car spaces shall be provided in the front area abutting the road so as to act as a recessed parking area for the drop/pick up for students.
- Internal road width - Single way - 3m
- Double way - 7m
- Slope of parking spaces shall be not more than 4% in any direction.
- Gradient for the ramps in parking spaces shall not be steeper than 1 : 8
- The Clear headroom (between floor and beam bottom) shall be minimum 2.2metres in parking spaces.

3.1.3 SANITATION

	Boys	girls
W.c	1/ every 40	1/ every 25
Urinals	1/ every 20	-
Wash basin	1/ every 40	1/ every 40
Drinking water	1/ every 50	1/ every 50
Cleaning sink	1/floor	1/floor
Taps	1/w.c	1/w.c

Source - tncdrbr, nbc

3.1.4 ELECTRICAL ROOM

- The electrical room with RCC roof shall have clear floor area 6m. X 4m with a vertical clearance of 2.75m.
- A clear space of 10m. x 4m. or 5m. x 5m. open to the sky shall be provided preferably at the main entrance.
- The transformers yards shall be located only in the periphery of the ground floor, observing suitable clearances.

3.1.5 DIFFERENTLY ABLED

- Minimum width of ramp shall be 1800mm with maximum gradient 1:12. Length of ramp shall not exceed 9.0m
- The minimum width of stairways shall be 1350 mm, riser - 15mm, tread - 30mm with 12 risers on a flight.
- The minimum toilet size shall be 1500 mm x 1750 mm, door shall be 900mm and shall swing out.
- The lift lobby shall be of an inside measurement of 1800 mm x 2000 mm or more.

Source - TNCDRBR, NBC

3.1.6 STAIRWAYS:

- Minimum width of staircase is 2 m.
- MINIMUM TREAD - The minimum width of tread shall be 300mm. In case of spiral staircase, it shall have the above minimum tread width at the outer end.
- MAXIMUM RISER - The maximum height of riser shall be 150mm and it shall be limited to 15 per flight. The minimum headroom in a passage under the landing of a staircase shall be 2.2m. The clear headroom in any staircase shall be 2.2m.

3.1.7 BATHROOMS AND WATER CLOSETS:

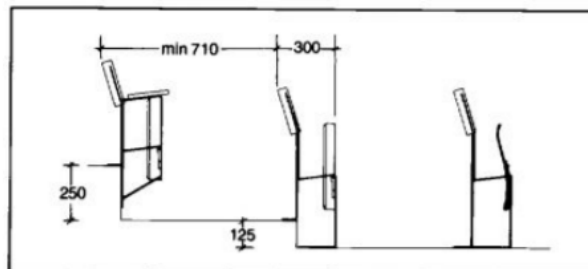
- The height of a bathroom or water closets measured from the surface of the floor to the lower point in the ceiling bottom of slab shall not be less than 2.1m.
- The area of a bathroom shall not be less than 1.4 sq.m. with a minimum width of 1.0m. The floor area of water closet shall be 1.0 sq.m. with a minimum width of 0.9m.
- If bath and water closet are combined, its floor area shall not be less than 2.4 sq.m. with a minimum width of 1.2m.

3.1.8 PLINTH:

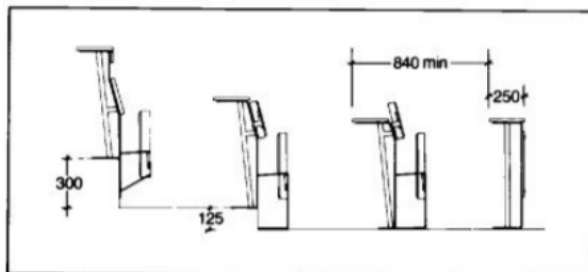
- The height of the plinth shall be not less than 45cm from the surrounding ground level.
- Interior courtyards and covered parking areas shall be raised at least 15 cm above the determining ground level and shall be satisfactorily drained.

