4.1 TERMINOLOGY :

Corridor :

A corridor is defined as :

"A broad geographic band connecting population and employment centers, served by various transportation modes within which passenger and freight travel, land use, topography, environment and other characteristics are evaluated for transportation purposes".

A corridor is an area of land, typically along a linear route, containing land uses and transportation system influenced by the existence of that route.

A transportation corridor contains lines of transportation like highways, rail/roads, or canals.

A corridor can vary in length from 1 km to over 100 km.

Corridor study area :

It includes the corrider itself as well as nearly areas and transportation facilities (e.g. airports, freight terminals) that

influence travel demand in the corridor. The geographic boundaries of the study area typically coincide with geographic units used for reporting population, employment and travel demand data, such as cities, towns or census tracts.

Corridor traffic study : May 2015

A corridor traffic study includes collection of all the traffic data, data forecasting for all the links, number of traffic lanes needed on a particular roadway and analysis of various transportation alternatives.

Corridor management :

The term corridor management refers to the practice of identifying and implementing a mutually supportive set of strategies to maintain and enhance access, mobility, safety, economic development, and environmental quality along the transportation corridor.

Corridor management plan :

Corridor planning is the coordination of landuse activity within a linear area. A corridor plan focusses on the integration of transportation route and surrounding linear area - an open space, a watercourse or other landuse.

Types of strategies included in the corridor plan are

- transportation improvements
- Land use strategies such as zoning, land conservation, access management
- landscaping
- preservation of right of way
- Management tools and processes such as development guidelines, design guidelines, plan oversight and monitoring.
- Mechanisms for interjurisdictional cooperation.

Count :

These are the various data collected during measuring and recording traffic characteristics such as traffic volume, speed weight, modes or a combination of these.

4.2 CORRIDOR COMPONENTS : (Nov. 2013, May 2014)

Fig. 4.1 shows a typical corridor model. Various components of the corridor model are.

Dec 2014
May 2015

1. Freeways
2. Arterials
3. Points
4. Segments

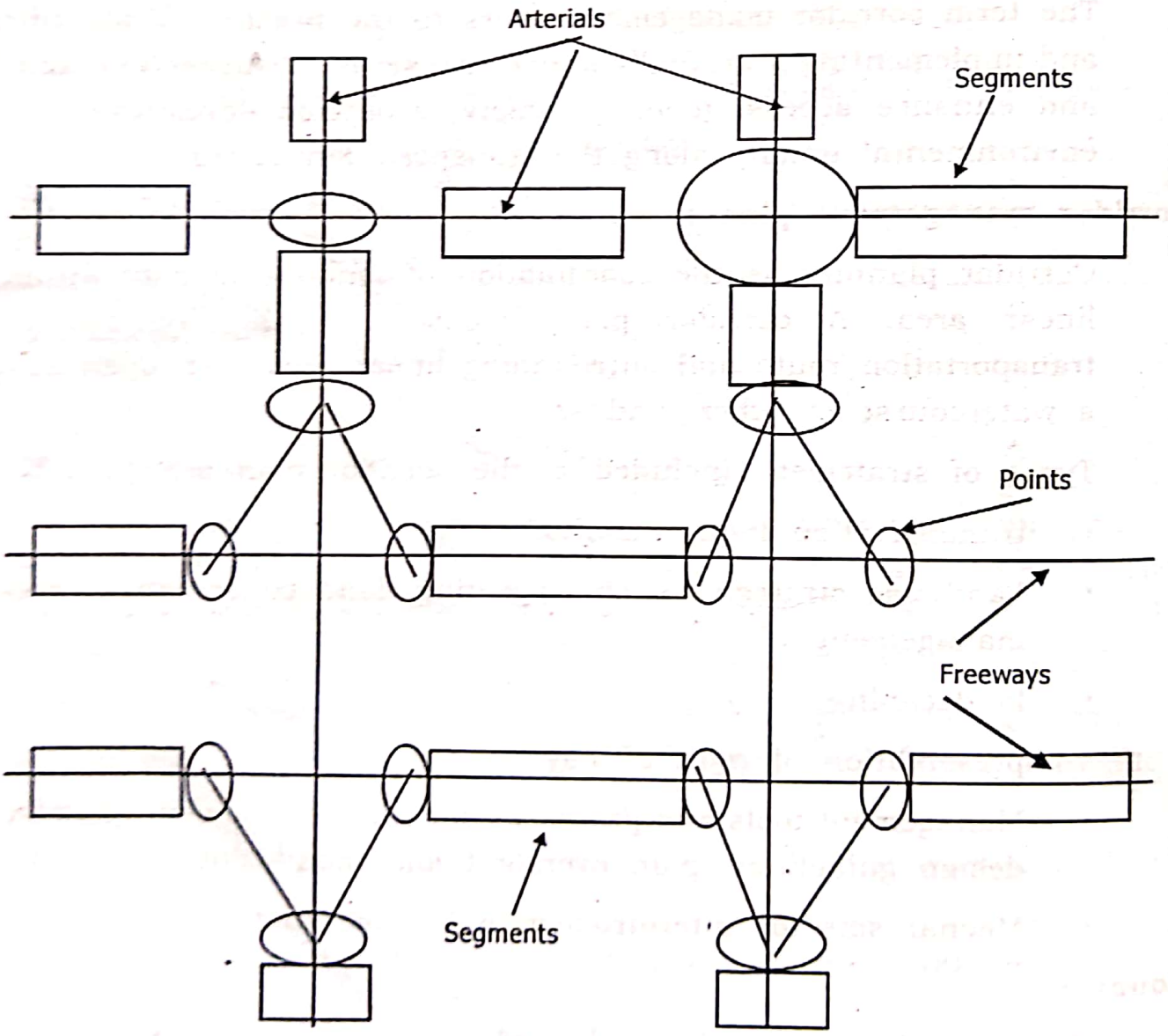


FIG. 4.1 CORRIDOR MODEL

Freeways :

Freeways are the major transportation facilities like highway, railroads, etc. along a particular traffic route. These freeways connect the residential areas to the business or employment segments.

Arterials :

These are the transport lines built across and parallel to the freeways.

