



TRANSPORTATION ENGINEERING

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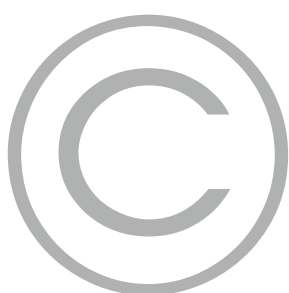
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TSPSC AEE SYLLABUS

Highway Classification as per IRC; Highway alignment; Engineering Surveys; Geometric Design; Cross sectional elements of road; Gradient; Grade compensation; Traffic Surveys – speed, Volumes, origin and destination; Highway capacity and level of service as per HCM 2000; Intersection – at grade and grade separated; Channelization; Rotary intersection; signal design – Webster method, traffic signs, pavement marking; Parking studies, accident studies, pavement types, Factors considered for pavement design, flexible and rigid pavements design concepts.

Railway Engineering: Permanent way, rails, sleepers, ballast; Creep, coning of wheel, rail fixtures and fastenings, super elevation, cant deficiency, curves, turnout; Points and crossings.

Airport Engineering: Selection of site of Airport, runway orientation and design, wind rose diagram, basic runway length, correction to basic runway length.

APPSC AEE SYLLABUS

Planning of Highway systems, Alignment and geometric design, Horizontal and vertical curves, Grade separation, Highway Materials and construction methods for different surfaces and maintenance. Principles of pavement design, Drainage. Traffic surveys, Intersections, Signaling, Mass transit systems, Accessibility, Networking.

SSC-JE SYLLABUS

Highway Engineering – cross sectional elements, geometric design, types of pavements, pavement materials – aggregates and bitumen, different tests, Design of flexible and rigid pavements – Water Bound Macadam (WBM) and Wet Mix Macadam (WMM), Gravel Road, Bituminous construction, Rigid pavement joint, pavement maintenance, Highway drainage, Railway Engineering- Components of permanent way – sleepers, ballast, fixtures and fastening, track geometry, points and crossings, track junction, stations and yards. Traffic Engineering – Different traffic survey, speed-flow-density and their interrelationships, intersections and interchanges, traffic signals, traffic operation, traffic signs and markings, road safety.

TRANSPORTATION

The word 'transportation' was taken from Latin, **TRANSPORTAE - TO CROSS ACROSS**

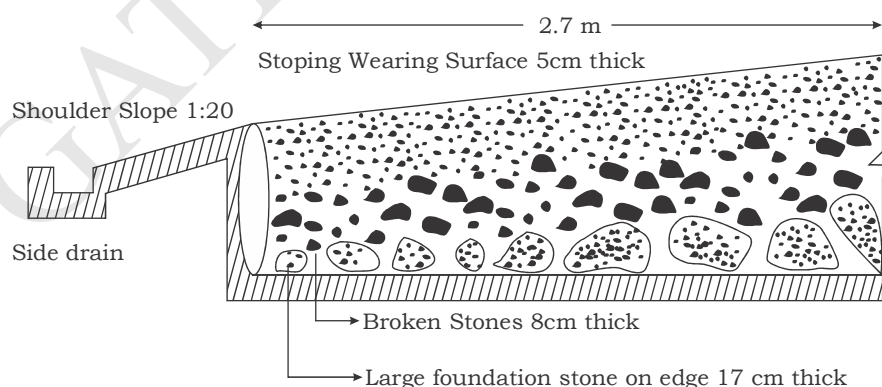
- ▶ The oldest mode of travel was on foot; later on animals were used to transport goods & people from one place to the other; further animal-driven vehicles were used.

Modes of Transportation // There are four modes of transport ;

- Land* - *Roadways* : This system can serve from door to door, most economic system.
- *Railways* : It is a fixed system which can serve from station to station.
- Water* - *Waterways* : Slowest but cheapest mode of transport system.
- Air* - *Airways* : Fastest but costliest mode of transport system.

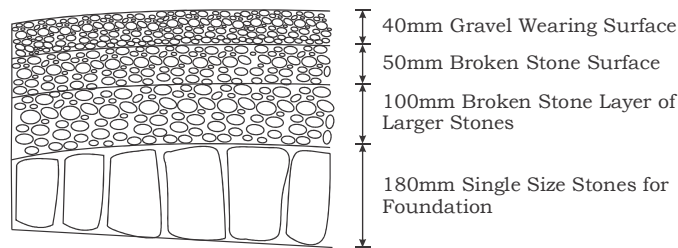
HIGHWAY DEVELOPMENT AND PLANNING**World Road Development**

- ▶ Mesopotamians (3500 B.C)
- ▶ Assyrians (1900 B.C)
- ▶ Romans (312 B.C):
- ▶ Romans were considered to be the pioneers in road construction. They constructed 580 km (Appian Way) straight road regardless of gradients.
- ▶ **British :**
 - ▶ First Grand Trunk (GT road, old NH-2) road was constructed from Calcutta to Delhi. Railways are introduced by British in India.
- ▶ **Tresaguet [1764] from France :**



- ▶ **Metcalf (1717-1810) from England :**
 - ▶ He was responsible for the construction of 290 km roadway in England.
- ▶ **Telford (19th century) :**
 - ▶ Subgrade was kept horizontal and hence subgrade drainage was not properly designed.

