2

HIGHWAYS IN INDIA

Highways play a significant role in making journeys easier and more expedient. This is of immense assistance whether travelling for work carrying cargoes. The highway system links large metropolises and rural segments across the nation. These systems have made expansion feasible, provided a suitable means to travel for more productive career opportunities, and permitted businesses to expand and develop nationwide. Further, highway transportation is particularly critical when it relates to the economy. A huge number of organisations depend on the expedience of distribution of their commodities and/or services over the road in order to compete in the fast paced trade world. Highways offer the quickest route from Point X to Point Y. Therefore those who must utilise this method of distribution will require utilising the quickest and most direct means of surface travel. This is where the highway structure becomes extremely critical.

LEARNING OUTCOMES

After studying this lesson the learner:

- explains the grid road System;
- demonstrates highway grid and usage of numbering system;
- identifies significant National Highways Number System;
- outlines different types of corridors in Highways;
- constructs the numbering of inter Roads in Highways.

2.1 MEANING OF GRID ROAD

It is a road that follows a surveyed division between areas of a township, municipality, etc. It is also a municipal road which follows a grid line created by the original survey of the region. a grid is generally an interconnected system of similar lines, wheather real or

imaginary. Most of the industrial countries' streets are laid out in a grid outline. This means that the streets interconnect at precise angles and terms a pattern of squares when viewed from above. To ensure inter linking of highways through a grid, the Indian Government has proposed to restructure a National Highways Programme. With the help of a financeable model, the National Highway Grid of desirable length and capacity will be created. Though the details of the grid have not been laid down, it is expected to unite 12 major ports, 45 out of 53 million plus cities and 26 capitals in addition to connecting tourist spots and other spiritual destinations.

Fig. 2.1: **Grid Road**

National highways (NHs) in India consist of over 1, 00,000 kilometres but there is no scientific road network pattern. This meant that the drivers could't take a straight raute from one destination to the other. In order to sort out this issue, NHAI has equipped a grid of 27 horizontal and vertical national highway corridors at a space of every 250 km. These corridors crisscross the nation. Further, these roads will be extended to at four lanes and will offer more road space for seamless shipment. The total length of these corridors as mentioned below is estimated at about 36,600 km where about 30,100 km are existing NHs. Out of these four lanes, only 18,800 km were constructed.

2.1.1 Different Types of Road Patterns

The following the different typies of road patterns**:**

1. Rectangular or Block Pattern
2. Radial Pattern
3. Radial or Star & Block Pattern

4. Radial or Star & Circular Pattern
5. Radial or Star & Grid Pattern
6. Hexagonal Pattern
7. Minimum Travel Pattern
8. Grid Pattern

1. Rectangular or Block Pattern

In this pattern method, the entire area is separated into rectangular blocks of plots, with streets **crossing** right angles**.**

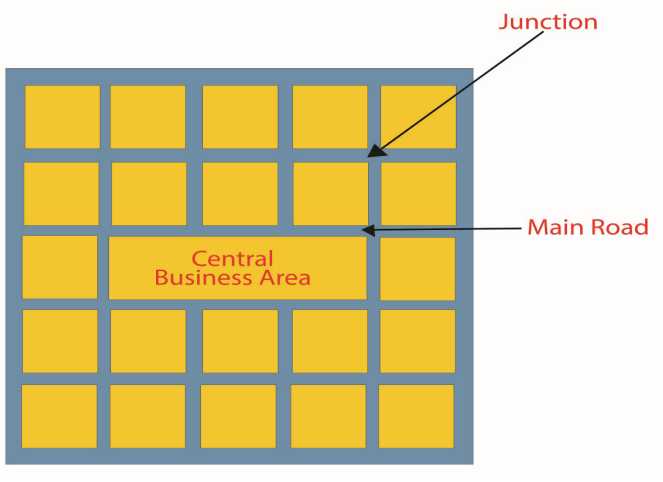


Fig. 2.2: **Rectangular or Block Pattern**

The main road which runs through the centre of the location should be adequately wide and other branch roads might be moderately narrow**.**

A. Pros of Rectangular or Block Pattern

1. The rectangular plots may be further divided into small rectangular blocks for the construction of buildings placed back to back, having roads on their fronts**.**
2. This pattern has been adopted for city roads.
3. The construction and maintenance of roads in this pattern are comparatively easier**.**

B. Cons of Rectangular or Block Pattern

1. At intersections, these pattern are prependicular, resulting in accidents since the vehicles face each other.

2. Radial Road Pattern

A straight approach to the main road is offered in this method. This pattern has been adopted on the city roads of Chandigarh. In this pattern, the roads are in the form of circles emanating from the centre of the area. This type of paradigm of a radial pattern is also being seen in our neighbourhood nation i.e. the Federal B Area of Karachi.

This pattern can also be categorised into there categories based on its layout.