Segments : Dec 2015 **(May 2014)**

These are the stretches of a facility in which the traffic demand and capacity conditions are relatively constant.

Points : Dec 2015 **(May 2014)**

The locations at the beginning and end of each segment are called points. At the points, traffic enters, leaves or crosses the facility.

Segment capacity : May 2015, Dec 2015 **(May 2012)**

- Maximum flow rate per hour, at which persons or vehicles can be expected to traverse a point of a roadway during a given time period, under prevailing roadway, traffic and control conditions, is called segment capacity.

4.3 CORRIDOR IDENTIFICATION : (Nov. 2011, May 2012)

Corridor identification is a process of selecting potential transportation alignment (route) and assigning the intensity of development accordingly.

A corridor study includes,

- a stretch of roadway, its right-of-way including utilities, drainage, traffic control devices, parallel sidewalks, etc.
- Adjacent land use development, zoning, land conservation
- Parallel roadways or rail lines
- Elements that compose the scenic view
- Existing transportation facilities, e.g. airports, freight terminals etc.
- All modes of travel including bicycling, walking, automobile and commercial vehicles along the corridor.
- Transit service (fixed route and paratransit)

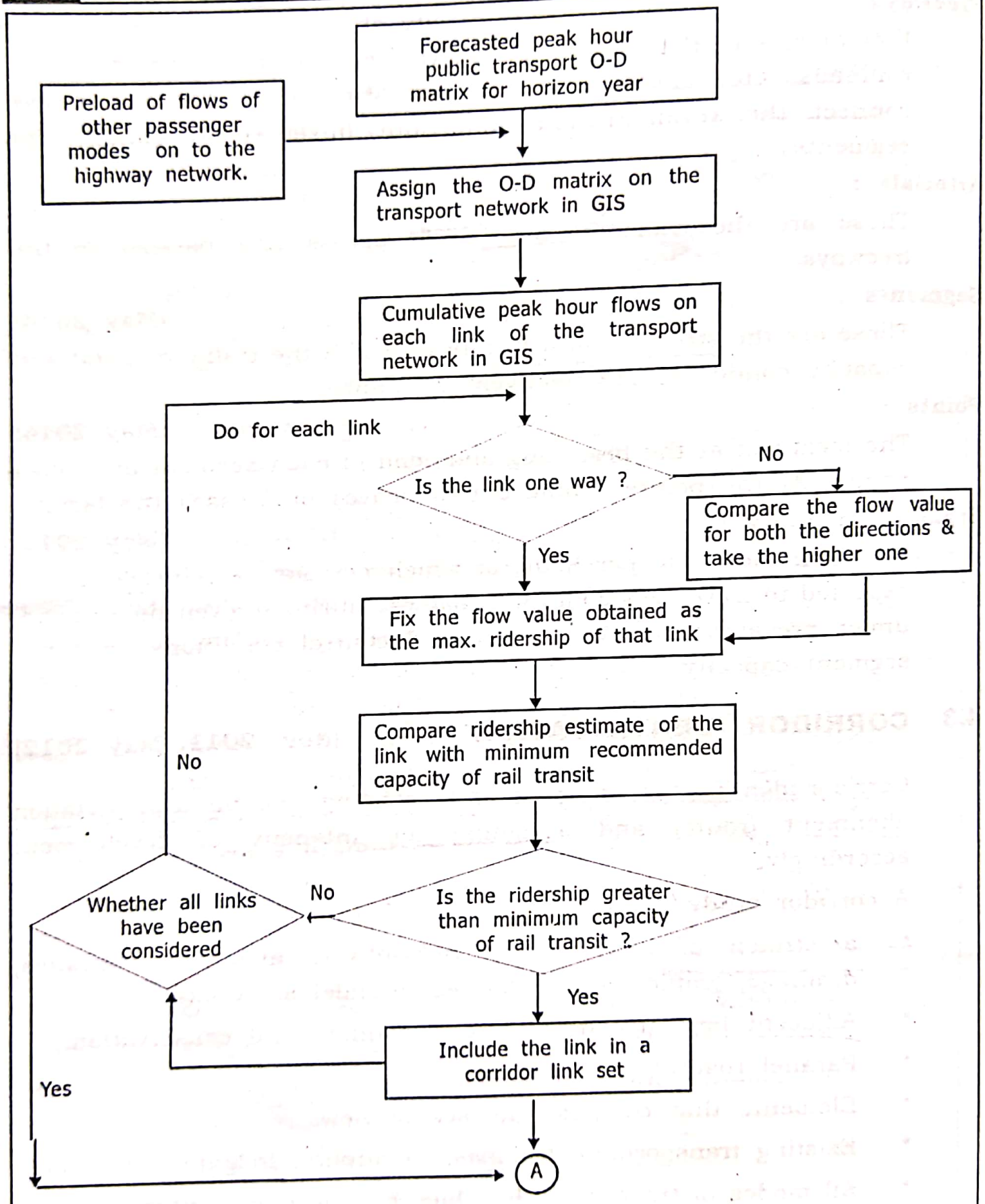


FIG. 4.2 RAIL CORRIDOR IDENTIFICATION MODEL

The rail corridor identified in a city should be optimum from the user's and operators' standpoint. The key concern of the user is to minimise the time spent in arriving and transferring at the stations, waiting for the rail on the station, riding in rail and reaching to their destination from the nearest station by walking or other modes. From the operator's view, the corridor should be aligned on a high demand passageway so as to guarantee maximum possible ridership, and at the same time to minimize operating cost, and construction cost.

A rail corridor identification model proposed by A.Verma, 115 Banglore is shown in the form of flowchart below :

The transport links having very heavy flow which may be beyond the capacity of street transit system to handle, is referred as "corridor link set". To identify this corridor link, the forecasted peak hour public transport O-D matrix for horizon year is assigned on to the base year transport network in GIS. This will give future public transport ridership pattern on every link of the transport network. If a link is two-way then the flow value for both directions are compared for the higher one, which is fixed as the maximum peak hour ridership of that link. Flow value for a one way link is used as it is. Further, if the maximum ridership estimate of a link is beyond the capacity of the street transit to handle then it is included in the corridor link set. Similar analysis is done for all the links to arrive at the complete corridor link set.

