

BUS TERMINAL

THESIS

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

By

**Justus Rejo
(3621037)**



**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**

May - 2021



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Nagar, Rajiv Gandhi Salai, Chennai – 600
119 www.sathyabama.ac.in



DEPARTMENT OF ARCHITECTURE

BONAFIDE CERTIFICATE

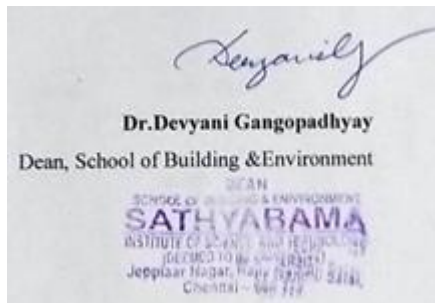
This is to certify that this Thesis Report is the bonafide work of **Justus Rejo (3621037)** who carried out the Thesis entitled "**Bus Terminal**" under our supervision from January 2021 to May 2021.

Internal Guide
Ar.Arun

Internal Review Member
Dr. Devyani Gangopadhyay

External Guide
Ar. Palaniappan

Dean and Head of the Department
Dr. DEVYANI GANGOPADHYAY



Submitted for Viva voce Examination held on _____

Internal Examiner

External Examiner

DECLARATION

I **JUSTUS REJO VALAN** hereby declare that the Project Report entitled **BUS TERMINAL CUM COMMERCIAL COMPLEX** done by me under the guidance of **Ar. KAVITHA** (Internal) and _____ (External) at **SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY** is submitted in partial fulfillment of the requirements for the award of Bachelor of Architecture degree in **SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY**.

DATE:

PLACE:

SIGNATURE OF THE CANDIDATE



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Internal Guide

External Guide (if Applicable)

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Submitted for Viva voce Examination held on_____

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with Signature)

External Examiner
(Name in Capital letters
with signature)

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to Board of Management of SATHYABAMA for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

**I convey my thanks to Dr. -----, Dean, School of ----- and Dr.-----
-----, Head of the Department, Dept. of ----- 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 Project Guide Dr./Mr./Ms----- for his valuable guidance, suggestions and constant encouragement paved way for the successful completion of my project work.

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

ABSTRACT

A Bus Terminal Cum Commercial Complex Study for Kuthambakkam , Chennai .

This thesis proposes a Bus Terminal Cum Commercial complex to serve the suburban and long distance bus needs of North Tamilnadu , Bangalore and Andhra.

These needs now depends on 2 old and completely inadequate stations. Goals of this project is to provide architectural surroundings which will both enhance downtown value and add attractiveness to public transportation like bus etc whereby it might be helped to increased importance.

An increased emphasis on bus transportation is usually recommended as a way of alleviating traffic congestion throughout the Metropolitan area. The project is based on a study of existing bus transportation within the area from which increased future needs are estimated.

The building has a passenger level oriented toward a plaza ,Buses enter from a secondary street and circulate on a level beneath the upper passenger level.

A restaurant, concessions and shops are included for the convenience of passengers and the financial well-being of the Terminal venture.

INTRODUCTION

Transportation is one among the foremost important requirements for the aid of communication from one place to other for visiting purpose or within the sense of tourism. Variety of things just like the convenience from one place to other, promotion of tourism, for communication between two places etc. have predicted the importance of designing like roadways industries within the as sense of bus terminals. Transportation improves the social, economic, industrial and commercial progress and further transform the society into an well organized one. It's one among the essential services, life force for determining the direction of development. To realize the specified transportation balance and for the system to be efficient, it's essential to supply organized facilities within the system. as transportation is concerned with the movement between two places involves the movement of individuals and goods, there's need for an access point within the system to be used..

Multiuse space concept

Efficient use of space for shopping ,entertainment & related activity, concept of planning of different activity evolution of commercial complex i.e. ancient agora & medieval plaza of European cities Indian context – Indian bazzars daily shopping at terminal itself rather than going to market places and thus save time.

AIM

To achieve design excellence and to return up with a prototype design for a bus terminal for urban scenario where space will become precious commodity & high bus trip will have to support from a site. Further to save space commercial activities will be incorporate with bus terminal and give to Kuthambakkam a missing landmark building.

OBJECTIVE

- Provide an architecture solution for integrating the terminal along with commercial complex.
- To provide fast & understanding flow of traffic.
- To provide clear segregation of different type of traffic like Private vehicles , Public Vehicles and Buses , And to control the congestion at peak hour.
- To integrate the different usage of space and to provide optimum connections between all elements and spaces, i.e. clear connection
- of functions.
- To incorporate today's communication , surveillance system etc. in to design.

METHODOLOGY

UNDERSTANDING BASIC NEED OF DESIGN, ITS SCOPE & LIMITATION			
NECESSARY DATA COLLECTED & ANALYSIS			
SITE ANALYSIS	CASE STUDY		LIT STUDY
	STUDY OF SPATIAL REQUIREMENT	STDUY OF SPATIAL INTERRELATIONSHIP	STUDY OF SPATIAL ORGANIZATION STUDY FLOW CIRCULATION OF PEOPLE & SERVICE
	COMARATIVE ANLYSIS		
FRAMING REQUIREMENT			
EVOLUTION OF DESIGN CONCEPT			
BUILDING OF CONCEPT & DESIGN			
FINAL DESIGN SOLUTION			

Chennai Mofussil BusTerminal

CHENNAI

INTRODUCTION

The Chennai Metropolitan Development Authority's another unique project is that the Chennai Mofussil Bus Terminus (CMBT), found out at the fringe of the town along Nehru road at Koyambedu, Chennai. It is Asia's greatest transport end built at an expense of Rs. 103 crores working since 18-11-2002. The terminal with stylishly satisfying and practically great structures and spaces was planned by an eminent Architect assessing the future



Designed by : Ar. Kuldip Singh

Location : CMBT, Koyambedu , Chennai ,TamilNadu

Transportation Mode

- Inter State Bus
- Intra City Bus,
- Access to Metro rail

Area of Project : 36 acres

Build Up Area : 17840 Sq.ft

Capacity : 2000 no's

It is situated on the 100 feet ring road (Jawaharlal Nehru Salai) in Koyambedu between SAF Village and the Koyambedu Vegetable Market. It's the biggest transport Terminus in Asia. What's more, second greatest transport warehouse in India after Delhi Millennium Depot. Chennai Metro Rail works a depot behind CMBT since 2015

- State : Tamilnadu
- Area : 1189 Sqkm
- Population : 46,81,087 (Ceencus-2011)
- Pupulation Density : 11,000 Persons / Sqkm
- Climate : Warm & Humaid Climate
- Avg. Temperature : 35–40 °C (Summers) 15–22 °C (Winters)
- Precipitation : 1400 Mm

MICRO CLIMATE

- Thus CMBT is planned in such a way that it is climate responsive with proper lighting and ventilation throughout.
- The main hall that's the commercial a part of the CMBT features a high ceiling with clear stories providing sufficient lighting