3. Radial or Star & Block Pattern

This type of network is a mixture of radial and block patterns with a radial system of roads radiating from the center flanked by main streets the entire area is divided into radial blocks.

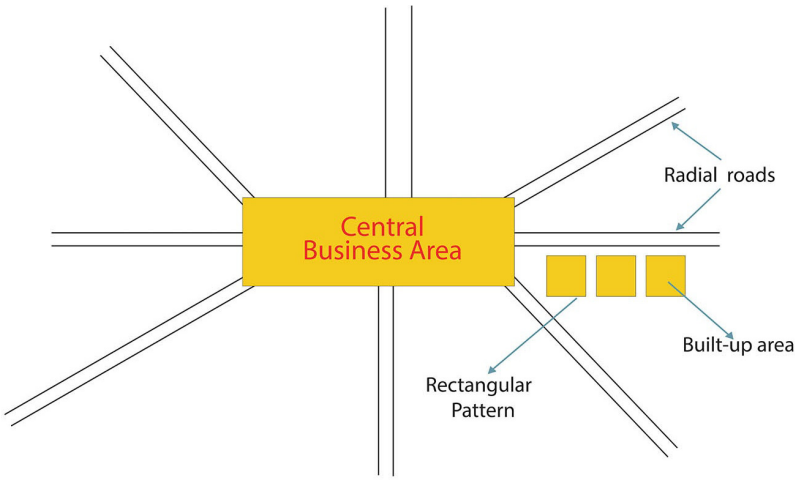


Fig. 2.3: **Radial or Star & Block Pattern**

A. Pros of the Radial or Star & Block Pattern

1. Less risky compared to a rectangular pattern.
2. It reduces the level of congestion at a primary bottleneck location.
3. If one radial road is closed another can be used as an alternative.

B. Cons of the Radial or Star & Block Pattern

1. Lack of safety appurtenances like rail transitions, crash attenuators and post support bases.

2. It is only effective when two-lane ramp traffic does not have to merge at the downstream end of the ramp.

4. Radial or Star & Circular Pattern

This type of network is a mixture of radial and circular pattern of roads. Here the key roads radiate from a central location and are linked along with concentric circle (ring roads).

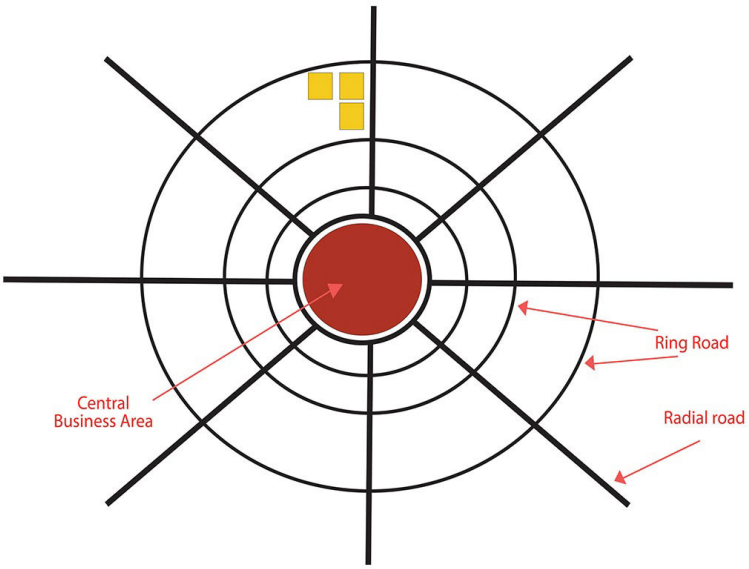


Fig. 2.4: **Radial or Star & Circular Pattern**

A. Pros of the Radial or Star & Circular Pattern

1. It is safer tham to the above patterns because vehicles travel in the same direction.
2. Roundabouts located in this pattern enhance the efficiency of traffic flace. This also reduces the full consumptions and emissions of the automobile.
3. Reduces the possibility of rear-end crashes.

B. Cons of the Radial or Star & Circular Pattern

1. Offering a good curve can be quite challenging.
2. In most cases, it affects the ability to drive (causes a decrase in vision in old drivers).

3. The proper provision of the traffic signals, road markings and lighting is essential to alert the drivers.

4. The Splitter islands should be extended far enough to provide a crosswalk and describe the roundabout.

5. Radial or Star & Grid Pattern

This type of network is a mixture of radial and grid pattern from the centres, a radial system of roads radiates outwards. The key arterial streets are interconnected by offering a grid pattern.