4.4 SCREEN LINE ANALYSIS : Dec 2014, Dec 2015

An imaginary line splitting the study area into two parts within the external cordon is called screen line. Natural or physical barriers like rivers, canals, railway line, etc. are taken as screen lines.

Based on house interview survey, trip assignments are made which would give the volume of traffic on different routes, from which the trips going across the screen lines can be determined. This is cross checked with the data on counts made at the screen line locations. A screen line survey identifies major traffic movements between two areas divided by a screen line.

The results of the trip assignment are compared with the traffic counts on roads in the screen line analysis. Screen line analysis is a process of comparing the directional sum of ground count traffic volumes across a screen line with the directional sum of the assigned traffic volumes across the same screen line. Trip assignment models can be calibrated by using screen line analysis.

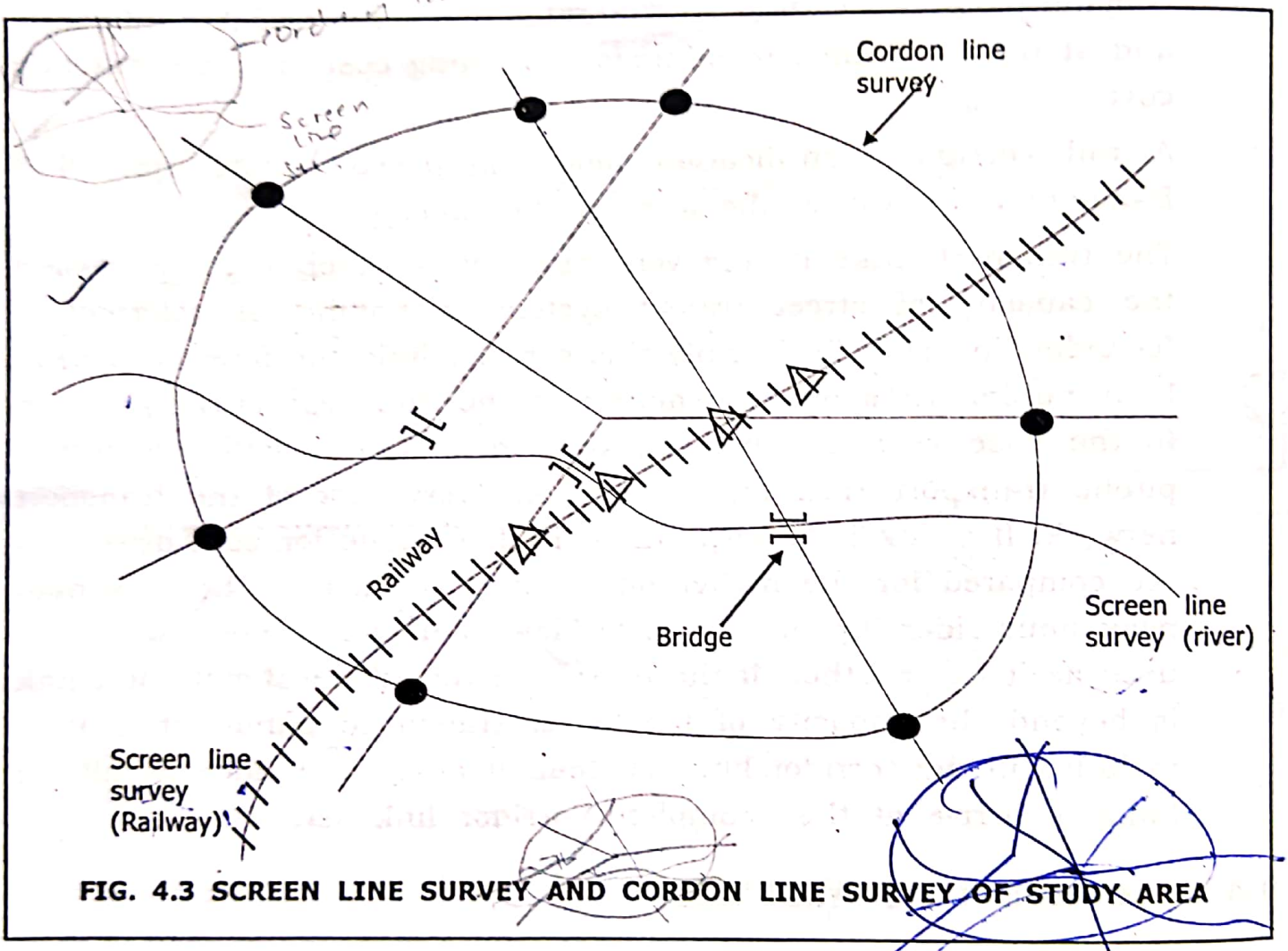


FIG. 4.3 SCREEN LINE SURVEY AND CORDON LINE SURVEY OF STUDY AREA

4.5 MASS TRANSIT SYSTEMS OR PUBLIC TRANSIT SYSTEMS :

Mass transit (Public transit) is an integrated group of transportation facilities (other than those privately owned for personal use) which enable people or freight to be transferred from one place to another.

Transits are a means of transporting massive either passengers or freight on a separated route especially in urban areas.

Modes of public transport are :

1. Buses and coach

2. City buses
3. Trains
4. Commuter rails and suburban rails
5. Metro trains
6. BRTS

In India, the percentage of trips performed by public transport is already high as given in Table 4.1.

Table 4.1 Trips by public transport in Indian Metropolitan cities

City	Average no. of passengers carried by mass transport (millions)	Percentage of trips by public transport to total no. of trips by all modes
1. Bombay	4.42	78
2. Kolkata	3.02	80
3. Chennai	1.28	68
4. Delhi	1.03	41

⇨ **Purposes of mass transit study :**

(i) to access the quality of existing transit service.
(ii) to study the operations, problems, location of stops etc.
(iii) to establish the extent of usage and determine vehicle types and routes.
(iv) to obtain characteristics of mass transit riders
(v) to plan, design and operate mass transit services
(vi) scheduling the transit services
(vii) to conduct an economic analysis of public transport operations and improvements.