TOPOGRAPHY

- The site is more flat with a light slope toward North

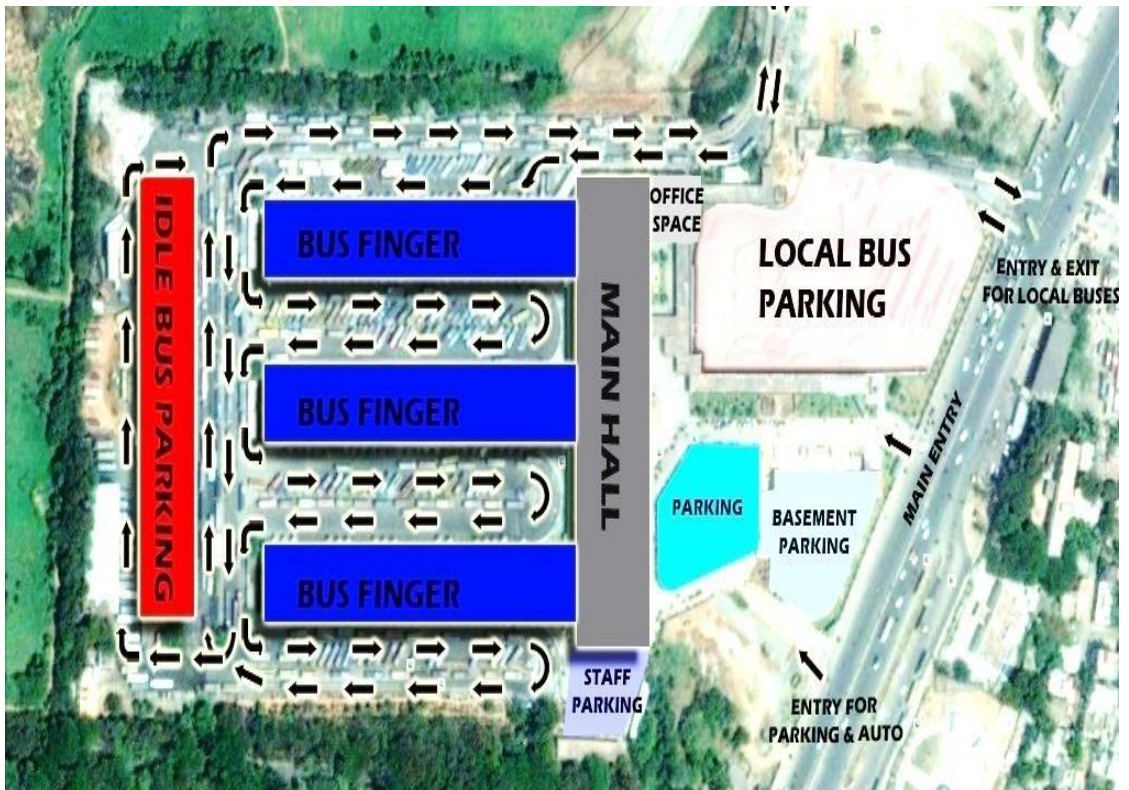
ACCESS TO THE SITE

- Separate Entry for parking and autos
- Main entry for pedestrian
- Separate entry and exitway for buses.

DISTANCE FROM MAJOR LANDMARK

- Chennai international airport : 12 km
- Central railway station : 13 km
- IIT madras : 18 km

ZONING



ENTRY AND EXIT

Entry and Exits for the Intra City buses : 17m Wide
Entry and Exits for the Inter State buses : 16m Wide
For Pedestrian and Vehicle Entry & Exits : 11m & 9m Wide
Main entry to Site wide : 11m Wide