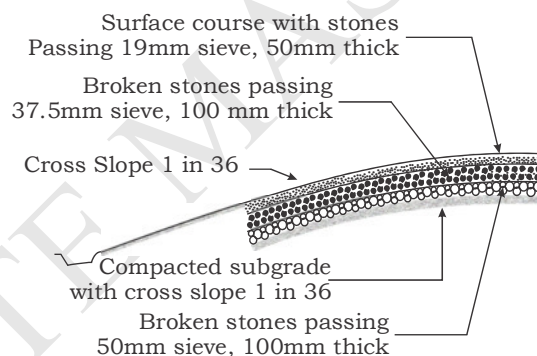
- ▶ Heavy foundation stones were used having 22 cm thickness at the centre and 17 cm at edge.



Telford's Cross-section of Road

▶ John Macadam (1756-1836) :

- ▶ He is renowned to be the father of highways. He made the first attempt to improve road condition in 1815.
- ▶ The importance of subgrade drainage and compaction is recognized. Cross slope is provided 1 in 36 from subgrade level itself.
- ▶ Macadam method of construction was the first method based on scientific thinking. He realized that stress due to wheel loads gets dispersed as we go down to lower layers of the pavement so bottom layers experience relatively lesser stress than top layers. However, the amount of stress in each layer should be compared with their strength parameter.



- ▶ Side drains are suggested by Macadam.

INDIAN ROAD DEVELOPMENT

- ▶ Indus valley civilization, Harappa-Mohenjo-daro (5000BC) towns were planned in grid patterns.
- ▶ Mouryans (4000 to 2000 BC) constructed 2400 km long roadway from Pataliputra to Takshasila.
- ▶ Mughals greatly improved the roads in India. Sher shah suri constructed longest road from Punjab to Bengal.

▶ After 1st world war (1914 -1918) :

- ▶ Usage of the roads by motor vehicles has been increased in India and this demanded better road network.
- ▶ Indian government decided to form a committee on road development.

- ▶ The committee was named as Jayakar committee, with Mr. M.R. Jayakar as chairman.
- ▶ It was formed in Nov.1927 and submitted their report in Feb.1928.
- ▶ It is also known as Indian road development committee.

▶ **Jayakar Committee Recommendations :**

- ▶ Road development in India should be considered as Nation's interest.
- ▶ An extra tax to be collected on fuel from the road user as a road development fund, in the form of central road fund (CRF).
- ▶ A semi-official technical body should be formed to pool the technical bodies to act as an advisory body on various aspects of the roads.
- ▶ A research organization should be instituted to carry out research and development works, resulted in CSIR-CRRI.

▶ **Central Road Fund (CRF) in 1929 :**

- ▶ Extra tax on petrol was 2.65 paisa/lit. fuel in 1929.
- ▶ The tax was revised in 1998 on petrol and diesel as 1 Rs./lit. and further revised many times.
- ▶ The total central road fund should be catered about 80% for state governments based on fuel consumption for the development of roads and 20% for central govt. as a central reserve for research and development.

▶ **Indian Road Congress (IRC) in 1934 :**

- ▶ It was an offshoot outcome of Jayakar committee.
- ▶ IRC is to publish journals, research publications, standardize the specifications on road development, and on various aspects of highway engineering.
- ▶ *Motor vehicle act* was enacted in the year 1939 to control over the motor vehicles & it was revised in 1988.

▶ **First 20-year road development plan (1943 to 1963) :**

- ▶ It was popular as **Nagpur** road development plan. Its target was to construct total road density of 16 km/100 sq.km.
- ▶ Roadways were classified into 5 categories;
 - NH = National highway
 - SH = State highway
 - MDR = Major District roads
 - ODR = Other District roads
 - VR/RR = Village roads/Rural roads
- ▶ Recommended *star and grid pattern* for road system.
- ▶ It was planned to construct a total road network length of 2 lakh km.

▶ **Central Road Research Institute (CRRI) :**

- ▶ Central Road Research Institute established in 1950, is situated in New Delhi for carrying out the research pertaining to road technology.

▶ **National Highway Act (NHA) :**

- ▶ National Highway Act was enacted in 1956.
- ▶ It's responsibility is to acquire land, develop and maintain national highways.