Source - TNCDRBR, NBC

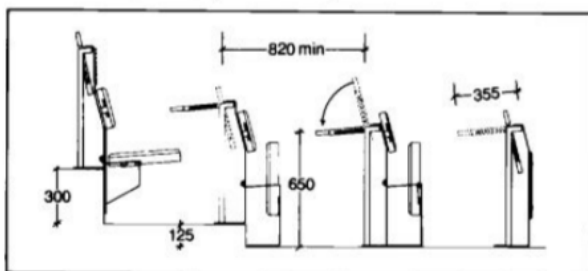
Unobstructed vertical space between seats - 300



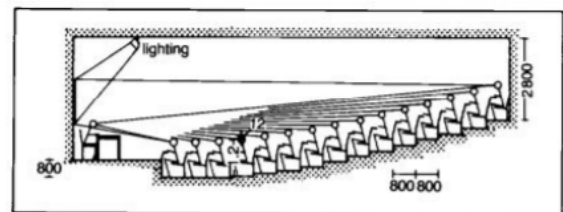
1 Fixed seating with tip-up seats



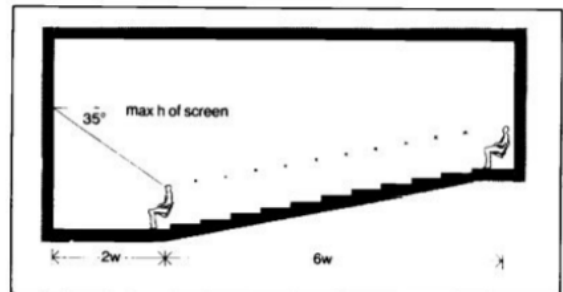
2 Fixed seating with tip-up seats & writing shelf



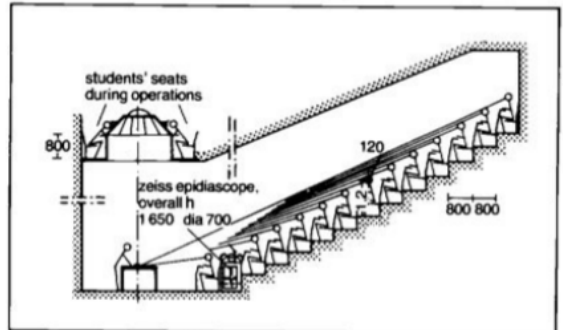
3 Fixed seating with tip-up seats & retractable shelving



5 Section through orthodox lecture theatre



6 Preferred viewing distances for cinema projection



7 Lecture theatre with demonstration table (surgical clinic)

Fig 3.1 Standards of an auditorium

3.2 AREA STATEMENT :

3.2.1 EXPERIENCE CENTER

Reception - 30 sq.m

Gallery - 1200 sq.m

Screening - 300 sq.m

Assemblage/ - 200 sq.m
Disassemblage

Cafeteria - 300 sq.m

Waiting - 100 sq.m

Retail store - 250 sq.m

Stimulation - 150 sq.m

Office - 100 sq.m

Storage and kitchen - 100 sq.m

3.2.2 INSTITUTE

ADMIN BLOCK

Dean's office - 30sq.m

Strong room - 50sq.m

Conference room -100sq.m

Reception office - 25sq.m

Vip lounge - 45sq.m

Accountant office - 25sq.m

Director's office - 40sq.m

Assist director's office - 35sq.m

Admission - 36sq.m

Career counselling - 50sq.m

Exam cell - 30sq.m

Cctv room - 30sq.m

3.2.3 RESEARCH AND DEVELOPMENT

Welding lab - 100sq.m

Material handling - 100sq.m

Cnc turning - 300sq.m

Fitting lab - 180sq.m

Loading and unloading - 25sq.m

Assembly / disassembly - 200 sq.m

Inspection and maintenance - 150 sq.m

Automobile w.s - 700sq.m

Electrical workshop - 70sq.m

Cad lab - 300sq.m

Diagnostic and repair lab - 70sq.m

Kitchen - 900sq.m

3.2.4 OTHERS

Classrooms - 70 sq.m,
Training officer - 16 sq.m,
Placement officer - 30sq.m
Seminar room - 200sq.m,
Staff room - 4sq.m / staff
Security - 8sq.m