MAIN HALL

Area : 10,850 sq.m

Roof height : 20 m

The roof is a huge dome of RCC shell

The dome is supported by a parabolic structure along with crisscrossing beams

Clear storeys are provided for better lighting

INTER STATE BUS TERMINAL

Shape : Angular 'L' shaped terminal

Arrangement : Angular bays

Movement : clear and well defined movement path

No. of bus fingers : 3 Fingers

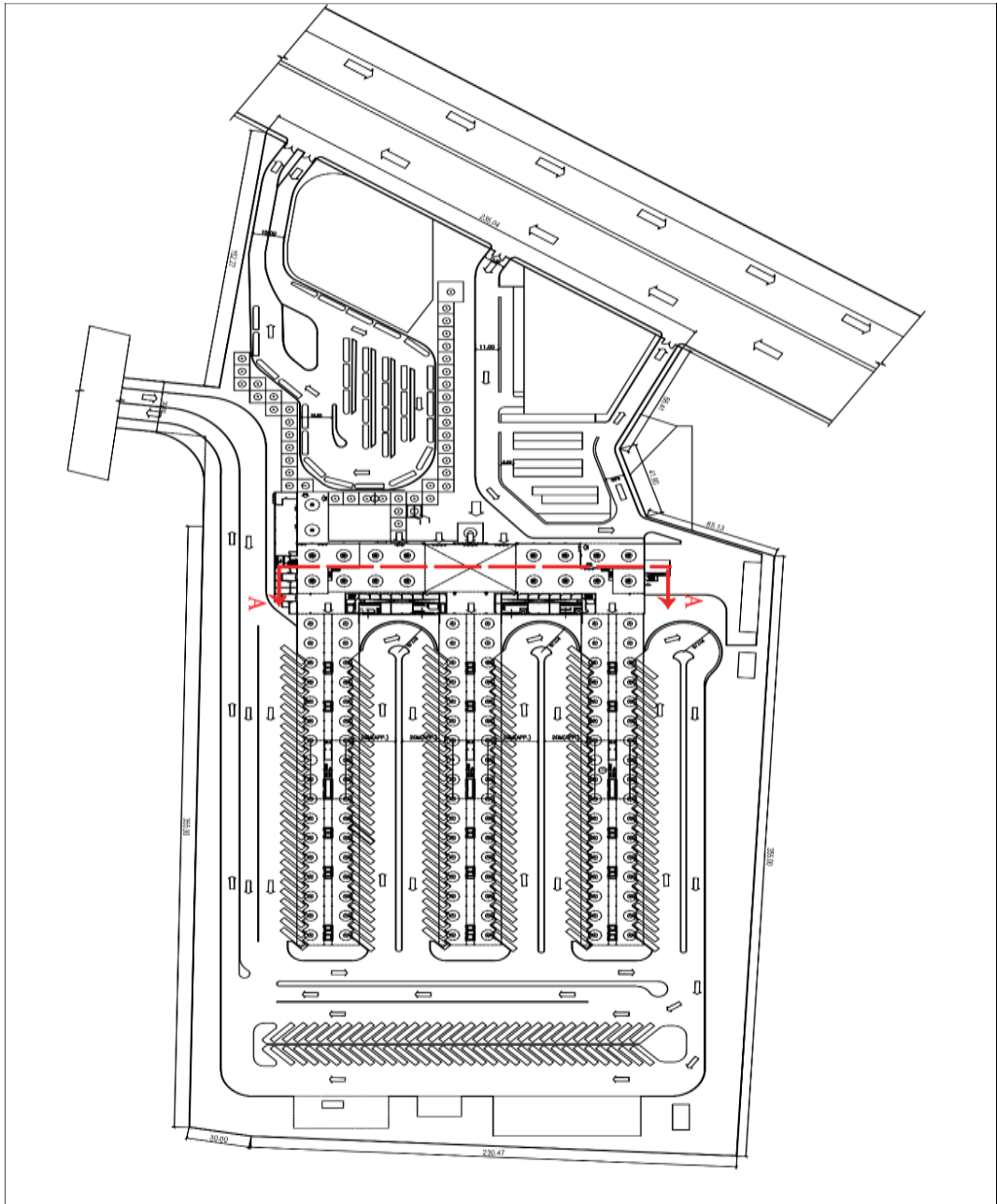
No. of platform : 6 Nos

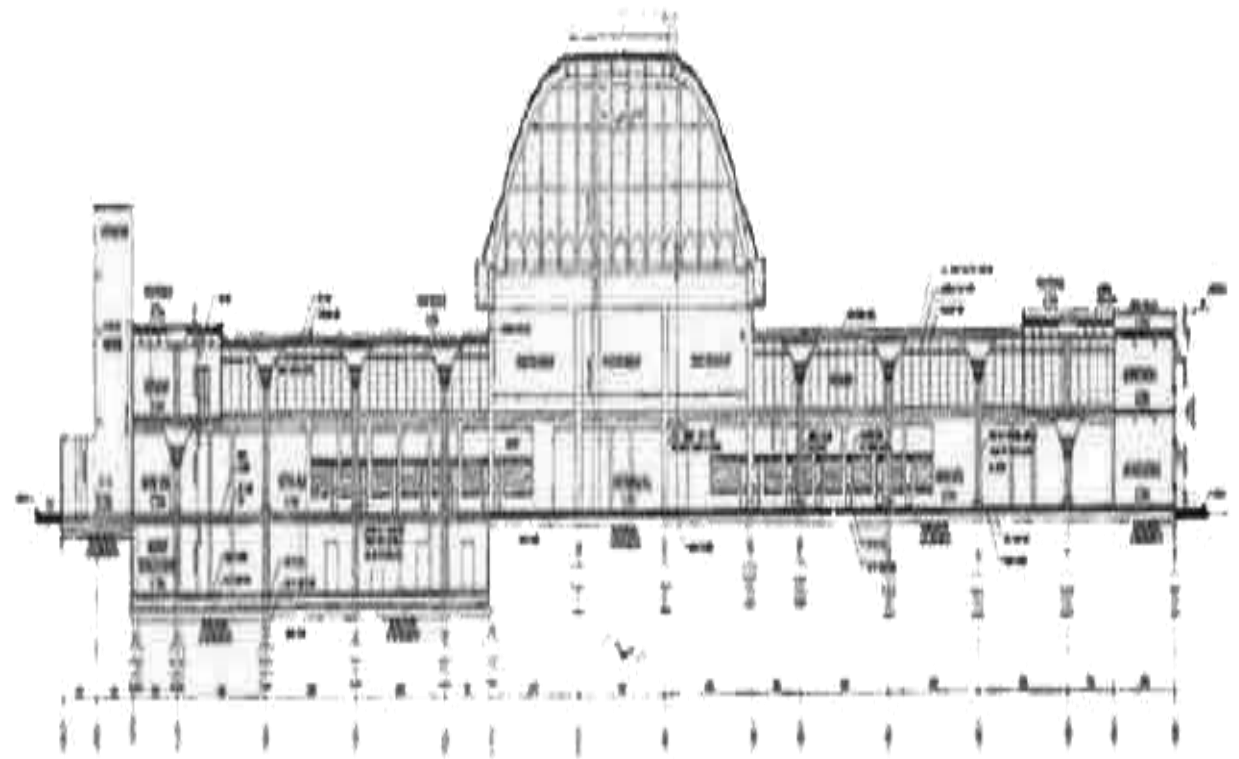
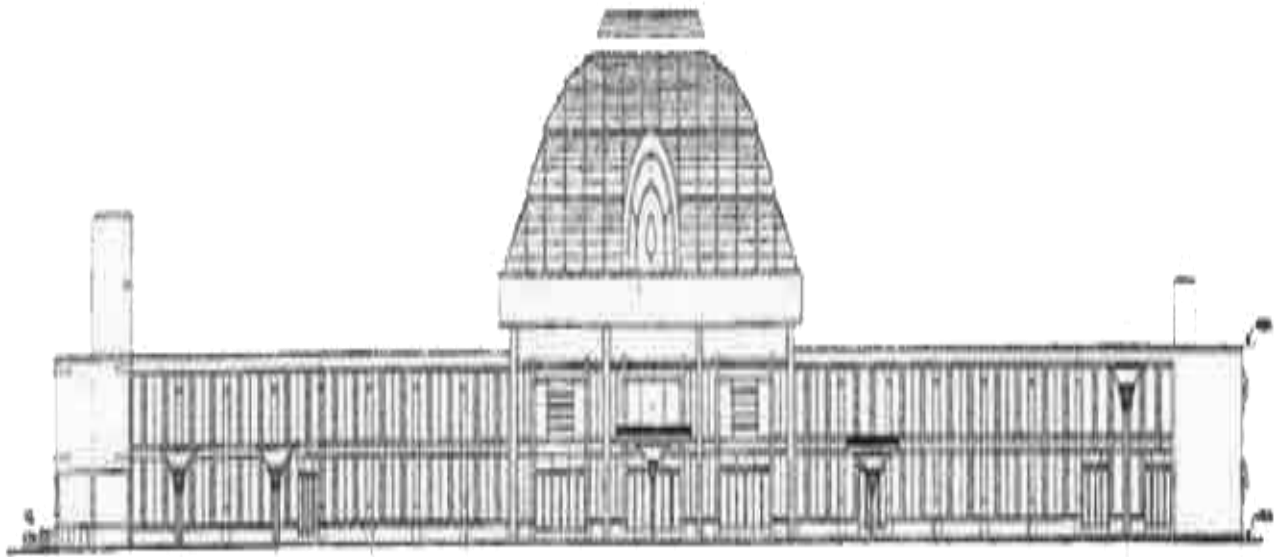
No. of bays : 180 Bays

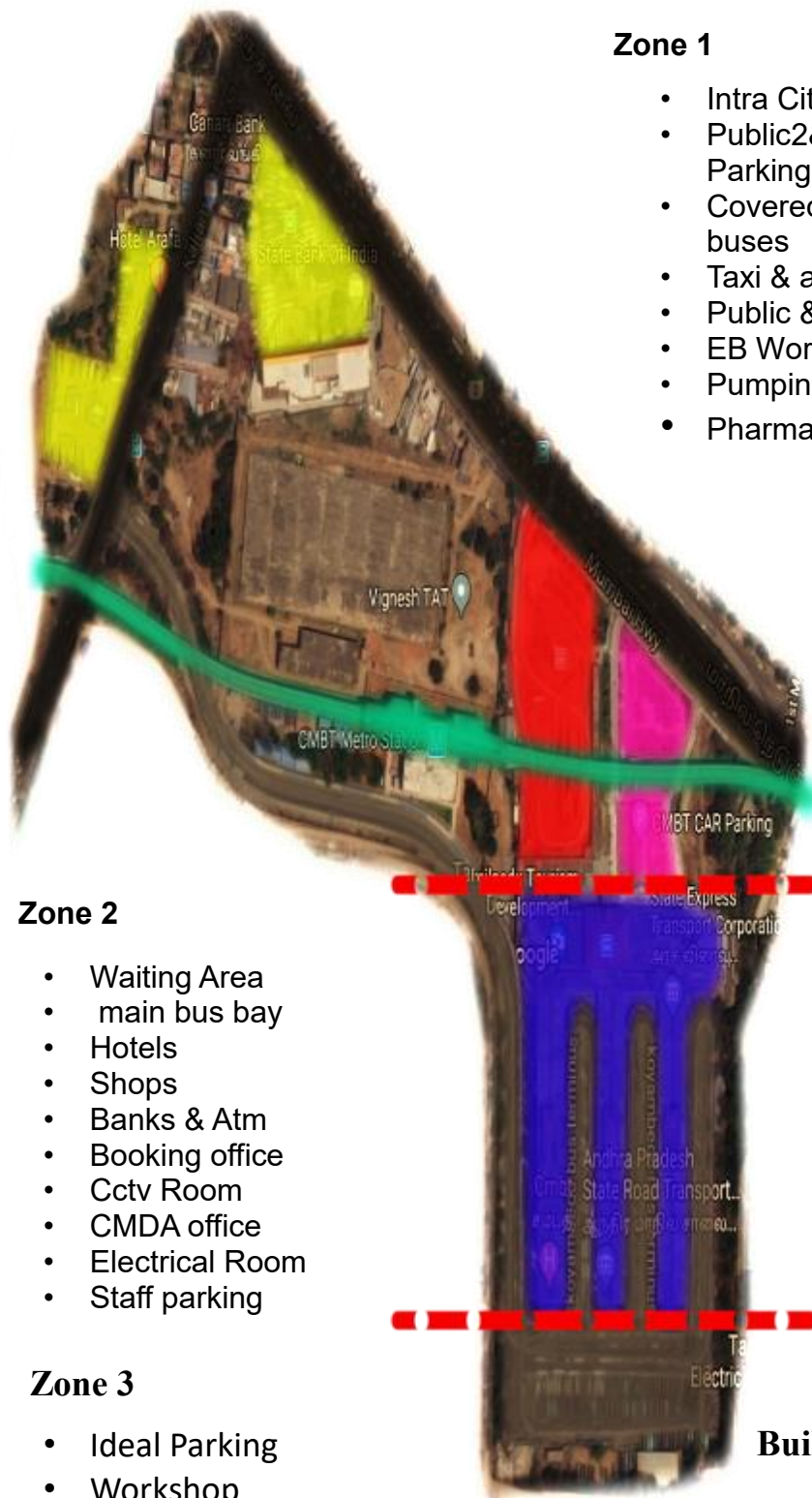
PARKING

Auto, cabs ,private cars : 2,300 sq.m

Two wheelers : 3,700 sq.m
Overall parkings : 6,000 sq.m
No of floors : 2 Basement and first floor







Zone 1

- Intra City Bus depot
- Public 2&4 Wheeler Parkings
- Covered Waiting area for buses
- Taxi & auto Parkings
- Public & Staff usage
- EB Workers station
- Pumping Stations
- Pharmacy

Zone 2

- Waiting Area
- main bus bay
- Hotels
- Shops
- Banks & Atm
- Booking office
- Cctv Room
- CMDA office
- Electrical Room
- Staff parking

Zone 3

- Ideal Parking
- Workshop
- Fuel Station
- Washing Area
- Waste Dissposal Area
- Fire pumping area
- Workshop staff canteen