4.6 CLASSIFICATION OF MASS TRANSIT SYSTEM : (May 2014)

Depending upon the service provided, mass transport system can be classified as :

(a) Rapid transit : **(May 2012)**

Mass transit service without interference or many stops, provided through fast buses, minibuses or railways.

Speed usually higher than 30 kmph.

Rapid transit systems generally consists of more than one large capacity vehicle moving as a train on fixed routes and following fixed schedules.

Generally vehicles on such services :

- Operate on routes with pre-defined stops within a greater metropolitan area.
- Use dedicated paths and guided technology like trains on rails (as opposed to streered technology like buses on streets).

  e.g. underground metro of kolkata.

(b) Mass transit : **(May 2012)**

Service provided for passengers and their incidental baggage on fixed route, following a fixed schedule of movement and fares. Normally provided by buses, minibuses and railways.

(c) Local transit :

Mass transit services on city roads, going through congested residential and market areas subject to various types of traffic interference, provided through buses, trams, rickshaws, etc.

(d) Point to point transit :

Services provided between two or more points over short distances in small vehicles like tongas, rickshaws, moving belts, escalators, etc.

(e) Railway transit :

Railway services on the periphery of an urban area, connected by a system of roads for entering CBD.

(f) Other transit :

This includes services by contract vehicles, taxies, etc. which are demand responsive.

Paratransit systems : **(Nov. 2013)**

Para-transit systems consists of small capacity vehicles which ply on more or less fixed routes but according to no pre-specified schedule.

Generally such services :

(i) use vehicles which shuttle between points of high demand within an urban area.

(ii) use the existing road network (as opposed to separate right of way)

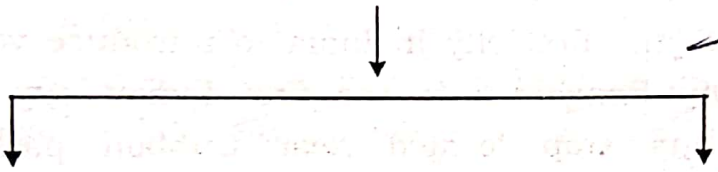
(iii) do not have pre-specified stop locations.

For example, 'Share-taxis' which run in many Indian Cities or between two nearby cities like Kanpur and Lucknow, Siliguri and Darjeeling, etc.

Based on transit technology, the Urban mass transit system is classified as under :

May 2015

Urban Mass Transit System



Road based transit	**Rail based Transit**
1. Buses and Coach	1. Trains
2. City buses /Commuter bus	2. Commuter rails and suburban rails
3. BRTS	3. Metro trains
	4. Mono rail
	5. Light rail transit system (LRTS)
	6. Sky rail

4.6.1 ROAD BASED TRANSIT SYSTEM :

The various modes used in road based transit system are :

1. Buses and coach
2. City buses/commuter bus
3. BRTS

1. Buses and Coach :

Bus services use buses on conventional roads to carry numerous passengers on shorter journeys. Buses operate with low capacity (i.e. compared with trams and trains), and can operate on conventional roads, with relatively inexpensive bus stops to serve passangers.

Buses are commonly used in smaller cities and towns, in rural areas as well as for shuttle services in large cities.

Coach services use coaches (long distance buses) for longer distance transportation. The vehicles are usually equipped with more comfortable seating, a separate luggage compartment, video and sometime a sleeping arrangement.

2. City buses/commuter bus :

City buses take up about 90% of public transport in Indian cities and serve as a cheap and convenient mode of transport for all classes of society. Service are mostly run by Municipal corporations.

Bengaluru was the first city in India to introduce volvo city buses in India in 2006. Bengaluru is the first Indian city to have an air-conditioned bus stop located near Cubbon park. Hyderabad is acknowledged as the single corporation having the largest fleet of buses in the world. City bus services in Ahmedabad (AMTS) and Mumbai (BMTS) are very popular in India.

Depending on the route coverage, bus services may be of the following types :

(a) City services

(b) Intercity services

(c) Rural services

(d) Minibus services

City services cover the major routes within the city limits. Intercity services connect the concerned city with other nearby cities, and have a central terminal in the CBD. Rural services connect nearby villages with cities and towns. Minibus operation is resorted to when it is necessary to provide bus connectivity on routes with less traffic demand and on routes passing through narrow city streets and in some cases as feeder services to Metro rail stations.

⇨ **Advantages of bus transport :**

(i) Buses can operate over existing road system. Hence bus systems can be implemented and expanded in a relatively short period of time.

(ii) The bus routes can be modified easily.

(iii) The bus schedule can be varied easily to suit the demand.

(iv) Buses can be used for charter and other services when not needed in the schedule service.

(v) A relatively small number of passengers would suffice to justify dispatching a bus.

(vi) Buses can serve more diverse, low density travel patterns than fixed way systems.

3. BRTS - Bus Rapid Transit System : Dec 2014, Dec 2015

In BRTS buses move in the dedicated lanes at high speed without the obstruction from vehicles crossing the lanes. High capacity or normal city buses ply in a dedicated lane or in a marked corridor which segregates bus movements from general traffic.

Advantages :

- Greater flexibility in route options and development.
- Must faster development
- Lower capital costs where dedicated highway capacity exists and lane conversion costs low.
- Rolling stock can serve multiple rolls.
- Feasibility of incremental capital investment.

Disadvantages :

- Lack of availability of land for dedicated lane in urban areas.
- Poor capacity to meet very heavy peak hour demand due to limited bus carrying capacity.
- Creates traffic congestion in a corridor.
- Reduced capacity to stimulate development sector and market places.

BRTS - Ahmedabad :

BRTS - Ahmedabad also known as **Janmarg** is a bus rapid transit system in Ahmedabad, India. It is operated by Ahmedabad Janmarg Limited, a subsidiary of Ahmedabad Municipal Corporation. It is designed by CEPT university.

Technical procedures was started in 2006. A part of the first corridor connecting pirana to RTO Junction was opened to public in 2009.

The second half of the first phase of the BRTS was also inagurated in 2009. It was stretched up to Kankaria lake later to cater extern part of the city. BRTS is operational on 18.7 km from RTO to Kankaria lake.