Cctv - 20sq.m
Electrical room - 30sq.m
Motor rooms - 12sq.m
Transformer yard - 30 sq.m
Stp - 300000lt

3.2.5 TRADES

Courses	no.of.years	no.of.seats
Mech autobody painting	1	24
Mech 2&3 wheeler	1	24
Mech motor vehicle	1	24
Mech machine tool Maintenance	1	25
AutobodyElectricals	1	25

CHAPTER 4

SITE STUDY AND ANALYSIS



Fig 4.1 SITE

Location :kundrathur
Site area : 20 acres
(82,151 sq.m)
Neighbourhood :
Madha matriculation
School, madha engineering college
Abutting road width :18m

4.1 SITE FEATURES :

- The boundary of the site is shared by madha matriculation school and has an access road of 18m long .
- The road connects to sriperumbadur, poonamalle, outer ring road and it has good connectivity to all around chennai
- There is no significant view points around
- The site and hence to be created within the site.
- The type of soil found in the site is clayey
South eastern part of the adjoins to the service road along the bridge which is under construction.

4.2 JUSTIFICATION :

- The site has good road network connectivity for all types of vehicles to access followed by the outer ring road and secondary road.
- Although there are several institutions all around there is no particular industrial schools that are present, where the area is significantly known for its industries present around the locality.
- This institute in kundrathur would more likely to fetch jobs from the nearby industries itself and hence this would be an apt environment.
- This institute and the experience center in kundrathur would become an opportunity for knowledge sharing
Among the people, and in case of any future expansion there wouldn't be any congestion of land.
- There is no significant experience center around the locality and hencethisinitiation would fetch interest
Among people.
- The context of the site responds to both institute as well as the experience center since much of similar

Activities happen around the site (industrial facilities)

- This institute in kundrathur for ola would be useful for educating the students and send them as trainees to their current production units for the manufacture of e scooters

4.3 FEASIBILITY STUDY :

4.3.1 MARKET ANALYSIS

- There is no significant institution for professional training in automobiles particularly near the site.
- Has good road network for transportation and also there are expected job opportunities within the industries present near to the site.

4.3.2 PRODUCTS AND SERVICES

- The services provided in here are more of industrial and technical studies, hence it involves work and manpower as of a industrial building and also the site responds for the same,
- The students emerging would have job oppurtunities and the Experience center would be an eye opener in the field of Electric automobiles

4.3.3 COMPETITION:

- This site would contribute to use the experience center hassell free as there are no such centers nearby
This site would host the first industrial school for automotive training apart from the professional courses offered by the colleges

4.3.4 FINANCIAL ANALYSIS :

- Reduced transportation costs since there are every roads accessible around the site including nh and sh
- Initial start up cost is quite high in terms of the services that are to be provided within the institution