▶ **Second 20-year road development plan (1961-1981) :**

- ▶ It is also known as *Bombay* road development plan. Its target was to construct a road density of 32 km/100 sq.km.
- ▶ It was planned to construct a total road network length of 10.5 lakh km.
- ▶ 1600 km length of Expressway's have been considered in this plan within proposed target of NH.
- ▶ **HRB – Highway Research Board** was formed in 1973 which gives proper guidance to road research activities in India.

▶ **Third 20-year road development plan (1981-2001) :**

- ▶ It is also known as **Lucknow** road development plan.
- ▶ Its target is to construct a road density of 82 km/100 sq.km.
- ▶ Construction of expressway's of 2000 km, was considered.
- ▶ It was planned to construct a total road network length of 12 lakh km.

▶ **Roadways were classified into 3 systems :**

Primary system : Expressways, National highways.

Secondary system : State highways, Major District Roads.

Tertiary system : Other District Roads, Village Roads.

▶ **Calculation of the length's of Roadways :**

- ▶ Length of NH in km = Area in km²/50
- ▶ Length of SH in km = Area in km²/25 (or) = 62.5 × No. of towns with population above 5,000 – $\left(\frac{\text{Area in sq.km}}{50} \right)$
- ▶ Length of MDR in km = Area in km²/12.5 (or) = 90 × No. of towns with population above 5,000

▶ **National Highway Authority of India (NHAI) :**

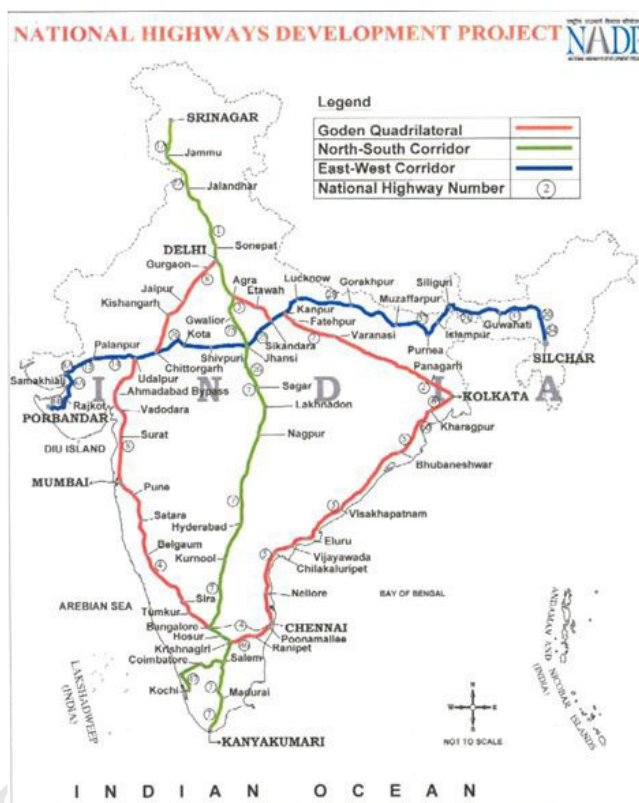
- ▶ It was established in 1988 but it became operational in Feb.1995.
- ▶ It is responsible for road development, maintenance and operation which is under the control of Ministry of Road Transport and Highways (MoRTH).

▶ **National Highway Development Projects (NHDP) :** To obtain;

- | | |
|------------------------------|--------------------|
| ▶ Better quality roads | ▶ Medians |
| ▶ Carriageway and shoulders. | ▶ Traffic control |
| ▶ Safety | ▶ Geometric design |

▶ Golden Quadrilateral :

- ▶ In golden quadrilateral, the aim is to connect Kolkata, Delhi, Mumbai, and Chennai. The length of the road network is about 4500 km.
- ▶ North-South and East-West corridors from Kashmir to Kanyakumari and from Assam to Gujarat respectively as a total road network length of approximately 7250 km.
- ▶ Port connectivity is 1150 km.



▶ Highway Research Institutes :

- ▶ Highway research institute – Chennai
- ▶ Road research institute – Nasik (Maharashtra)
- ▶ Gujarat Research institute – Vadodara

NRRDA/NRRDP » National Rural Road Development Agency / Program

- ▶ Under this agency, the campaign was started namely **PMGSY** (*Pradhan Mantri Gram Sadak Yojana*) on Dec-2000 to develop the rural road network in terms of connectivity.
- ▶ The main aim of **PMGSY** is to connect the villages above 1000 population by the end of the year 2003. The villages above 500 population should be connected with a road network by the end of the year 2007.