Features :

- As the bus arrives at the platform of the station, the door of the platform and of the bus open up and thereafter close simultaneously before the bus leaves.
- The buses are fully air-conditioned.
- Stations are in the median.
- Stations are provided with ramps for physically challanged people to use wheel chairs.
- With walls in the ramp (pathway) there is no slippage of people in the path of the bus.
- The platforms have good seating arangement especially for ladies waiting for the arrival of the bus.
- When the bus leaves the dedicated lanes to cross a junction, red signals stops other vehicles.

4.6.2 BUS ROUTE PLANNING :

Dec 2014

Transport by bus is the predominant mode of public transport in many Indian cities. In Chennai metropolitan area, about 80% of public transport trips are carried by buses because of inadequate rail transit facilities.

Planning a bus route play a vital role in the efficient operation of a city bus system. The aim of route planning is to determine an acceptable alignment for an efficient, fast, reliable and profitable bus operation between two trip ends. An addition aim is to form a network of such routes for an urban area, which will lead to an optimal use of the buses and other resources.

⇨ **The need for route planning may arise under the following situations :**

(i) to maximize the utility of the existing fleet

(ii) to enhance the efficiency of the existing road network.

(iii) for extension or modification of the existing routes.

(iv) for a new town under development.

⇨ **The functions of the bus routes are :**

(i) Collection of passengers from dispersed residential areas, shopping areas, work places.

(ii) Provision of suitable alignment for line haul between origin and destination.

(iii) Dispersal of passengers to work places, shopping areas and residential areas.

For an urban bus service to be feasible, the town should have a minimum population of 30,000.

⇨ **Passenger travel characteristics influencing bus route planning :**

(i) The passenger demand stabilities over a period, the onward and return journeys are nearly equal.

(ii) Passengers handle themselves, unlike goods which require handling and delivery.

(iii) Passengers exercise choice of mode based on their perceived utility.

(iv) Passengers tend to form travel habits, and they do not change their travel patterns easily.

Types of routes :

City bus routes can be classified functionally as :

1. Grid type
2. Radial and ring type
3. Linear routes
4. Linear with spurs and loops

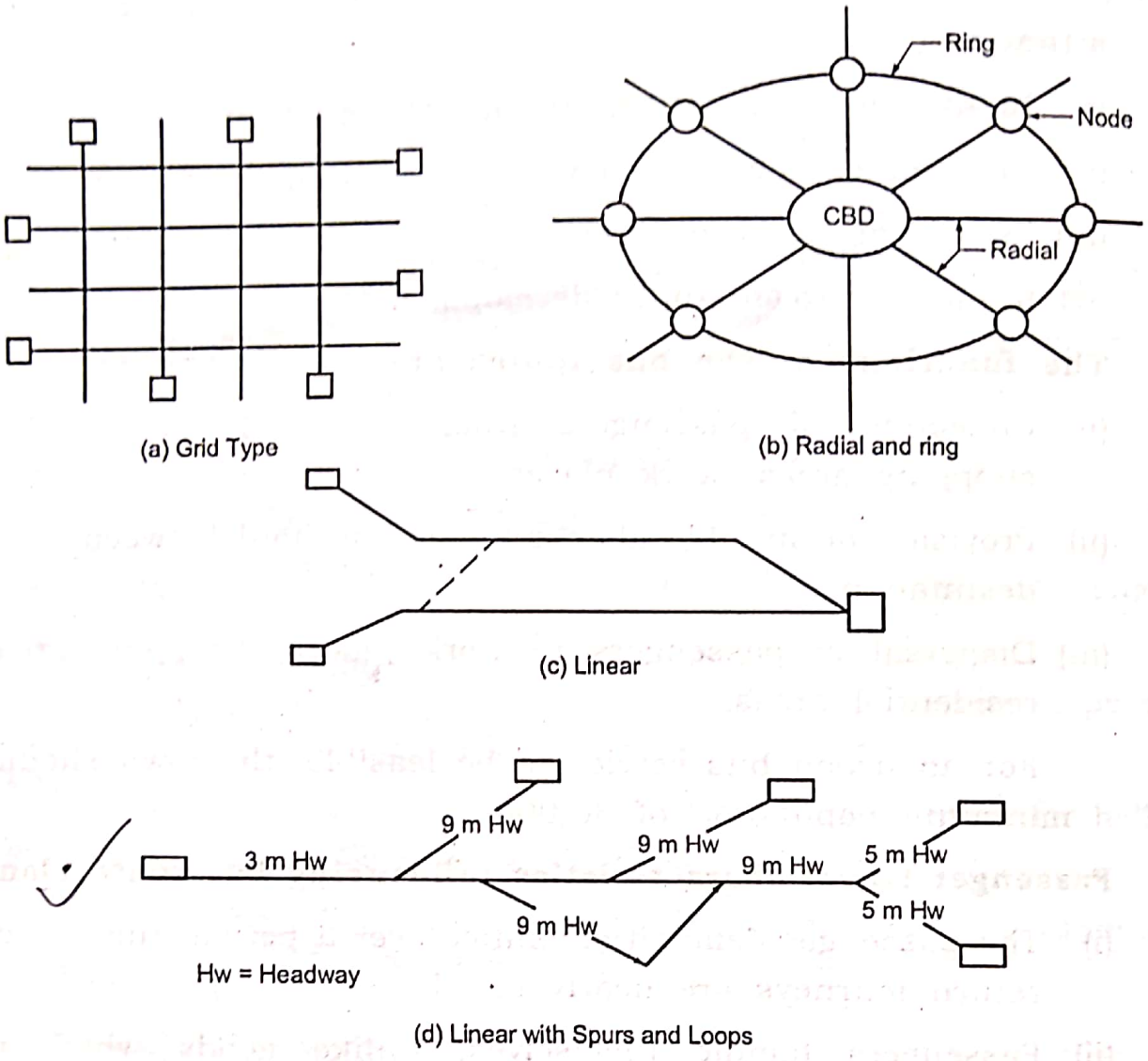


FIG. 4.4 DIFFERENT TYPES OF BUS ROUTES

⇨ **Route planning process :**

The route planning process involves following basic studies :

(a) Inventory of existing route network

(b) Changes in the road network, future road building and land use form.

