

CMR Institute of Technology, Bangalore

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING /MECHANICAL
ENGINEERING /INFORMATION SCIENCE AND ENGINEERING

III - INTERNAL ASSESSMENT SOLUTIONS

Semester: 6-CBCS 2018

Subject: TRAFFIC ENGINEERING (18CV652)

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Date: 2 Aug 2021

Time: 01:00 PM - 02:30 PM

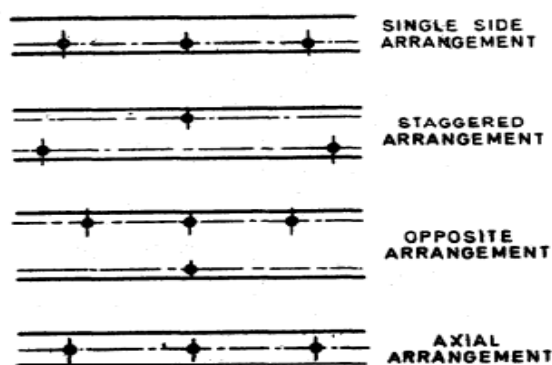
Max Marks: 50

1. Explain the factors to be considered for design of road lighting.

Solution: -

The design factors for highway/road lightings are

- Lamps – the various types of lamps in use for highway lighting are filament, fluorescent lamps, sodium or mercury vapour lamps.
- Luminaire distribution of light- the distribution of light should be downward so that high percentage of lamp light is utilized for illuminating the pavement and the adjacent areas. The distribution of luminaire should cover the pavement between the kerbs and provide adequate lighting the adjacent areas i.e., 3 m to 5 m beyond the pavement edges. According to Indian Standards Institution, an average level of illumination of 30 lux on important roads carrying fast traffic and 15 lux on main roads, the ratio of minimum to average illumination being 0.4
- Spacing of lighting units – large lamps with high mountings and wide spacings would be preferred from economy point of view.
- Height and overhang of mounting – usually mounting height range from 6 m to 10 m.
- Lateral placement – the street lights should not be too close to the pavement edge. For roads with raised kerbs, the pole should be at a distance of 0.3 m to 0.6 m from the edge of the kerb.
- Lighting layouts – this can be either single sided, staggered or central.



Spacing (s) of streetlamp can be computed as

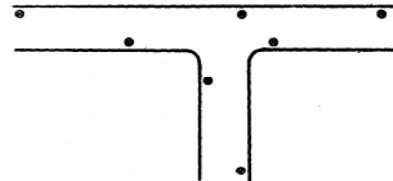
- $$S = \frac{\text{Lamp lumen} \times \text{coefficient of utilization} \times \text{Maintenance factor}}{\text{average flux} \times \text{width of the road}}$$

- Single side arrangement is suitable for narrow roads.
- For wide roads, staggered, opposite or central lighting system can be provided.
- Spacing is decided based on location, lamp size, mounting height and lighting requirements. Spacing range between 30-60 m.
- At curves they are installed at closer spacing's than on straights.

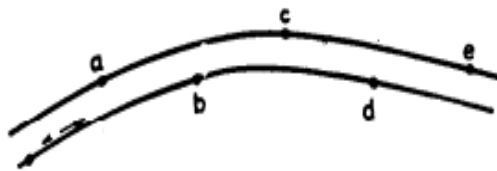
Basic arrangements of street lighting



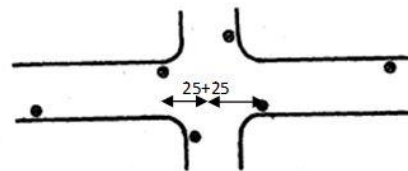
5A Single Side Arrangement of Luminaires on a Bend