Build up Spaces

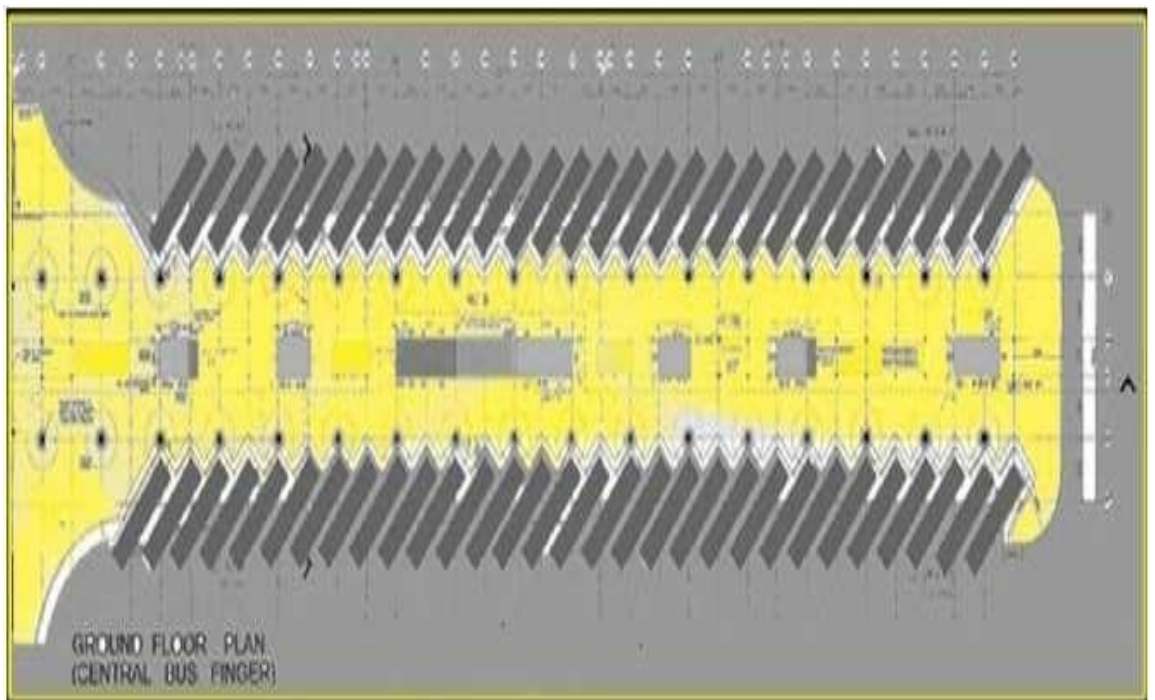
- Main Hall: 10850 Sqm
- Bus Fingers: 2500 Sqm
- Pedestrian Walkway: 2500 Sqm
- Electrical Substation: 350 Sqm
- Maintenance Shed: 1400 Sqm



Largest shell roof in India while constructed

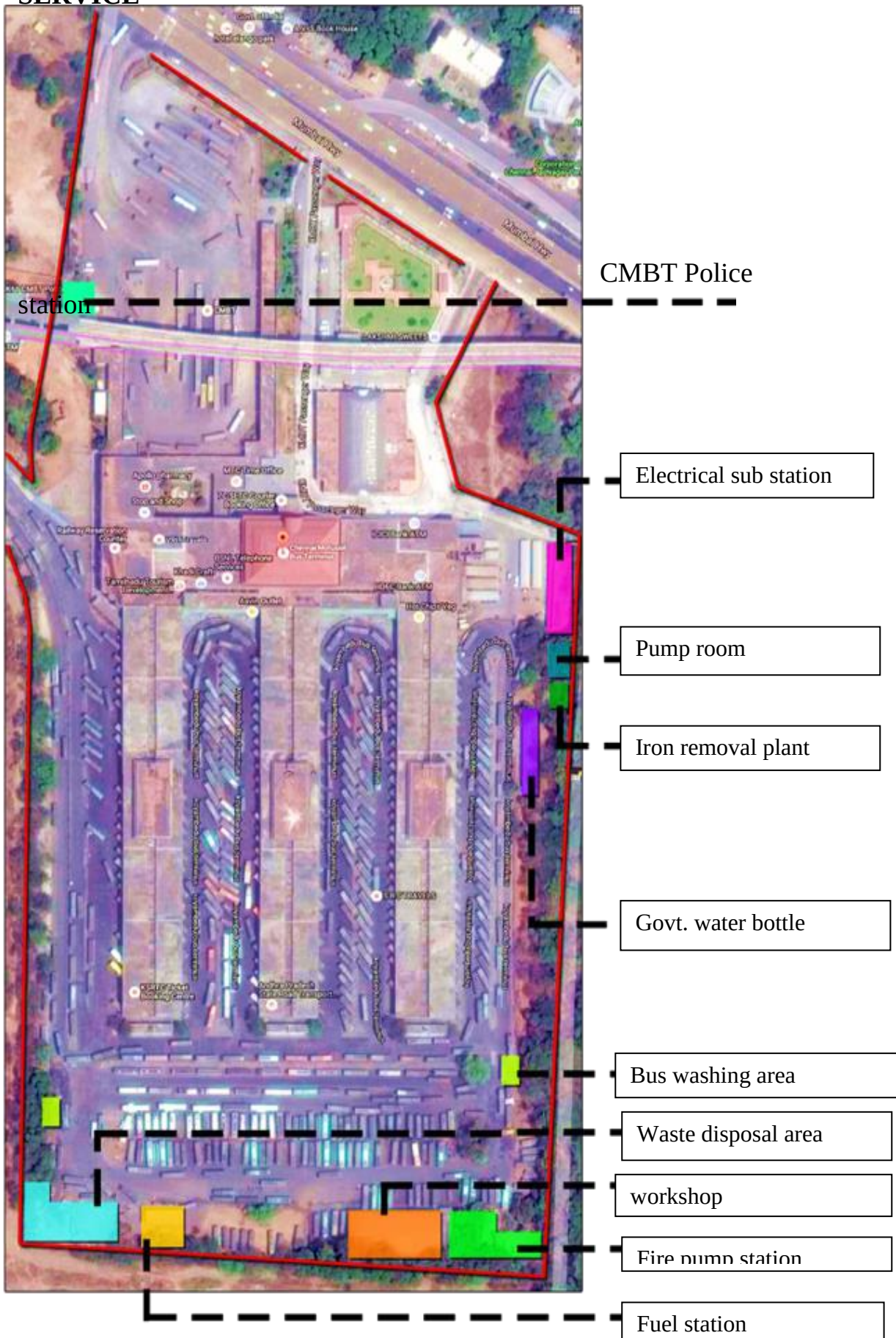


Mushroom column with double height ceiling



Bus Finger with 60 bays (30 on each)

SERVICE



Merits

- Well organized planning.
- Planned and define Movement pattern.
- No Conflicts between pedestrians and vehicles.
- Well Planned movement Pattern for the buses.
- Separate entry provided for buses, pedestrian, vehicles.
- Defined alighting Bay.