(c) Origin - destination pairs of the present and projected routes.

(d) Accessibility to bus services and road conditions.

While deciding on route alignment, the following general principles may be taken into account :

(i) A direct bus route along the shortest distance may be desirable, but may not necessarily be the best. Deviations may be necessary to accommodate the desired origins and destinations.

(ii) Each route should connect more than one landuse.

(iii) For the passengers the distance from residence to the nearest bus stop should be less than 500 m or corresponding to 5-minute walk.

(iv) Terminals should be sited near points of convergence of passengers. Railway stations should be chosen as terminals for important bus routes.

(v) The bus depots should be so located that the dead km is minimum.

(vi) A direction oriented routing pattern is likely to be more efficient for operation than a destination oriented system.

(vii) Stops should be provided close to major activity centers.

4.6.3 RAIL BASED TRANSIT : Dec 2014

Rail based urban public transportation systems can be classified as :

1. Trains
2. Commuter rails and suburban rails
3. Metro trains (Rapid rail transit - RRT)
4. Mono rail
5. Light rail transit system (LRTS)
6. Sky rail

1. Trains :

Railway is the most convenient mode of long distance travel in India. Indian rail network is the second largest in the world after Russia. Railways are used for transporting passengers as well as freight like coal, machinery, food, fertilizer, oil etc. for long distances.

2. Commuter rails and suburban rails :

Commuter rail is the part of an urban area's public transport. It provides faster services to outer suburbs and neighbouring terms and villages. Trains stop at stations that are located to serve a smaller suburban or town center. The stations often being combined with shuttle bus or park and ride systems at each station. Frequency may be up to serveral times per hour.

The present suburban railway services in India are limited and are operational only in Mumbai, Kolkata, Pune, Chennai, Delhi and Hyderabad.

The Mumbai suburban railway system in India which began services in Mumbai in 1867, transports 6.3 million passengers daily and has the highest passenger density in the world. The first rapid transit system in India, the Kolkata Suburban Railway, was established in Kolkata in 1854. The first service run between Howrah and Hoogly covering a distance of 38.6 km.

3. Metro trains (Rapid rail transit - RRT) :

The first modern rapid transit in India is the Kolkata Metro and started its operataions in 1984. The Delhi Metro in New Delhi is the second conventional metro began operations in 2002. The Namma metro in Bengalore is India's third operational rapid transit and began operations in 2011. Currently, rapid transit systems have been deployed in these cities and more are under construction or in planning stage in several major cities of India.

Cities that have a Metro system	Metro system under construction
Kolkata metro	Mumbai Metro
Delhi metro	Navi Mumbai metro
Namma Metro -Bengalore	Chennai metro
Chennai Mass Rapid transit system	Hyderabad metro
Jaipur metro	
Kochi metro	
Rapid metro Rail-Gurgaon	

Advantages of metro :

(i) Very high capacity (around 20,000 - 1,00,000 passengers per hour per day direction - PPhpd)

(ii) High operational speed (25 to 60 kmph)

(iii) Free from interference from other traffic

(iv) Low level of air pollution.

Disadvantages of Metro :

(i) High initial cost

(ii) Lengthy construction period

(iii) Requires separate stations and efficient signalling systems.

(iv) Requires automatic closing of doors

(v) Require fast fare collection facilities and high platforms

(vi) Noise pollution

⇨ **Types of RRT :**

Various types of RRT are :

1. **Subway :**

When there is a need to cater a densely populated area like CBD, subway (tube) is constructed. The cost of construction of subway is about 4 times that of construction at grade.

2. **Heavy rail (at grade) :**

The on grade position is the commonest and often the most economical. Generally, metro at grade connects the suburban area and main city.

3. **Elevated :**

Elevated construction can be used in locations presenting difficulties in acquiring sufficient land to have surface operation. It can follow street alignments for the major part of the length. The cost of elevated track is likely to be over five times that of surface track. The structures should be designed esthetically to suit the surroundings.

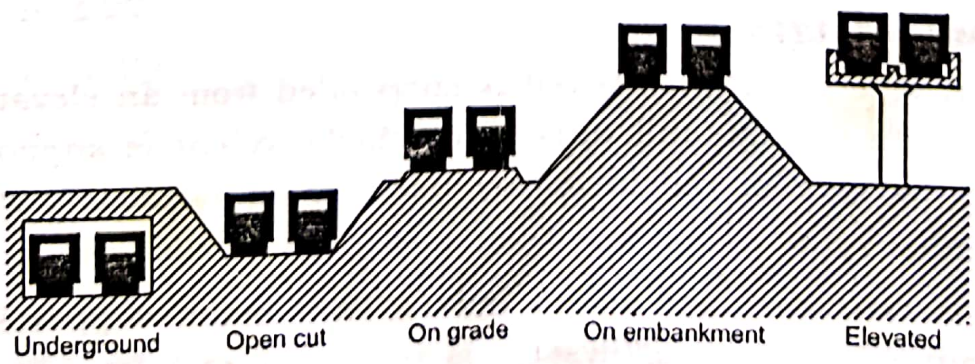


FIG. 4.5 POSSIBLE TRACK SECTIONS

4. Monorail :

Monorail system (MRS) compries a single rail track with the vehicles suspended from or stradding the guide way. Monorail vehicles are wider than the supporting guideway structure. In most cases, the rail is elevated, but it can also be at grade, below grade or in subway tunnels.

The first monorail for public transport was the Wuppertal Schwebebahn opened in 1901 in Germany. Since than many monorail systems have been introduced in several countries.

Advantages :

- requires minimal space - horizontal and vertical
- safe and cost effective
- aesthetically attractive
- environmentally friendly
- physically not capable of derailing
- capable of climbing steeper grades
- Lower infrastructure cost and lower maintenance costs.

Disadvantages :

- requires dedicated track, can not be directly integrated with other rail system.
- Special design and operational procedures are needed for switching of tracks.
- Special arrangements are required for evacuation of passengers in case of breakdowns/accidents.