4.4 SITE ANALYSIS

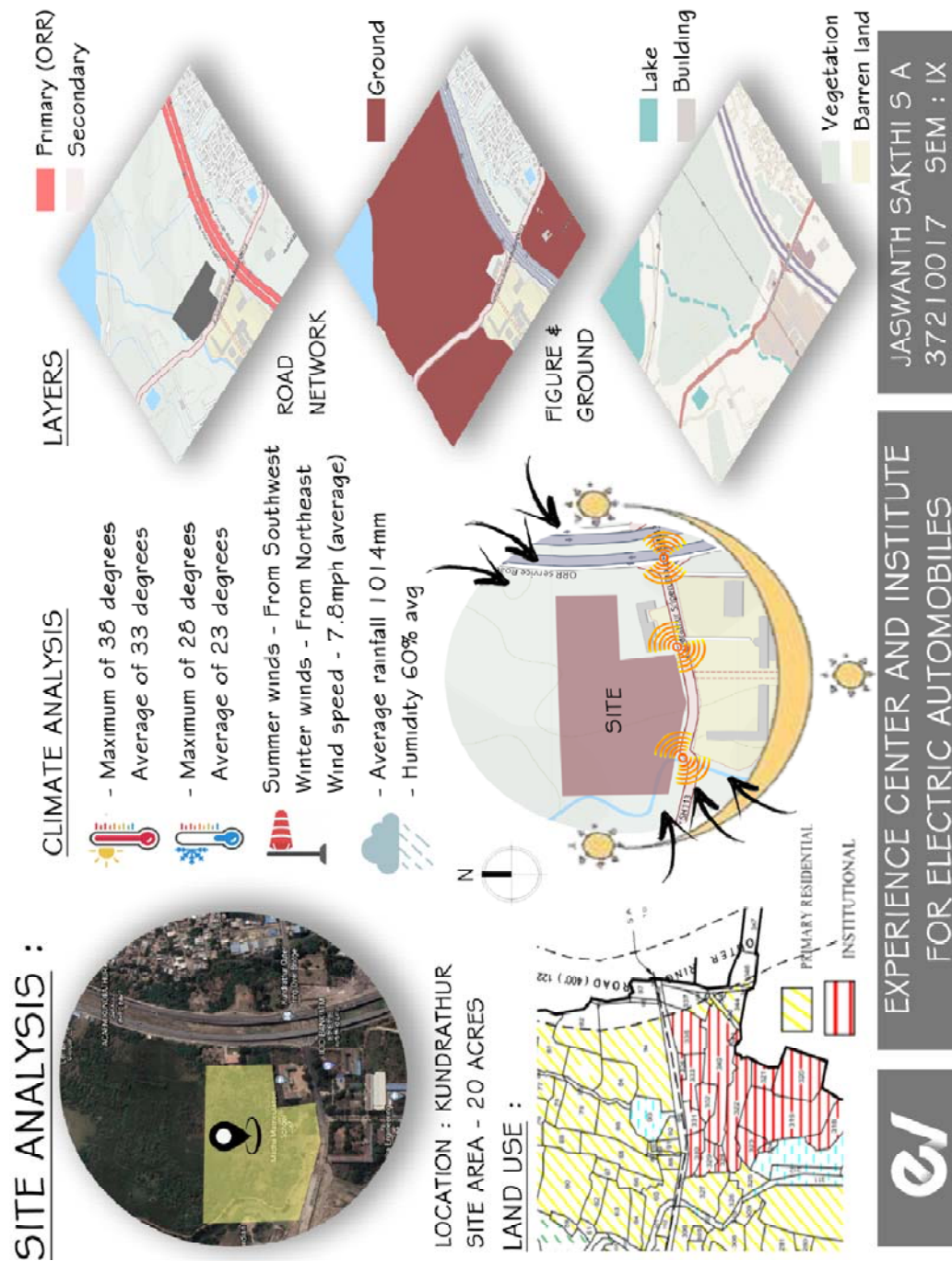


Plate 4.1 Site analysis

CHAPTER 5

ARCHITECTURAL DESIGN



Plate 5.1

[illegible]

GROUND FLOOR PLAN



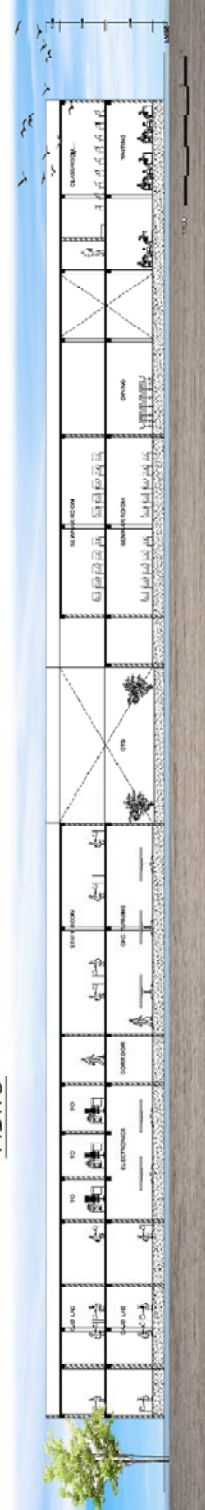
EXPERIENCE CENTER AND INDUSTRIAL
TRAINING INSTITUTE

28

MAIN BLOCK :