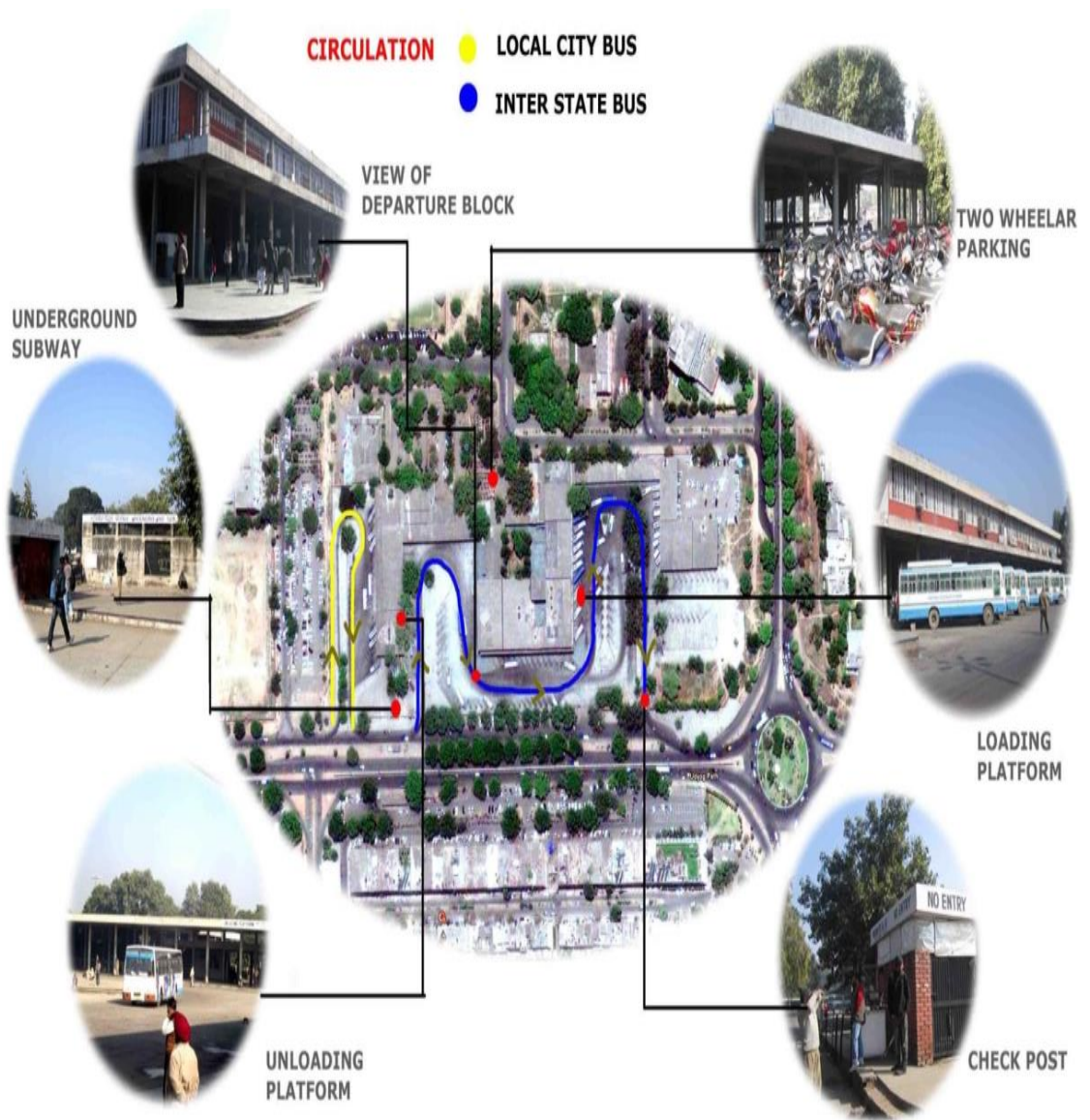
Demerits

- No spaces available for future expansion.
- Non organized planning for Omni bus stand.
- Lack of proper maintenance of facilities.
- Unhygienic public service area.

ISBT SECTOR, CHANDIGARH

INTRODUCTION

The bus depot was developed to serve as the primary transport node for Chandigarh city,



It is located within 2 to 3 miles from the Chandigarh railway station.

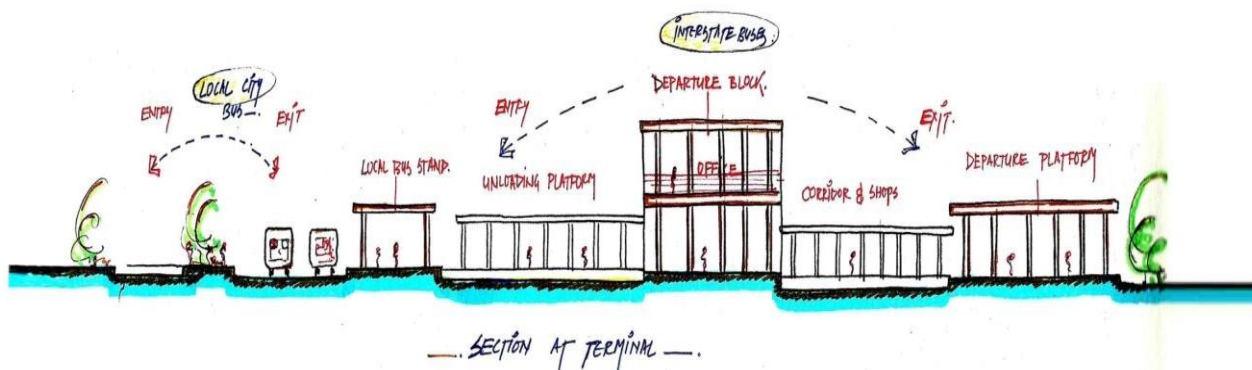
Site has been drawn closer by two significant expressways NH-21 to Rupnagar and NH-22 to Shimla.

Catering to passenger traffic from Chandigarh, Delhi and Haryana

OPERATOR	CHANDIGARH TRANSPORT UNDERTAKING
ARCHITECT	ADITYA PRAKASH
COMPLETED IN	1957
TOTAL AREA OF THE SITE	8.5 ACRES (NOW INCREASED TO 10 ACRES)
BUILDING STRUCTURE	MAX. G + 1

DETAILED COMPONENTS

- Principle design somewhat centrally situated in the main building with central waiting hall, all travelers and staff offices are situated around it.
- It is column and beam structure with grids of 17'3" x 17'3".
- Facade is of expose brickwork.along the north- west side, the building is in three levels



DESIGN PRINCIPLES

- Entry and exit of the highway transports are given solely from the bus lane.
 - Separate parking garages for-city transports, private vehicles, auto, rickshaw, taxi, cycle, cart.
 - Separate entries for the intercity buses.
 - Concept of corridor planning.
 - Play of light with the utilization of rooftops at various levels.
 - Scope for future expansion.
-
- It caters to a daily of 3456 buses and handles transports from 5 states.
 - Open yard has been accommodated light and ventilation of building yet because of absence of appropriate support the patio stay messy.
 - The restaurant of first floor never completely used the explanation being that the traveler can't find it and if sitting in the café, can't watch out for the buses.
 - At some spot, wash room are not given
 - The seating limit with regards to the traveler is deficientthe light and ventilation is quite good in the building except the toilet where ventilation is provided but direct sunlight does not enter



Ground floor - waiting hall, ticket counter, loading bays, ticket counter, canteen, toilet, food, bookstall, cloak room, enquiry office, etc.

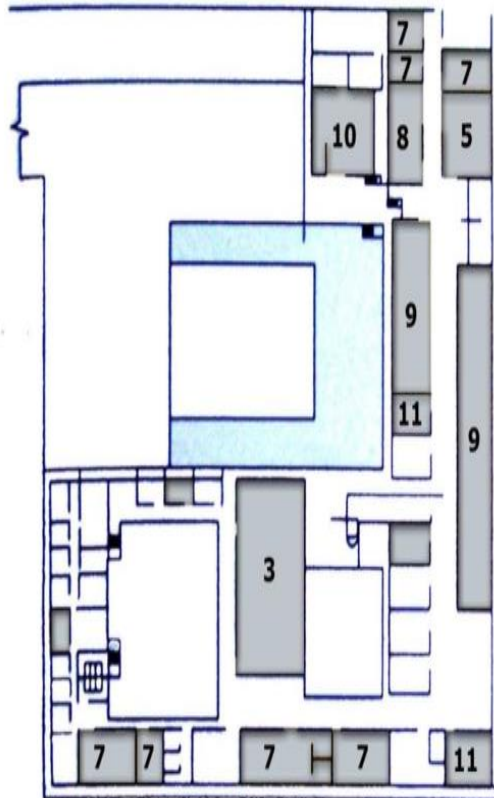
First floor – police post, station incharge room, railway booking office, post office, tourist rest room, tourist information office, restaurant, tourism office of chandigarh etc. have been provided

Loading platform

A total no of 53 loading lanes

The loading lanes are straight saw tooth type 12'6" wide and 4" high. covered platform, many of bus stoppers

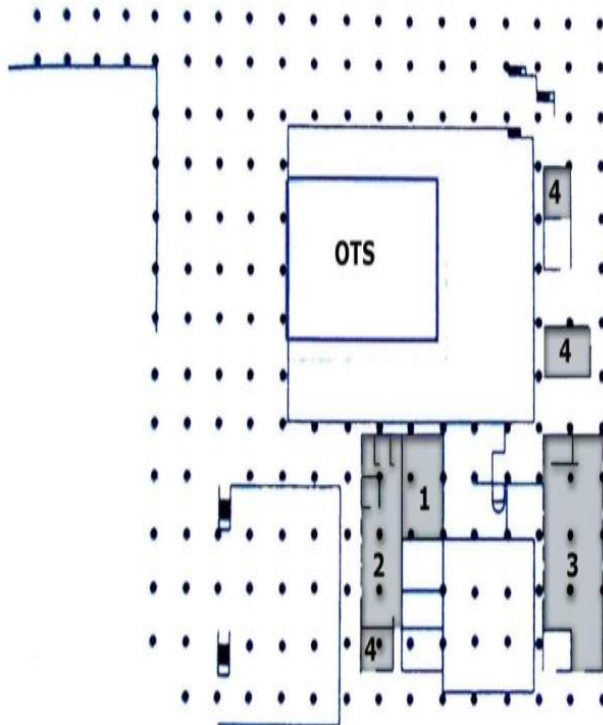
Sometimes during peak hours, 2- 3 buses stand on a single bay thus create congestion



DEPARTURE BLOCK



**COLUMN & BEAM
STRUCTURE**



**OPEN COURTYARD FOR
LIGHT & VENTILATION**

1. CLOAK ROOM
2. TICKET BOOTH
3. RESTAURANT
4. SHOP
5. GENTS WAITING
6. LADIES WAITING
7. REST ROOM
8. POST OFFICE
9. RAILWAY RESERVATION



**STANDARD TURING
RADIUS**

UNLOADING PLATFORM

- Near the entry point due to lack of covered platform, its undersell during summer and rainy season.

