

# REDESIGNING OF ST BUS DEPOT

## BORIVALI EAST

By

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A report submitted in partial fulfillment of the requirements for the degree of  
Bachelor of Architecture.



**University of Mumbai**

2019

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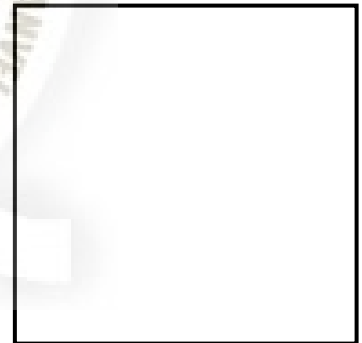


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## ABSTRACT

Public transportation is mandatory and key factor in developing a well-functioning and sustainable city. Public transportation is more accessible in Maharashtra as it is well connected from rural area to urban area. If road-based transportation system is crafted in public transport, then the need for private vehicles reduces resulting in less traffic congestion, low CO2 emission and affordable journey.

A State Transport Bus depot is the spine of any city, as it serves the most basic necessity of city that is public transportation. Infrastructure aesthetic value and comfort attract passenger and increase ridership. And network and fare of industry which is second part.

A transportation system involves movement of the people and goods, there is a need of a terminal point in transport system to use it. And these terminals can also provide many facilities, i.e. inter-state, intra-state, local bus facilities and private cabs. Bus terminals form connection between passengers and transport. Bus terminal facilities have to be safe, convenient and accessible easily for more people and to be ease in circulation.

The project is made in Borivali East as Mumbai don't have any big inter-state bus-terminus. The (ST) bus terminus is a private operator. The terminus will make a change in the field of transportation, as it makes greater revenue for government and better facilities and amenities to passengers.

## **Introduction:**

### **Background study:**

Transportation system plays an important role in India's economy. Transportation is the movement of people, goods, cattles from one location to other. Modes of transport include air, water, railways etc. A number of factors like convenience from one place to other, promotion of tourism, communication between places etc. Transportation system is divided into infrastructures, vehicles and operations. The connection between rural and urban area has to be good for better growth of economy. Roads, railways and air carry 90% of the traffic of our country. India developed its transportation system since British rule.

Efficient use of space for entertainment, shopping and related activity, concept of planning of different activity, evolution of commercial complex i.e. ancient agora and medieval plaza of European cities Indian context.

### **PUBLIC TRANSPORT BENEFITS :**

- Public transportation in India is important part of the solution to the national economic, energy, and environmental challenges - helping to bring a better quality of life.
- Public transportation provides personal mobility and freedom for people from every walk of life.
- Access to public transportation gives people transportation options to get to work, go to school, visit friends, or go to a doctor's office. And Public transportation provides access to job opportunities for millions of Users.
- Public transportation saves fuel, reduces congestion.
- Public transportation saves money.
- Public transportation provides affordable journey for many users, alternative to other transport system.
- Public Transportation reduces carbon\_footprint by fulfilling 'n' number of passenger needs.

- A single commuter switching his or her commute to public transportation can reduce a household's carbon emissions by 10%.
- Public Transport has much lower Accident Rate hence it is safe.
- Annually public transit prevent 200,000 deaths, injuries, and accidents had equivalent trips been made by car.
- The National Safety Council estimates riding the bus as over 170 times safer than private car.





## **Problem Statement:**

Road based transport system is more accessible in Maharashtra as compare to other transport system because it is well connected from rural area to the urban areas. And provide good mobility of passengers as well as of goods.

Proposed 'Transformation of ST Bus Depot' is to understand the concept of transit system. And provide user friendly and environmental sustainable design. If the road-based transport system is crafted in public transport system then the need for private and other vehicle reduces. Therefore, it raises environmental sustainable quality by reducing CO<sub>2</sub> emission, green house gases, traffic, etc. Also, public transport system is affordable as compare to private and other vehicle services. It uses less energy resources and gets advantage in Gross Domestic Product (GDP) of India.

MSRTC is only Government based transport system in rural area, which connects rural area of Maharashtra to urban area of Maharashtra and selected city of other State like Madhya Pradesh and Karnataka, Hyderabad. This industry has a good reputation in transport system since 1948, to maintain this reputation, MSRTC has to be function better according to the modern age. As in modern age technology changes, customer's expectation also changes by time. Passenger need more comfort good functional system and facilities in their daily life. As other industries are giving good amount of care to it.

Owing to this issue, MSRTC (state owned road transportation services) regularly upgrade their fleet so as to suit the travel requirements of everyone. But this is not enough to get emphasized. Depot is a driving structure of MSRTC other than buses. Structural facility also has to be upgrade to relay good performance and get benefited of by providing sufficient access to users and buses operator. And providing various asset's for traveller. Therefore it become 'all needs at one point' centre/structure for traveller. And it will get emphasize by quality and various facilities for traveller (public).

## History of ST buses:

In 1950, a Road Transport Corporation Act was passed by the Central Government and it delegated powers to states to form their individual road transport corporations with the Central Government contributing one-third of the capital. The Bombay State Road Transport Corporation (BSRTC) thus came into being, later changing its name to MSRTC with the re-organization of the state.

The ST started with 30 Bedford buses having wooden bodies, coir seats. The fare charged on the Pune-Nagpur route was nine paise. With time, the ST buses underwent many changes, including increasing the seating capacity from the original 30 to 45 to the present 54, introduction of all-steel bodies to replace wooden bodies to make them stronger and cushion seats for more comfort. Later, in 1960, aluminium bodies were introduced as steel corrodes, especially in coastal areas, and the colour code also changed to red from the blue and silver. A partial night service was launched in 1956; the overnight service about a decade later and the semi-luxury class came into being during the Asian Games in 1982.

The ST. buses are also used for transportation of the postal mail, distribution of medicines, newspapers and even tiffins sent by people from rural areas to their relatives in cities. Transporting goods of the farmers to cities is also one of their jobs. The luxury transport services of the corporations on the Dadar-Pune-Dadar route started since 1981. As the traffic on this route has been becoming popular, the more rounds have been expanded. The overnight service and the semi-luxury class came into existence in 1982. Mumbai - Pune Railway Station has been turned on air conditioning ashvamedha transport buses in 2002. The Volvo bus traffic passengers have been placed and new vatanukulita buses handling in the way that getting a good response, and from Dadar, Thane, Borivali-Sion, Nashik, Aurangabad to Swargate, and etc. Have been placed in the path of seeing the urgency of handling AC buses for passengers.

## **About MSRTC :**

The Maharashtra State Road Transport Corporation was established by State Government of Maharashtra. The MSRTC is operating its services by the approved scheme of road transport. The area covered by the scheme is entire area of the state of Maharashtra. The undertaking is operating stage and contract carriage services in the entire area of the state of Maharashtra except ST undertaking.

The Present Maharashtra State Road Transport Corporation (M.S.R.T.C.) merged of three streams for providing passenger road transport in the public sector. These related to the Pre-1956 Reorganization states of Bombay, Madhya Pradesh and Hyderabad.

## **About Bus Depot :**

As in Olden days there are no proper roads for travelling from one place to another; people have to sacrifice their level of comfort because of it. Buses of MSRTC are there to fulfil the needs of public to travel in Maharashtra. But bus, passengers, driver and conductor need halt in between to rest and release stress that develop while travelling on that unconditioned road. Buses need refuelling and maintenance regularly. While driver and conductor has to report their journey and refresh them self to carry further journey. And passenger need some food in between journey and want to relax. They all need a break in between their journey. So that Depot were formed.

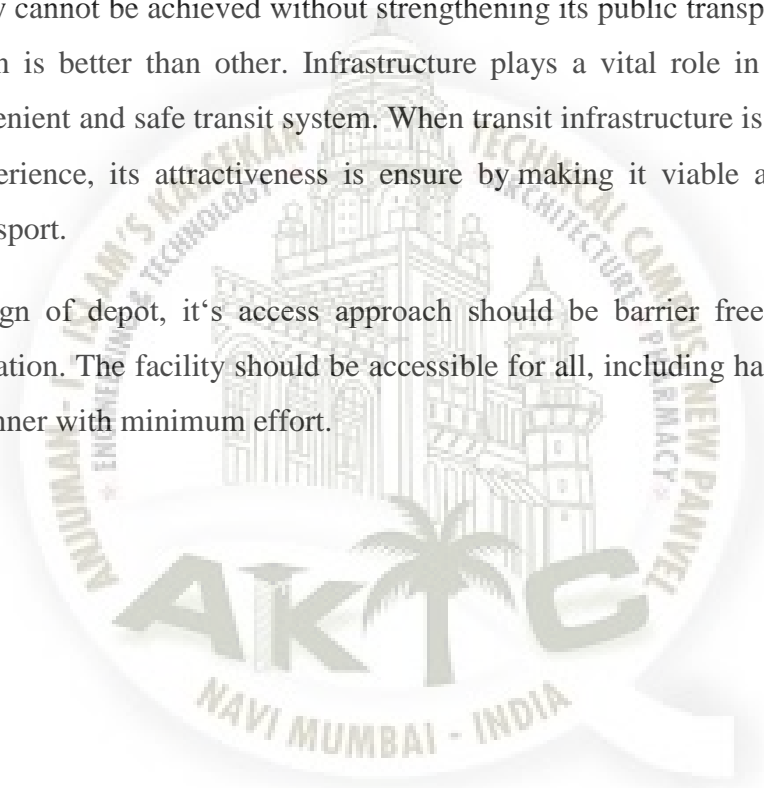
Basically depots are used as fuelling point and garage for buses; check point for driver and conductor; Eatery and resting place for passengers, driver and conductor.

## **PURPOSE :**

For developing sustainable transport systems; safety and comfortable public transport system are first condition. Bus transport systems in particular are extremely relevant since they form the finite number of public transport trips which provide more people to travel in a trip as compare to private vehicles. Improved bus services and developing infrastructure like bus terminals, depots and stops can attract users and increase ridership.

Public transport hold centre stage in the urban transport agenda. A well-functioning and sustainable city cannot be achieved without strengthening its public transport system as transit-oriented design is better than other. Infrastructure plays a vital role in the operation of an efficient, convenient and safe transit system. When transit infrastructure is designed to enhance passenger experience, its attractiveness is ensure by making it viable alternative to private motorized transport.

For good design of depot, it's access approach should be barrier free and facilitate good internal Circulation. The facility should be accessible for all, including handicap person, etc in a seamless manner with minimum effort.



## Introduction :

### Aim:

- Redesign ST bus terminal with commercial development at (Borivali East) Mumbai.

### Objectives:

- To provide an architectural solution for integrating the bus terminal with commercial complex.
- Provide fast and sensible flow of traffic.
- To provide clear segregation of different types of traffic, no connections of at peak hours.
- To provide optimum connection between all elements and spaces i.e. clear connection of functions.
- Maximize the space i.e. full usage of FSI.
- To make legalize transit hub for private buses.

### Scope:

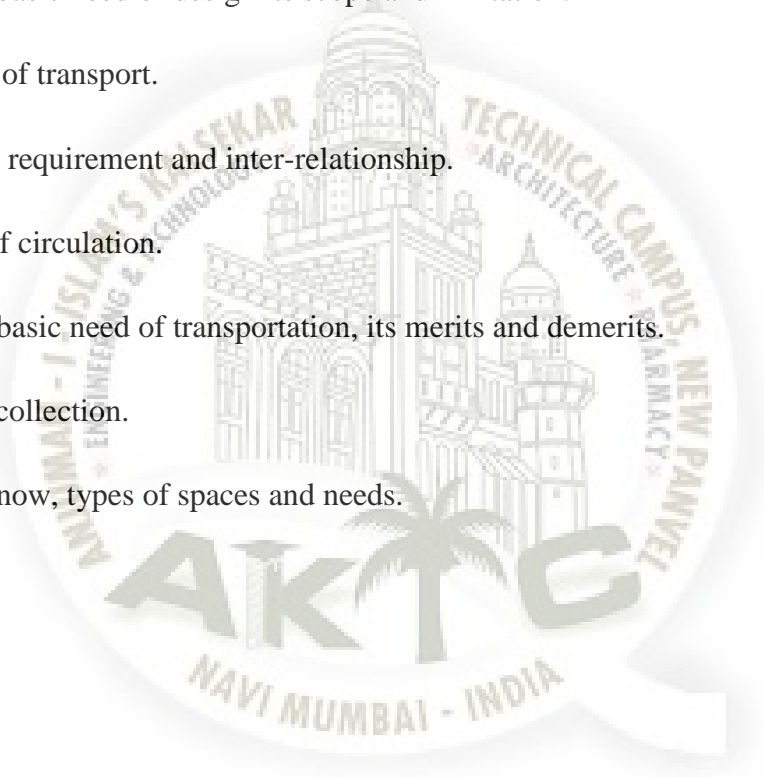
- The design is intend to cater for four aspect of potential user involvement.
- Intra-city, inter-city, inter-state commuters and passengers.
- Commercial complex intended for passengers, tourists, as well as residents of Borivali.
- Offices for divisional heads and other department involved.
- The terminus will help control and regulate informal drop-off or pick-up points on the Western Express Highway by private operators.
- Develop facilities as per user rate, passenger comfort and affordability.

**Limitation:**

- Height restriction.
- External road width.
- Slums around.

**Research Methodology:**

- Understanding basic need of design its scope and limitation.
- Studying mode of transport.
- Study of spatial requirement and inter-relationship.
- Study of flow of circulation.
- Understanding basic need of transportation, its merits and demerits.
- Important data collection.
- Case study to know, types of spaces and needs.



## Literature Review :

### Definition and Description :

There are main two spaces of depot : (viz. Workshop and Stand)

#### Workshop :

Workshop is a space in depot where buses maintained by giving servicing to its engine (garage) and body. Also buses are cleaned / washed and fuelled and also provide shelter for buses, and also houses Administration block and Head office.

#### Design elements of workshop :

**Cleaning Area :** An area provided by depot to wash buses so that buses were ready for next journey. This area is equipped by water tank and pipe or whole washing machine according to the facility.

**Fuelling area :** An area provided to refuel a bus tank with diesel to continue its journey. A cabin and two fuel tower (min) are the content of it.

**Garage :** It is a shaded area provided where MSRTC buses are serviced and repaired by mechanics.

**Head Office :** A room provided for the head of the depot to keep watch on working of depot and its premises.

**Locker Room :** A room or part of room is provided to store essential premises of employee and lock them for a while.

**Log office :** A back office where daily attendance happen and responsible for all depot data book (excluding financial).

**Meeting Room :** A room provided for meeting beside head office to gather and discuss various issue or do presentation.

**Resting Room :** A room provided for MSRTC employee to take rest in between their work when they feel to take rest.

**Revenue Office :** A back office that is responsible for financial matter.

**Security Cabin :** It is a cabin of guard to restrict people to enter in restricted area's of depot, and also give information about that site.

**Storage :** A room provided to store batteries, shock absorber and other elements of bus. It is a place where stock of this elements were kept.

**Bus testing lane/ground :** A lane or ground is provided in workshop area to test bus after servicing it, and also for new driver to test their driving.

**Stand :** Stand is a space where people comes to get buses for their journey, and also Stand provide necessary amenities for user are as follow :

**Design Element of Stand :**

**Circulation Area :** Separated Free movement area provided for buses as well as for people to do their action without any interruption.

**Dormitory :** A large sleeping room containing several beds provided to the passengers so that they can stay over there for period of time.

**Eatery :** It is a place where we get facility to eat food. Like canteen, stalls, etc.

**Enquiry and Announcing Counter :** A counter where passenger come to ask about bus route and their times and also this counter act as a check point for bus staff to check in/out when they arrive at that depot, and also it announce about buses arrival and departure.

**Parking :** A separated vehicular parking allotted for staff as well as for public to park there two wheelers, four wheelers without disturbing other circulation on site.

**Platform Ticket :** A ticket required to enter depot premises. A cabin should be provided at the entry of depot for platform ticket. Act of revenue generation.



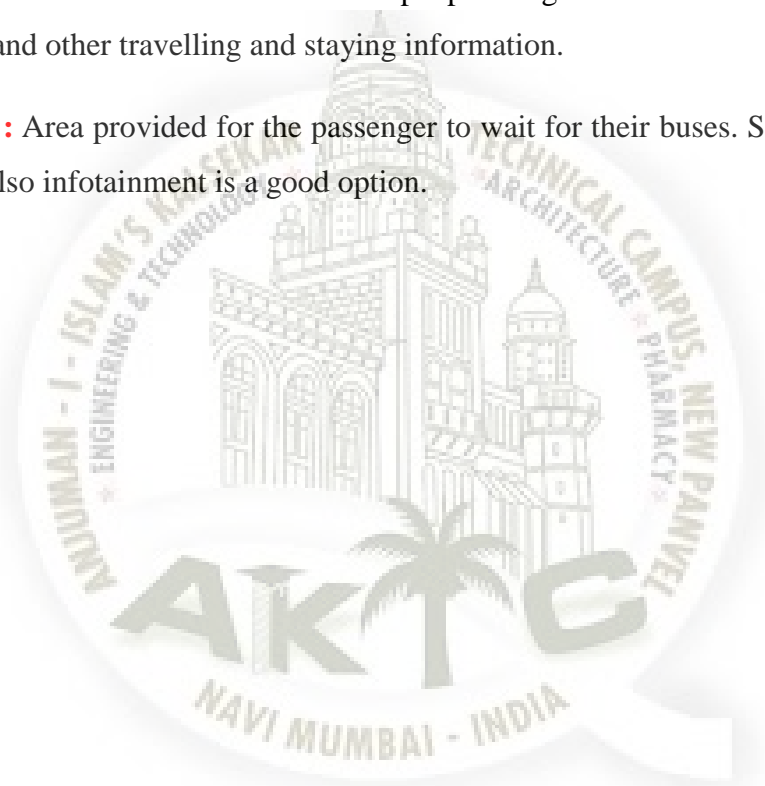
**Storage for name plate of routes :** A room or a part in room provided to store name-plate of the route that name-plate use in buses to assign the route of bus that which bus is going where.

**Ticketing Booth :** A counter provided to give ticket, passes and other schemes of bus to passenger (user : depot staff).

**Ticketing Queue Area :** An area provided to stand and make a queue to get ticket and passes and not disturb other space in depot (user : passengers).

**Tourist Information :** A counter allotted for peoples to get information about locality, nearby tourist places, and other travelling and staying information.

**Waiting Area :** Area provided for the passenger to wait for their buses. Seating is provided in this area, and also infotainment is a good option.