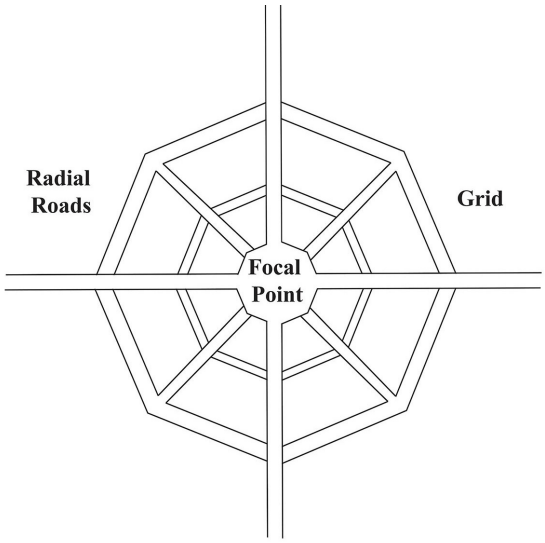


Fig. 2.5: **Radial (Star) and Grid Pattern**

A. Pros of the Radial or Star & Grid Pattern

1. It increases the efficiency of land usage and unit density.

2. It improves the traffic flow in both directions utilising Savannah's cellular structure.

3. It provides high safety to vehicular traffic with a high proportion of 3-way intersections.

4. It reduces the cut-through traffic.

B. Cons of the Radial, Star, & Grid Pattern

1. Splitter islands should be extended **far** enough.

2. Construction cost for extra road markings and signals.

6. Hexagonal Road Pattern

In this pattern method, a network of roads develops in such a manner that they form hexagons. Here the three roads meet the built-up spot boundary on the sides of the hexagons at each corner which can be further divided into appropriate sizes.

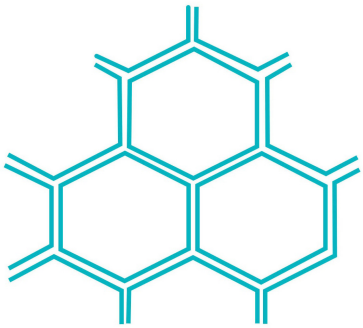


Fig. 2.6: **Hexagonal Pattern**

A. Pros of the Hexagonal Road Pattern

1. on the hexagonal sides three roads meet he build up - boundary.

B. Cons of the Hexagonal Road Pattern

1. Traffic signs, pavement markings, and lighting should be adequate so that drivers are aware that they should decrease their travel speed.

7. Minimum Travel Pattern

In this pattern method, road pattern develops linearly in one direction feasible (straight roads) only owing to the presence of some nearby natural forces like ocean on one part of the city. These are short roads.

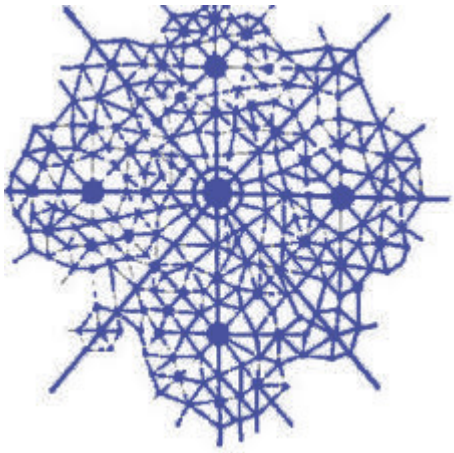


Fig. 2.7: **Minimum Travel Pattern**

A. Pros of the Minimum Travel Pattern

1. These sorts of potentially serious crashes are virtually eliminated.

B. Cons of the Minimum Travel Pattern

1. The traffic signs, pavement markings and lighting must be adequate so that drivers are aware that they should decrease their travel speed.

2. Older drivers may find intersections particularly challenging.

8. Grid Pattern

Grid Pattern Definition

A **grid** is a system of interconnecting parallel lines, either actual or imaginary. Most of the developed nations streets for example America are laid out in a grid pattern. This meaning the streets interconnect at the right angles and create a pattern of squares when viewed from the above.

Fig. 2.8: **Grid Pattern**

The grid can also be referred to as a physical network of sorts, not necessarily made of straight or parallel lines. The grid plan, grid street plan, or gridiron plan is a type of city plan in which streets move at right angles to each other, creating a grid. The infrastructure price for regular grid patterns is normally higher than for patterns with discontinuous streets.

Street prices are determined primary by four variables: Street width, Street length, block width, and pavement width. Grid plans are unique because of their regular intersections and orthogonal geometry. As a result of geometry, orientation and everyday

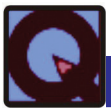
intersections with paths to desired destination become easier and more direct.

A. Pros of the grid Pattern

1. Grids are helpful for pedestrians because there are several different paths to travel from A to B.
2. Grids are suitable for retail stores and restaurants because they provide a lot of corner lots.
3. Navigating a grid is quite straightforward.

B. Cons of the Grid Pattern

1. Grids are unsate for drivers and bicyclists because they have a lot of intersections and therefore several potential conflict points.
2. Grids can encourage people to use residential streets as shortcuts.
3. They lead to unnecessarily steep streets in cities with a lot of hills.
4. An inconsistent grid may result in traffic chaos.