⇨ **Types of monorails :**

(i) Suspended type :

In this type a single steel rail is suspended from an elevated structure along with a single rail runs. The vehicle weight is supported by the rail. This type of rail is mostly used in amusement parks.

(ii) Straddle type :

In this type cars are moved over a RCC beam supported over RCC columns. This type of system is most suitable for congested areas like CBD.

(iii) **Maglev monorail :**

Maglev monorail operates on the same line as straddle monorail, but the difference is it operates on the basis of magnetic levitation. It is more faster and energy efficient.

5. Light Rail Transit System (LRTS) :

The light rail transit (LRT) systems are being increasingly used in urban areas all over the world as a mode of rail based public transport. As the name implies, LRT uses relatively lighter vehicles and lighter track. It can be developed in stages from a modern tramway that shares its right of way with other traffic to a rapid transit system operating on its own exclusive right-of-way, underground, on embankments or viaducts.

The major components of a LRT system include :

(i) Infrastructure consisting of the right of way, superstructure, stations, signal and power system.

(ii) Light vehicles -length 25 to 35 m, single vehicle or 2-3 vehicles.

(iii) Operation.

The right of way used for LRT systems fall in to three categories :

(i) **Shared right of way** - where the track area lies within the regular traffic area shared with other road users.

(ii) **Separate right of way** - where the track area is outside the regular road traffic area.

(iii) **Exclusive right of way** - which is fully controlled, without any legal access for any other traffic, as in elevated or underground operation.

Advantages of LRT :

- It uses light articulated vehicles.
- Its capacity can be higher than the bus system
- Capital cost is lower.
- It is possible to start as a tram and upgrade RRT standards as the traffic and available resources rise.
- It can negotiate sharp curves of about 75 m radius.
- It can follow city street alignments.

Disadvantages :

- not suitable for small cities.
- Safety of pedestrians and cyclists becomes an important issue when operated in mixed traffic.

6. Sky rail :

Skyrail is the modified version of the light rail transit (LRT). It is a two line urban mass transit system operating on Bombardier's Advanced Rapid Transit Technology. It is a fully automated train running mainly on elevated tracks, but it may be suspended type also.

As the trains are fully automated, there are less chances of accidents. It has higher operating speed. On the other hand, capital investment is very high and accessibility to sky stations is also a major problem.

4.6.4 ADVANTAGES AND DISADVANTAGES OF MASS TRANSIT SYSTEM :

⇨ **Advantages :**

1. Environmental Impacts :

Mass transportation is believed to be more environmental friendly than other public transport facilities.

Mass transit reduces number of cars on the road which in turn reduces air pollution.

Public vehicles release less toxic gases like carbon monoxide which is major air pollutant.

2. Social Impacts :

All members of the society irrespective of their financial status, religion or cast, are able to travel, which enhances social integrity of the country.

The necessity of a driving license is eliminated.

It is a blessing for those individuals who are unable to drive.

3. Economic Impacts :

It results in increased business, commercial development and thus serves to improve the economy of the country.

It offer considerable savings in labour, materials and energy over private transit system.

4. **Freight transport :**

It allows higher amount of load to be transported to far away destinations in lesser time.

5. **Fuel savings :**

Because of their large capacity offering them to carry high efficient engines, they also help in fuel savings.

6. **Reduces congestion :**

It reduces number of vehicles on road by providing a larger capacity vehicles which carries higher number of passengers, thus eleminating congestion on roads.

7. **Save times :**

Mass transit reduces the travel time to a great extent as it moves at high speeds and stops only at specific spots.

8. **Cost effective :**

Mass transit is comparably cheaper than other modes of public transport.

⇨ **Disadvantages :**

1. One big disadvantage of public transport is that is is incredibles expensive to set up and operate, particularly trains, subways, metro rails etc.
2. There is possibility of being attacked or robbed. Bomb blast in trains may endanger safety of the passengers.
3. Malfunctioning of equipment as well as service distruptions caused by emergencies & labour strikes.
4. These are usually overcrowded.
5. Passengers may be attacked by infectious diseases.
6. Late night safety is not assured.
7. Accidents may cause large casualties.
8. Change in time schedule or cancellation of certain buses / trains may cause inconvenience to the passengers.

4.7 CAPACITY OF RAPID TRANSIT SYSTEMS :

(May 2012, Nov. 2013)

Dec 2014

The capacity of a rapid transit system (RTS) may be defined as the maximum number of passengers the system can move across a point in a specified period of time.

The capacity of RTS is often referred to as the **line capacity** of the RTS.

The capacity of RTS is measured in terms of **Passengers Per Hour Per Direction (PPHPD).**

Time headway (h) :

The time interval between the passage of two successive vehicles moving in the same lane and measured from head to head as they pass a point on the road is known as the time headway.

It is expressed in minutes.

$$\text{Headway (in min) } h = \frac{60 \text{ veh - min/hr}}{f \text{ (veh/hr)}}$$

Frequency (f) :

The number of vehicles per unit time past a certain point on the road, is known as frequency.

It is expressed in vehicles per hour.

$$\text{Frequency (veh/hr) } f = \frac{60 \text{ veh - min/hr}}{h \text{ (min)}}$$

Reliability (R) :

Percentage of vehicle arrivals with less than a fixed time deviation from schedule is referred as reliability.

Transit capacity

↓

Vehicle capacity (C_v) ← ↓ → Passenger capacity (C_p)

Vehicle capacity (C_v) :

Maximum number of vehicles pass a point on the road per hour is called vehicle capacity.

$$C_v = \frac{60}{h} \times R \text{ ..... veh/hr}$$

where,

h = headway in minutes

R = reliability in percentage fraction

i.e. for 90%, R = 0.90

load factor ($\propto$) :

$$\text{Load factor} = \frac{\text{Passenger per Bus}}{\text{bus capacity}}$$

$$= \frac{65}{60} = 1.08$$

As the load factor is greater than 1, the bus is running beyond its capacity and it indicates that the level of service is deteriorating.

Passenger capacity (C_p) :

The maximum number of passengers the system can move across a point in 1 hour per direction is known as passenger capacity.