IDEAL PARKING

- A total no of 70 bus parking, bays are provided of which 7 are provided of which for long term parking ideal parking is provided on the opposite side of the loading platform
- Parking for local conveyance back side of terminus, from where the people enter the terminal. 500 scooter & 25- 30 cars
- A huge space in the basement is additionally given neighboring the open leaving for private vehicles it has a limit of 500 bike and 1500 cycles in particular
- Light is the primary issue in the basement as bay windows gave are lacking

SUBWAY

- The pedestrian from the sector 21 use the underground subway to reach the terminus.

MERITS

- Well organised planning.
- Planned and define Movement pattern.
- Subway To Reach The Terminus.
- Spaces available for future expansion
- Play of Light With The Utilization Of Rooftops At Various Levels.

DEMERITS

- Insufficient seating
- Lack of proper maintenance of facilities.
- Unhygienic public service area.

CENTRAL BUS STATION, VADODARA

INTRODUCTION

- Vadodara, also known as Baroda, is the third largest city of Gujarat state, after Ahmedabad and Surat.
- It has 235 sqkm. and population of 20,65,771 and population density is 8,800/km², as per census report 2011. the city sits on the bank of the river Vishwamitri.
- According to the bureau of Indian standard, The Vadodara falls under seismic zone-iii, in a scale of i to v (in order of increasing increase chance of earthquakes).
- The city is on the major rail and road arteries joining Mumbai with Delhi and Mumbai with Ahmedabad. due to this Vadodara is known as a gateway to the golden quadrilateral.

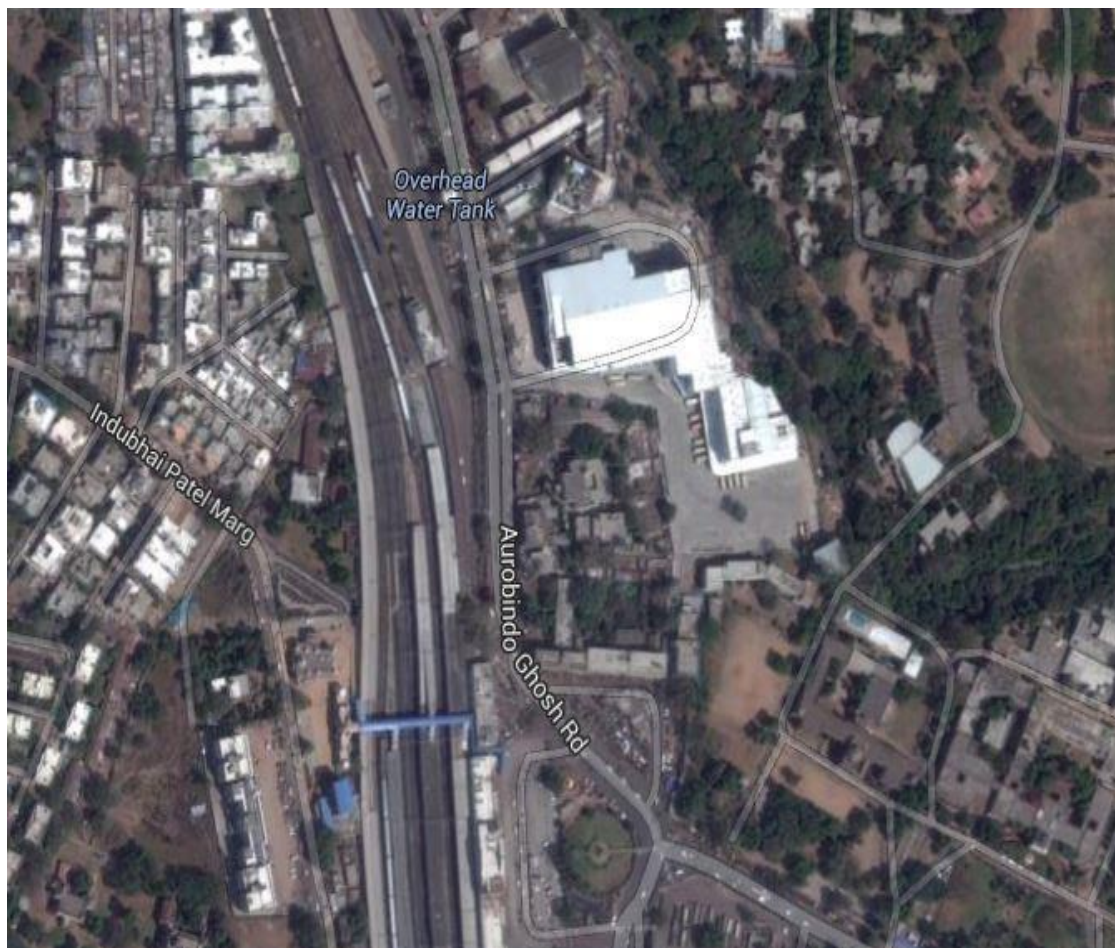
CLIMATE

- Vadodara features a tropical wet and dry climate .
- There are three main seasons: summer, monsoon and winter. aside from the monsoon season, the climate is dry.
- The weather is hot through the months of march to July . the average summer maximum is 40 °c (104 °f), and the average minimum is 23 °c .
- From Nov to Feb, the average maximum temperature is 30 degree Celsius , the average minimum is 15 degree Celsius , and the climate is extremely dry.
- The southwest monsoon brings a humid climate from mid- June to mid-September.
- The average rainfall is 93 cm (37 in), but infrequent heavy rains cause the river to flood.

- The site area of bus station is 22325 sq.m and builtup area is 1.8 times than the site area 40,150 sq.m as it also incorporates shopping mall(Integrated). it is inaugurated in 14th of February, 2014 by our prime-minister Shree Narendra Modi. right now, the depot already handle over 800 buses and nearly 35,000 passengers daily.
- It is built under a public and private partnership between the Gujarat state road transport corporation and Realty firm cubes construction.
- The terminal has four accesses : First is bus entry, second is bus exit, third is public entry directly to the terminal, and fourth is through the shopping area.
- The site is west facing and the road width is 18m people as well as busses accesses through.
- Railway station is located just opposite the access road (0.2km) and airport is 5.2km away from the bus terminus.

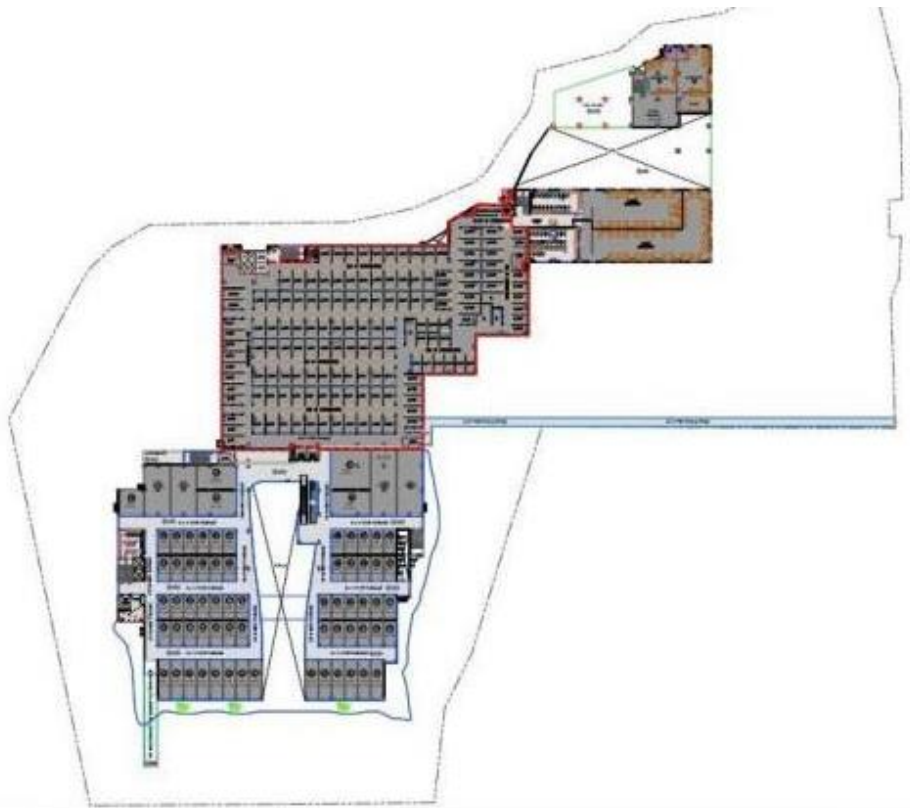
SURROUNDINGS ARE AS FOLLOWS

- Commercial shops
- Maharaja sayajirao university
- Commercial shops / fuel filling station
- Road (18m wide)