- ▶ **Important National Highways :** (old system)
 - ▶ NH-1 : Delhi-Ambala-Amritsar (DAA)
 - ▶ NH-2 : Delhi-Calcutta(DC)
 - ▶ NH-3 : Agra-Bombay(AB)
 - ▶ NH-4 : Chennai-Bangalore-Poona(CBP)
 - ▶ NH-5 : Chennai-Calcutta (CC)
 - ▶ NH-6 : Calcutta-Dhule(CD)
 - ▶ NH-7 : Varanasi-Kanyakumari (including Selam, longest NH)
 - ▶ NH-8 : Delhi-Bombay (DB)
 - ▶ NH-65 : Bombay-Hyderabad-Vijayawada
 - ▶ NH-10 : Delhi-Fazilka (DF)

Note :

The Govt. of India took a major decision in 2010 to rationalize the highway numbers in a way that the number provides some clue about the geographic location and the direction of a particular highway.

- ▶ Total road network length is about 5.89 million km.
 - ▶ Rural road/village road – 41.66 lakh km
 - ▶ SH – 176,166 km
 - ▶ NH – 131,326 km
 - ▶ Expressways – 1455 km
- ▶ India has second largest road network length in the world, first being USA.
- ▶ **Current Status of Traffic : (Source NHAI website)**
 - Passengers** : 80% by road, 20% by railways.
 - Freight/Goods** : 70% by road, 30% by railways.
 - ▶ National Highways constitute only about 1.7% of the road network but carry about 40% of the total road traffic.
- ▶ **Maximum utility system/Saturation system :**
 - ▶ It gives the optimum utility road network length of an area in sq.km/unit length of the road. It gives the best route among all the alternate routes.
- ▶ **Factors affecting maximum utility system are :**
 - a) Population
 - b) Production : i) Agricultural ii) Industrial

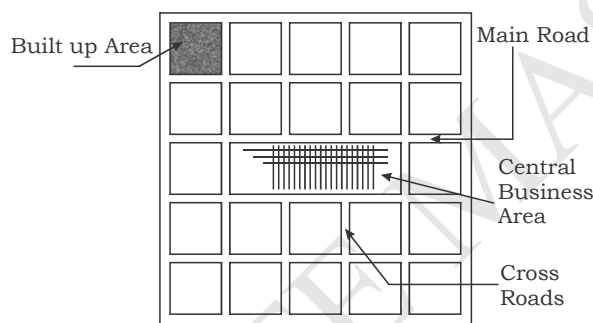
► **Utility units:**

- Provide utility value of 0.5 to lowest population range and increase it as multiple of 2 for next population range.
- Provide utility factor of 1 to production.

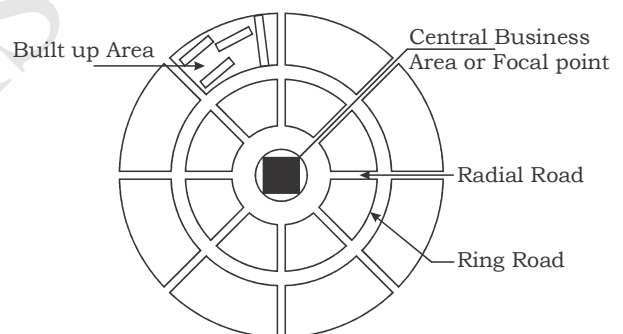
► **Expressways :**

- **P. V. Narasimha Rao Express flyover** is the first elevated expressway in ASIA; length is about 11.6 km in Hyderabad (Shamshabad to Mehdiapatnam).
- **Mumbai - Pune** expressway was the first limited access expressway of length 95km.
- **Delhi-Gurgaon Expressway** is 28 km long expressway as a part of golden quadrilateral.
- **Ahmedabad-Vadodara Expressway** is 93 km long expressway connecting Ahmedabad to Vadodara.