INTEXT QUESTIONS 2.1

1. Define grid road
2. A radial system of road radiates from the centre towards outwardly -True / False
3. A grid is a system of _____ similar lines, either real or imaginary.
4. _____ pattern, the main road is offered with a straight approach to outside the city.

2.2 INDIA'S TOP CORRIDORS

1. Kanyakumari to Srinagar
2. Porbandar to Kolkata
3. Surat to Paradip Port
4. Rameswaram to Dehradun
5. Mangalore Port to Chennai Port

Fig. 2.9: **National Highway Grids**

Most of the remaining 6,500 km without NH links are either single or two lane highways or major region routes. Moreover, these stretches are required to be transformed into highways by widening them it into four lanes for smooth transport. In order to convert this into a four lane road, the government has to invest about Rs 25,000 crores. By preparing these kinds of maps it will be easier for the government to re-designate the National parks for easy recognition. For instance, all odd number NH grids can be identified for roads connecting north end to south as even numbers for corridors joining east to west. As the government is focusing on integrated transportation networks, these grids will be significant. Further these grids will link all the major ports in the country which will assist in fast evacuation and transport of goods from one destination to the other.

2.2.1 India's Top Corridors

1. Delhi-Mumbai Industrial Corridor (DMIC)
2. Chennai Bengaluru Industrial Corridor (CBIC)
3. Extension of the CBIC project to Kochi via Coimbatore.
4. Amritsar-Kolkata Industrial Corridor (AKIC)
5. Hyderabad Nagpur Industrial Corridor (HNIC)
6. Hyderabad Warangal Industrial Corridor (HWIC)
7. Hyderabad Bengaluru Industrial Corridor (HBIC)
8. Bengaluru Mumbai Industrial Corridor (BMIC)
9. Vizag Chennai Industrial Corridor (VCIC)
10. Odisha Economic Corridor (OEC)
11. Delhi Nagpur Industrial Corridor (DNIC)

1. Delhi-Mumbai Industrial Corridor (DMIC)

The industrial corridor such as Delhi-Mumbai is considered as a mega infrastructure venture by the Government of India. This corridor covers a total length of 1483 km between the political capital of Delhi and the commerce capital, Mumbai. This project cost is around US$ 90 Bn it is being funded by various stakeholders such as the Government of India, Japanese loans, ventures by Japanese corporations and via Japan depository receipts offered by Indian firms.

The National Industrial Corridor Development Corporation (NICDC) Limited, earlier known as Delhi Mumbai Industrial Corridor Corporation (DMIC) Limited, is the main integrating agency for the project. This NICDC has been registered as a firm with 49% equity of the Government of India, 26% equity of Japan Bank for International Cooperation (JBIC) and the remainder held by government financial institutions. The NICDC has been integrated to establish, support and assist the development of the DMIC project. It carries out and facilitates project improvement services, for several central government agencies as well as state governments, connecting to investment provinces /industrial segments/economic areas / industrial nodes as well as townships.

In Phase-1, there will be almost 24 investment provinces in eight industrialised cities.

The five cities that have been selected in Phase 1 as investment sections are:

- Manesar – Bawal (Haryana)
- Dadri – NOIDA – Ghaziabad (Uttar Pradesh)
- Ahmedabad – Dholera (Gujarat)
- Pithampur – Dhar – Mhow (Madhya Pradesh)
- Khushkhera – Bhiwadi – Neemrana (Rajasthan)

The three cities that have been selected as Industrial sectors are:

- Shendra – Bidkin (Maharashtra)
- Dighi Port (Maharashtra)
- Jodhpur – Pali – Marwar (Rajasthan)

A. Present Status of Project:

The DMIC venture has made considerable progress with trunk infrastructure improvement activities nearing completion in nearly four spots such as Gujarat, Maharashtra, Uttar Pradesh as well as Madhya Pradesh.

The land which is developed has been allocated to industries. Nearly 77 plots covering 536 acres of land have already been allocated. As of December 2020, this is anticipated to bring ventures worth USD 2.25 bn.

B. The Major approved ventures under this are (Under Implementation):-

- Dholera Special Investment Region (DSIR), Gujarat
- ShendraBidkin Industrial Area (SBIA), Maharashtra
- Integrated Industrial Township – Greater Noida (IIT-GN), Uttar Pradesh
- Incorporated Industrial Township – VikramUdyogpuri (IIT-VUL), Madhya Pradesh
- Incorporated Multi-Modal Logistics Hub – Nangal Chaudhary, Haryana

C. The following projects has been approved on 30/12/2020

- The Multimodal Logistics Hub as well as the Multimodal Transport Hub (MMLH & MMTH), Uttar Pradesh
- Dighi Port Industrial Area, Maharashtra

- Multimodal Logistics Park, Sanand, Gujarat
- Jodhpur PaliMarwar Industrial Area, Rajasthan
- Khushkhera BhiwadiNeemrana Industrial Area, Rajasthan

2. Chennai Bengaluru Industrial Corridor (CBIC)

The industrial corridor such as Chennai -Bengaluru has been proposed to facilitate accelerated development in the regional business agglomeration states of Tamil Nadu, Karnataka as much as Andhra Pradesh. The main purpose of this corridor is to help achieve the development of a well-planned and competent industrial base. This industrial corridor will attain the goal by offering smooth access to business production units, decreasing transportation and logistic cost, improving distribution time as well as reducing inventory cost. This will ensure increased private investment in manufacturing and industrial movement in the three states.