## Bus Bay Types :

**Loading Bay :** A platform where buses park to load passengers and goods so that they start their journey.

**Offloading Bay :** A platform where buses park to unload passengers and goods when the journey ended.

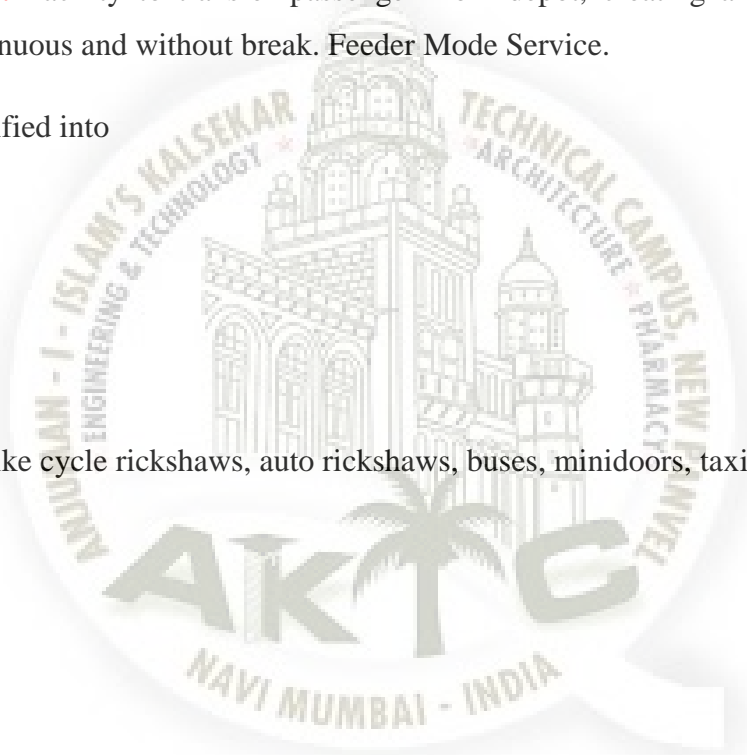
**Idle Parking Bay :** A platform where buses can park when buses are not in action or at work.

**Feeder Mode :** Facility to transfer passenger from depot, creating an impression that the journey is continuous and without break. Feeder Mode Service.

Types are classified into

- Feeder Lane
- Feeder Bay
- Intermodal

Feeder modes like cycle rickshaws, auto rickshaws, buses, minidoors, taxi, private vehicles etc.



## Facilities :

**Drinking Water Facility :** Total 88 units of drinking water facility is built by MSRTC in Maharashtra. And more units are in progress by MSRTC. And private sectors are also making such drinking water facility from MSRTC scheme in depot land.

**Toilets :** MSRTC aimed 300 toilet blocks in Maharashtra, from which 126 toilet blocks are done and open to public. And this facility maintain by 'International Toilet' company.

## Parcel Service :

- MSRTC has availed a service for citizen to transport their goods, parcels or packages from one destination to another. This kind of service is also a good source of income for MSRTC. Considering this fact, MSRTC has availed parcel services along with the passenger services since the beginning of the ST services.
- MSRTC has appointed a single agent for entire state and the rights for finalizing the parcel service rates etc. have been given to them.
- All the major Bus Stands of MSRTC are having parcel service offices for providing a reliable, trustworthy and competitive parcel service.
- Uncle Parcels & Forwarders Pvt. Ltd (Authorised Agent of S.K. Translines Pvt. Ltd) is operator of parcel service for MSRTC.
- Mumbai, Nagpur, Nashik, Pune, Aurangabad, Amravati are the parcel operators region in Maharashtra. And Indoor (M.P.), Sendawa, Burhanpur, Karnataka state, Belgaon, Bijapur are interstate operator region of parcel service for MSRTC.

## BUSES OF MSRTC :

Travelling by buses forms the most common mode of transportation in India. All cities are interconnected through a huge bus network run by state owned corporations. In general, the bus service is available between larger cities at short intervals and are very cheap when compared with other countries. Nearly all cities and towns have their own 'bus stand'.

The services have been implemented in the MSRTC Corporation. The traffic is provided to the following types of traffic services in Maharashtra.

### 1) **Parivartan** (Simple service) (9.5 x 2.4 x 3.1)

Parivartan of MSRTC is a 2x2 ordinary bus service which offers comfortable service to mass passengers.

Fast service - bus service is running from the beginning

Night service - starting from 01.04.1968

Total quantity of this type buses = 14601 no.s



### 2) **Asiad** :

Asiad is semi-luxury non air-conditioned 2x2 bus service. Typically buses under this service are of white and green with blue band on it. Initially MSRTC started this service between Pune and Dadar which got very good response of passengers. After the success of this route, MSRTC start Asiad service in all cities of Maharashtra. In 2010 color of Asiad buses change to purple and shiny white.

- **Hirakani (Nimaram services)(Asiad) - (9.59 x 2.5 x 3.2) - since 1982**

Total quantity of hirakani buses = 947 no.s

Air-condition service - From May 1996 (on the Dadar-Pune road)



- **Shivneri (Air-conditioned Volvo) - from December 28, 2002** This is an air-conditioned bus service of MSRTC which runs between major cities of Maharashtra. The service is run through world class Volvo B7R buses. Initially this service was started on Pune-Dadar route, after that extended to all major cities of Maharashtra. Few buses under Shivneri service are also connect Maharashtra to Bangalore, Hyderabad, Goa(Panjim) etc.

Total quantity of Shivneri buses = 106 no.s



- **Ashwamedh (On rent Sleeper Coach)** - From 05.06.2013

Total quantity of this type buses = 2 no.s



- 3) **Yashwanti (MIDI) service** - since 2002

Total quantity of yashwanti buses = 476 no.s



- 4) **Sheetal** - (nimaram vatanukulita service) - from 27.09.2010 (Dadar - Pune route) dated 08.03.2013 nimaarama buses "hirackni" that was renamed.

This service is one of the recent service of MSRTC. Under this service semi-luxury air conditioned 2x2 buses are used. The fare of Sheetal bus service is lower than Shivneri and higher than Asiad bus service. Till 2010 this service is on Pune-Dadar route, now MSRTC have plan to extend this service.

Total quantity of sheetal buses = 7 no.s



- 5) **City Bus** - S.T. operates City Bus Service in 7 different cities of Maharashtra State. City Bus Service is operated in Nashik, Nanded, Ratnagiri, Miraj, Vasai, Nalasopara, Aurngabad & Chandrapur. City buses provide service to passenger of small town and semi-urban area.

Total quantity of city buses = 390 no.s



- 6) **Daily conducted tour** : A single day tour operated by Asiad or Hirakani buses. Route of Tours are available from Aurangabad to Ajanta and Ellora caves.



- 7) **Yatra - (festival service)** : The Yatra bus service is for passengers who want to visit various festivals of Maharashtra.



- 8) **Tourism Package :** Tourism package is a service in which passenger buy a single ticket and visit selective group of tourist destination in Maharashtra. Group are created on the basis of tourist destinations of a district to which this service belongs.





## **Motor Vehicle Act 1939 and RTC Act 1950 :**

### **Motor Vehicle Act 1939**

**21A .Necessity for conductor's licence. (1) No person shall act as a conductor of a stage carriage unless he holds an effective conductor's licence issued to him authorizing him to act as such conductor; and no person shall employ or permit any person who is not so licensed to act as a conductor of a stage carriage. -----**

*1 Subs. by Act 20 of 1942, s. 6, for the original cl. 2 Ins. by Act 56 of*

*1969, s. 9 (w.e.f. 1-10-1970). 3 Ins. by Act 100 of 1956, s. 18 (w.e.f 1-8-1957). -43*

### Road Transport Corporations Act, 1950

*Establishment of Road Transport Corporations in the States.*

*The State Government, having regard to*

- a. *The advantages offered to the public, trade and industry by the development of road transport;*
- b. *The desirability of coordinating any form of road transport with any other form of transport;*
- c. *The desirability of extending and improving the facilities for road transport in any area.*
- d. *Providing an efficient and economical system of road transport service therein; may, by notification in the Official Gazette, establish a Road Transport Corporation for the whole or any part of the State under such name as may be specified in the notification.*

**48. Transitional provision relating to Bombay State Road Transport Corporation.**

*Not with standing anything contained in section 47A, it shall be lawful for the Government of the State of Bombay to frame a scheme under sub-section (1) thereof and forward the same to the Central Government before the 1st day of May, 1960, and in such a case, the power conferred on the Central Government to make an order under sub-section (2) thereof may be exercised before that day but no order so made shall take effect till that day.]*

**1** *Ins. by Act 11 of 1960, s 71, original s. 48 rep. by Act 36 of 1957, s. 2 and Sch.I.*

### Basic Research on MSRTC :

Transport in India consists of transport by land, water and air. Public transport remains the primary mode of transport for most of the livelihood in India, and India's public transport systems are among the most heavily used in the world.

Buses are an important means of public transport in India. Due to this social significance, bus transport is predominantly owned and operated by public agencies, and most state governments operate bus services through a State Road Transport Corporation. These corporations (MSRTC) have proven extremely useful in connecting villages and towns across the country.

### Today's Network and Size of MSRTC :

- 6 - Regional Offices
- 31 - Divisional Workshops
- 3 - Central Workshop
- 250 - Depots (Terminal)
- 3 - Training Centre
- 9 - Tyre Retreating Plant
- 597 - Bus Depot
- 3639 - Bus Stands / 4150 Bus Stops
- 104000 - Worker/Employee
- 240 - Books Stalls
- 935 - Shops (fast food, canteen)
- 2253 - Other Amenities

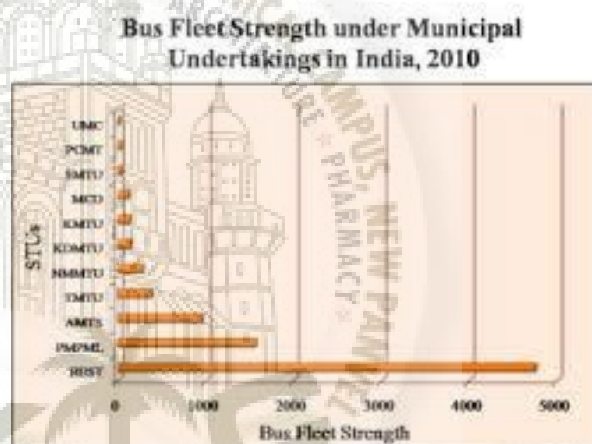


Fig 4.5

Data Source: ASRTU, 2012

### Service Seasons :

- 1) Crowded Season = March 01 to June 30 (4 Months)
- 2) Less Crowded Season = July 01 to February 29 (8 Months)

## Various Departments of 'MSRTC'

### 1) FINANCE AND ACCOUNTS DEPARTMENT

Finance and Account department exercises financial control over financial activities of the corporation. Financial advisor and chief account officer is head of department (HOD) of Accounts and Financial department and is appointed by State Government.

#### Functioning of Finance and Account Department

- a) Finance
  - i. Budgeting
  - ii. Fixed Deposit Scheme and FD Rates
- b) Accounts
  - i. MSRTC C.P.F. / EDLI / Gratuity
  - ii. Profit and Loss account and balance sheet (last)
  - iii. Profit and Loss account and balance sheet (un-audit)
- c) Audit
  - i. Internal audit in MSRTC
  - ii. Government audit in MSRTC
- d) Information and Technology
  - i. Online reservation system
  - ii. Electronic ticket issuing system
  - iii. Smart card
  - iv. Vehicle tracking system
  - v. Stores inventory control system
  - vi. Provident Fund, Fixed Deposit, Gratuity, Financial and Vehicle Accounting.

### 2. TRAFFIC DEPARTMENT

The functioning of Transport Department is carried out under the guidance of General Manager (Transport). It draft the buses timetable and route of buses for MSRTC.

### 3. MECHANICAL DEPARTMENT

The mechanical department planned to make available the required vehicles (buses) to operate schedule (timetable proposed by traffic department) at assigned route. And it also decide the maintenance and life of buses and purchase of new bus chassis.

#### 4. PERSONNEL

The Personnel Department is dealing with the employees of the Corporation, right from recruitment up to termination and beyond termination to look after the terminal benefits of its employees.

viz. gratuity, provident fund, employees' pension etc.

Functions Of Personnel Department :-

- a. Recruitment
- b. Promotions
- c. Seniority
- d. Service Benefits-increments, selection grade etc.
- e. Labour Settlements
- f. Discipline & Appeal Procedure
- g. Maintenance of Industrial Relations

The department is liable to frame policies of the Corporation for employees.

#### 5. CIVIL

Civil Department in MSRTC is looking after construction works as demanded by Traffic Department, Mechanical Department and Administration.

It's main objective is to provide infrastructural facilities for functioning of Depots,

Divisional Workshops, Bus Stations etc. by constructing required buildings and to maintain the constructed structures.

Similarly, the lands required for new establishments are acquired by Civil Department.

In addition to above functions, Civil Department is dealing with establishment of commercial complex on vacant lands and MSRTC premises where open land is available.

**6. PLANNING AND MARKETING:**

Planning and Marketing Department		
Branch	Planning	Marketing
Object	Structural and Method of the Corporation	Framing of schemes to increase revenue of the Corporation
Function	<ul style="list-style-type: none"> <li>- Inspection of various Unit.</li> <li>- Proposals for establishment of new Regional and Divisional office.</li> <li>- Proposals for restructuring of the Organizational setup of the Corporation</li> <li>- Proposals for decentralization.</li> <li>- Proposals for delegation of powers.</li> <li>- Action on Recommendations made by the committee appointed by State Government if any</li> <li>- Fixation of targets for important parameters of Traffic and Mechanical Department.</li> <li>- Review of operational parameters with reference to the targets and actual achieved.</li> <li>- Preparation of plan for Disaster Management during monsoon period.</li> <li>- Permission to students for collection of data for Ph.D. Study from Corporation.</li> </ul>	<ul style="list-style-type: none"> <li>- Advertisement of concessional schemes, various services and facilities offered by the Corporation to passenger at various places like Govt./Pvt. Offices, market place, Educational/Professional institute, IT hub, Gram panchayat, Hospitals etc through S.T. employees.</li> <li>- Introduction of various schemes to increase the revenue of the Corporation.</li> <li>- To frame the policy for increase in revenue of casual contract by offering maximum no. Of buses to various industries, institutes, private offices, resort and for tour packages, etc.</li> <li>- Marketing of the MSRTC services through Digital/Electronic media like audio, video system. Attractive colouring of buses, creation of brand, logo, tags line etc. By appointing professional consultant.</li> </ul>

## 7. STATISTIC

Management Information System (MIS) is established to provide information of various operational performances to the management. Information is compiled at divisional, regional level & final compilation is done at Central Office, Mumbai.

Basic documents from depots and associated documents from Traffic, Mechanical, Accounts, Personnel & Stores Department are collected, scrutinized and compiled to prepare various Statistical reports.

### Parameter & Analysis –

To measure operational efficiency of Traffic & Mechanical department, various performance indicator are taken into account and those are as follow:

Traffic indicators- Route, Schedule, Effective Kilometer, Traffic Receipt, Earning per km. percent Load Factor, Vehicle Utilization, Crew Utilization

Mechanical Indicators - percent Fleet Utilization, Rate of Breakdown, KPTL, KPL, Tyre consumption, Spring Consumption, etc.

This information analysis is made available to each unit using advanced "Geographical information system (GIS)". This information is useful for decision making.

## 8. LEGAL

Legal Department of MSRTC look after legalization, cases in law court if any for the corporation.

## 9. PUBLIC RELATION

Publicity in public activities such as passenger transport is the unique general entity. The relationship is a link between corporation and traveler. Public Relation Department plays an important role in upholding the general body image.

## 10. SECURITY AND VIGILANCE DEPARTMENT.

The security and vigilance department of the corporation is referred to as "eyes and ears" of management. The main objective of the Department is to bring out the issues related to irregularities, financial irregularities and financial harm to corporations, and to prevent them from being exposed at the same time, so as to provide law and order to the passenger, pay attention to the law and order and to make these matters known to the corporation from time to time.

Incidents of violation of law and order and damage to the corporation are promptly communicated to the central office and at the level of the Corporation, contacting the concerned district police force should take immediate action against such incidents or take appropriate steps to prevent corporation and people from any harm. This is to work effectively to stay safe and secure.

### **It's Function:**

- Protecting the property and the contents of the corporation.
- Help the Transport Department in carrying out illegal travel traffic.
- Inspection of night buses running on highways and exit areas.
- Roads to keep passengers safe. Do the drivers checking of alcohol.
- Investigations about the purchase of fuel, lubricant and store bags of billions of rupees, whether their arrivals / outward settlements are done and also investigate scrap material.

### **11. STORES AND PURCHASE :**

Deputy General Manager (Stores): - To control stock storage, to monitor the functioning of purchasing decentralized works, to facilitate functioning.

Senior Warehousing Officer (Self): - Procure purchase of spare parts for bus vehicles and make available necessary resources for them.

Senior Warehousing Officer (All-1): - Process of procurement of materials required for bus vehicles, processing of cloth for labourers and making available official material for office work and providing necessary resources for them.

Senior Supervisory Officer (All-2): - Fuel(Diesel) for buses, all types of automobile oils, tires, tubes, flaps, tire retreading material etc. Process of purchase and providing necessary resources for it.

### **About missing thing: To get back the missing and in custody belonging :**

If any person left his/her belonging in bus, then he/she has to ask for it in respective depot of MSRTC to get back his/her missing thing. MSRTC / ST keep missing thing only for one month of period, Therefore he/she has only one month to get back that thing from MSRTC Depot. If people are careless then, After One month MSRTC give missing object to 'Auction-Mahamandal'. Auction-Mahamandal is a committee which create a auction environment in every year, as so many objects are missing in the year, but there is no storage or shortage of storage to store such bulk missing thing. But before auction, the owner of that missing thing came to get back his/her belonging in Auction- Mahamandal, then he/she has to proof that the missing thing is of his/her own property, then he/she has to pay 10% of the total price of that missing thing to the Auction- Mahamandal.

### Charges at MSRTC Depot:

If the price of missing thing is less than Rs.100 then MSRTC charges 50 paisa per day upto Rs.5 .

If the price of missing thing is more than Rs.100 then MSRTC charges 50 paisa per day upto Rs.10 .

If passenger/customer demand to get that missing object to other location than that depot, then parcel charges will be applied to that missing object.

### 1. Users of MSRTC Depot :

#### A) Facilitator (Employee of MSRTC)

##### 1. Terminal Staff in.

- 1) Min. 2 Person in Revenue Office.
- 2) Min. 2 Person in Terminal Office (Log Office)
- 3) 1+3 and 1 Secretary in Head Office
- 4) Min. 1 Person in each Block of Enquiry and Ticketing
- 5) Mechanic's According to the Pit in garage area (1person / Pit)
- 6) Depot Cleaning staff
- 7) Security

##### 2. Bus Staff.

- a) Driver
- b) Conductor

#### B) Passengers. (Customer of MSRTC)

- a) Kids
- b) Working age (Men, Women)
- c) Old

(Medical conditioned, Poor, Rich)



## **PASSENGER:**

### **Purpose of Visit to depot:**

People use bus service to get Work at Office, for School, College, or to interchange/change mode of Transport, for Municipal work, watching Movie in Theatre, Mall or Market for Shopping, Other Purpose According to the Site Context.

About 60% of passenger use transit for work, to go to office.

The second is 25% are Students who are go to school and colleges.

And 15% is of Medical trip, personal purpose and other purpose. (according to APTA)

### **When do people use public transit:**

If the orientation of transit route match's to their office, school/college route. Then those people use public transit as it is affordable from other mode.

### **Basic needs of passenger to get attracted towards depot:**

- Seating area with shed.
- Less distance Facilities.
- Something time-pass like television or wifi.
- Timetable announcing speaker/ screen.
- Lighting.
- Ventilation.
- Good paving and flooring.