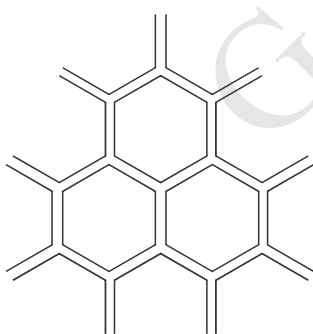
Road Patterns



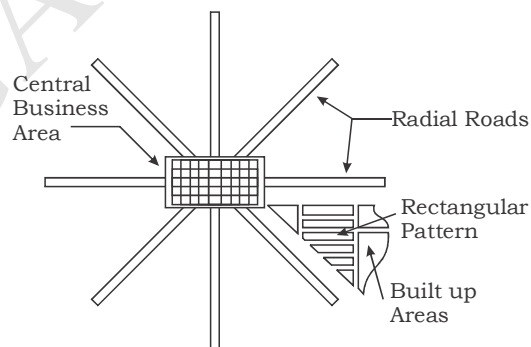
a) Rectangular or block pattern



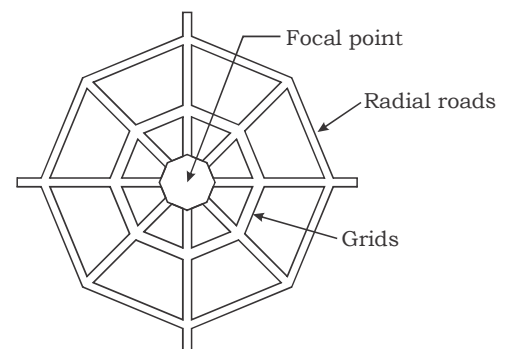
b) Radial or star and circular pattern



c) Hexagonal pattern



d) Radial or star and block pattern



e) Radial or star and grid pattern

Practice Questions

1. Nagpur road plan recommended for road system **(AEE 2003)**
 - a) star and circle pattern
 - b) star and grid pattern
 - c) star and block pattern
 - d) star and hexagonal pattern
2. The period of long term plan drafted for the development of roads in India, known as Bombay plan, was for **(polytechnic Lecturer 2007)**
 - a) 10years b) 15years
 - c) 5years d) 20years
3. Jayakar committee was appointed by the government with Mr. Jayakar as chairman in **(TSPSC 2015)**
 - a) 1920 b) 1925 c) 1926 d) 1927
4. A central government, semi-official technical body known as Indian Roads Congress (IRC) was formed in the year **(TSPSC 2015)**
 - a) 1950 b) 1934 c) 1929 d) 1943
5. In functional classification of highways, which one of the following highway type have highest mobility and less accessibility **(TSPSC AEE Manager 2015)**
 - a) Street and Village roads
 - b) State Highways
 - c) Major District roads
 - d) National Highways
6. In India, the modes of transportation in the order of their importance, are
 - a) Air transport, shipping, roads, railways
 - b) Railways, roads, shipping, air transport
 - c) Roads, railways, air transport, shipping
 - d) Shipping, railways, roads, air transport
7. For the administration of road transport, a Motor Vehicle act was enacted in **(HMWSSB 2020)**
 - a) 1927 b) 1934 c) 1939 d) 1947
8. IRTDA (Indian Roads and Transport Development Association) was set up in Bombay in
 - a) 1907 b) 1917 c) 1927 d) 1937
9. The inventor of road making who made it as a building science was
 - a) Sully b) Tresaguet
 - c) Telford d) John Macadam
10. The road foundation for modern highways construction was developed by
 - a) Telford
 - b) Macadam
 - c) Tresaguet and Telford simultaneously
 - d) Telford and Macadam simultaneously
11. An executive engineer of roads executes work under direct control of
 - a) Superintending Engineer
 - b) Secretary to the Govt.
 - c) Chief Engineer
 - d) None of these
12. On the recommendation of Nagpur conference, the minimum width of a village road may be
 - a) 2.45m b) 2.75m c) 3.66m d) 4.90m
13. The basic formula for determination of pavement thickness was first suggested by
 - a) Spangler b) Picket
 - c) Kelly d) Goldbeck
14. Which one of the following is the chronological sequence in regard to road construction / design development?
 - a) Telford, Tresaguet, C.B.R., Macadam

- b) Tresaguet, Telford, Macadam, C.B.R.
 c) Macadam, C.B.R. Tresaguet, Telford
 d) Tresaguet, Macadam, Telford, C.B.R.

15. Pradhan mantri gram sadak yojana (PMGSY), launched in the year 2000, aims to provide rural connectivity with all-weather roads. It is proposed to connect the habitations plain areas of population more than 500 persons by the year

- a) 2005 b) 2007 c) 2010 d) 2012

16. Three new roads P, Q, R are planned in a district. The data for these roads are given in the table given below. Based on the principle of maximum utility the order of priority for these three roads should be

Road	Length (km)	Number of villages with Population		
		<200	2000-5000	> 5000
P	20	8	6	1
Q	28	19	8	4
R	12	7	5	2

- a) P, Q, R b) Q, R, P
 c) R, P, Q d) R, Q, P

17. The second twenty year road development plan 1961-81 is also called as _____ **(HMWSSB 2020)**

- a) Delhi road plan
 b) Bombay road plan
 c) Nagpur road plan
 d) Lucknow road plan

KEY

- 1) b 2) d 3) d 4) b 5) d 6) b 7) c 8) c 9) d 10) d
 11) a 12) a 13) d 14) b 15) b 16) d 17) b

ALIGNMENT

- ▶ The positioning or laying out of the centre line of a road on the ground is called as an alignment.

Requirements : The basic requirements of an ideal alignment are

- ▶ Safety
- ▶ Short
- ▶ Easy
- ▶ Economic

An improper alignment will increase :

- ▶ Construction cost
- ▶ Maintenance cost
- ▶ Vehicle operation cost
- ▶ Accident rate

Factors affecting highway alignment

- ▶ *Obligatory points :*

These are the controlling points and the points through which an alignment has to pass & not to pass

Ex : Water bodies, Heritage structures, Prayer places, Mountains etc.,

▶ **Hydrology**

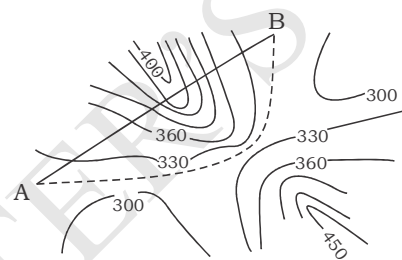
- ▶ *Traffic :*

Origin and Destination (O&D) studies are done and desire lines are to be drawn to find the actual desire of road user. O&D studies are used to find the necessity of road improvement.