For the Comprehensive Integrated Master Plan of the CBIC, the study team of Japan International Cooperation Agency had conducted a groundwork study. They recognized 25 priority projects, across several sectors that aim to eradicate infrastructural blockages in the venture.

A. Present Status of Project: 16

The outlook plan has been finished for the overall CBIC venture.

Totally three nodes have been recognized for further progress:

- Krishnapatnam (Andhra Pradesh)
- Tumakuru (Karnataka)
- Ponneri (Tamil Nadu)

SPVs for the implementation of the venture at Krishnapatnam node in Andhra Pradesh as well as Tumakuru node in Karnataka have correspondingly been integrated. Preliminary engineering activities have been comfirmed for the main activation sector of aproximately 2500 acres of Krishnapatnam and nearly 1736 acres for Tumakuru. The Cabinet had approved the industrial Corridor nodes at Krishnapatnam as far as Tumakuru under the scheme of CBIC.

B. The two major projects under this are:-

Ventures which have been sanctioned on 30/12/2020

- Krishnapatnam Industrial Area, Andhra Pradesh

- Tumakuru Industrial Area, Karnataka

The venture development activities which are underway is

- Ponneri Industrial Area, Tamil Nadu

C. Expansion of the CBIC venture to Kochi through Coimbatore

The NICDIT has offered its sanction for the expansion of the CBIC venture to Kochi through Coimbatore.

The two main nodes have been recognized for further growth:

- Palakkad (Kerala)
- Dharmapuri (Tamil Nadu)

D. Present Status of the venture

- Groundwork of comprehensive master planning as well as beginning engineering has been undertaken for Palakkad (Kerala) as well as Salem (Tamil Nadu).
- The Finalization of Shareholder's Agreement (SHA) as well as the State Support Agreement (SSA) is also underway.

3. Extension of the CBIC project to Kochi via Coimbatore (AKIC)

This venture expands from Amritsar (Punjab) to Dankuni (West Bengal). Moreover; the AKIC will have a control area among seven Indian states such as Punjab, Haryana, Uttar Pradesh, Bihar, Jharkhand as well as West Bengal. The total length of the Amritsar-Kolkata Industrial Corridor (AKIC) is around 1839 km.

Seven additional incorporated Manufacturing Clusters (IMCs) have been recognized:

- Rajpura-Patiala (Punjab)
- Prag-Khurpia Farms (Uttarakhand)
- Bhaupur (Uttar Pradesh)
- Gamhariya (Bihar)
- Barhi (Jharkhand)
- Raghunathpur (West Bengal)
- Hisar (Haryana)

A. Present Status of Project:

The viewpoint plan of the AKIC has been finished.

One Incorporated Manufacturing Cluster (IMC) has been confirmed for further development in seven states.

A Land recognition, agreement measuring 2935 acres, shareholder's agreement and state support agreement are being decided for the Prag-Khurpia farms in Uttarakhand.

The activities which are connected to the selection of comprehensive master planning as well as initial engineering consultant for the new spot i.e. Hisar. This is being considered as a substitute for Saha.

B. The major ventures under this are:-

- Raghunathpur Industrial Park, West Bengal
- Hisar Integrated Manufacturing Cluster IMC, Haryana
- Prag Khurpia incorporated production Cluster IMC, Uttarakhand
- Rajpura Patiala IMC, Punjab
- Agra, Uttar Pradesh
- IMC at Gaya, Bihar

Venture improvement activities have not been commenced yet

- IMC at Jharkhand

4. Hyderabad Nagpur Industrial Corridor (HNIC)

Telangana and Maharashtra are affected by this corridor. By connecting rail, road and airways, we came boost a industrial enlargement.

A. The major venture under this:-

- Zaheerabad Phase I, Telangana

5. Hyderabad Warangal Industrial Corridor (HWIC)

This venture has an influential location streching across the states of Telangana and Maharashtra. It will assist the development of a well-planned and resource competent industrial base which will bring innovation, production and job creation.

A. The major venture under this:-

- The Hyderabad segment I, Telangana project is identified under this.