### **Off board information:**

Off board information is provided to passengers at the time of Offloading at Depot. Usual up to date predictions provided include :  
(Passenger Information System 2015)

- Which Route is Operated by the next bus to Arrive, Including its Expected Departure Time and Destination.
- General Announcement that may useful to the passenger in order to Understanding the Implications for their Travel Plans.

### Passenger don't want congested area :

Passengers are Sensitive Enough about their surrounding Space. When they feel space is compromised by crowding, they perceive it as a disintegrate of service. (Transportation Research Board 2011).

### i. Capacity Relationship :

#### Trips :

Two Ways of Measuring a Trip

1. Unliked Trip = Number of People Boarding and Riding.
2. Liked Trip = Number of Trips taken by Bus.

#### How to Calculate Capacity and Footfall :

a. Frequency (vehicle/Hr.) =  $F = \frac{60\text{min}/\text{Hr.}}{H}$

b. Headway (in Min) =  $H = \frac{60\text{min}/\text{Hr.}}{F}$

Capacity (Passenger/hr) on the route =  $C_{\text{route}}$

$$C_{\text{route}} = F \times N_{\text{car}} \times C_{\text{car}} \text{ Where,}$$

$F$  = Frequency

$N_{\text{car}}$  = Number of Coaches (1 for Bus)

$C_{\text{car}}$  = Maximum Number of Passenger per Bus

(Source : Fundamental of Transport "Its Operation and Capacity".)

## **Financing :**

Investments in infrastructure are very costly. Adding to this cost, once infra gets ready, it requires operating and maintenance cost also. In many cases governments subsidize infrastructure by providing it free.

Financing is classified into Two Types :

### **1) Public Funding :**

Governments subsidize public transport for environmental, political, social or economic reasons. Subsidies is the form of direct payments which is unprofitable for government, but owner of transport industry get benefit from subsidy to run its service. Further development in infrastructure include promoting business and economic growth to get benefited of.

The use of taxpayer capital to fund mass transit will ultimately save taxpayer money in other ways, and therefore, state-funded mass transit is a benefit to the taxpayer. Reduction in public transport results in more traffic, pollution, and road construction to accommodate more vehicles, this all costly to taxpayers; providing public transport system will negotiate these costs.

The main sources of financing in transport sector are ticket revenue, government subsidies and advertising. The revenue from passenger charges (percentage) is known as the fare box recovery ratio.

### **2) Public private Partnership (PPP) :**

When public funds is low to meet the investment requirements, then a terminal infra project have to take public private partnership method to increase Investment.

Public private Partnership has many methods, most common is exchange of land rights related to the terminal site. This exchange means transferring a component of a site to the private partner, for Commercial Development and Ancillary functions.

## **Maintenance and Services :**

### **Maintenance :**

Maintenance of Depot Infrastructure is costly and time consuming because of ongoing transporting service, It is a critical indicator of a Infra attractiveness. Creating a Maintenance Schedules is the only way to execute Maintenance of Depot Infra.

### **Services :**

The Services is an Essential Component of Bus Depot Design. Services include lighting, drainage, fire fighting, and information systems, Without these services a good integrated design of a Depot is impossible.

#### **1) Lighting :**

Bus Depot Service continue beyond sunset which tends to need of lighting provisions. And lighting is also requires during day time when solid roofing of Infrastructure create inside Spaces dark and discomfoting.

The main motto is to provide sense of personal security to the passengers. Lighting features are components of Crime Prevention and Avoid the use of Depot Space from non-bus Rider. Adequate lighting in the Depot helps operators in proper management of bus operation.

#### **2) Drainage :**

Water Logging on-site is a Major Problem in most Indian Bus Depot. It impacts Depot's Performance resulting in discomfort to commuters, and a reason of unattractive Depot. Also it generates additional Maintenance expenses. Thus large open spaces should incorporate the necessary Design profile, in order to avoid Water Logging and ensure easy flow drainage system, even in peak rainfall month.

#### **3) Fire Fighting :**

A Depot Space and Infrastructure should be Constructed, Equipped, Maintained and Operated in Fulfilment of the Need to avoid Unreasonable Danger to the Life and Safety of Users from fire, smoke and other panic, in the time period necessary for escape.

# MSRTC make a successful turnout in Kolhapur district

TNN | Updated: Feb 23, 2017, 05.47 AM IST



(Representative Image)

KOLHAPUR: The **Pravasi Wadhva** (attract passengers) campaign of the **Maharashtra State Road Transport Corporation** (MSRTC) has taken a successful turn in Kolhapur division.

The campaign has successfully increased five lakh passengers in the month of January, 2017. As per figures of January 2016 MSRTC had a total of

1,30,82,000 passengers in Kolhapur district and after launching **Pravasi Wadhva** **campaign** in January this year, the number of passengers amplified to 1,35,69,000. MSRTC had successfully implemented this campaign across twelve depots last month.

Divisional traffic inspector, D B Kadam, said, "In a span of one month, we have added as many as five lakh new passengers. The **Kagal depot** proved to be the most profitable after adding 1.05 lakh passengers followed by **Sambhajinagar** and **Aajra** depots with 97,000 and 75,000 passengers respectively. Remaining depots have added marginal passengers under this campaign."

He added, "We have been consistently working to increase the number of passengers in MSRTC buses. We have conducted meetings with drivers and conductors for effective coordination at depot level. We are also allowing passengers to board the bus from our regular halts. Despite of the fatal accident of company workers in Kagal we have our permanent passengers there. Our campaign will run till the end of March. And the drivers and conductors will be getting financial rewards for their performance."

A transport expert said, "Instead of a three month campaign, MSRTC must continue this for the entire year. The conductors and the drivers are the major driving force of MSRTC. They should commit for increase passengers like their counterparts in Karnataka. Besides the official halts, the drivers must stop their buses wherever they

### Case Study on Bus Depot : Panvel Bus Depot : (Live Case Study)



It is Existing and Operating.  
 It Serve Local, Intercity and  
 Observe Layover Time = 15-20 min.  
 No any Real Estate Development.

ENTRY to the bus depot.

*entry circulation of bus and space allocation of depot*



**Depot Entry**



**Bus Circulation Area**



- No Proper Public Entry Exit to the Depot Provided.
- Pedestrian and Vehicular Circulation Intersect Each Other
- No Passenger safety.
- Common Bay for Loading and Offloading.
- Traffic Congestion as Public Vehicle also enter in Bus Circulation Area.
- No Division Between Vehicular and Pedestrian Access.
- Problem to Carry Luggage from drop-up Point to Feeder Service as there is no Paved Pathway.
- No drinking water facilities, washroom, Medical facilities near to the drop-up point



passengers standing on bay



public vehicle entry on bus bay



passengers standing on bay and pedestrian, vehicular intersection



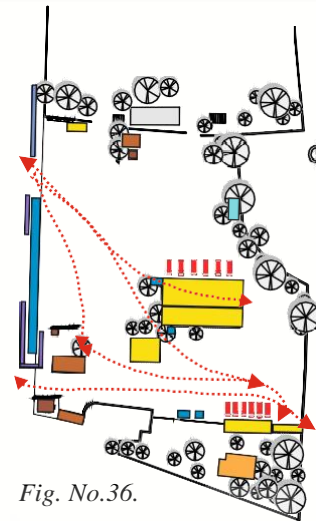
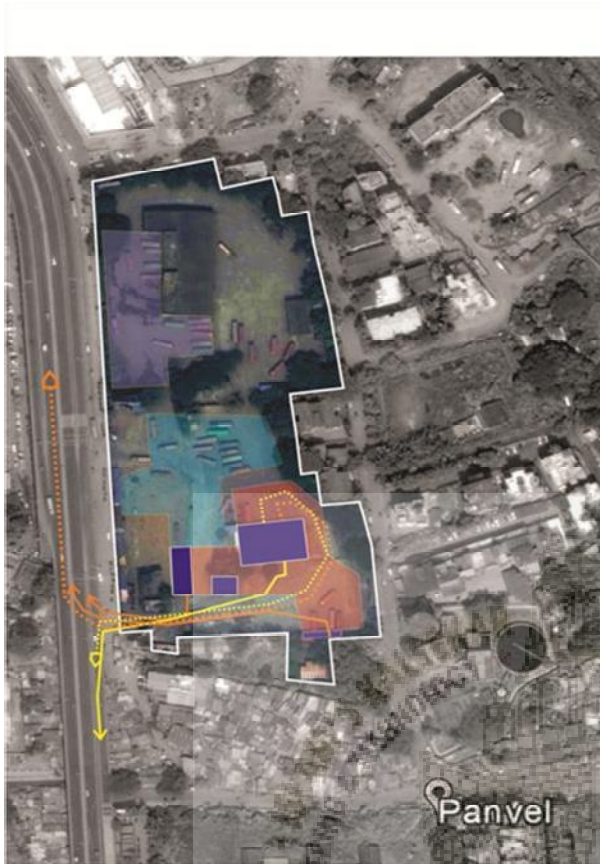
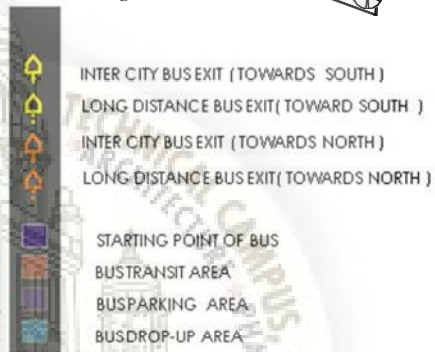


Fig. No.36.



EXIT from the bus depot.



. bird's eye view of exit



Bird eye view of bus circulation area,



- 1) Due to undefined Pedestrian Walkway, people walks within Bus Circulation area.
- 2) Narrow Exit Leads to Traffic Congestion and also Toilet is Placed near it.
- No Adequate Shaded Waiting area provided for Passengers so people prefer to stand below trees.
- As Food Stalls are Placed along the Vehicular Path, it creates Congestion.



Waiting area



Inside of Waiting area

Dark Space in Waiting Area as Huge Roof on it and No Lighting



inside of Waiting area (Konkan route bay) Infotainment



Waiting area (Alibaug route bay)



Ticketing Block (Night View)



Ticketing Block

(Day)



**Passengers boarding in Queue**



**(Night View)**

- This means if we Create a sense/rule to follow certain discipline, Passengers follow it.
- We can Restrict Passengers from going in bus Circulation Area.



**. Pit Area in Garage**



**entry to garage area with ramp**



**Bus parking in Garage area**



**Buffer Area in Garage**



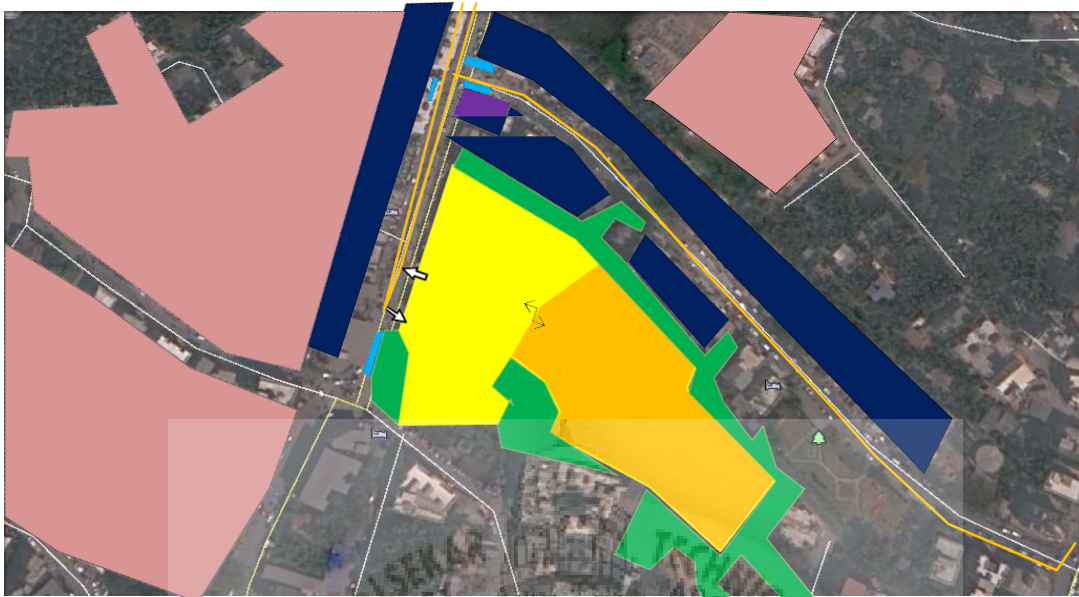
**bus washing tower**



**washing bus with hand**



**Alibaug Bus Depot :**



**LEGENDS**

**Space of Alibaug Depot**

<input type="checkbox"/>	BUS DEPOT BAY AREA		It is Existing and Operating.
<input type="checkbox"/>	BUS DEPOT WORKSHOP		It Serve Local and Intercity Buses Service.
<input type="checkbox"/>	BUS ROUTE		Observe Layover Time = 5-10-20 min
<input type="checkbox"/>	FEEDER		No any Real Estate Development on Site.
<input type="checkbox"/>	GREEN AREA		Bus Flow Possible as per available Site area = 30
<input type="checkbox"/>	FERRY TICKET (Interchange)		Other Activity = Food and Book Stall, People Gather and form group on bus circulation area, Hoarding.

Feeder Service (Auto Rickshaw Stand) :



- 1) Separate Entry and Exit to the Site.
- 2) Single Entry, Exit to Workshop Area.
- 3) Pay and Park Facility and also
- 4) Irregular Parking of Public
- 5) Sufficient Waiting Area and Canteen Provided.
- 6) Separate Offloading Bay Provided
- 7) Toilet are not Maintain

**Offloading Bay :**

**Pay and Park Facility :**



**Common Parking Without Pay :**



**Workshop :**



**Formal staff parking**

**Informal Staff Parking**

**No Metal Object Should be stored in MetrRoom**



**E. Generator**



**Panoramic View of Stand Area**

## CASE STUDY OF PAREL DEPOT:

### HISTORY OF MSRTC:

The Maharashtra State Road Transport Corporation is established by State Government of Maharashtra as per the provision in Section 3 of RTC Act 1950. The M.S.R.T. Corporation is operating its services by the approved scheme of road Transport.

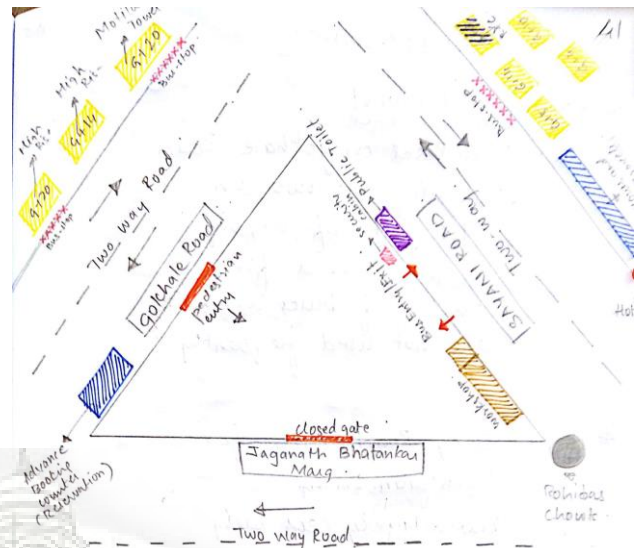
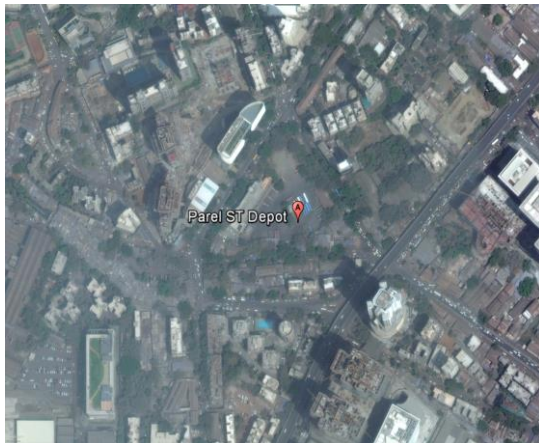


The area covered by the scheme is entire area of the State of Maharashtra. The undertaking is operating stage and contract carriage services in the entire area of the state of Maharashtra except S.T. undertaking defined under Section 68 A. M. V. Act and other exception published in the scheme. The Present Maharashtra State Road Transport Corporation (M.S.R.T.C.) represents the confluence of three streams for providing passenger road transport in the public sector. These to the Pre-1956 Reorganization states of Bombay, Madhya Pradesh and Hyderabad. However, in chronological sequence, the place of pride for providing public road transport services goes to the Hyderabad state.

No matter what, the ST reaches every village that is connected by road, however bad it may be, truly living up to its motto of jithe rasta, tithi ST' (where there's a road, there's a ST bus)!



## PAREL ST DEPOT

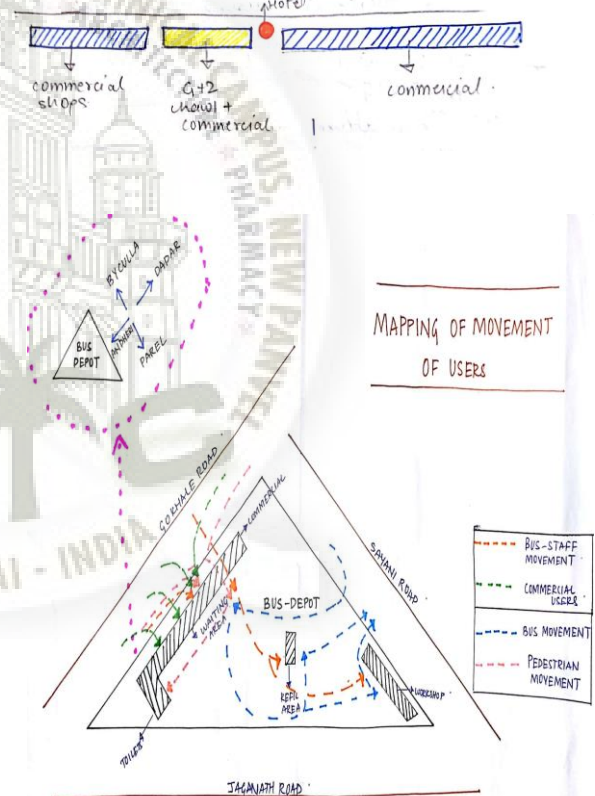


**Strength:**  
 Triangular site roads on all three sides of triangle  
 three different entry and exit points given to Avoid any crowding or congestion.  
 Segregation of activities all across the site.  
 Pedestrian waiting, entry exit points of buses and maintenance area planned in such a way that the entire site is being used in an efficient manner.