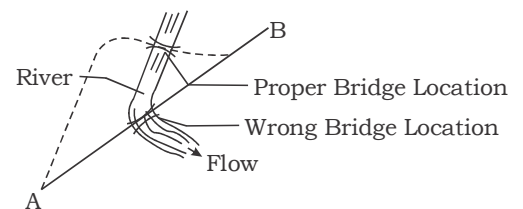
▶ **Economy**

- ▶ *Topography:*

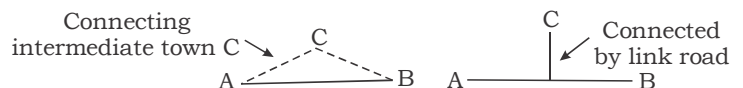
Hillside passes are preferable.



(a) Alignment along hill side pass



(b) Alignment to suit proper bridge location



(c) Alignment to connect Intermediate area



(d) Alignment avoiding intermediate area

Studies

- ▶ Economic studies - Estimating the requirements
- ▶ Financial studies - Income, various revenues and Taxes
- ▶ Traffic studies - Origin and Destination studies
- ▶ Engineering studies - Traffic volume studies etc.,

ENGINEERING SURVEYS

- ▶ **Map study:**
 - Key map - proposed & existing routes
 - Index map - General topography of the area
- ▶ From map study, all the rough and likely routes (alternate routes) are to be identified.
- ▶ **Reconnaissance :**
 - ▶ General characteristics of an area will be studied; Aerial surveys should be done for vast areas.
- ▶ **Preliminary Survey :**
 - ▶ In this survey, different proposal of alignments will be compared and necessary physical information like topography, drainage and soil is obtained.
 - ▶ Cost of the project (for different proposals) will be worked out & quantity of required earthwork materials is obtained.
 - ▶ The best route is identified among all the alternate routes (finalizing the alignment).
- ▶ **Detailed study :**
 - ▶ Transferring of the best route to the ground is done in this stage.
 - ▶ Detailed soil survey is done by collecting the soil samples at a depth of 0.5 m to 1.5m
 - ▶ In the case of water affected areas, carriageway or pavement should be 0.6 m above the high flood level (HFL).

Practice Questions

Level - 1

1. Consider the following surveys:

1. Reconnaissance survey
2. Preliminary survey
3. Traffic survey
4. Location survey

The correct sequence in which these surveys are conducted before the alignment of a track is finalized, is

(AEE-2006)

- a) 1, 3, 2, 4 b) 1, 3, 4, 2
 - c) 3, 1, 4, 2 d) 3, 1, 2, 4
2. The sequence of four stages of survey in a highway alignment is **(AEE-2006)**
- a) Reconnaissance, map study, preliminary survey and detailed survey
 - b) Map study, preliminary survey, reconnaissance and detailed survey
 - c) Map study, reconnaissance, preliminary survey and detailed survey
 - d) Preliminary survey, map study, reconnaissance and detailed survey
3. Layout of centre line of the highway on the ground is called as **(TSPSC AE 2015)**
- a) Setting out b) Stake out
 - c) Alignment d) Base line
4. Alternate routes for a highway project are suggested by the study of **(TSPSC AE 2015)**
- a) Political map b) Traffic map
 - c) Topographic map d) Road map
5. Reconnaissance is best done with the help of
- a) Aerial photographic surveys
 - b) Cadastral surveys
 - c) Topographic surveys
 - d) None of these
6. An index map used in a highway project shows

- a) The proposed and existing roads and important places to be connected
 - b) Details of various alternates alignments
 - c) The general topography of the area
 - d) The general details of existing structure like buildings, wells etc.
7. The survey in which final alignment is selected is
- a) Final survey
 - b) Reconnaissance
 - c) Preliminary survey
 - d) None

Level - 2

1. Choose the option in which the items of list-I are correctly matched with the items of list-II **[TSPSC RWS : 2018]**

List-I

- A. Secondary Road System
- B. Economics studies
- C. Engineering
- D. Road use studies

List-II

1. Demographic study
2. Traffic volume
3. State Highways
4. Topography

Codes

- | | A | B | C | D |
|----|---|---|---|---|
| a) | 3 | 1 | 4 | 2 |
| b) | 1 | 3 | 2 | 4 |
| c) | 3 | 1 | 2 | 4 |
| d) | 1 | 3 | 4 | 2 |