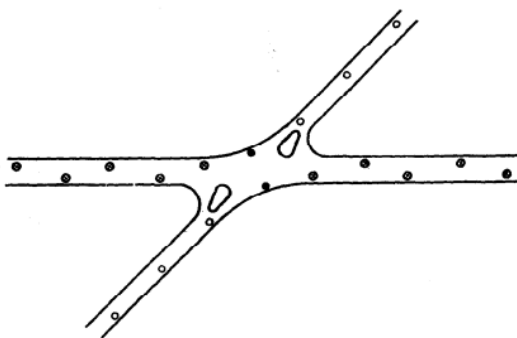
SITING RECOMMENDED AT A T-JUNCTION



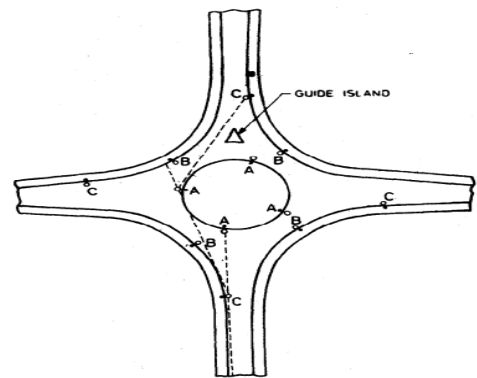
6A Staggered Arrangement on a Curve



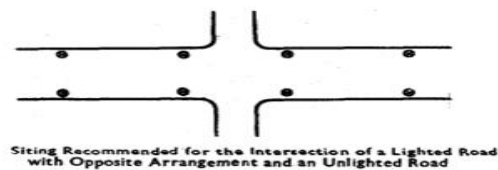
SITING RECOMMENDED AT THE INTERSECTION OF TWO ROADS LIGHTED WITH STAGGERED ARRANGEMENT



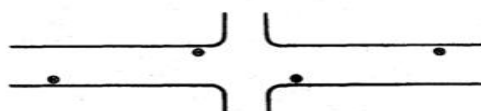
SITING RECOMMENDED AT ROAD WITH GUARD ISLAND



TYPICAL LAYOUT AT A ROUNDABOUT



Siting Recommended for the Intersection of a Lighted Road with Opposite Arrangement and an Unlighted Road



Siting Recommended at the Intersection of a Lighted Road with Staggered Arrangement and an Unlighted Road
SITING RECOMMENDED AT THE INTERSECTION

2. Explain the various measures of decrease the accident rates.

Solution: -

3 E's such as Engineering, Enforcement and Education can be utilized to reduce accidents.

Safety measures related to engineering

Road designs:

- Sight distances, width , horizontal and vertical alignment, intersection design elements
- Pavement surface characteristics, skid resistance values
- Necessary bypasses may be constructed
- Grade separated intersections

Preventive maintenance of vehicle

- braking system, steering system, lighting system should be checked regularly
- Heavy penalty on defective vehicles
- Special checks on public carriers

Before and after study

- By comparing the condition and collision diagnosis “before and after” the introduction of preventive measures
- After necessary improvements in design and enforcing regulation

Road lighting

- Proper road lighting especially at the intersections, bridge sites and at places where there are restriction in traffic movement Safety measures related to enforcement

Speed control:

- Checks on spot speed of all vehicles should be done at different locations and timings and legal actions on those who violate the speed limit should be taken

Training and supervision

- The transport authorities should be strict while issuing licence to drivers of public service vehicles and taxis.
- Driving licence of the driver may be renewed after specified period, only after conducting some tests to check whether the driver is fit

Medical check

The drivers should be tested for vision and reaction time at prescribed intervals of time

Safety Measures related to education

The various measures of education that may be useful to prevent accidents are enumerated below.

Education of road users:

- The passengers and pedestrians should be taught the rules of the road, Correct manner of crossing etc.
- Introducing necessary instruction in the schools for the children and
- Posters exhibiting the serious results due to carelessness of road users.

Safety drive: Documentaries and films for road users and drivers

- Training courses and workshops
- Imposing traffic safety weeks

3. Explain the detrimental effect of traffic noise and detail the technique available to control the traffic noise.

Solution: -

- (i) Improve vehicle design and maintenance.
- (ii) Use of small cars instead of big ones.
- (iii) Patronage of public transport system.
- (iv) Use of alternative fuels and method of propulsion.
- (v) Restraining traffic through road pricing.
- (vi) Stopping engines at the time of delays at intersections
- (vii) Constructing bypasses and ring roads.
- (viii) Staggering work hours

4. Explain the importance and applications of ITS in-traffic engineering.

Solution: -

Intelligent Transportation Systems (**ITS**) is the application of computer, electronics, and communication technologies and management strategies in an integrated manner to provide traveler information to increase the safety and efficiency of the surface transportation systems. These systems involve vehicles, drivers, passengers, road operators, and managers all interacting with each other and the environment, and linking with the complex infrastructure systems to improve the safety and capacity of road systems.

ITS user services

Some of the user services offered by ITS are described as follows:

1. Travel and traffic management

The main objective of this group of services is to use real time information on the status of the transportation system to improve its efficiency and productivity and to mitigate the adverse environmental impacts of the system. This includes pre-trip information, enroute information, route guidance, route matching and information, traveller service information etc.

2. Public transportation operations

This group of service is concerned with improving the public transportation systems and encouraging their use. This includes services like real time public transit services and its maintenance, enroute information,

3. Electronic payment:

This user service allows travellers to pay for transportation services with a common electronic payment medium for different transportation modes and functions. Toll collection, transit fare payment, and parking payment are linked through a multi-modal multi-use electronic system. With an integrated payment system a traveller driving on a toll road, using parking lot would be able to use the same electronic device to pay toll, parking price and the transit fare.