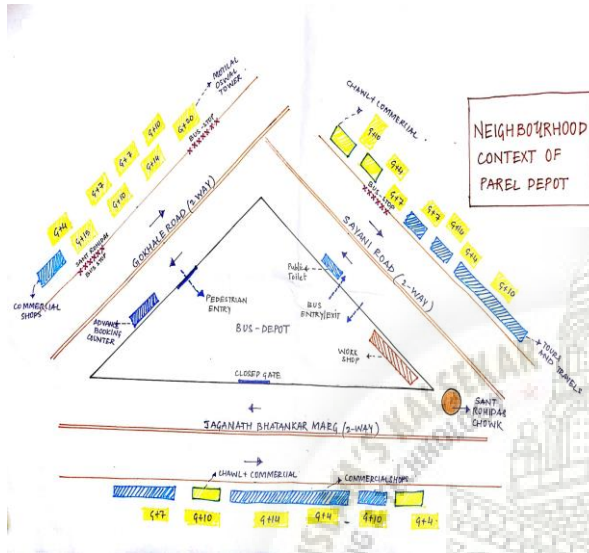
**Weakness :**  
 Workshop area near the entry/exit point of bus. Congestion is bound to happen when buses are parked at the workshop area for repair. Thereby obstructing the out movement of buses.

**Opportunities :**  
 Parking of buses that are not in use frequently is done at the corner of the site which is always shaded due to high rise motilal oswal present. Many vacant spaces are present on the site which can be put to suitable use like pantries and public toilets.

**Threat :**  
 No public toilet inside the depot for depot users.  
 No proper lights provided for efficient Functioning of the depot at night.  
 Women safety is an issue at night due to lack of proper lights across the site.  
 Facilities for staff taking care of their rest and recreation should be looked







Neighbourhood context of Parel depot

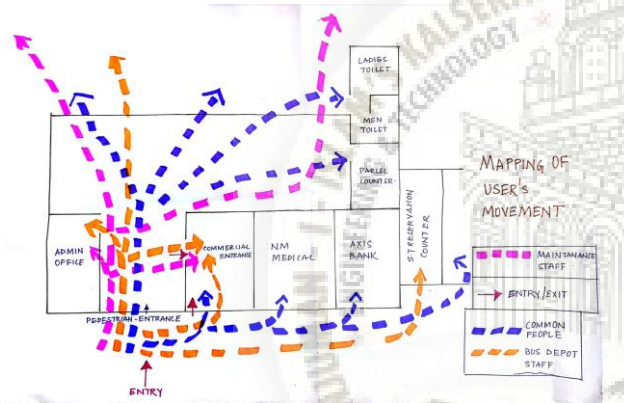


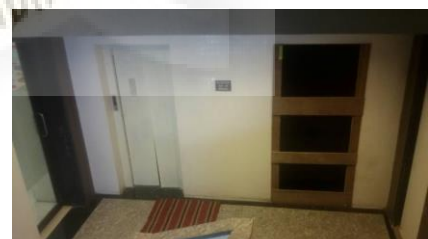
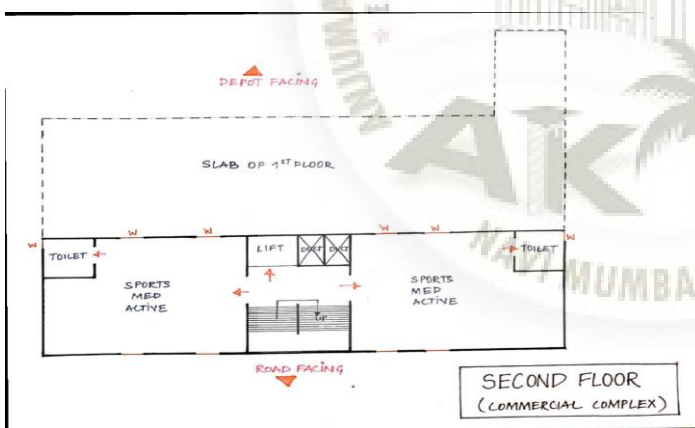
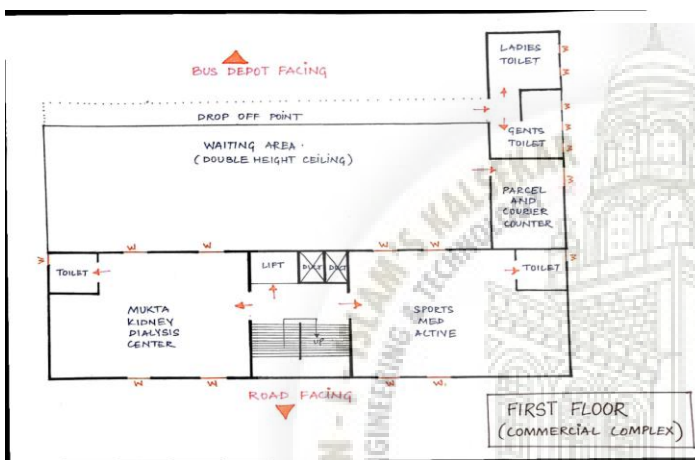
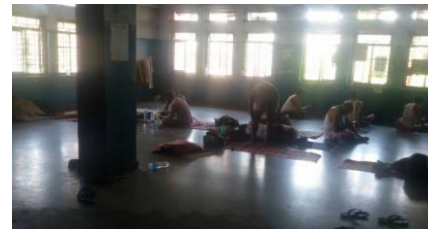
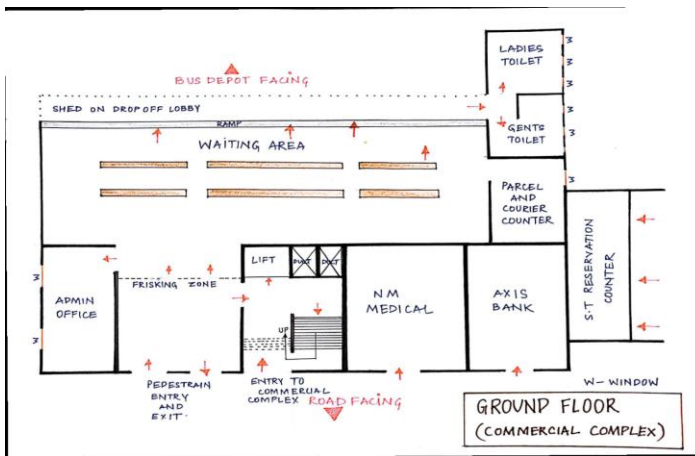
**CONCLUSION FROM THE COMMERCIAL FLOOR PLAN**

- 1) Privacy and comfort given priority as staff rest room is provided on third floor.
- 2) double height ceiling for the waiting area waiting area thermal comfort and temperature is maintained even when it gets crowded.
- 3) feeling of spaciousness.
- 4) commercial zone entries are provided separately at every floor and not as same as pedestrian entry to avoid crowding separate pedestrian and vehicular entry, commercial area.
- 5) kept or placed near pedestrian entry to avoid any congestion with the in and out movement of buses from depot.



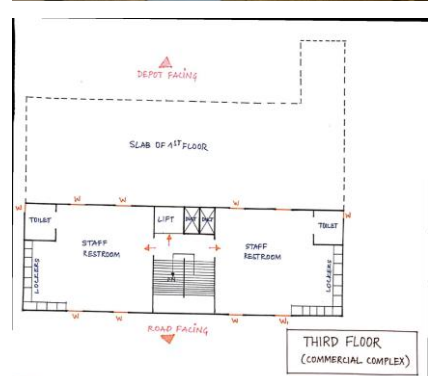
**Mapping of users movement in main block**

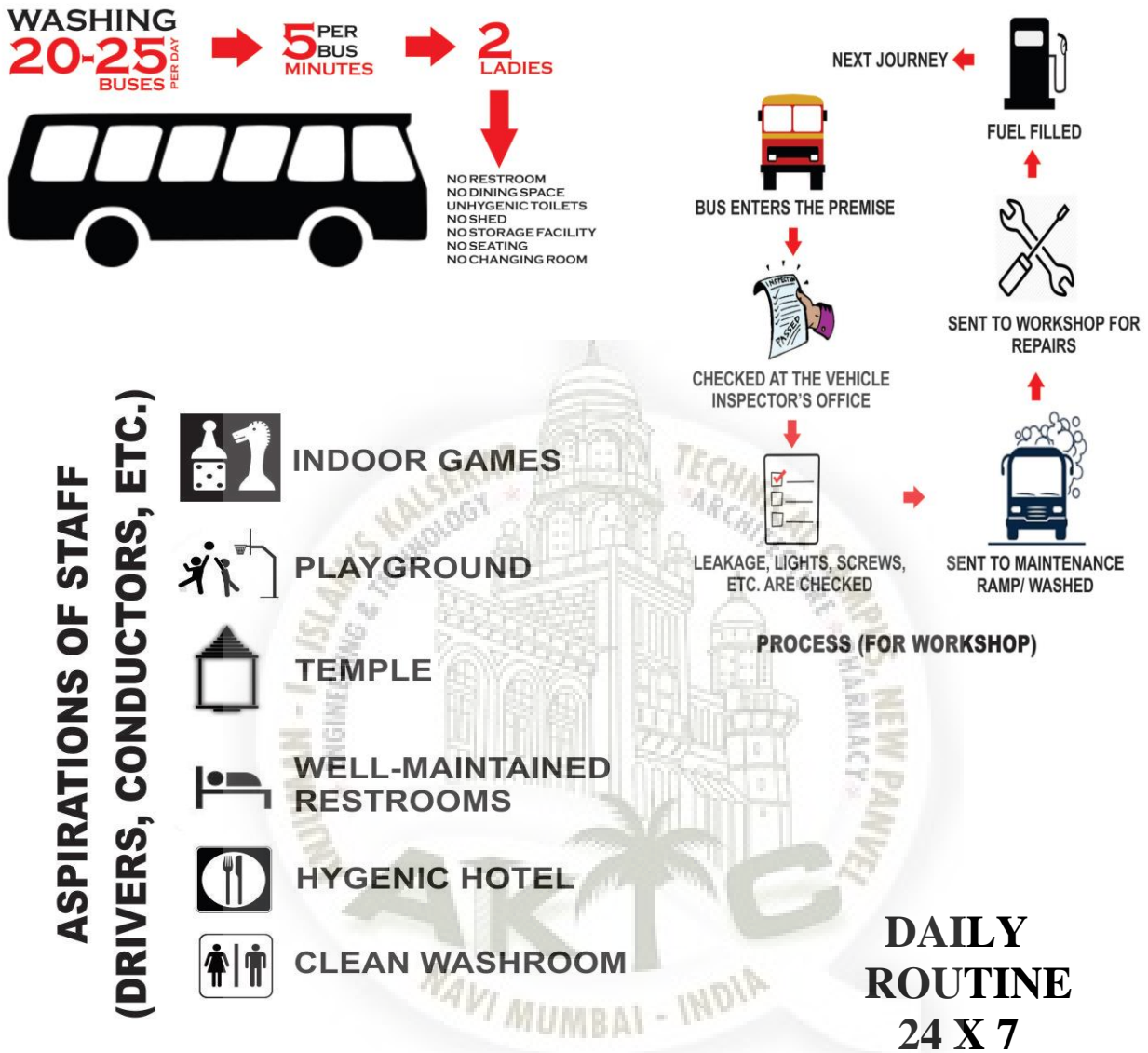




**Conclusion from all floor plan**

- 1) Privacy and comfort given priority as staff rest room is provided on third floor.
- 2) double height ceiling for the waiting area waiting area thermal comfort and temperature is maintained even when it gets crowded.
- 3) feeling of spaciousness.
- 4) commercial zone entries are provided separately at every floor and not as same as pedestrian entry to avoid crowding separate pedestrian and vehicular entry, commercial area.
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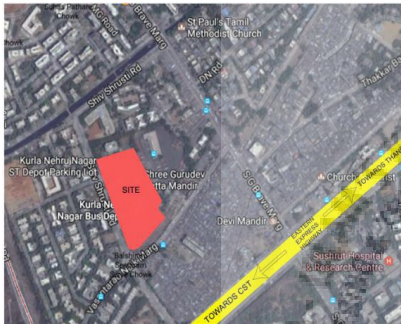




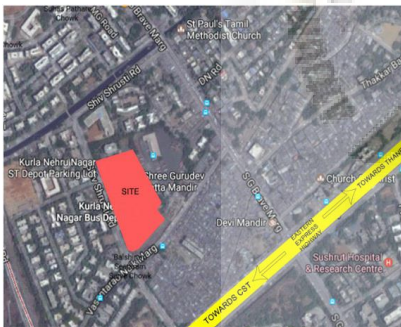
**CASE STUDY :- Nehru Nagar Bus Depot, Kurla**

- IT IS MUMBAI’S SECOND BIGGEST MSRTC BUS DEPOT.
- AREA OF THE PLOT IS 35352 SQ.M.
- THERE ARE INTER-CITY, LOCAL AS WELL AS INTER-STATE TRANSPORTATION BUSES.
- MANY BUSES FROM KARNATAKA, TELANGANA, TAMIL NADU REACH THIS STATION ON A DAILY BASIS.
- IT HAS 10 BAYS AND A BUS TERMINAL.
- IT STARTED OPERATING IN 1990.
- THE FREQUENCY OF INTER STATE BUSES IS ONE BUS EVERY 15 MINS.
- THE FREQUENCY OF IN STATE BUSES IS ONE BUS EVERY 5 MINS.

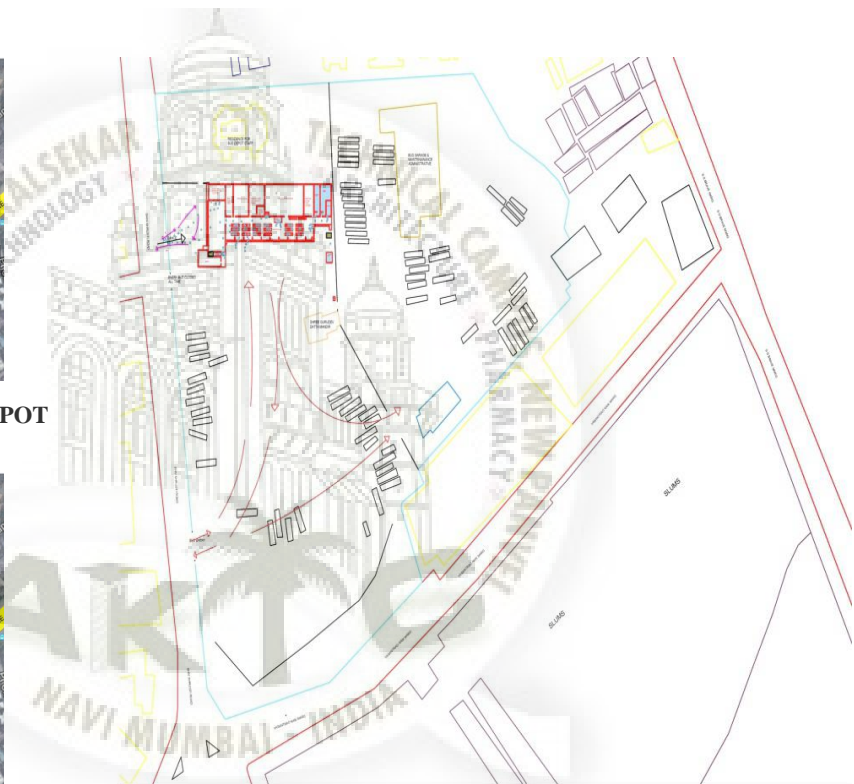
**SITE LOCATION**



**MICRO CONNECTION TO THE DEPOT**



**FIGURE AND GROUND**



**SITE LOCATION AND CONNECTION**

- ANNOTATIONS**
- ← BUS CIRCULATION
  - ← PEDESTRIAN ENTRY
  - ← VEHICULAR CIRCULATION
  - (BIKE, CAR, AUTORICKSHAW)
  - PEDESTRIAN CIRCULATION



**INTERSTATE BUS SERVICES**

**EICHER 1212 K**  
 SINGLE DOOR  
 LENGTH 9.59  
 WIDTH 2.4  
 HEIGHT 3.1  
 TURNING RADIUS 10  
 GROUND CLEARANCE 0.249



**TATA 1512c**  
 SINGLE DOOR  
 LENGTH 9.5  
 WIDTH 2.56  
 HEIGHT 3.2  
 TURNING RADIUS 10.15  
 GROUND CLEARANCE 0.249



**INTERCITY BUS SERVICE**  
**ASHOK LEYLAND VIKINGS**  
 SINGLE DOOR  
 DOUBLE DOOR  
 LENGTH 10.86  
 WIDTH 2.5  
 HEIGHT 3.4  
 TURNING RADIUS 11  
 GROUND CLEARANCE 0.249



**ASHOK LEYLAND CHEETAH**  
 SINGLE DOOR  
 DOUBLE DOOR  
 LENGTH 9.946  
 WIDTH 2.44  
 HEIGHT 3.197  
 TURNING RADIUS 10.4  
 GROUND CLEARANCE 0.249



STAFF AREA



SERVIELLANCE AND CONTROL ROOM



GARBAGE AREA



MAIN ENTRANCE AND ATM



DRINKING WATER



BUS BAYS



BANK



WAITING AREA



LUGGAGE AREA

**STRENGTH**

- THE TERMINAL HAS SYSTEMATIC PLANNING.
- ALL THE ACTIVITIES FROM PURCHASING TICKET TO PUBLIC UTILITY SERVICES ARE SEGREGATED PROPERLY.
- PUBLIC UTILITY IS PROVIDED.

**WEAKNESS**

- THE GARBAGE AREA IS NOT PROPERLY MAINTAINED.
- THERE IS A LOT OF SPACE IN THE AREA WHICH COULD HAVE BEEN USED MORE EFFICIENTLY.
- LACK OF SHADING DEVICES.
- LACK OF REAL -TIME INDICATOR FOR BUS ARRIVAL
- NO PARKING ZONE FOR TWO WHEELER OR FOUR WHEELERS AND NO SPACE ALLOTMENT FOR PICK UP AND DROP SERVICE

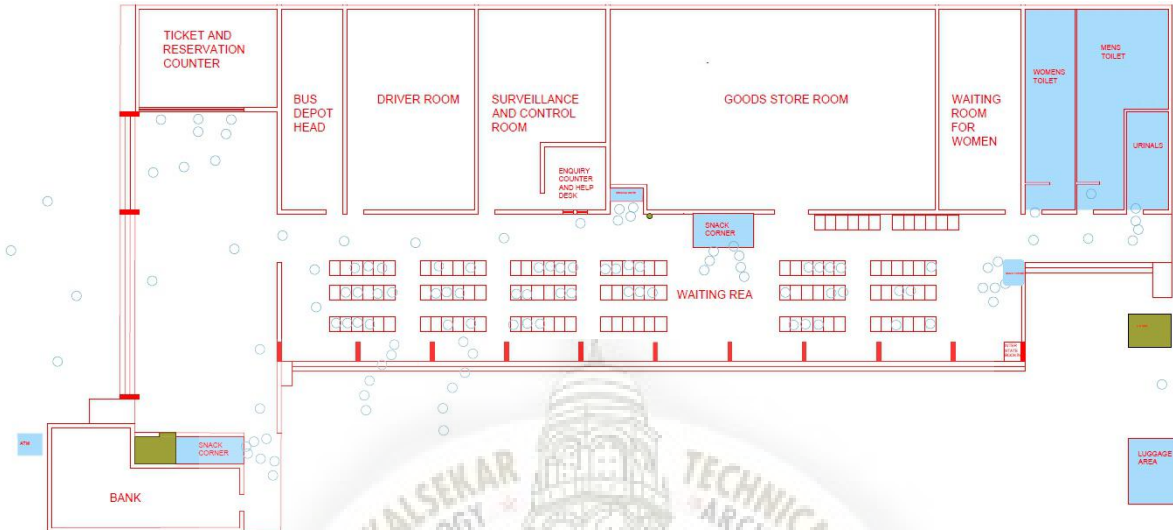
**OPPORTUNITY**

- BEING THE 2ND LARGEST DEPOT OF MUMBAI THIS SITE HAS MORE POTENTIAL TO BE EXPLORED AS THERE IS ABUNDANT AREA.