2. Match List I (Highway survey) with List II (Outcome) and select the correct answer using the codes given below

List - I

- A. Map study
- B. Reconnaissance

C. Preliminary survey

D. Detailed survey

List - II

1. Best alignment of road
2. Cross drainage locations
3. Grade line and central line of road
4. Obligatory points

Codes:

A B C D

a) 1 2 4 3

b) 4 3 1 2

c) 1 3 4 2

d) 4 2 1 3

3. In which of the following location surveys of the road profile, is sampling done up to a depth of 1 m to 3 m below the existing ground level? **(IES 03)**

a) Preliminary survey

b) Final location survey

c) Construction survey

d) Material location survey

4. Read the following statements related to road alignment: **(HMWSSB 2020)**

A. Improper alignment would result in increase in construction cost.

B. Improper alignment would result in increase in maintenance cost.

C. Improper alignment would result in decrease in vehicle operation cost.

D. Improper alignment would result in increase in accident rate.

Identify the WRONG statement

a) B only

b) C only

c) D only

d) A only

Level - 1

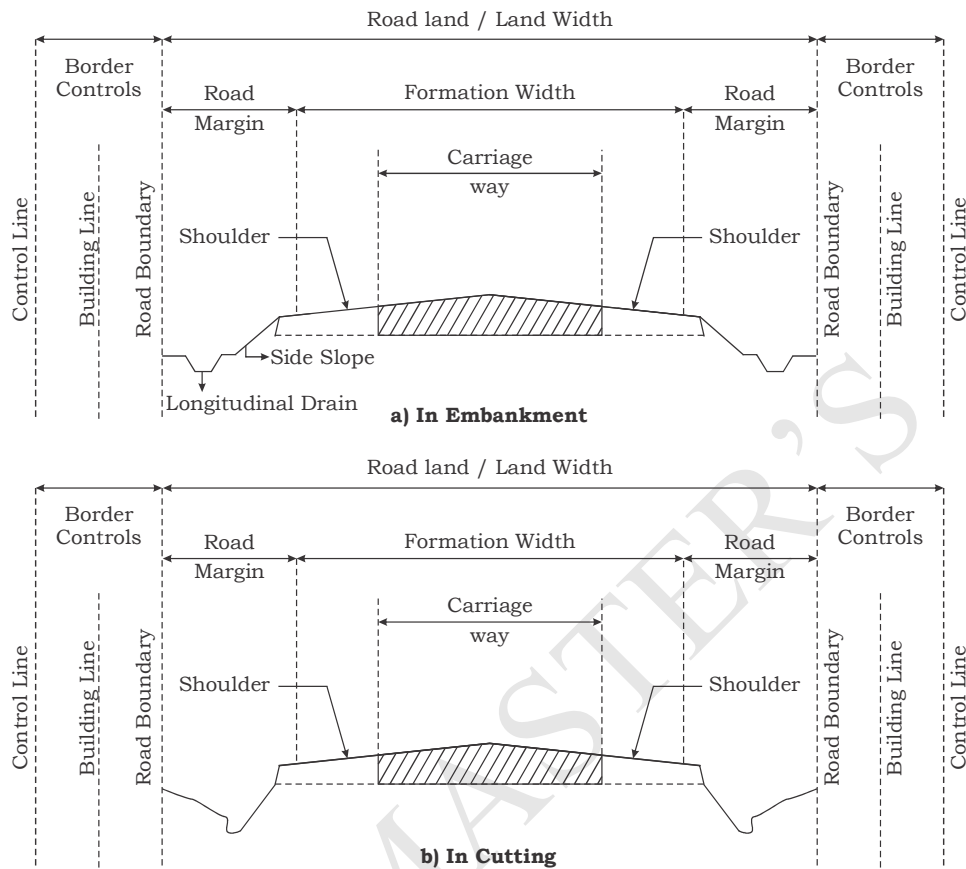
KEY

1) d 2) c 3) c 4) c 5) a 6) c 7) c

Level - 2

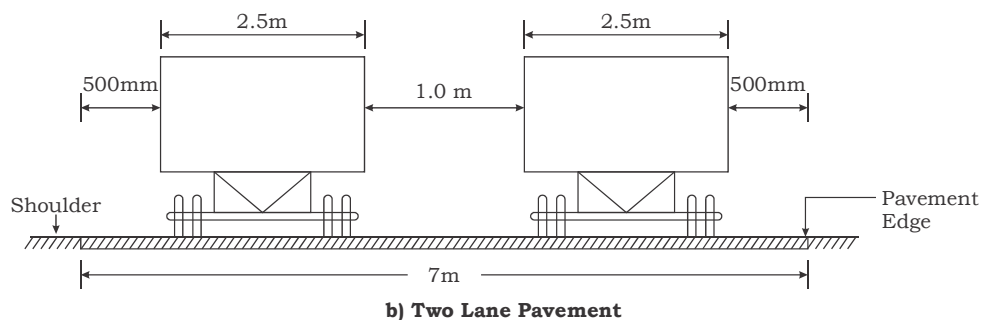
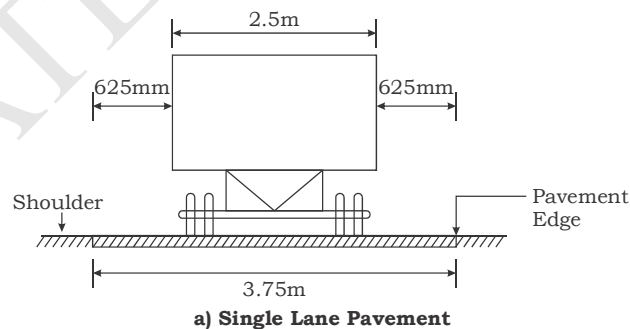
KEY

1) a 2) d 3) a 4) b



Carriage width (or) Pavement Width :

- Maximum width of the vehicle as per IRC is 2.44 m and side clearance is of 0.65m
- The maximum height of a vehicle as per IRC is 3.80 m (single deck) and is 4.70 m (double deck).



S.No.	Class of Road	Width of carriageway, (m)
1.	Single lane road	3.75
2.	Two lanes, without raised kerbs	7
3.	Two lanes, with raised kerbs	7.5
4.	Intermediate carriageway	5.5
5.	Multi-lane pavements	3.5 per lane

▶ **Shoulder :** (also called as service lane)

- ▶ Shoulder serves as an emergency lane in which the surface is relatively rougher than carriageway. As per IRC, shoulder width is 2.5 m.
- ▶ If there is no provision of separate shoulder from carriageway, then the shoulder width must be 1.6 m.

Traffic Separator (or) Median

- ▶ It is also called as a **central reserve**. The median is provided for separation of traffic, to avoid head-on collision, and head light glare during the night time.
- ▶ As per IRC width of the median is 5 m for rural roads and it may be reduced to 3 m, where the land is constraint. It is provided up to 1.2 m to 1.5 m on long bridges.