VIEWS



EXPERIENCE CENTER AND INDUSTRIAL
TRAINING INSTITUTE

JASWANTH SAKTHI S A
37210017 SEM : IX

Plate 5.2

EXPERIENCE CENTER:

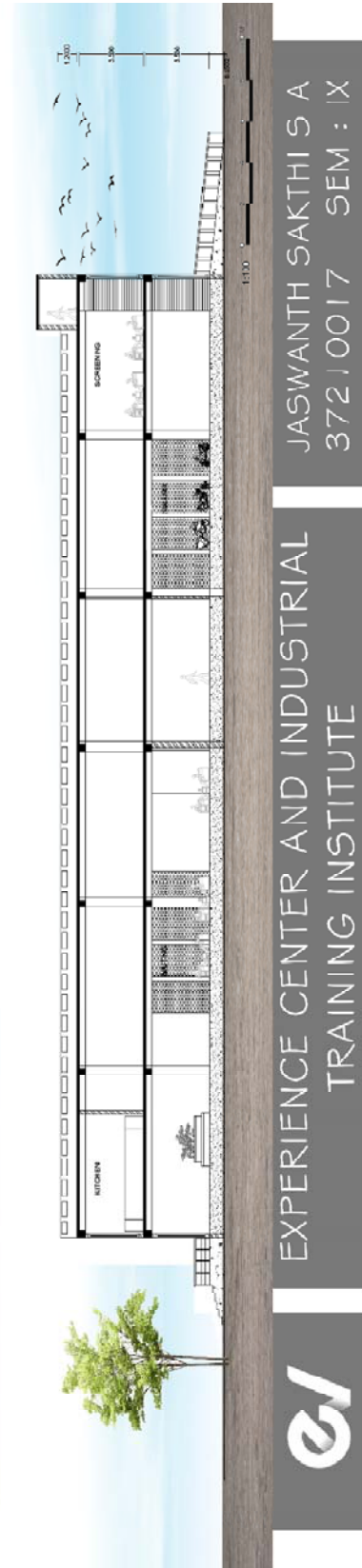
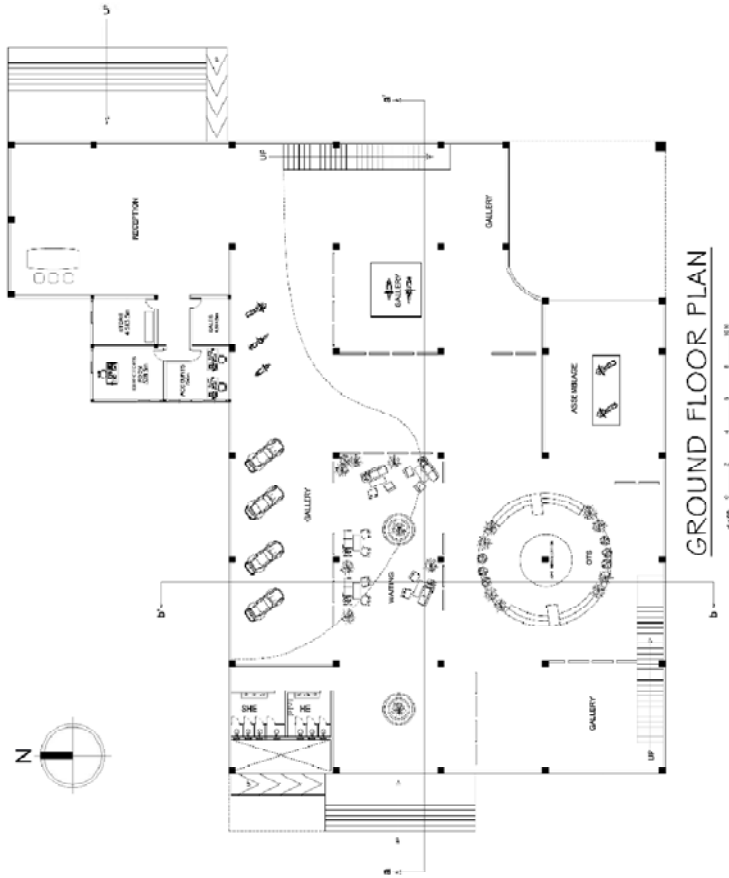