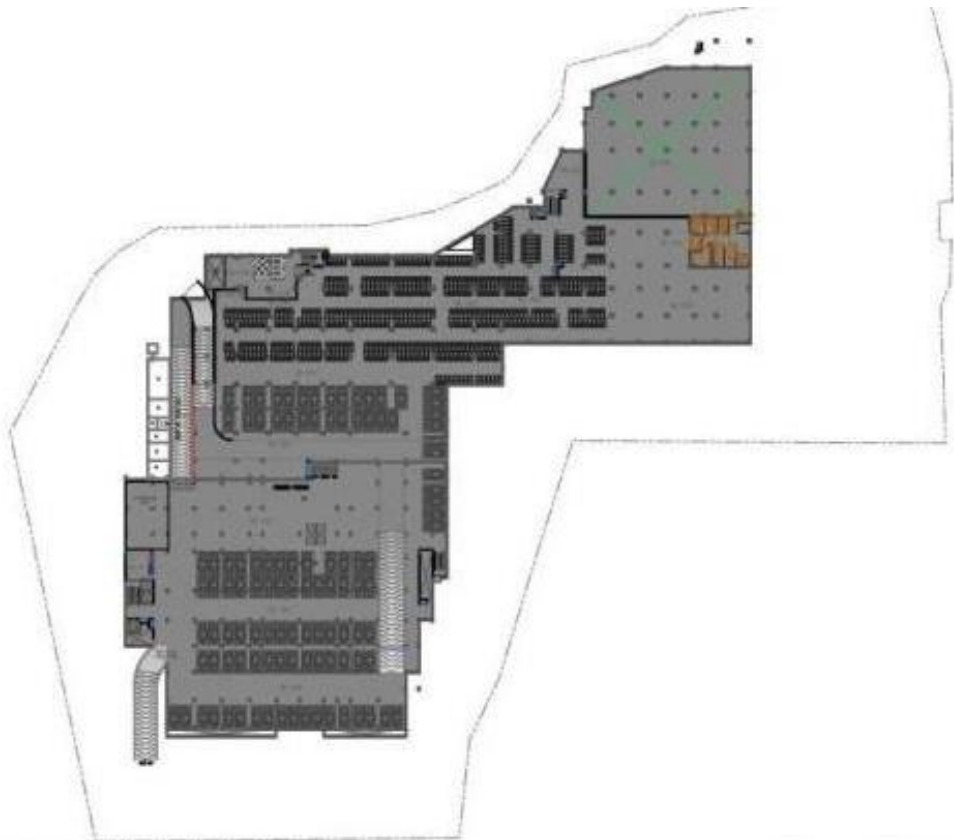
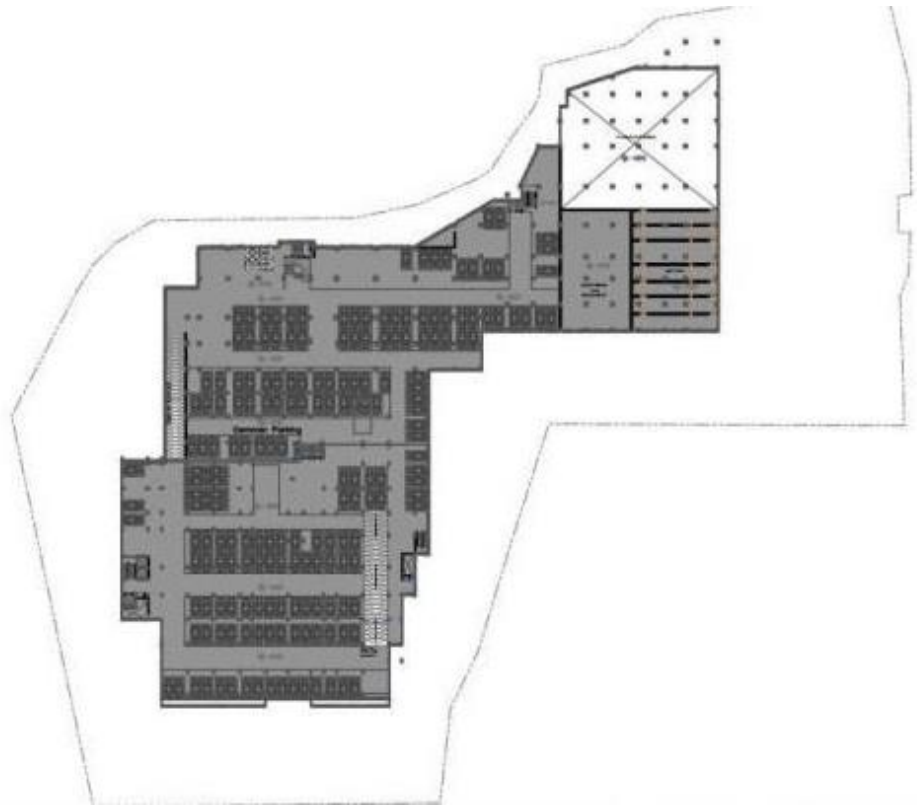


The bus terminal have : 20 plate farms, 8 ticket counters, inquiry counter, parking area for 10 buses, waiting area for 200 peoples, cafeteria , cloak room, 12 shops, medical shop, tourist information cabins, parcel office, water body in semi open area, guest room dormitories for 120 male & 80 female, 1st class waiting hall for 200 people, administrative department, potable water area, toilets for male & female, GSRTC office, parking for 274 four- wheelers & 400 two-wheelers. Auto stand .











Building is based upon RCC. frame structure. the pathways are covered with Ferro cement structure. its façade shows banyan tree as the meaning of name of city is increase in every field.



The openings are covered with Ferro cement structure and a beam is provided through platforms to stop the tyre of buses.

POSITIVE ASPECTS

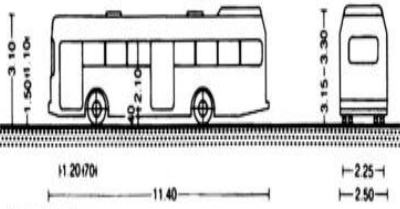
- The building is friendly for physically challenged people.
- There are fire extinguishers and sprinklers at several points for fire fighting.
- There is a mall connected with the bus station so the people can utilize their time in the mall during waiting time.
- The building have security check point at three places for safety.
- The whole campus is neat & clean because it is in the private control.
- Bus entry, exit and public entry are separate to control traffic as well as crowd.

- The total new concept and design of the project will make this place a "city icon" and would surely become pride for the city.

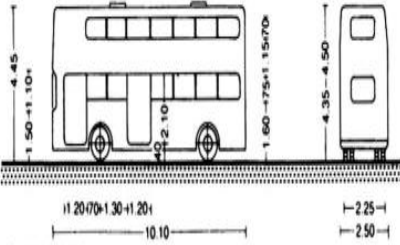
NEGATIVE ASPECTS

- The dormitory, guest rooms and 1st class waiting hall are not accessible to physically challenged people as they are on different levels.
- The administrative area which is on b-1 floor is poorly constructed with aluminum glass work and is not ventilated at all.
- The campus don't have fuel filling station in it.