6. Hyderabad Bengaluru Industrial Corridor (HBIC)

This corridor will have an influence on three states Telangana, Andhra Pradesh and Karnataka. It is an expansion of the Hyderabad Nagpur Industrial Corridor (HNIC) with a goal to link central parts of the nation with southern parts. The following nodes have been recognized for expansion in the preliminary phase:

- OrvakalNode

7. Bengaluru Mumbai Industrial Corridor (BMIC)

This corridor is aimed at assisting the growth of a well-planned as well as resource competent industrial base offered by world-class sustainable link infrastructure, bringing significant benefits merits in terms of innovation, production, job generation and resource safety. It will be stretched across Karnataka as well as Maharashtra.

A. Present Status of Venture: 14

The strategic plan has been executed for the total BMIC venture.

In Karnataka, the Dharwad node has been recognized as the main concern for further execution. Moreover, the Maharashtra Government has approved in principle the improvement of Sangli/Solapur.

B. The major ventures under this are:-

- Dharwad Node, Karnataka
- Satara Node, Maharashtra

8. Vizag Chennai Industrial Corridor (VCIC)

This corridor is considered the first coastal economic corridor in the nation. It is a division of the East Coast Economic Corridor (ECEC). This province has one of the largest concentrations of industrial, mineral and urban nodes. It covers an additional 800 km of Andhra Pradesh's coastline and it is associated with the Golden Quadrilateral. Further it plays an important role in the "Act East Policy" of India which focuses on raising the incorporation of the Indian economy into the economies of ASEAN. The ADB will carry out preliminary improvement activities for VCIC and will recognize the following

four nodes for progress:

- Visakhapatnam
- Chittoor
- Donakonda
- Machilipatnam

These four nodes recognized by ADB are based on the subsequent criteria:

- Present level of industrial agglomeration
- Availability of land for improvement of new industrial clusters
- Closeness to urban centres and seaports
- Connectivity (Rail and road)
- Accessibility of power and water.

A. Present Status of Venture: 18

The Asian Development Bank (ADB) sanctioned a loan of around USD 625 mn to the Andhra Pradesh government for the development of this project in phase -1 of VCIC, the National National Industrial Corridor Development and Implementation Trust has approved improvement to Visakhapatnam and Chittoor. ADB financing will be used meet seven civil works agreements provided by the Andhra Pradesh Government. The granted civil works are as specified below:

- Development of 1 MLD Common effluent treatment plant, Naidupeta
- Augmentation of Industrial area, Naidupeta
- The bulk water supply as well as summer storage tank, Naidupeta
- Samarlakota –Rajanagaram Road
- Expansion of Sub Stations in Visakhapatnam Node
- Augmentation of Sub Stations in Chittoor Node
- Water Supply distribution network improvement in GVMC area

B. The major ventures under this are:-

- Koparthy Industrial Area, Andhra Pradesh

- Visakhapatnam Industrial Area, Andhra Pradesh
- Chittoor Industrial Area, Andhra Pradesh

9. Odisha Economic Corridor (OEC)

This Corridor will be enhanced as a division of the East Coast Economic Corridor.

The subsequent 2 nodes have been recognized for development:

- Gopalpur-Bhubaneswar-Kalinganagar (GBK)
- Paradip-Kendrapara-Dhamra-Subarnarekha (PKDS)

10. Delhi Nagpur Industrial Corridor (DNIC)

This corridor will stretch among the North-South corridor of dedicated freight corridors (DFC) and on the existing NH network. These dedicated freight corridors are operated by the Ministry of Railways.

Presently, the remaining DFC's are in a sophisticated phase of completion:

- Eastern dedicated freight Corridor (Ludhiana to Dankuni)
- Western dedicated freight corridor (JNPT/Mumbai to Dadri)

INTEXT QUESTIONS 2.2

1. Which is considered a mega infrastructure venture by the Government of India?
2. Hisar is being considered as a substitute for which place?
3. _____industrial corridor is regarded as the first coastal economic corridor in the nation.
4. The total length of the Amritsar-Kolkata Industrial Corridor (AKIC) is around _____ km.

2.3 INTER ROAD NUMBERING SYSTEM

In the month of April 28, 2010, the Ministry of Road Transport formally published the revised numbering method for the National Highway system. This was in the Gazette of the Government of India. It is a systematic numbering scheme based on the orientation and geographical location of the highway. This was implemented to ensure more flexibility

and steadiness in the numbering of existing as well as newly construted national highways. In India the major Interstate highways are chosen by one- or two-digit numbers.

Routes with odd numbers run East and West, while even numbers run North and South. The Interstate utilise a numbering system in which the main Interstates are **allocated with one- or two-digit numbers** for the shorter paths and similarly for the longer ones they are allotted with **three-digit numbers** where the last two digits contest the parent path.

2.3.1 How the New Highway Numbering in India Works?

Until recently, the number system on Indian highways was in a very confusing style that didn't offer any logic besides their numbers. Moreover, the Indian Government had taken a major decision in the year 2010 towards the highway numbering system. This was in order to offer some sort of clue about the **geographical spot and the direction** of an exacting highway.