4. Commercial vehicle operations: The aim is to improve the efficiency and safety of commercial vehicle operations including freight mobility, automated road side safety inspection, etc.

5. Advance vehicle control and safety systems: This user service aims to improve the safety of the transportation system by supplementing drivers' abilities to maintain vigilance and control of the vehicle by enhancing the crash avoidance capabilities of vehicles.

6. Emergency management: This includes emergency notification and personal security on the occurrence of an accident as well as emergency vehicle management.

7. Information management: This service is aimed to provide the functionality needed to store and archive the huge amounts of data being collected on a continuous basis by different ITS technologies.

8. Maintenance and construction management: This user service is aimed to provide the functionality needed for managing the fleets of maintenance vehicles, managing the roadway with regards to construction and maintenance and safe roadway operations.

ITS Architecture

The ITS Architecture provides a common framework for planning, defining, and integrating intelligent transportation systems. It specifies how the different ITS components would interact with each other to help solving transportation problems.

ITS Planning

ITS planning is to integrate ITS into the transportation planning process

5. Define Travel demand management (TDM) and explain management measures.

Solution: -

TDM techniques are aimed at reducing the traffic flows, especially during the peak hour.

Direct methods are the methods that can be directly quantified/ visible by the road user itself. Indirect methods are the methods which cannot be directly measured. Among the different techniques enlisted below, except road pricing all are direct methods.

The different techniques adopted are

1. Car-pooling and other ride-sharing programmes- Leverage public and private funds to increase the use of ridesharing and other commuting options that reduce traffic congestion and improve air quality
2. Peripheral parking
3. Chartered buses - Subsidizing transit costs for employees or residents, workplace travel plans
4. Staggering of office hours - Flex-time work schedules with employers to reduce congestion at peak times
5. Internal shuttle service in CBD
6. Parking restraint - Requiring users of parking to pay the costs directly, as opposed to sharing the costs indirectly with others through increased rents and tax subsidies.

7. Road pricing- Time, distance and place (TDP) road pricing, where road users are charged based on when, where and how much they drive.
8. Congestion pricing during peak hours.
9. Entry fee
10. Priority for buses in traffic - Including and improving public transportation infrastructure, such as subway entrances, bus stops and routes.
11. Restrictions on entry of trucks during day-time.
12. Including or improving pedestrian-oriented design elements, such as short pedestrian crossings, wide sidewalks and street trees.
13. Bicycle-friendly facilities and environments, including secure bike storage areas and showers.
14. Providing traveler information tools, including intelligent transportation system improvements, mobile and social applications, wayfinding tools, and other methods for promoting alternatives to single occupancy vehicle (SOV) modes
15. Road space rationing or alternate-day travel by restricting travel based on license plate number, at certain times and places.
16. Roadspace reallocation, aiming to re-balance provision between private cars which often predominate due to high spatial allocations for roadside parking, and for sustainable modes.

6. Suggest some traffic regulatory measures suitable for urban areas.

Solution: -

The phases of traffic regulations include The first phase of traffic regulation is

- a) Driver controls
- b) Vehicle controls
- c) Traffic flow regulations
- d) General controls

Regulations on vehicles

1. Speed limits: this is generally controlled by the type and volume of traffic. This is also dependent upon
 - Environment of roads
 - Traffic composition
 - Character of road
 - Casualty
2. Enforcement of speed limits – violators will be summoned or arrested or punished. For enforcement, radar speedometers are installed.

3. Establishment of speed zones
4. Vehicle registration for different states, different purposes are categories with reference to registration plate number. The order of age can also be identified with reference to the alphabets associated with the number plate.
5. Construction and equipment of vehicles: regulations in this category include brake and steering system, length of the truck trailer unit if any, wheel loaf, wheel load, emission, use of horns, periodical testing and inspection of vehicles, prohibition on use of horns and so on.
6. Control of transport vehicles – regulations with reference to goods movement, competition among different modes and so on.
7. Insurance: mainly to cover the liability in respect of death or injury to persons or damage to any property

Regulations concerning the driver

1. Licensing of the driver – given to an individual after he passes a test of competence. He should be able to portray his ability as a driver as well as his knowledge in different rules and regulations.
2. Requirements of physical fitness – night blindness, epilepsy, inadequate perception, heart diseases etc make a person unfit for driving
3. Age of drivers – in india, an individual should be of 18 years of age to get a driving license, whereas he should be of minimum of 20 years to get license to drive transport vehicles.
4. Disqualification and endorsement of licenses- habitual drinking, dangerous driving, offences and penalties make a person unfit for driving.

Some other general regulations and provisions are made.

They include reporting of accidents, recording and disposing traffic violation cases, etc