**THREAT**

- SINCE THE AREA IS QUITE BIG AND NOT WELL LIT, THERE ARE BUSES PARKED INTERSTATE AS WELL AS SOME SCRAP BUSES MAKING IT A HOTSPOT FOR ILLEGAL ACTIVITIES.

### NEHRU NAGAR TERMINAL PLAN, KURLA



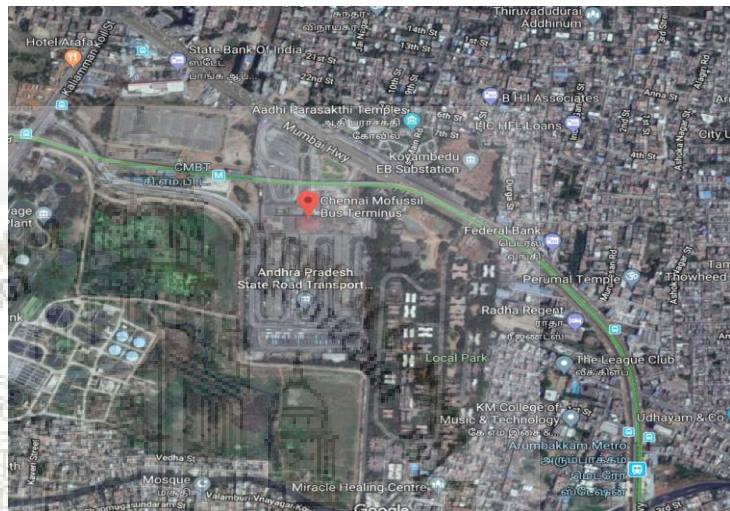
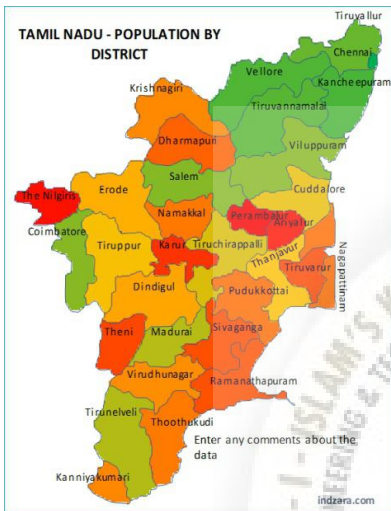


## Case Study:- Mofussil bus terminus, Chennai

### Introduction:

The Chennai Mofussil Bus Terminus or CBMT is a modern bus terminus located in Chennai, India, providing outstation transport services. Spread over an area of 2 of 37 acres (150,000 m) in Koyambedu. It is accredited with the 9001:2000 quality certification for its quality management and excellence. It is located on The 100 feet inner ring road (Jawaharlal Nehru Road) in Koyambedu between SAF Games Village and the Koyambedu Vegetable Market. It is the largest bus Terminus in Asia. And second biggest bus depot in India after Delhi Millennium Depot.

### Location:



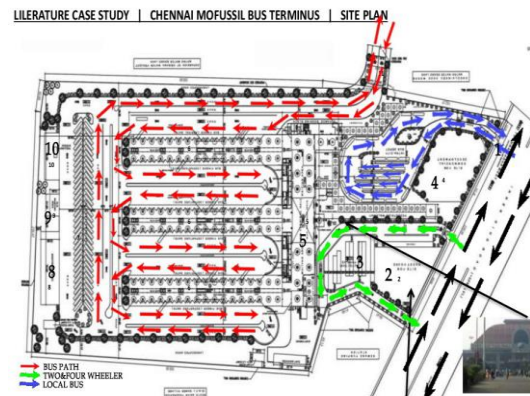
### Chennai Facts

- State : Tamil Nadu
- Area : 1189 Sq km
- Population : 46, 87, 087 (Census-2011)
- Population density : 11, 000 person/ Sq km
- Climate : Warm and Humid
- Average temperature : 35 – 40 degree celcius (summer)
- Precipitation : 1400 mm



### Chennai Mofussil Bus Terminus

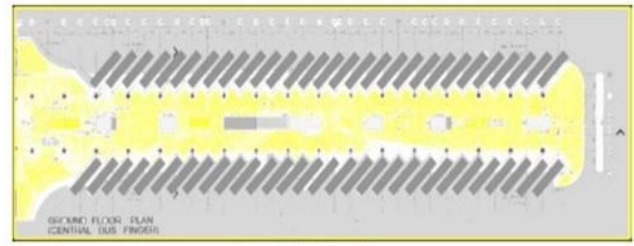
- Site area : 14.5 hectares
- Built up area : 17, 840 Sq m
- FSI : 0.123
- Ground coverage : 10%
- Architect : Mr. Kuldeep Singh
- Foot fall/ day: 2, 50, 000 persons
- Handling capacity : 3000 buses
- Idle parking capacity : 60



**Barrier free architecture**

Surrounding bus terminal as follows:

- North : 30m road
- East : Residential colony
- South : Koyambedu S.T.P
- West : Koyambedu S.T.P
- Nearby hospital : Kamla hospital 2 KM



**Access to the site**

**Figure and ground floorplan**

- i. : Entry for parking and autos.
- ii. : Main entry for users.
- iii & iv. : Entry and exit ways or buses.

**Distances from major landmarks**

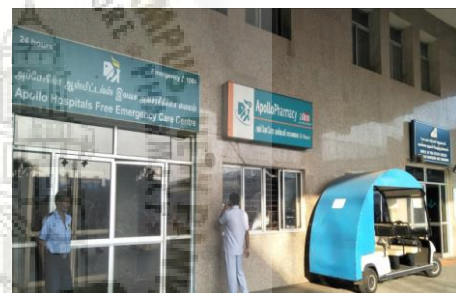
- Chennai international airport : 12 KM
- Chennai railway station : 13 KM
- IIT Madras : 18 KM

**Facilities at the ground floor level**

- Dispensary : 1 M/S Apollo Clinic
- Cloak room : 1 Nos
- Reception/ Enquiry counter : 2 Nos
- Maintenance shed : 1 Nos (1400 Sqm)
- Fuel filling station : 1 Nos (855 Sqm)
- Crew restroom : 2 Nos (500 Sqm)
- Time keepers room : 6 Nos
- Drinking water with coolers: 7 Nos
- Police outpost : 1 Nos
- Security cabin : 5 Nos
- Free wheel chairs : 6 Nos
- Bank ATM : 4 Nos
- Telephone booth : 30 Nos



**Prepaid auto counter**



**Apollo clinic (first aid)**

**Facilities at the first floor**

- Office / commercial : 2300 Sqm
- Trade centre : 2 Blocks of % shops each  
Total 600 shops (600 Sqm)
- Shops in main hall : 10 Nos
- 1 Bus finger : 24 Nos
- Trade centre : 10 Nos



**Waiting space**



**View of bus fingers**



**Government dorm centre**



**Auto stand**



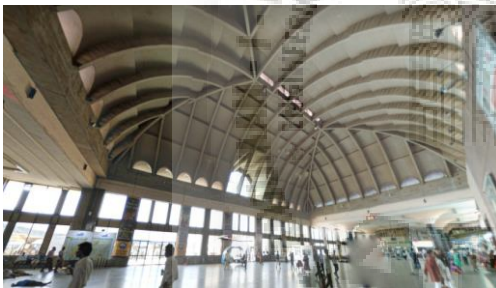
**Ariel view of terminus**



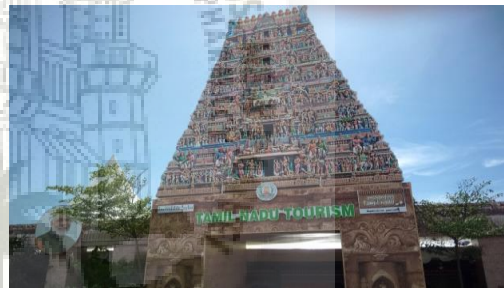
**Bus parked**



**Police out post**



**Roofing of internal space**



**Tourism centre**



**View of Mufossil bus terminus**

## Luleburgaz Intercity Bus Terminal, Turkey

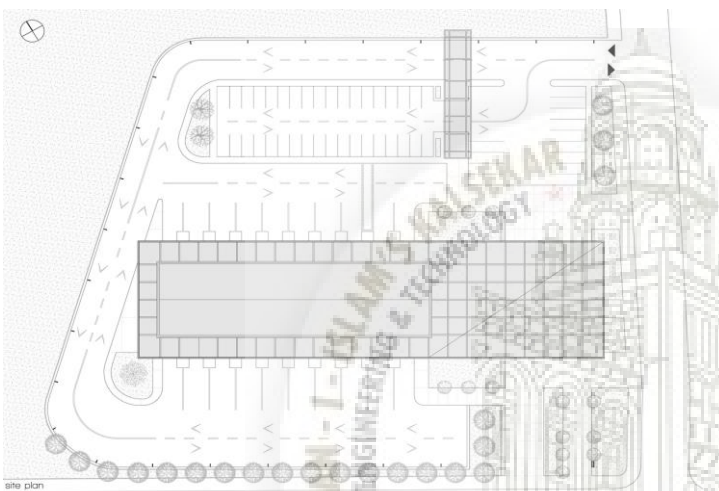
**Location :** Lüleburgaz, Kırklareli, Turkey  
**Project Year :** 2016  
**Area :** 1200.0 sqm  
**Client :** Municipality of Lüle  
**Architects :** Collective Architects & Rasa Studio

### LOCATION

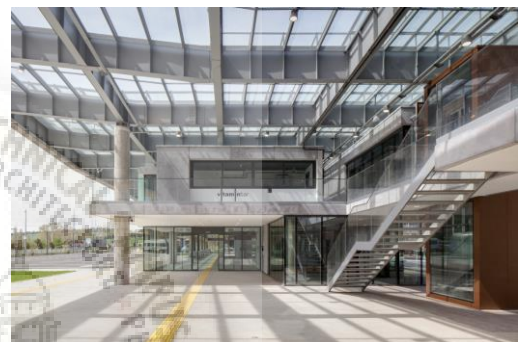


This transportation building is the entrance point of the city. It is a functional and social transportation complex in Lüleburgaz.

- VEHICULAR ENTRY- BUSES
- PEDESTRIAN ENTRY
- VEHICULAR ENTRY- 4 WHEELER



Site plan



Internal view of bus terminal



View of bus terminal



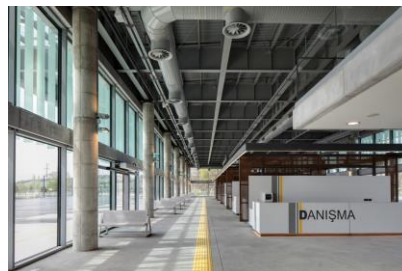
View of bus terminal



Night view of bus terminal

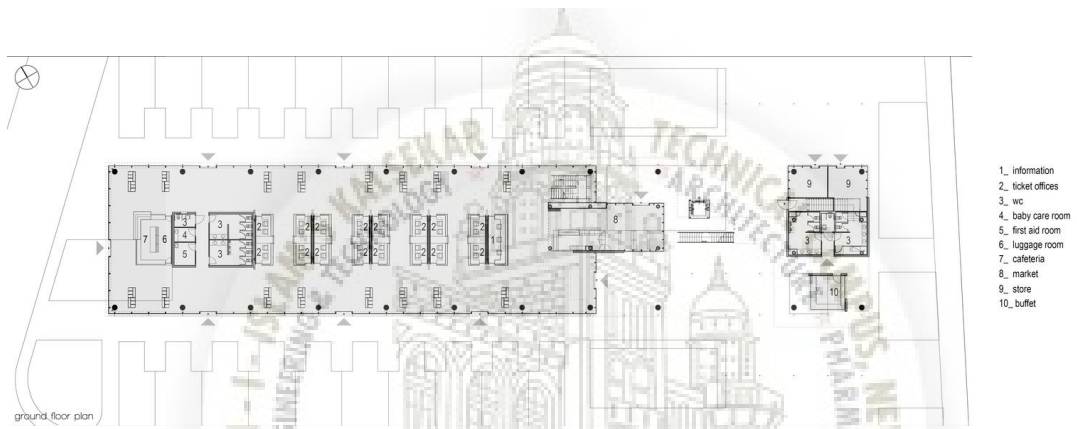


Interior views





**Views of bus terminal**

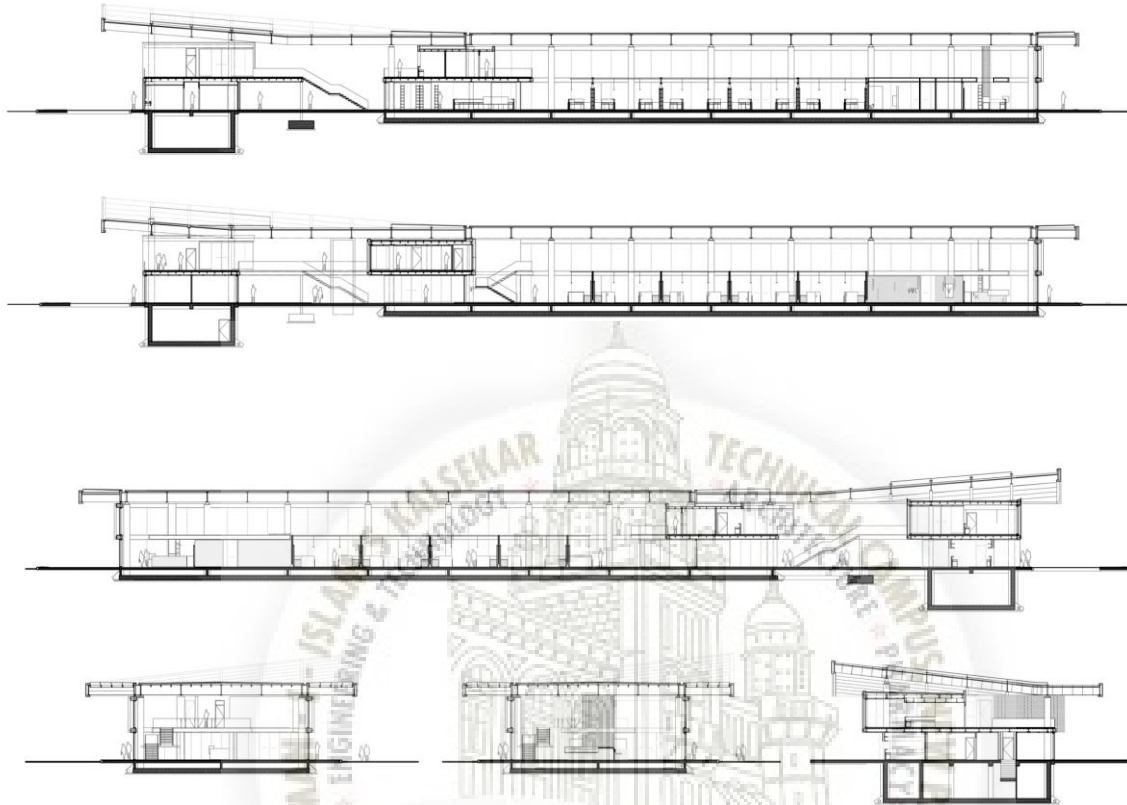


**Ground floor plan**



**First floor plan**

### Sections



### Elevations



## Inference :

Bus Depot is a Point where Passengers get transportation facility and Stock Holder get there Profit. Retail market Attracts Passenger activity, which tends to increase in Depot Footfall Resulting in more ridership to the MSRTC and also increase in business Profit.

Aesthetic value and comfort ability of Infrastructure and its Facility Attract People to Use it. The List of Facilities are listed on next page, And Facilities are allotted according to the Site Area and its Context. Also Vertical Construction of a Infrastructure helps in getting more vehicular circulation Space on Site.

Passengers are Conscious about their surrounding Space, Passengers want more Comfortable and Safe Space. Congested Public Area make a negative Sense about the Facility that we Provide to them. Hence The Future Capacity of that space has to be Calculated while Designing Public Space like Bus Depot. Easy Public flow and Vehicular Circulation with No or less Interruption is a Mandatory Care has to be taken while Designing a Bus Depot. And also access/approach to the site should be Design According to the Context where people can access that site easily.

Place Fuel Pump near Stand Area, so that Loaded Bus also take advantage of refilling Fuel Tank. Fuel Tank of a Parivartan and Asiad Bus is of 400Litre Capacity, which require 10-15 minute to fully refill it when it gets empty.

## Facilities :

Depot Facilities are Classified into Three different Category, And allotted according to the Site Area, context and its Capacity.