The **logic behind national highway numbering in India** is as follows:

1. It is not uncommon fro the highways of **North-South** to clutch **EVEN numbers.**
2. The highways **of East-West** will carry **ODD numbers**
3. All major roads will be **single digit or double digit** in number (see the exception in point 6 below)
4. **North-South highways** will **increase their numbers from East to West**. For instance, in Central or Western India, a particular North-South highway will move towards a higher number than the one in East India. Let's assume that NH4 lies in East India and highway 44 lies in West India. Due to odd numbering 5 both runs North-South.
5. Likewise the **East-West highways** will expand as they shift **from North to South**. By this sense NH1 will be moving East-West anywhere in North India whereas NH 83 might be moving down south. Certainly, there might be minor confusion besides few roads that might be operating diagonally in stretches.
6. **THREE digit** numbered highways are **secondary routes or branches** of a main highway. For instance, the branches highway 44 will be 144, 244, and 344. Please note that since the corridor NH44 runs the length of the country from North to South a side shot say 144 may be up north while something like 944 may be down south.
7. **The A, B, C, D etc. The Suffixes** are included to the three digit sub highways to spotlight very small spin-offs or widens of sub-highways. For instance, **966A, 527B** etc.

2.3.2 Speed limits

Due to the freeways, generally the Interstate Highways have the highest speed limits in a given location. Speed limits are determined by individual states. From 1975 to 1986, the maximum speed limit on any highway in developed nations such as the United States was 55 miles per hour (90 km/h). Presently, rural speed limits elsewhere usually range from 65 to 80 miles per hour (105 to 130 km/h). Several portions of various highways such as those in rural areas have a speed limit of 80 mph (130 km/h).

In certain locations, speed limits on Interstates can be considerably lower in places where they traverse extensively hazardous spots. The maximum speed limit on is 50 mph (80 km/h) in certain areas because of two sharp curves with a suggested limit of 35 mph (55 km/h) in a heavily congested area.

INTEXT QUESTIONS 2.3

1. North-South highways will increase their numbers from East to West - True / False
2. Three digit numbered highways are primary routes of a main highway True / False
3. Routes with _____ numbers run East and West.
4. Speed limits are determined by _____ states.

2.4 NUMBER ALLOCATION OF NATIONAL HIGHWAYS

The numbers assigned to National Highways in India are as follows:

Fig. 2.10: **Number Allocation of National Highways**

1. In India, for all the national highways which commence from **North to South, the even numbers are used.** It is allocated **from East to West in the method of ascending order.** For high longitudes lower numbers are allocated and for lower longitutude, high numbers are allocated. North Eastern state are fame to NH-2 while Rajasthan is fame to NH-68. NH-8 Delhi to Mumbai, Maharashtra (via Jaipur, Ahmedabad and Vadodara)

2. Odd numbers are assigned to al highways in india, especially from East to West. In this incident, the highways are named in ascending numbers from East to West. It is assigned in such a way that, for high latitudes lower numbers are allocated and for lower latitudes higher numbers are allocated. For example, NH-87 is located in southern India and NH-8 is located in Jammu and Kashmir.