Plate 5..3

EXPERIENCE CENTER:

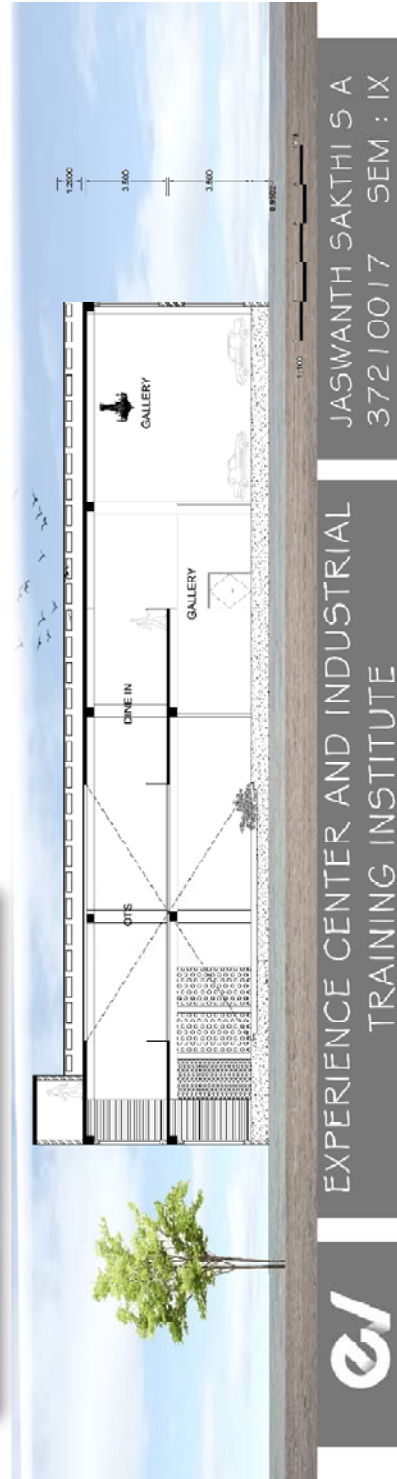
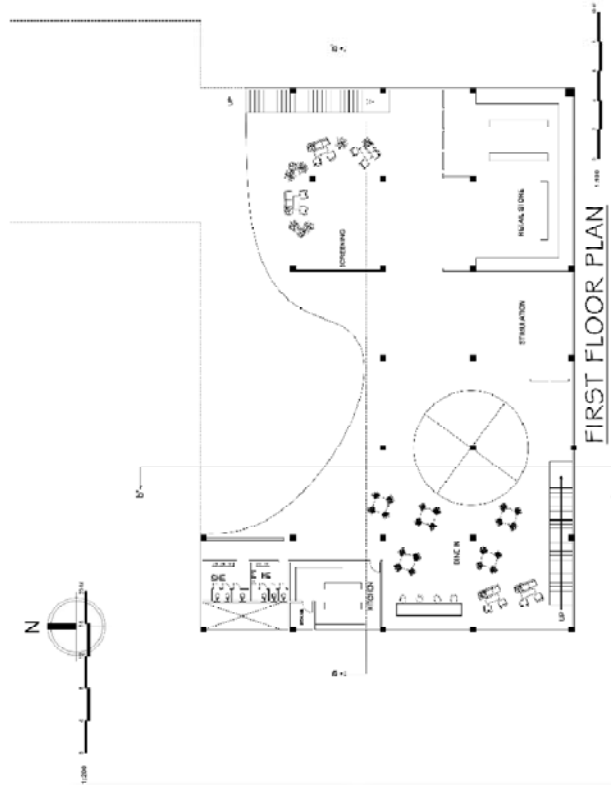