The Classification of Depot Facilities are as follows :

### 1) Basic Facilities.

#### A. For Depot Staff

- Drinking water Facility
- Toilets
- Resting Room
- Canteen
- Revenue Office
- Storage
- Security Cabin
- Ticketing Booth
- Maintenance Staff Area (Garage)

#### B. For Bus Staff

- Drinking water Facility
- Toilets
- Resting Room
- Canteen
- Dormitory
- Locker Room

#### C. For Passenger

- Drinking Water Facility
- Toilets
- Concourse
- Waiting Area
- Eateries
- Tourist Information
- Cloak Room
- Ticketing and Queuing
- Enquiry Counter
- Dormitory
- Baggage Trolley's
- Circulation Area



**D. For Buses**

- Loading Bay
- Off-Loading Bay
- Idle Parking Bay
- Garage
- Bus Testing Lane (optional)
- Circulation Area
- Fuelling Area
- Washing and Cleaning Area

**2) Ancillary Function**

- Bank / ATM
- Post Office
- Railway Booking Office
- Freight Service
- Clinic

**3) Commercial / Real Estate Development**

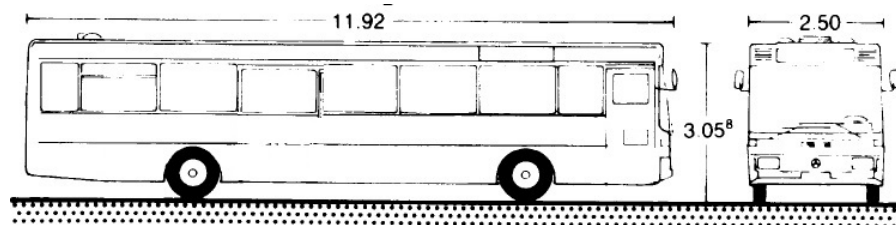
- Shop
- Mall
- Office
- Gym
- etc,



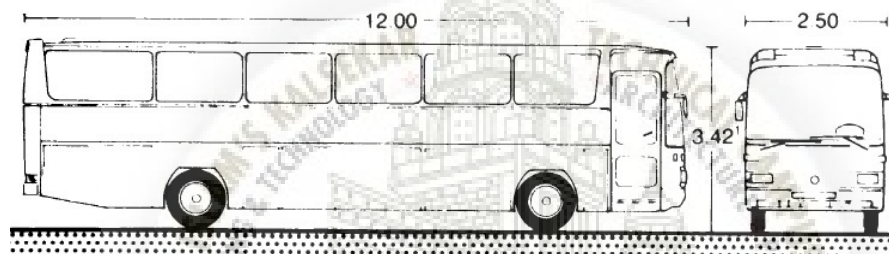
## Design Research :

### Bus Design Standards

#### Geometric Design Standards for Bus :



Standard Dimension for Privartan and City Buses

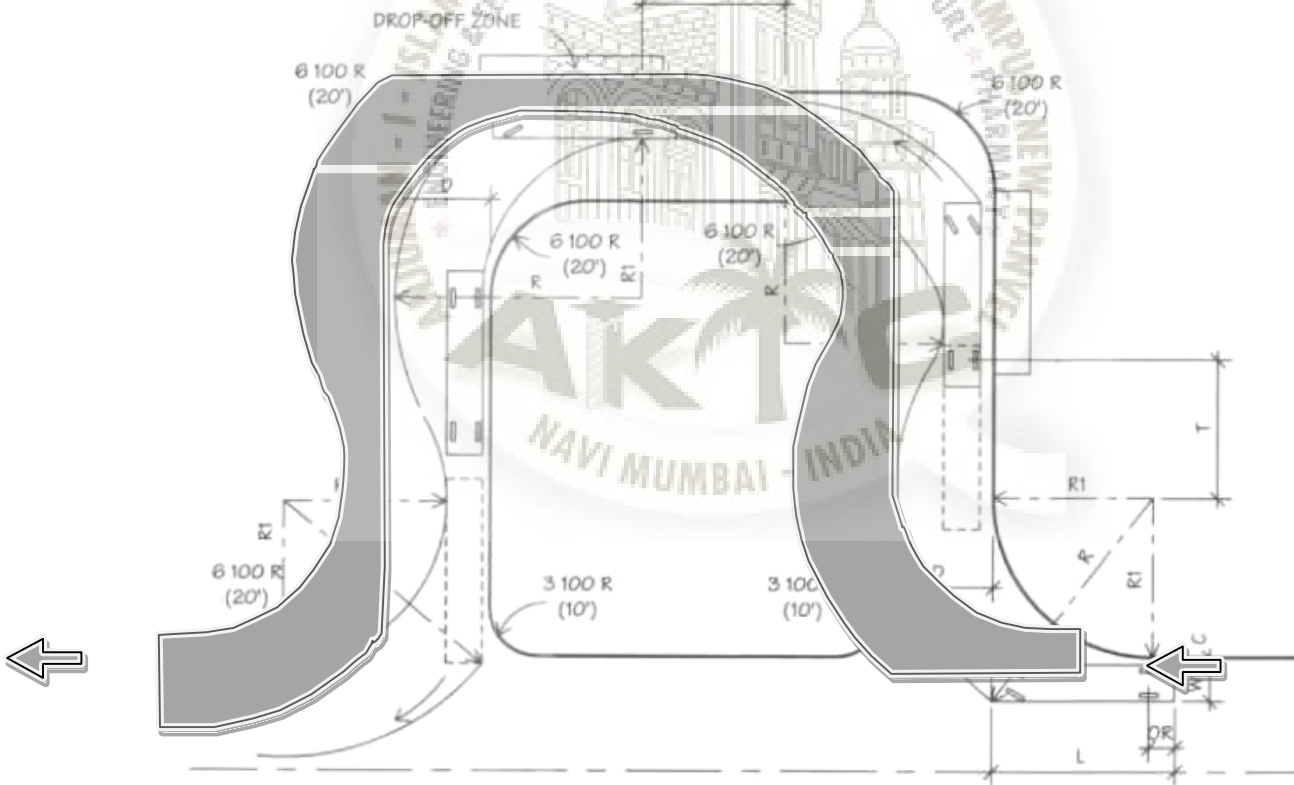
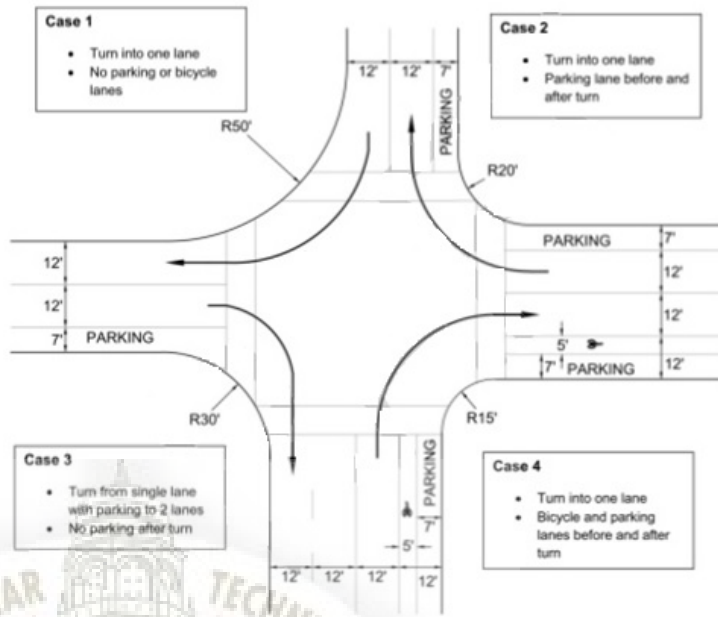
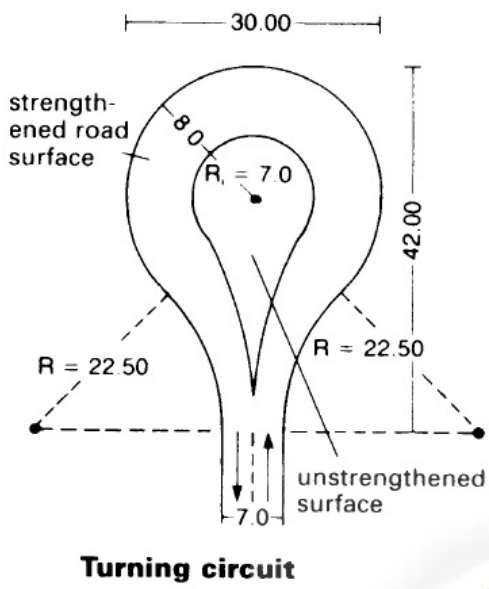


Standard Dimension for Asiad and Hirakni

\* First Step of bus (Passenger side) = 27-30cm

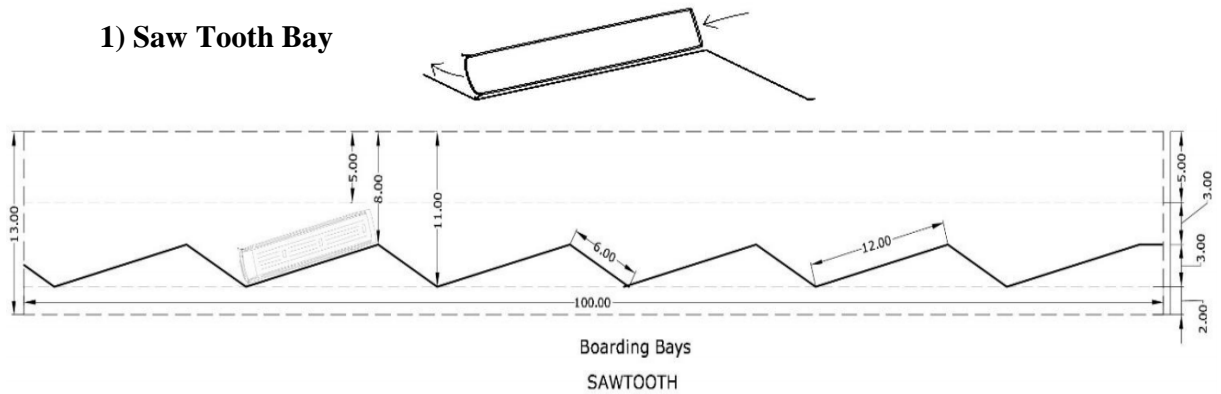
\* Ground Clearance of Bus = 40cm

Sr.no.	Type's of Vehicle	Length	Width	Height	Turning Radius
1	Motor Cycle	2.2	0.7	1	1
2	Car	4	1.7	1.5	5.65
3	Refuse Collection Vehicle	1.47	2.5	3.3	7.8
		7.64	2.5	3.3	9.25
4	Fire Engine	6.8	2.5	2.8	9.25
5	Standard Bus	11.9	2.5	3	10.25
		12	2.5	3.45	11



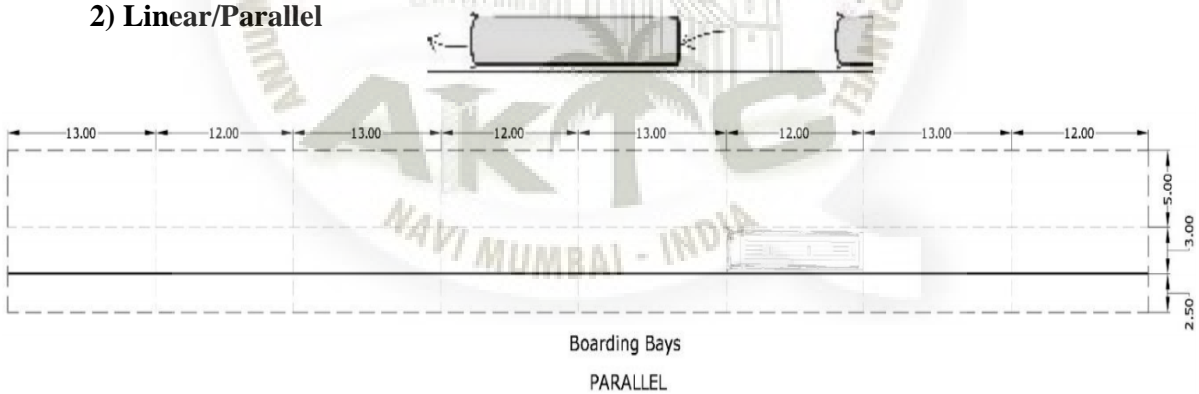
**Bus Bay :**

**1) Saw Tooth Bay**



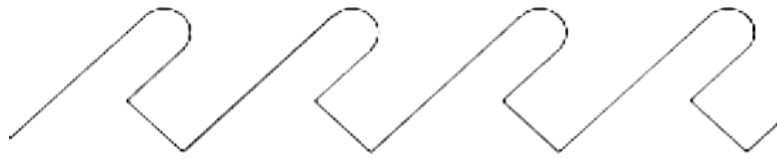
Saw tooth Bay	This arrangement allows easy docking of buses but requires long curb lengths. To avoid long continuous lengths, saw tooth bays maybe provided in parallel arrangement with passing lanes and connecting raised crossing for passenger access.	217sqm/bay (preferred for offloading bays)
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**2) Linear/Parallel**

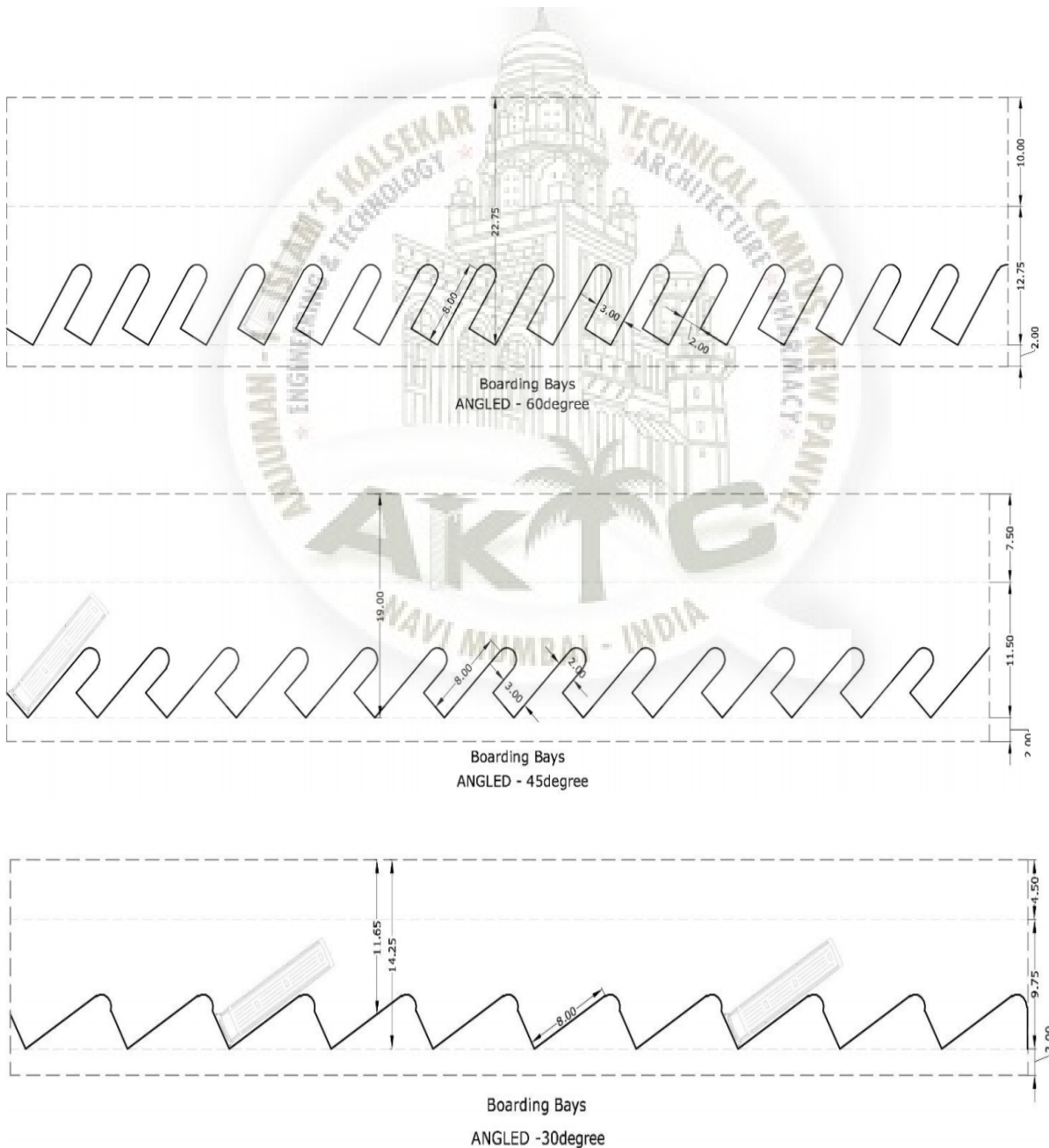


Linear/parallel bays	This arrangement requires longer curb length as buses are stacked one behind the other with adequate head space. There is an overtaking lane parallel to the bus bay. One may combine it with an-other adjacent parallel bay with overtaking lane in between.	262 sqm/bay
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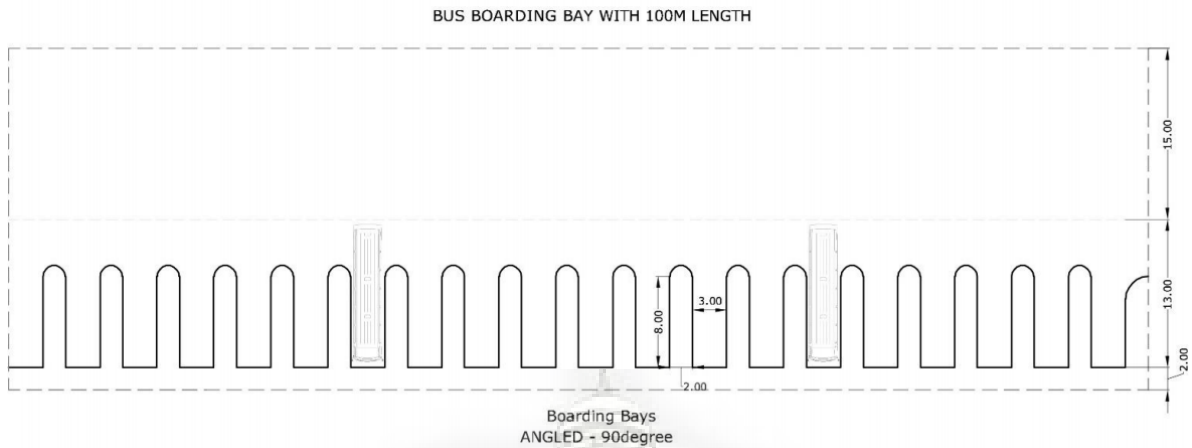
**3) Angular Bays :**



<p>Angular bays 30°, 45°, 60°</p>	<p>This arrangement allows easy docking of buses with shorter curb length. This may be combined with parallel arrangement in terminals with lower bus flow</p>	<p>163 sqm/bay, 150 sqm/bay, 145 sqm/bay.</p>
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#### 4) Perpendicular Bays



Perpendicular bays	Bays aligned perpendicular to concourse. Ideal arrangement for idle parking	150sqm/bay (Loading bays); 75 sqm/bay (Idle Parking)
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#### 5) Drive Through