Passenger capacity

$$C_p = C_v \times n \times S \times \propto \text{ ... persons/hour}$$

where,

C_v = vehicle capacity (veh/hr)

n = no. of vehicles

S = No. of seats in a vehicle

$\propto$ = load factor

Example-1 : *Find the maximum capacity per hour of BRT and Metro for the frequency of 60 trips per hour on any corridor.* **(Nov. 2011)**

Solution :

frequency, f = 60 veh/hour

$\therefore$ headway $h = \frac{60}{f}$ minutes

$= \frac{60}{60} = 1$ minute

$\therefore$ Vehicle capacity (C_v)

$C_v = \frac{60}{h} \times R$

$= \frac{60}{1} = 60$ veh/hr

Assume reliability

R = 100% = 1.0

Maximum capacity of BRT :

Assume seat capacity = 50 = S

load factor = 1.10 = α

$\therefore$ Passenger capacity

$C_p = C_v \times n \times S \times \alpha$

$= 60 \times 1 \times 50 \times 1.10$

$= 3300$ persons/hour

Maximum capacity of metro :

Assume 4 coach, each of 75 capacity

load factor = 1.10

$\therefore$ Passenger capacity

$C_p = C_v \times n \times S \times \alpha$

$= 60 \times 4 \times 75 \times 1.10$

$= 19800$ Persons/hr

Example-2 : *An existing transport corridor is to be converted into BRT having reliability 85%. The seat capacity of bus is 70 with permissible standing 50% and headway is 15 minutes. Calculate the vehicle capacity and passenger capacity of BRT.*

Solution :

Reliability, R = 85% = 0.85

headway, h = 15 min

∴ **vehicle capacity,**

$$C_v = \frac{60}{1} \times R$$

$$= \frac{60}{15} \times 0.85$$

$$= 3.4 \text{ say } 4 \text{ veh/hr}$$

Passenger Capacity :

$$C_p = C_v \times n \times S \times \alpha$$

$$= 4 \times 1 \times 70 \times 1.50$$

$$= 420 \text{ passenger/hr}$$

load factor

α = 1.50 for 50% standing.

4.8 URBAN FORM AND STRUCTURE :

Nov 2011 Dec 2014 May 2015 Dec 2015

⇨ **Urban Form :** **(Nov. 2011)**

The spatial pattern or 'arrangement' of individual elements - such

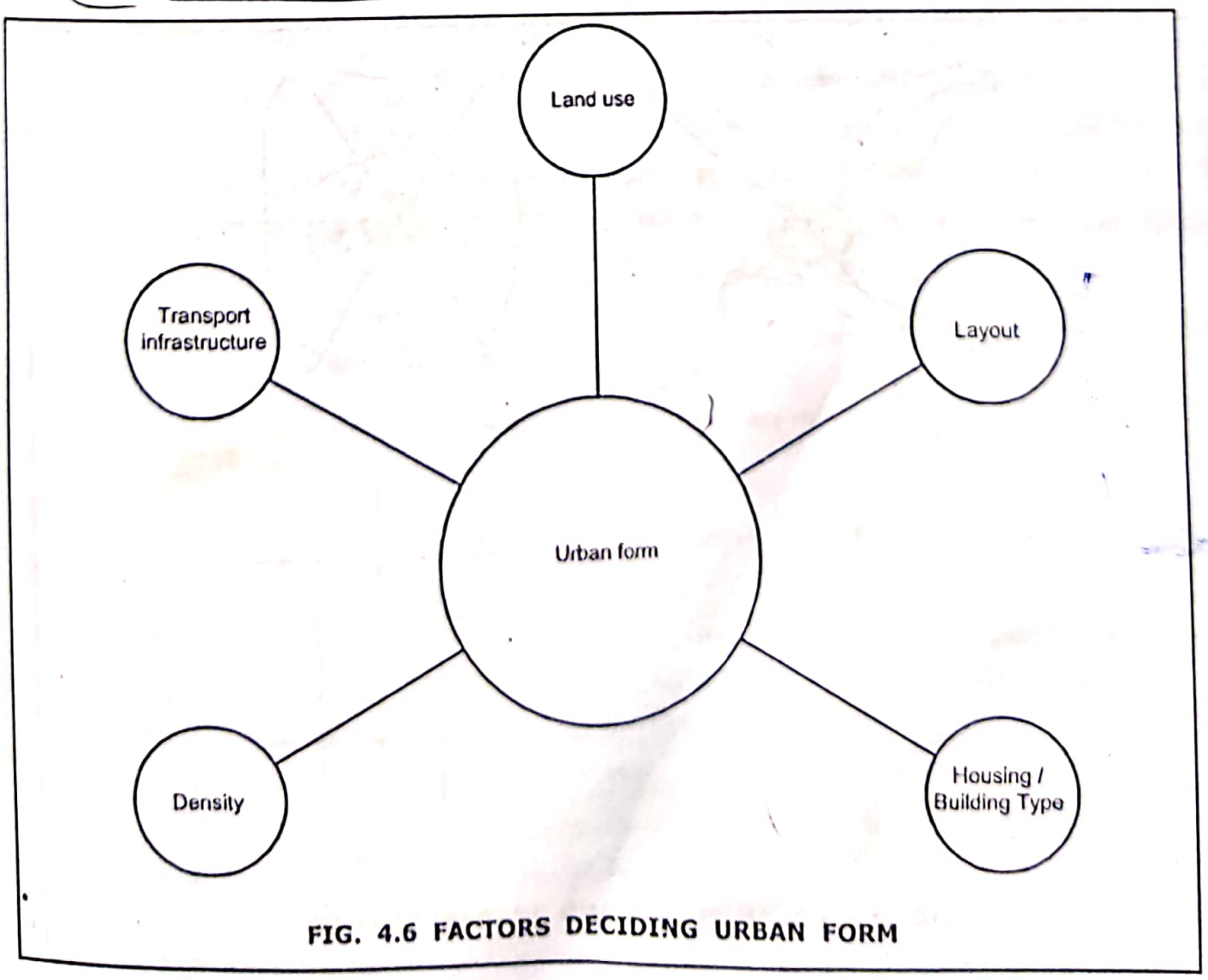


FIG. 4.6 FACTORS DECIDING URBAN FORM