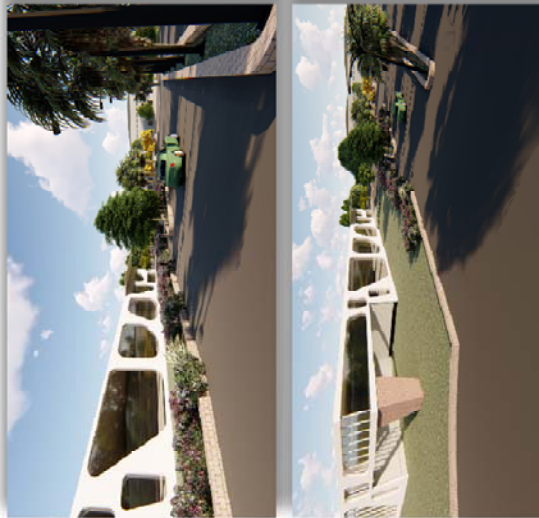
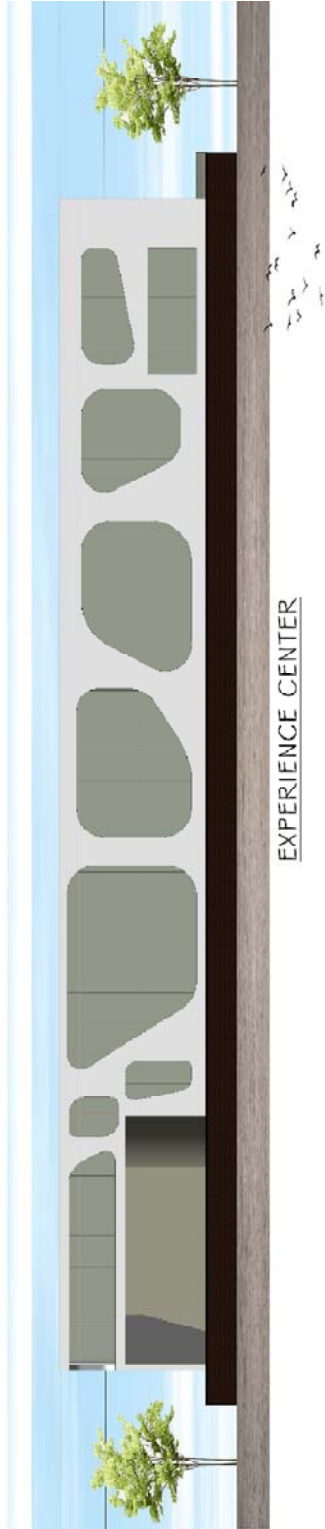