   For example, NH-11 Agra, Jaipur, Bikaner

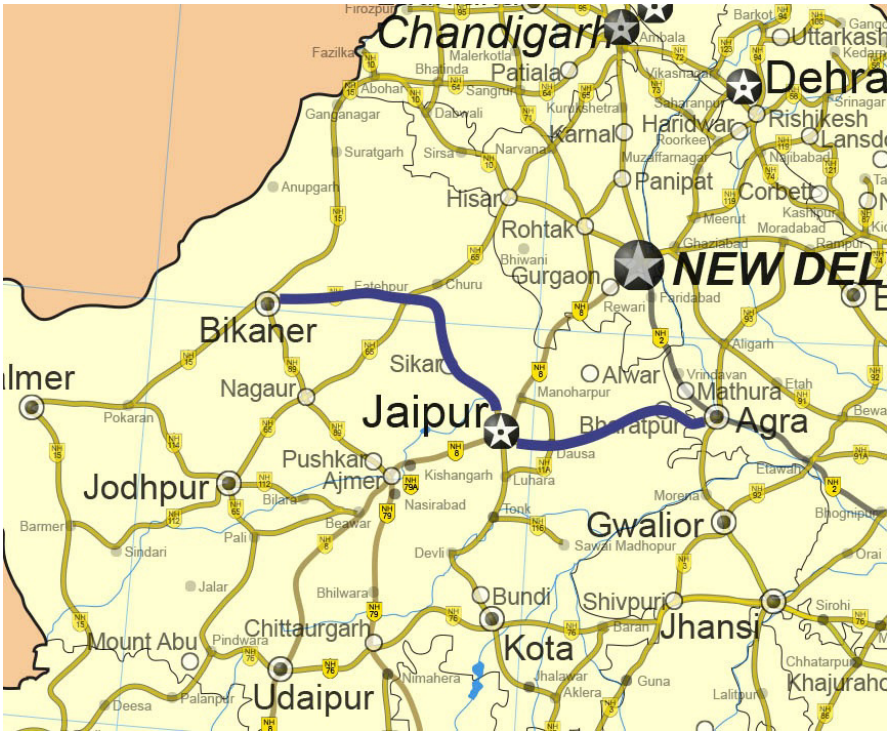


Fig. 2.11: **NH-11 Agra, Jaipur, Bikaner**

3. One or two digit numbers are used for all the major highways.

4. In India if we start moving from the East to the West, the number of highways in the North to South direction will be increased. For instance, if the number four is utilized for a highway positioned on North to South but in an Eastern State, then the number for a highway situated on North to South but in a Western State or Central State will always be indicated by more than four.

Fig. 2.12: **National Highway numbers**

5. A subsidiary highways a highway that is denoted by three digit numbers in India. 244, 144, and 344 are the branches of the National Highway number of 44. Where us in the auxiliary highway number, if the first numeral is odd, then the highway is positioned from East to West. If the first numeral is even, it is situated from North to South.

6. The sections of the auxiliary highways are denoted by a letter, A, B, C or D in the three digit number.

INTEXT QUESTIONS 2.4

1. NH-2 is situated in the North Eastern States - True / False.
2. NH-87 is located in Jammu and Kashmir True / False.
3. The numbers such as 244, 144, 344 are the branches of the National Highway number of _____.
4. NH-68 is positioned in _____.

WHAT YOU HAVE LEARNT

- A grid road that follows a surveyed division between areas of a township, municipality, etc. It is also a municipal road which follows with a grid line created by the original survey of the region. Generally a grids referred to as a system of connecting simillar lines, whether they are real or imaginary.
- The types of road patterns are Rectangular or Block Pattern, Radial Pattern (Radial or Star & Block Pattern, Radial or Star & Circular Pattern, Radial or Star & Grid Pattern), Hexagonal Pattern, Minimum Travel Pattern and Grid Pattern.
- India's top corridors are 1. Kanyakumari to Srinagar, 2. Porbandar to Kolkata, 3. Surat to Paradip Port, 4. Rameswaram to Dehradun and 5. Mangalore Port to Chennai Port
- The main industrial corridors are Delhi-Mumbai Industrial Corridor (DMIC), Chennai Bengaluru Industrial Corridor (CBIC), Extension of the CBIC project to Kochi via Coimbatore., Amritsar-Kolkata Industrial Corridor (AKIC), Hyderabad Nagpur Industrial Corridor (HNIC), Hyderabad Warangal Industrial Corridor (HWIC),Hyderabad Bengaluru Industrial Corridor (HBIC), Bengaluru Mumbai Industrial Corridor (BMIC),Vizag Chennai Industrial Corridor (VCIC), Odisha Economic Corridor (OEC) and Delhi Nagpur Industrial Corridor (DNIC)
- Routes with odd numbers run East and West, while even numbered run North and South. The Interstate utilise a numbering system in which main Interstates are allocated with one- or two-digit numbers for the shorter paths and similarly

for the longer ones they are allotted with three-digit numbers where the last two digits contest the parent path.

- In India, for all the national highways which commence from North to South, the even numbers are used. It is allocated from East to West in the method of ascending order. All the highways especially from East to West, the odd numbers are allocated.

KEY TERMS

Grid	Corridor	Highways
Inter road	Pattern	Number
National	Project	Township
Location	Speed	Length

TERMINAL EXERCISE

1. Define Grid system.
2. Explain Block Pattern.
3. Explain Delhi -Mumbai Corridor.
4. What is the Inter-road number?
5. Explain NH -68.
6. Outline the Pros and cons of the Radial Pattern.
7. Write a note on minimum travel patterns.
8. Brief the Chennai -Bangalore Industrial corridor.

9. List out India's top corridors.

10. What do you understand about highways Three Digit Number.

11. Sketch the inter road numbering system

12. Spotlight the different types of road pattern

13. Which industrial corridors is significant - Justify your answer

14. How does the New Highway Numbering system work in India?

15. In what way Asian Development Bank connected with the industrial corridor?

ANSWERS TO INTEXT QUESTIONS

2.1

1. It is a road that follows a surveyed division between areas of a township, municipality, etc.
2. True
3. Interconnect
4. Radial Road

2.2

1. Delhi-Mumbai Industrial corridor
2. Saha.
3. Vizag Chennai
4. 1839

2.3

1. True / False
2. False

3. Odd

4. Individual

2.4

1. True

2. False

3. 44

4. Rajasthan

DO AND LEARN

Learners can undertake their activity work in the areas of Road infrastructure highway development organisations.