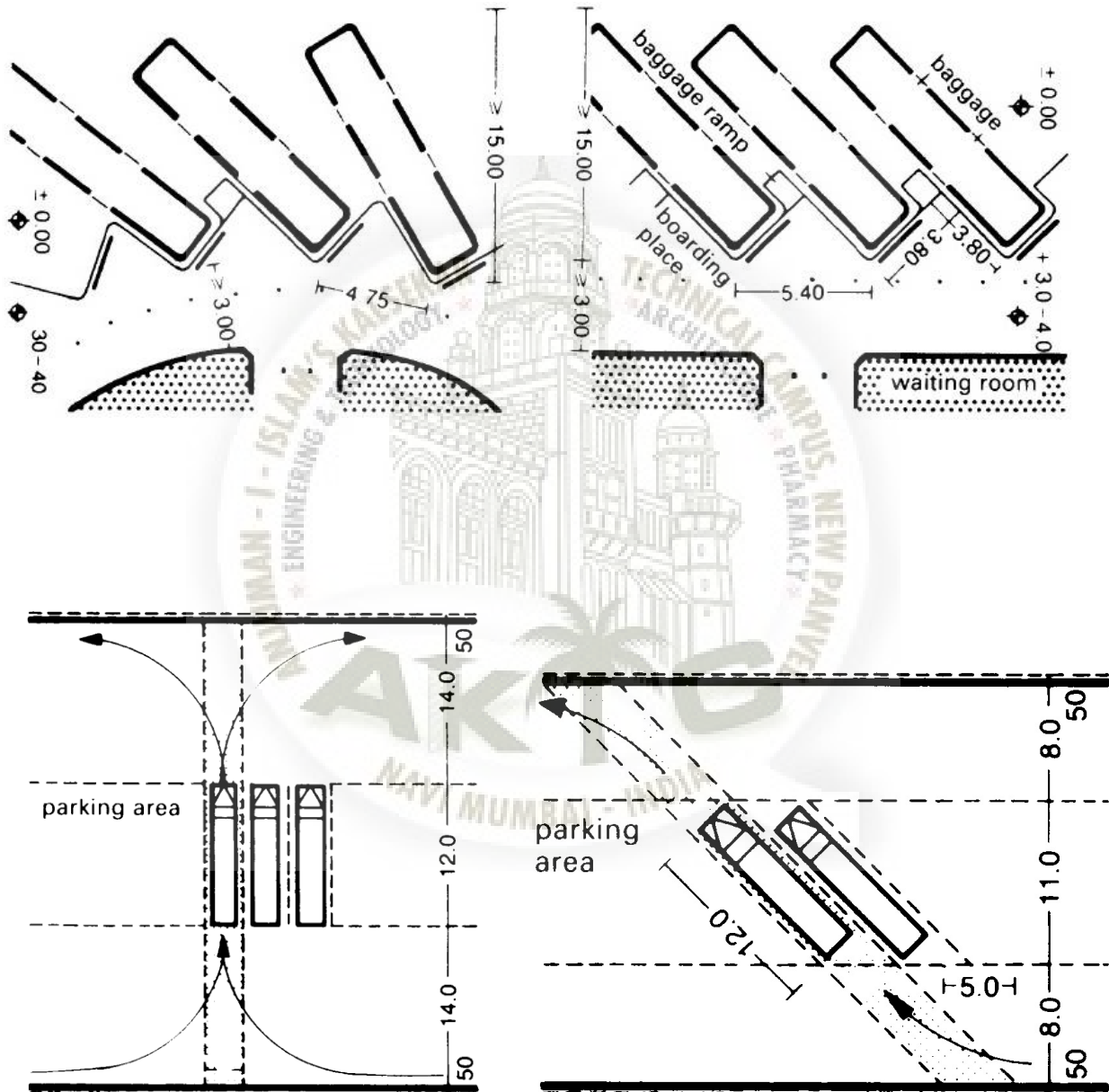


Drive through	The bays are parallel arrangement without passing lanes. Thus parallel boarding lanes are segregated from each other by their respective boarding bays	258 sqm/bay
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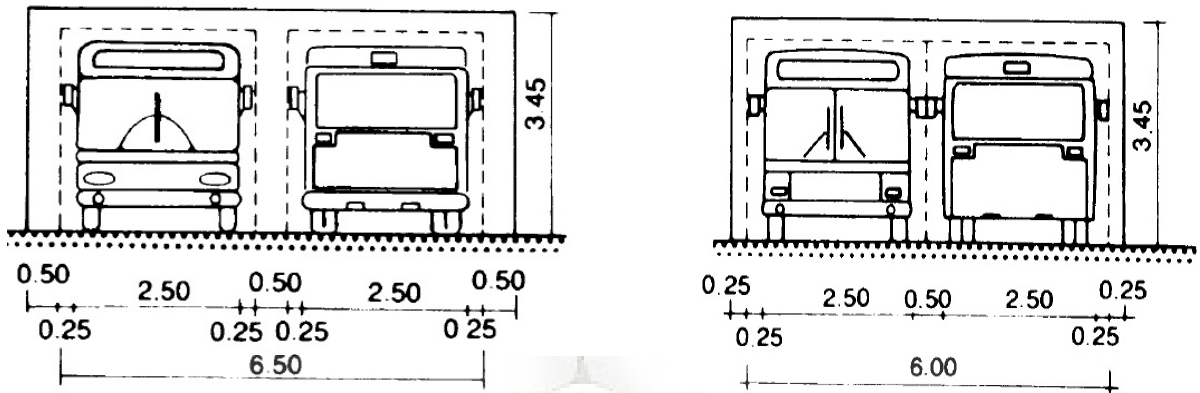
### Standard of Interlocking Bus Bay :

Angular bus parking

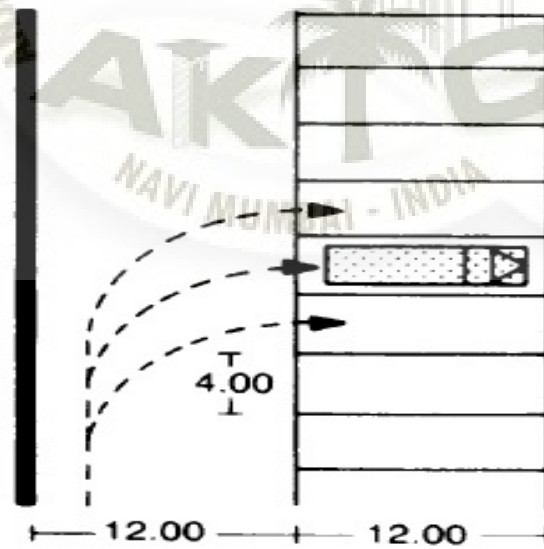
Parallel Bus Parking



**Bus Parking :**



Relation to Line of Arrival	Parallel	at 45°		at 90°	
Length of parking Space	32	12	24	12	24
Parking Option	2 Buses	1 Bus	2 Buses	1 Bus	2 Buses
Width of Parking Space	3.5	3.5	3.5	3.5	3.5
Width of Arrival Lane	4	8	8	14	14
Parking Area incl. Roadway	88	135	89	140	91



**90° parking, a single truck**



**Space Standards :**

Sr.no.	Spaces	Area Required
	<b>Passenger Amenities</b>	
1	Waiting Area	30% of footfall
2	Ticketing	22Sq.m/100pax
3	Eateries	1.5sqm/person for 15% terminal occupancy
4	Vendor/Hawker zone	4sqm/vendor
5	Dormitory (for night operations)	1bed/50pax; 6.31 sqm/bunk (Neufert, 2000)
6	Drinking Water	1.1 sqm/fixture 2/1000pax (DCR)
7	Toilet Male	3WC / 1000 pax 1WB / WC 4Urinals / 1000 Person
	Female	4WC / 1000pax add 1 Indian WC in each of above
8	Cloak Room	2 Sq.m / 100pax
9	Private Vehicle Parking	2ECS/100sqm for Terminal Building 3ECS/100sqm of commercial built-up
	<b>Terminal Staff Amenities</b>	
10	Revenue Office	10sqm/person
11	Terminal Office	10sqm/person
12	Resting room	2sqm/person
13	Garage	140 Sq.m / bay
	<b>Bus Staff Amenities</b>	Ramp for Bus = 30-40cm high
14	Dormitories	1bed/10 bus personnel; 6.31 sqm/bunk (Neufert, 2000)
15	Resting Room	2sqm/ bus personnel for 80% bus staff

**Signage :**

Signage play vital role in regulating vehicular and pedestrian movement. Signage should provide relevant information, warnings and give directions accordingly. Signage should be strategically placed and easy to Read.

1.

1	Telephone	8	Escalator	15	Drinking Fountain
2	Mail	9	Stairs	16	Waiting Room
3	Currency Exchange	10	Lift / Elevator	17	Information
4	Cashier	11	Toilet, Men	18	Taxi
5	First Aid	12	Toilet, Women	19	Bus
6	Lost and Found	13	Toilet	20	Ground Transport

2.

	Car Rental		Shops
	Restaurant		Barber shop/salon
	Coffee Shop		Barber Shop
	Bar		Beauty Salon

3.

1	Ticket Purchase
2	Baggage Check-in
3	Baggage Claim
4	Customs

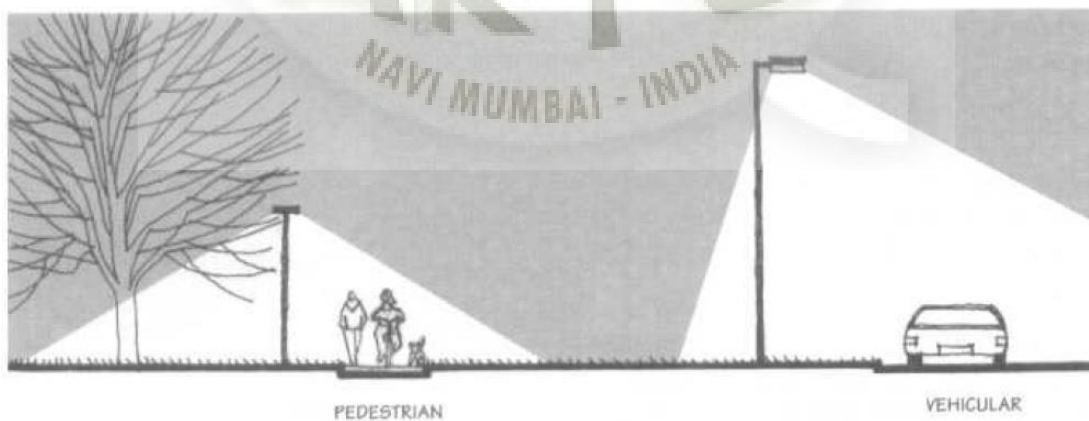
4.

1	Smoking	4	No Parking	7	Exit
2	No Smoking	5	No Pets	8	Fire Extinguisher
3	Parking	6	No Entry	9	Litter Disposal



**Lighting :**

Sr. no.	Location of Use	Type of Lighting		
		Continuous	Standby	Mobile
1	Critical Infra access point		x	
2	Fare Gate	x		
3	Kiosk	x		
4	Parking Lot Open Area	x		x
5	Waiting Area	x		
6	Parking Structure Roof	x		
7	Platform (outside canopy)	x		
8	Platform (inside canopy)	x		
9	Pedestrian Pathway	x		x
10	Restricted Entry/Exit Area		x	
11	Station Entry / Exit	x		x
12	Ticketing Area	x		
13	Vehicle Approach	x		
14	Vehicle Staging Area	x		x



Height of Street Lighting For Pedestrian and Vehicle

**Guideline for Designing Bus Depot :**

Access / Approach : Access to the Depot should be convenient, and Barrier free.

Location : - Centrally located depot in the city are inter-connected. Have Better interchange Opportunity.

- Depot located at the periphery of city work best in reducing dead mileage.

**Operational Parameter :** Design according to the route's to be catered and their peak hour, footfall, Idle parking.

**Multi-Modal :** Create the impression that the journey is continuous and without break by interchanging mode of transport.

**Crime-Prevention :** Effective Lighting, Barrier free Circulation, enhance Visibility, Sinages.

**Circulation :**

- Reduce intersection between Pedestrian and Bus Circulation.
- Restrict Public vehicle to enter on Bus bay and circulation area.
- Create barrier for the passenger, so that they stay in waiting area. (Without disturbing circulation)
- Low Distance Amenities for User's.
- Place Toilets near Waiting Area, so that passenger from bus can easily use it.

## Usability Criteria :

Seven Criteria that use to measure the usability of public transport, The criteria are :

- 1) Speed,
- 2) Comfort,
- 3) Safety,
- 4) Cost,
- 5) Proximity,
- 6) Timeliness and
- 7) Directness.

Where,

- **Speed** is calculated from total journey time.
- **Proximity** means how long passengers must walk to began their journey and how close it leaves them to their desired destination.
- **Timeliness** is waiting time required at terminus to get bus.
- **Directness** records how far this bus journey deviates from the shortest route.

## Site Selection and Site Justification : Sukurwadi ST bus depot, Borivali east.

Proposed Design Site Borivali ST Bus Depot as Thesis site because the condition of infrastructure in Borivali bus depot is dilapidated, and also the main reason is because of its low capacity and resources on site, which tends to compromising amenities such as - no proper entry for passengers on site,

- dislocation of function,
- no proper bus circulation on site,
- insufficient waiting area for users,
- parking issue and lots of more issue
- Insufficient Platform Allotted in Relation with Bay given further in analysis that's why I choose Borivali bus depot, which has huge amount of people using it.

## Maharashtra State Road Transport Corporation (MSRTC)

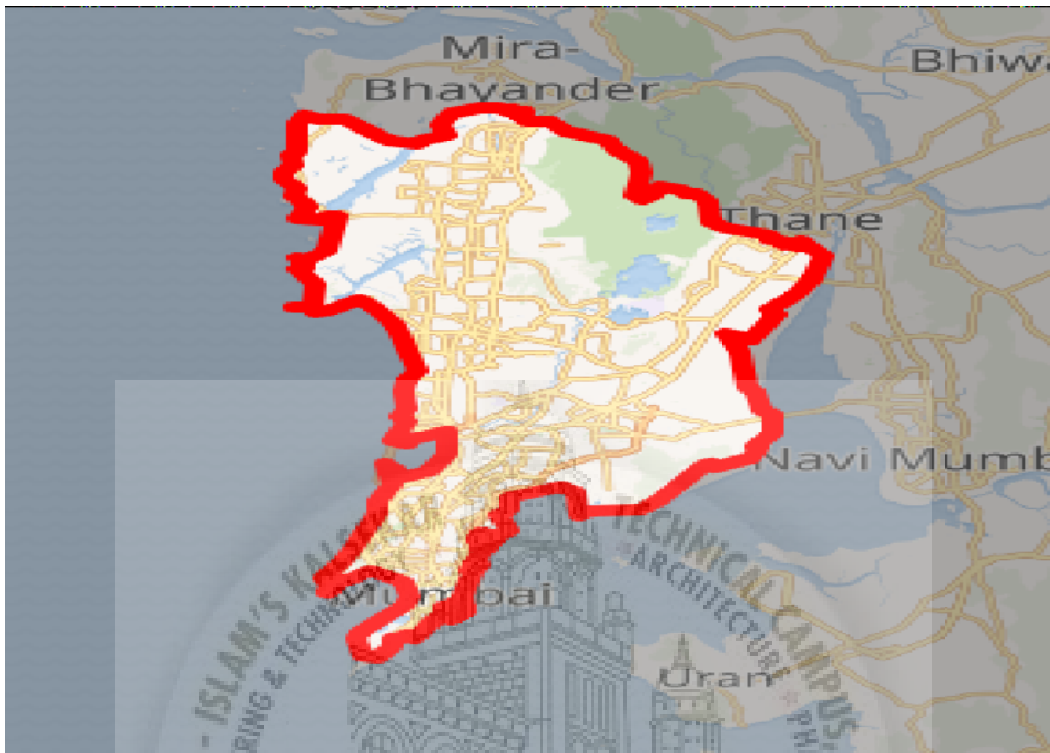
Has proposed to develop **Borivali Bus Depot** to meet modern requirement of passenger and provide better facilities for User and increase ridership from that depot.

Facilities such as Basic Amenities of depot as well as Shops, Office Complex, Food Court, Gym, etc according to the context to generate good amount of revenue.

**About Borivali , Mumbai :** Borivali is a neighborhood located in north-west Mumbai. Borivali is approximately 18 kilometres (11 mi) from Mumbai Airport. The estimated population of Borivali in 2010 was 513,077.

Borivali was developed of what once used to be a congregate region of smaller towns namely; Eksar, Poisar, Vazira, Shimpoli, Mandpeshwar, Kanheri, Tulsi, Magathane and others, which were situated on and around Mount Poinzur, between the Dahisar River and Poisar River.