Plate 5.3
31

ELEVATIONS:



EXPERIENCE CENTER



MAIN BLOCK



SITE SECTION



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Plate 5.4

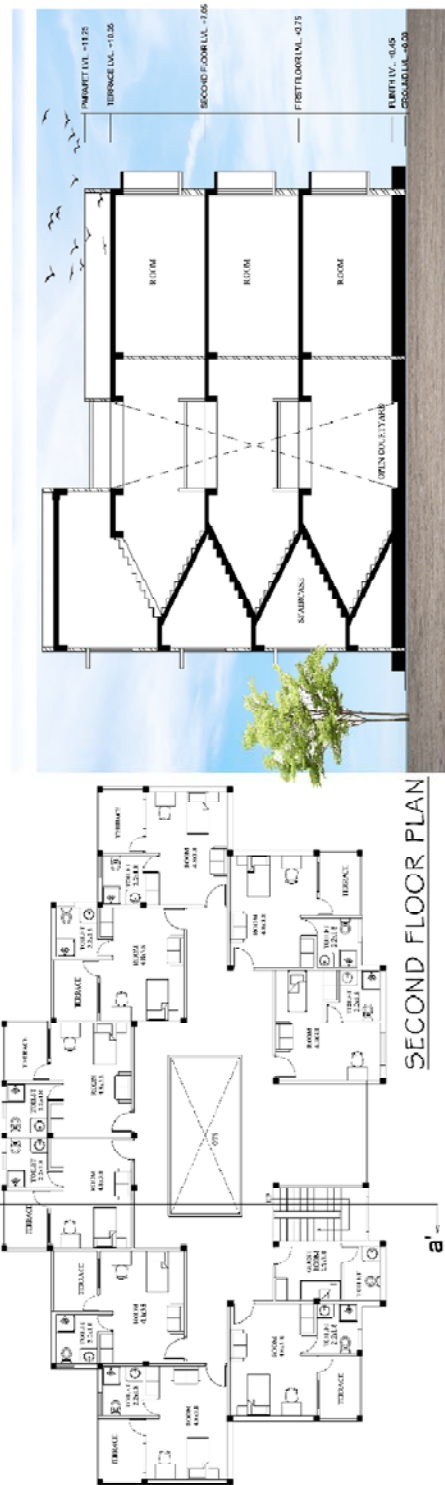
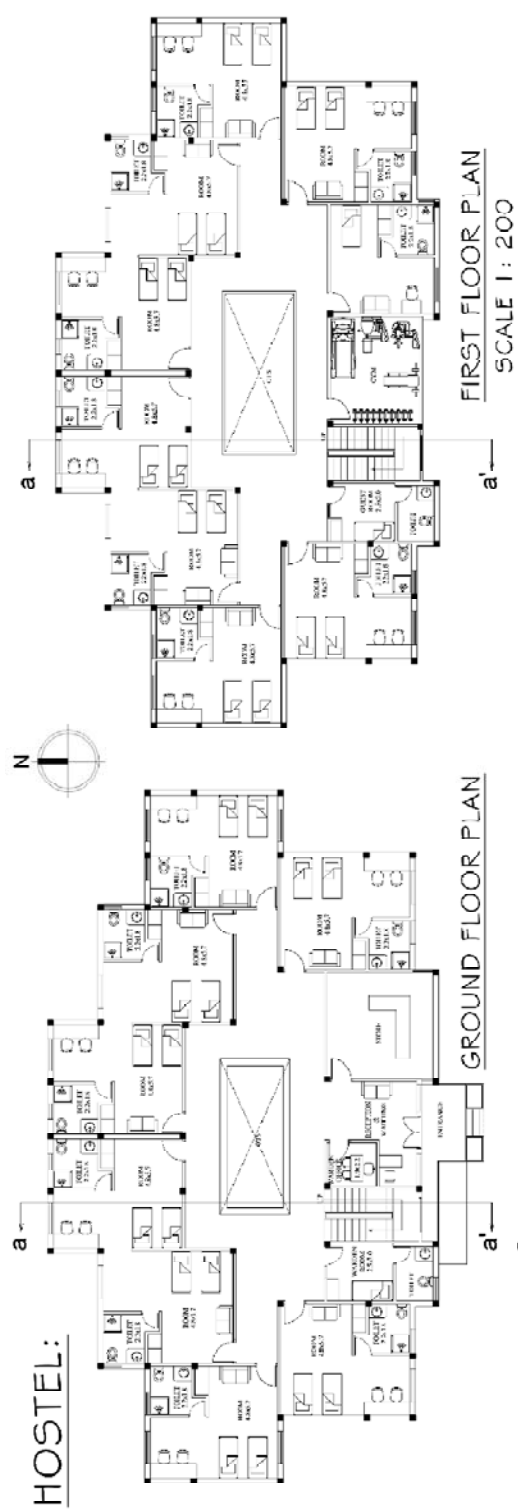
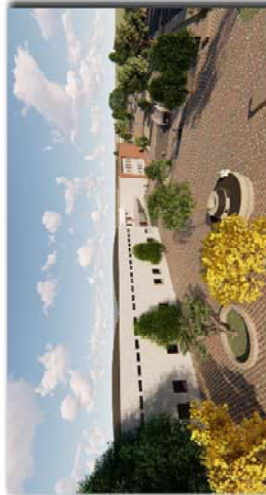


Plate 5.5

VIEWS:



OAT



MAIN BLOCK



OAT



TEST TRACK



TEST TRACK



MAIN BLOCK



VIEW OF MAIN BLOCK



VIEW OF MAIN BLOCK



ISO VIEW OF SITE



EXPERIENCE CENTER AND INDUSTRIAL
TRAINING INSTITUTE

JASWANTH SAKTHI S A
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Plate 5.6

CHAPTER 6

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TNCDRBR,NBC