- ▶ In urban areas, median is provided when number of lanes is ≥ 6 .
- ▶ Absolute minimum width is 1.2 m and desirable minimum width is 5 m in urban areas.

▶ **Kerb (or) Curb :**

- ▶ Kerb is the separator between carriageway and i) Median ii) Footpath
 - ▶ Low curb (mountable) – 100 mm height.
 - ▶ Semi barrier type curb – 150 mm height.
 - ▶ Barrier type curb – 200 mm height.
- ▶ As per IRC, the height of stone should be 15 cm.

▶ **Guard Rails :**

- ▶ Guard rails are provided when the pavement is constructed on embankment height of 3 m to prevent the vehicles from running off the embankment.
- ▶ Guard stones are indicated with black and white strip lines.

Formation width is Carriage way + Shoulder + Medians (if any). It is also called as Roadway

- ▶ The minimum roadway width on single lane bridge is 4.25 m.

S.No.	Road Classification	Roadway width, m	
		Plain & Rolling Terrain	Mountainous & Steep Terrain
1.	National & State Highways		
	Single Lane	12	6.25
	Two Lane	12	8.80
2.	Major District Roads		
	Single Lane	9	4.75
	Two Lane	9	-
3.	Other District Roads		
	Single Lane	1.5	4.75
	Two Lane	9	-
4.	Village Roads	7.5	4

- ▶ **Right of Way (RoW) :** (also known as Land Width)
 - ▶ It is the land acquired for the road along its alignment and is the width between both the road boundaries.
 - ▶ **RoW** = formation width + road margins
- ▶ **The width of RoW :** 45 m in urban; 60 m in rural areas
 - ▶ Width between two building lines is 80 m.
 - ▶ Width between two control lines ranges from 120 to 150 m.

The Different Elements in Road Margins are :

- ▶ **Driveways :**
 - ▶ It connects the highways with commercial establishments like fuel stations, service stations, cellar entry & exit ways.
- ▶ **Cycle track :**
 - ▶ It is provided where the cycle traffic is high.
 - ▶ The width of cycle track is 2 m and additional 1 m width may be considered based on cycle volume.
- ▶ **Frontage roads :**
 - ▶ To give access to properties along an important highway with controlled access to the expressway (slow moving vehicles).
- ▶ **Footpaths :**
 - ▶ These are for pedestrians to walk along the roadway. The width of the footpath is 1.5 m to 2.0 m.
- ▶ **Parking Areas :**
 - ▶ This is provided for parking of vehicles in which on-street parallel parking is allowed.
 - ▶ As per IRC; Width = 3.0 m.

Note :

Road margins are provided in urban areas only