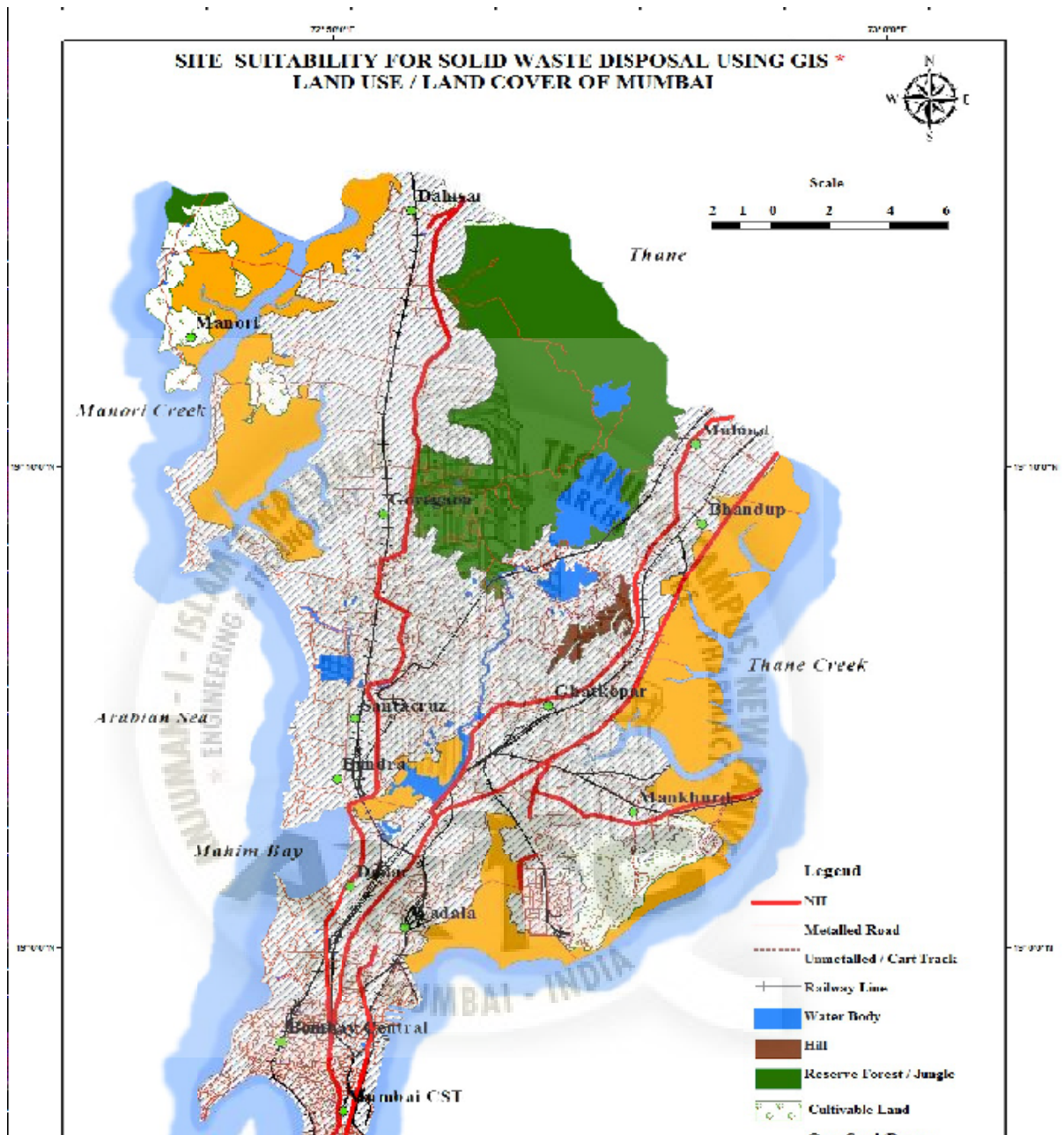
### Map of Mumbai



### District map of Mumbai



### Land use map of Mumbai





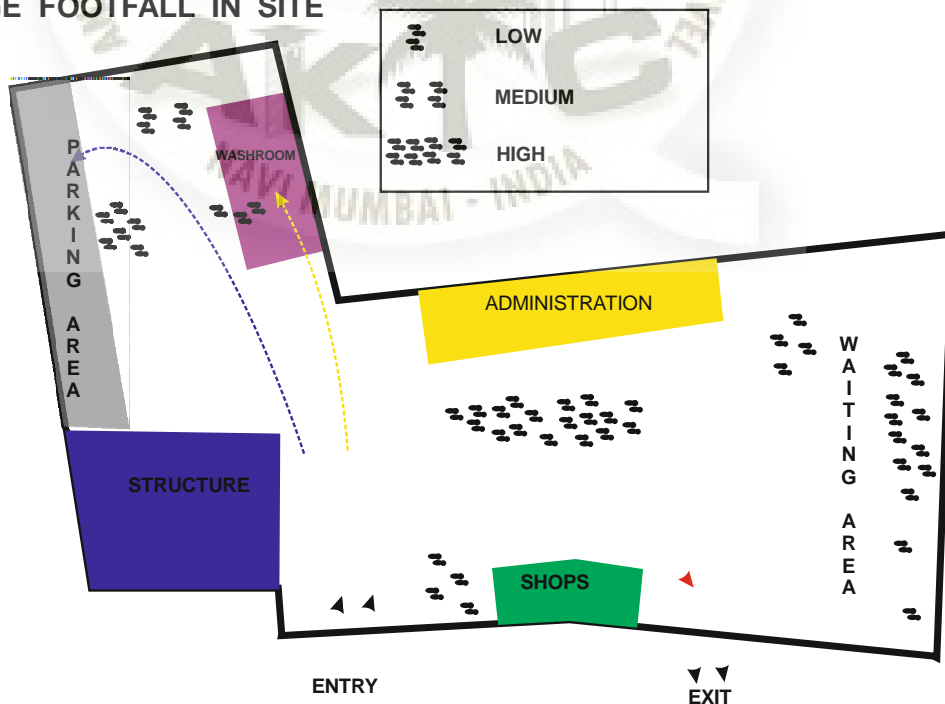
### Location map of site



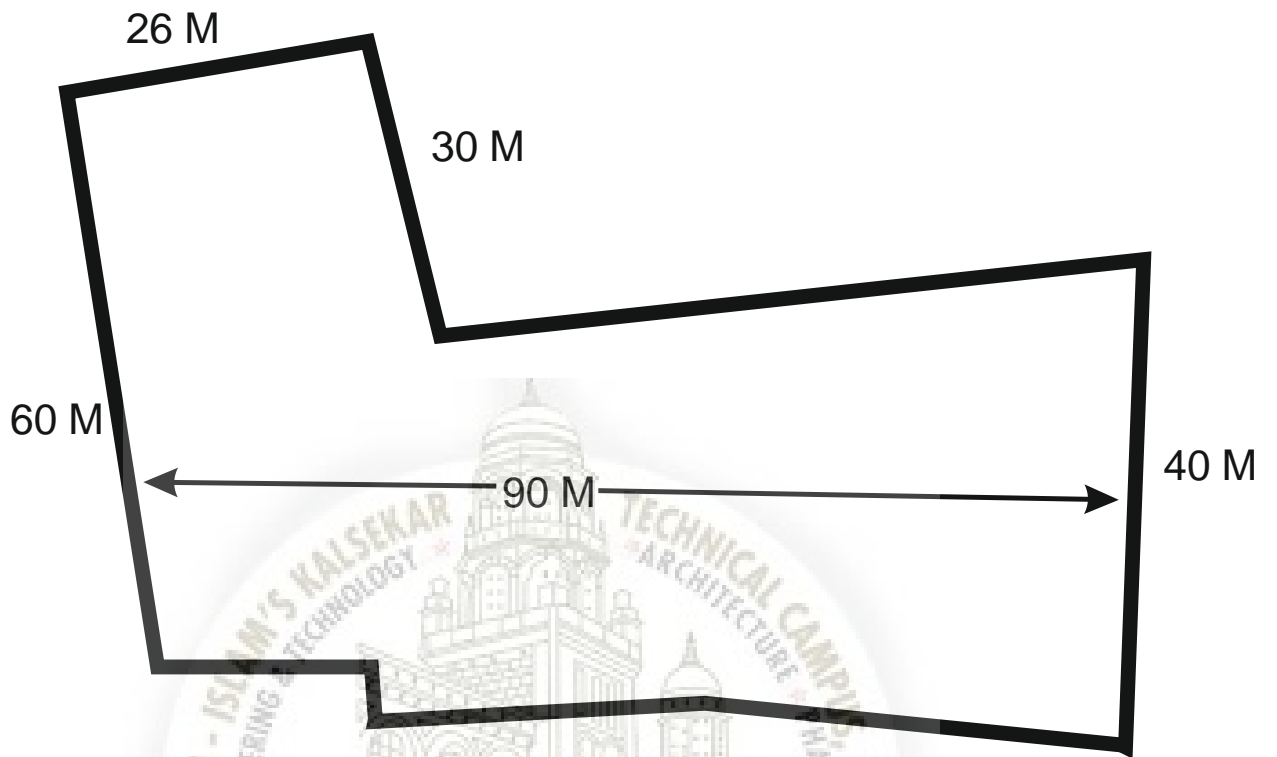
**Site location :** The site of Sukurwadi bus depot which is to be redeveloped is located in Borivali East, Mumbai, Maharashtra.

**Site area :** The site area of Sukurwadi bus depot comprises of all facilities is 4,380 sq m approx. of land at the time of construction in 90s.

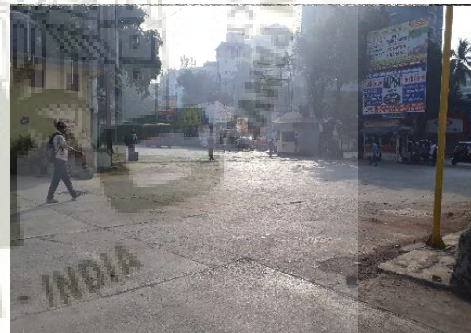
#### AVERAGE FOOTFALL IN SITE



**Site dimension**



**WASHROOM**



**SHOPS**

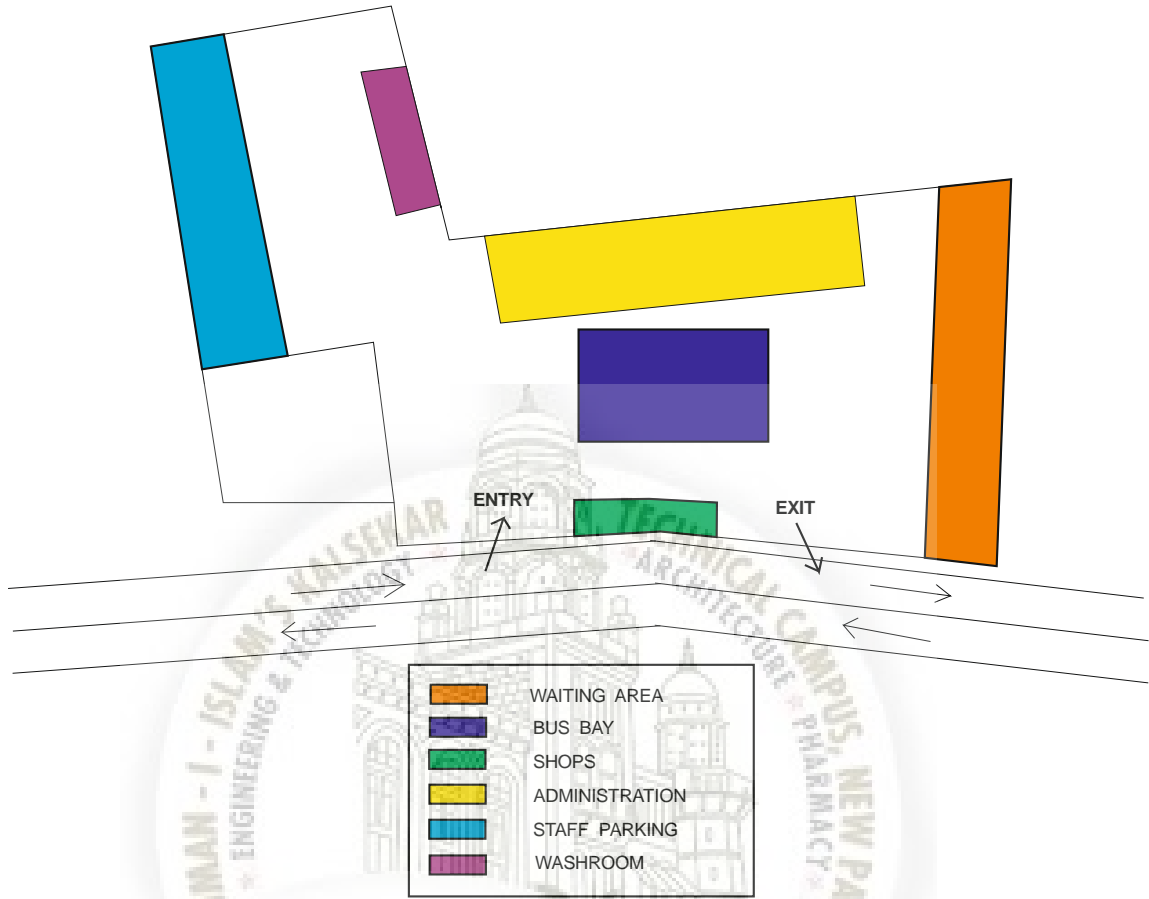


**WAITING AREA**



**EXIT**

### Existing site plan



**VIEW FROM ENTRANCE**



**PARKING**



**VIEW**



**ADMINISTRATION**

**CLIMATE, BORIVALI**

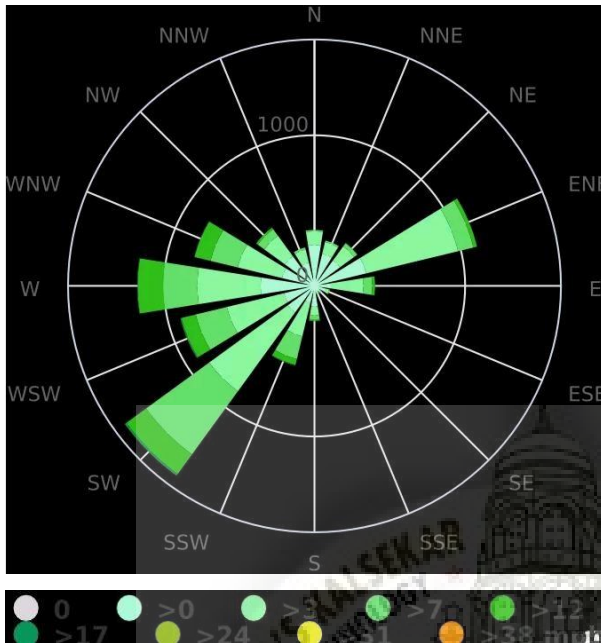
The driest month is January. There is 0 mm of precipitation in January. The greatest amount of precipitation occurs in July, with an average of 1247 mm.

**BORIVALI CLIMATE TABLE / HISTORICAL WEATHER DATA**

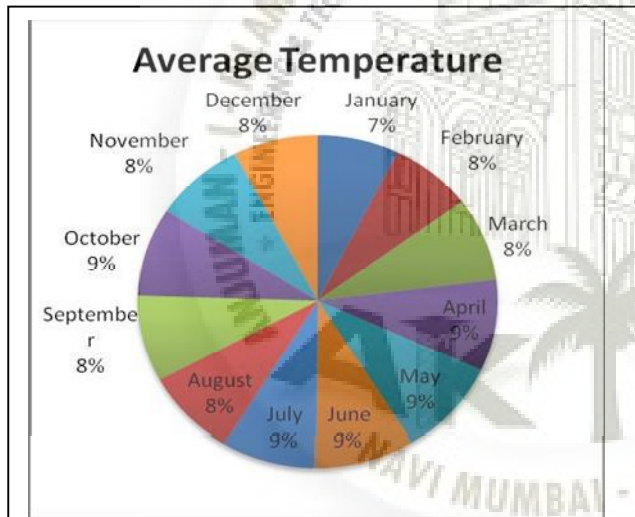
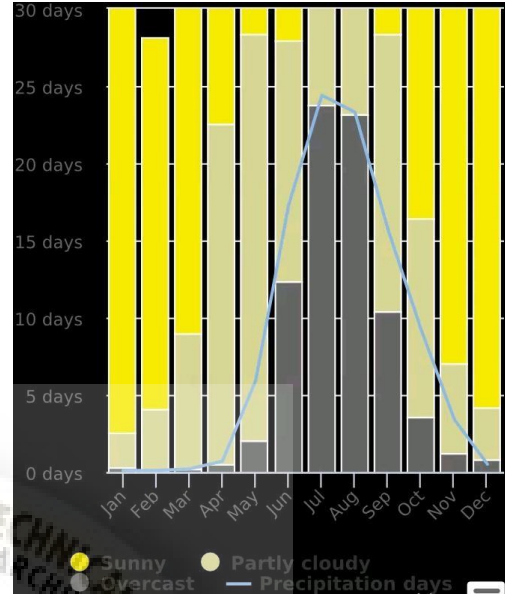
Month	Average Temperature (°C)	Average Temperature (°F)	Precipitation / Rainfall (mm)
January	23.6	74.5	0
February	24.1	75.4	0
March	26.4	79.5	0
April	28.7	83.7	2
May	30	86	12
June	28.9	84	589
July	27.4	81.3	1247
August	27.1	80.8	802
September	27.1	80.8	436
October	27.8	82	104
November	26.5	79.7	12
December	24.7	76.5	3

The precipitation varies 1247 mm between the driest month and the wettest month. The variation in temperatures throughout the year is 6.4 °C.

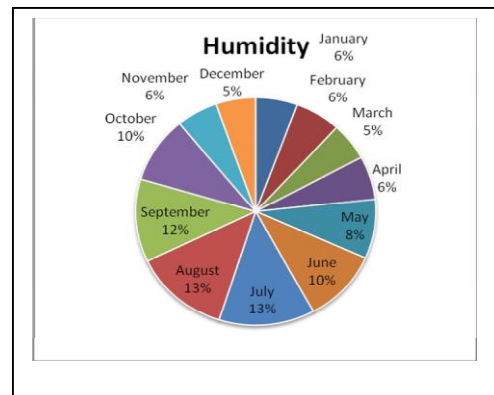
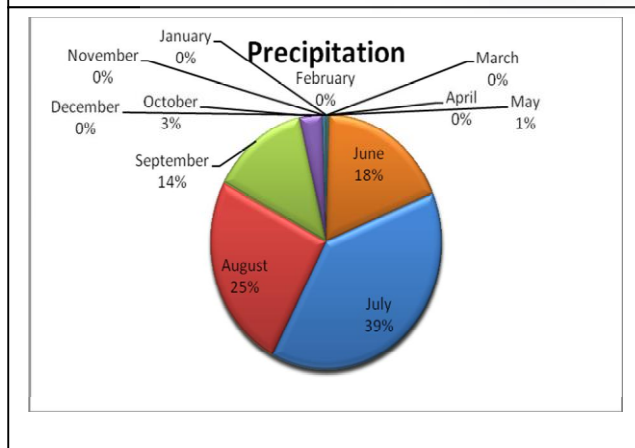
**Wind Rose Diagram Cloudy,**



**Cloudy, Sunny and Rainy days**



Month	Humidity
January	43.5
February	47.5
March	41
April	48
May	65
June	80
July	100
August	100
September	91
October	73
November	43
December	41.5

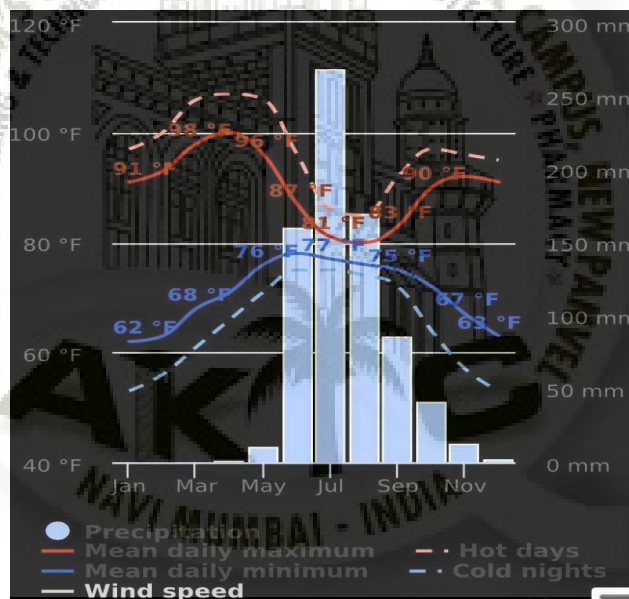


## Climatology :

### Borivali, Maharashtra.

#### Warm-humid climate (Equatorial)

- Average monthly temperature is between 18°C-26.9 °C in Borivali are defined by differences in seasonal rainfall distribution.
- A warm-humid climate has a fairly constant temperature, both over the day and over the year.
- Humidity and cloudiness make diffuse solar radiation important, and the potential for radiative sky cooling is lower.
- Seasons are often determined by rainfall and winds.  
Precipitation/rainfall in Borivali averages 3207 mm.
- The climate is tropical in Borivali. Most months of the year are marked by significant rainfall.



### TEMPERATURE, BORIVALI

With an average of 30.0 °C, May is the warmest month. The lowest average temperatures in the year occur in January, when it is around 23.6 °C.

## Site Merits and Demerits :

### Demerits :

- Low Capacity and Resources
- No adequate Seating provided
- Provided Seating Create Barrier to Access Bay
- No Proper Waiting Area
- Dilapidated Structure
- Dislocation of Function
- No proper Paving or concrete on site for Bus Circulation
- Rainwater Logging on site
- Irresponsive to passenger
- Public Parking Problem
- Insufficient Platform Allotted

### Merits :

- Water Facility on Site
- Fuelling Station near site.
- Access/Approach from 2 side of Site.

## Bibliography:

- 1) SGArchitects, Shakti Sustainable Energy Foundation, Bus Terminal Design Guidelines.(pdf)
- 2) *National Building Code* , 2nd revision, New Delhi: Bureau of Indian Standard, 2005, Print.
- 3) Bousmaha Baiche and Nicholas Walliman, Ernst and peter neufert Architects Data, 3rd Edition,2008.
- 4) Charles w.harris and Nicholas T.Dines, *Time Saver Standards for Landscape Architecture*, 2nd edition, 1998
- 5) *Standardize Development Control and Promotion Regulation for Municipal Council and Nagar Panchayats in Maharashtra* : government of maharashtra urban development department2013.
- 6) [www.Climate-Data.org](http://www.Climate-Data.org)
- 7) '*Climatic Design of Buildings using Passive Techniques*' by Hans Rosenlund
- 8) [www.Meteoblue.com](http://www.Meteoblue.com)
- 9) *Bus Stop Design Guide 6 - on street physical characteristic.*
- 10) [www.apta.com](http://www.apta.com)
- 11) [www.MSTRC.com](http://www.MSTRC.com)