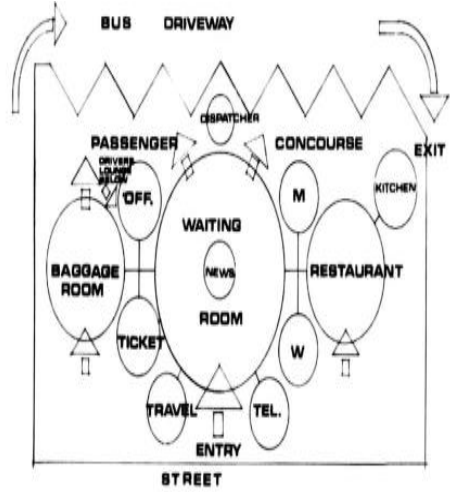
BUS DIMENSIONS



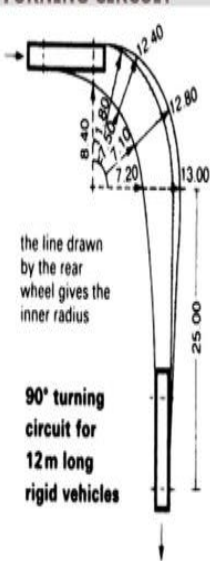
Single-decker bus



Double-decker bus

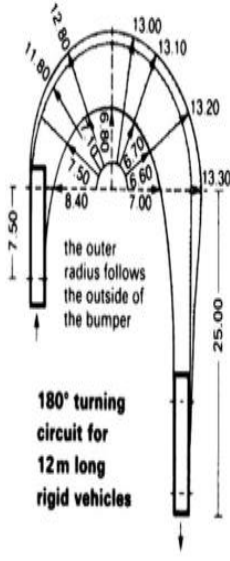


TYPES OF BUS BAY



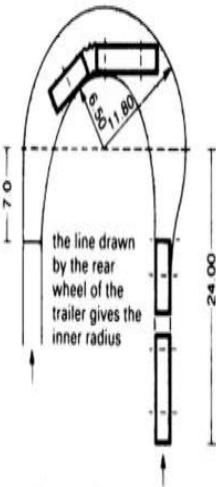
the line drawn
by the rear
wheel gives the
inner radius

**90° turning
circuit for
12 m long
rigid vehicles**



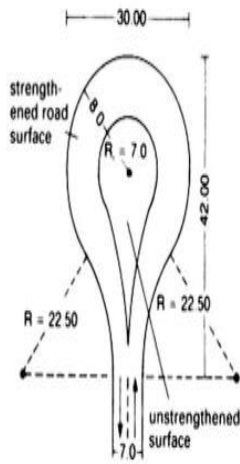
the outer
radius follows
the outside of
the bumper

**180° turning
circuit for
12m long
rigid vehicles**



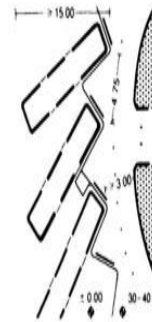
the line drawn by the rear wheel of the trailer gives the inner radius

180° turning circuit for 17m long articulated vehicles

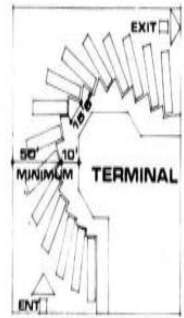


strengthened road surface

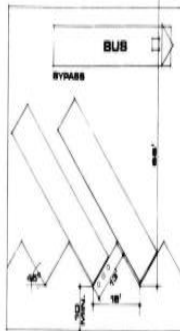
Turning circuit



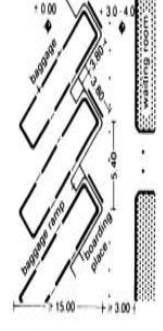
Radial layout providing more room at the front



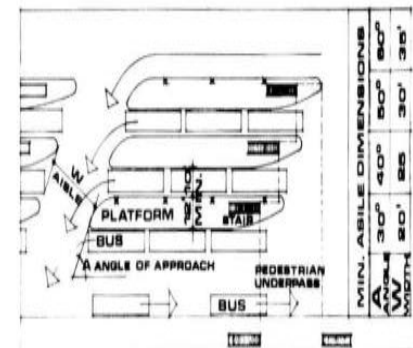
RADIAL SAWTOOTH



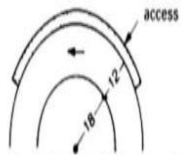
COUNTERCLOCKWISE MOTION
TOOTH LOADING



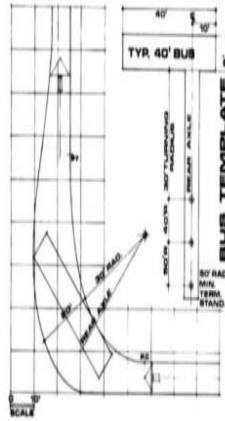
Standard interlocking layout



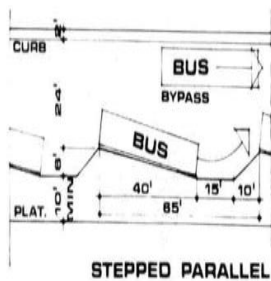
PARALLEL SINGLE LANE ISLAND



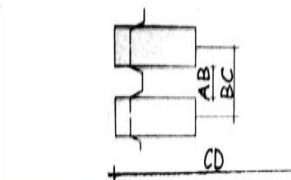
Semi-circular platform outside loop; no pedestrian crossing necessary



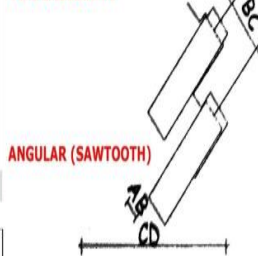
SWEEP PATH 40' BUS 90° TURN



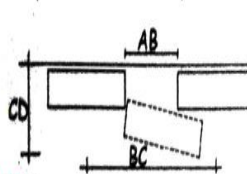
STEPPED PARALLEL



PERPENDICULAR



ANGULAR (SAWTOOTH)

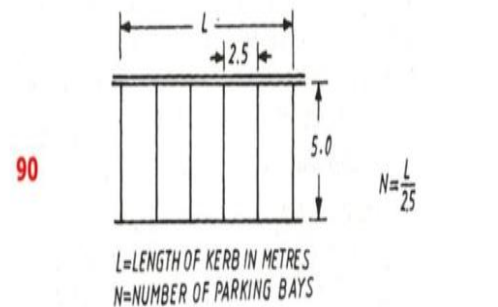
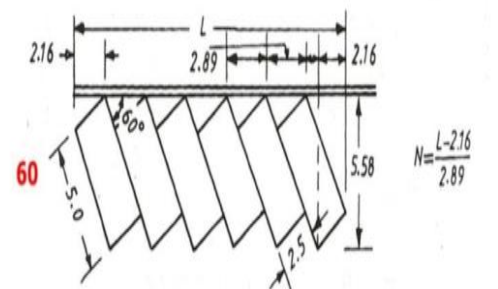
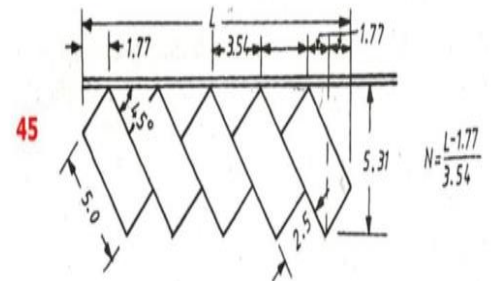
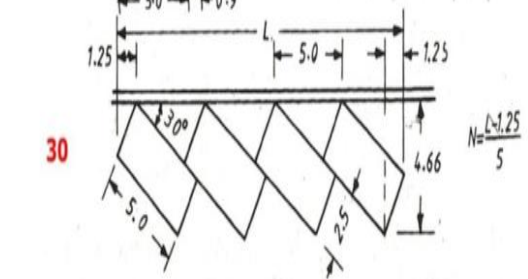
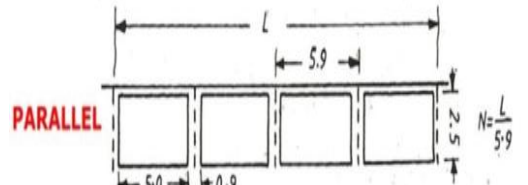


PARALLEL

BUS BAY AREA

CLEARANCE	TYPE			
	IDLE PARKING	45	90	PARALLEL
BC	3.4	4.25	4.6	16.9
CD	19.5	17.10	31.7	6.1
AB	0.75	1.70	2.0	6.5

CAR PARKING



L=LENGTH OF KERB IN METRES
N=NUMBER OF PARKING BAYS

