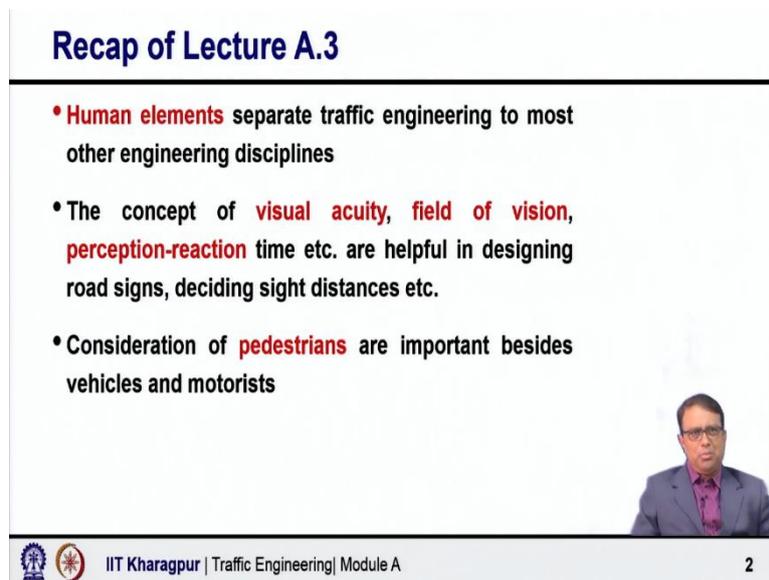


Traffic Components and Characteristics
Professor. Bhargab Maitra
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Lecture No. 04
Vehicles, Roadways and Traffic Control Devices

Welcome to module A, lecture 4. In this lecture, we shall discuss about three other components of traffic system namely vehicles, roadways and traffic control devices.

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The slide is titled "Recap of Lecture A.3" in blue text. It contains three bullet points in black text with red highlights for key terms. A small video inset of the professor is in the bottom right corner. The footer includes the IIT Kharagpur logo, the text "IIT Kharagpur | Traffic Engineering| Module A", and the number "2".

Recap of Lecture A.3

- **Human elements** separate traffic engineering to most other engineering disciplines
- The concept of **visual acuity, field of vision, perception-reaction** time etc. are helpful in designing road signs, deciding sight distances etc.
- Consideration of **pedestrians** are important besides vehicles and motorists

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In lecture 3, we talked about road users. Road users are extremely important in the context of traffic engineering and one of the four major components. In fact, the human element separate traffic engineering from most other engineering disciplines their behaviour, their characteristics are extremely important.

We discussed about various characteristics of road users particularly say drivers and other road users say pedestrians and so and how these characteristics influence or why they are important in the context of traffic engineering.

If you talk about the drivers, then the several characteristics of drivers, visual acuity, both static and dynamic field of vision, perception reaction time, all these characteristics are extremely useful and important for designing several traffic engineering facilities and elements for example, road signs, design of road sign, designing the sight distance requirement or make the signs visible.

Also, various characteristics of pedestrians, which are important for design of particularly pedestrian facilities both by the side of the road, walkways and also the particularly the crossing facilities, design of the green time that is required for crossing of roads by pedestrian during the green time.

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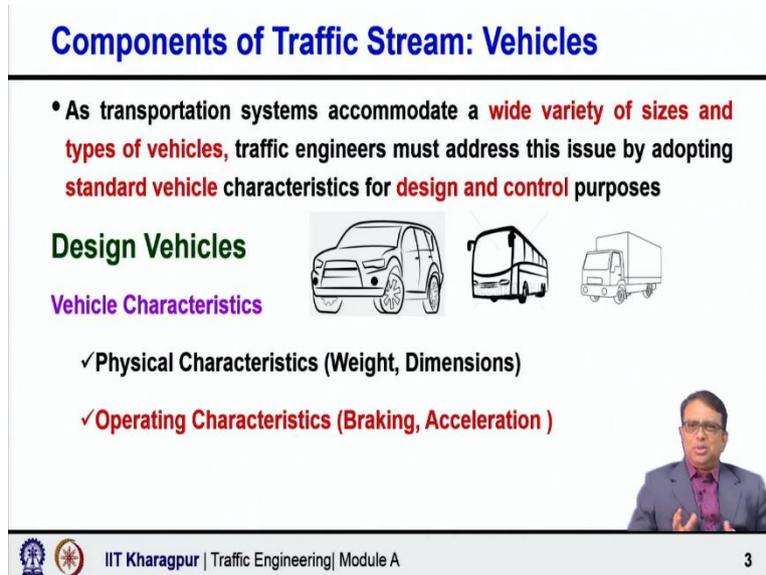
Components of Traffic Stream: Vehicles

- As transportation systems accommodate a **wide variety of sizes and types of vehicles**, traffic engineers must address this issue by adopting **standard vehicle characteristics for design and control purposes**

Design Vehicles

Vehicle Characteristics

- ✓ Physical Characteristics (Weight, Dimensions)
- ✓ Operating Characteristics (Braking, Acceleration)



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So, now, today we discuss about other components, first to start with vehicles. So, vehicles are very, very important because a road system or traffic system if you see we have road users we have vehicles. Now, in Indian scenario, there is a wide variety of vehicles that are existing. Wide variety of sizes, wide variety of types of vehicle bigger smaller different acceleration deceleration capabilities, different power weight ratio.

So, the traffic engineers must have to address this issue by adopting a standard vehicle characteristic for design and control purpose. You know that not the all roads are used for all purposes, the accessibility, mobility functions will decide that which road is designed primarily for accessibility or primarily for mobility, how what is the kind of functions.

So, depending on the functional classification of the road, we need to consider something called design vehicles. That means, the characteristics of all those for the design vehicles will be used for design purpose. So, design vehicles may not be same for all kinds of road because if you are talking about the residential streets, we do not expect probably very big commercial vehicles to use those roads on a day to day basis.

But if you are talking about national highways or the major inter-urban roads right, you expect this kind of bigger vehicles to use the road. So, the concept of design vehicles become

very important, the characteristics of design vehicle primarily govern the design of the traffic system or the route system. When we talk about designing vehicle, the vehicle characteristics are important and both physical characteristics and operating characteristics.

Physical characteristics may include weight, dimensions. Operating characteristics may include braking characteristics, acceleration deceleration characteristics, braking also is there already I have said so, these are very important.

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Components of Traffic Stream: Vehicles

- Design vehicles are used to determine a variety of **geometric features** of highway such as **lane width, extra widening on curves, minimum corner radius, clearance height, etc.**

Acceleration Characteristics

- **Heavier** vehicles have **lower rates** of acceleration than passenger cars
- **Difference in acceleration capability** of different types of vehicles is a major cause of inefficiency in mixed traffic streams

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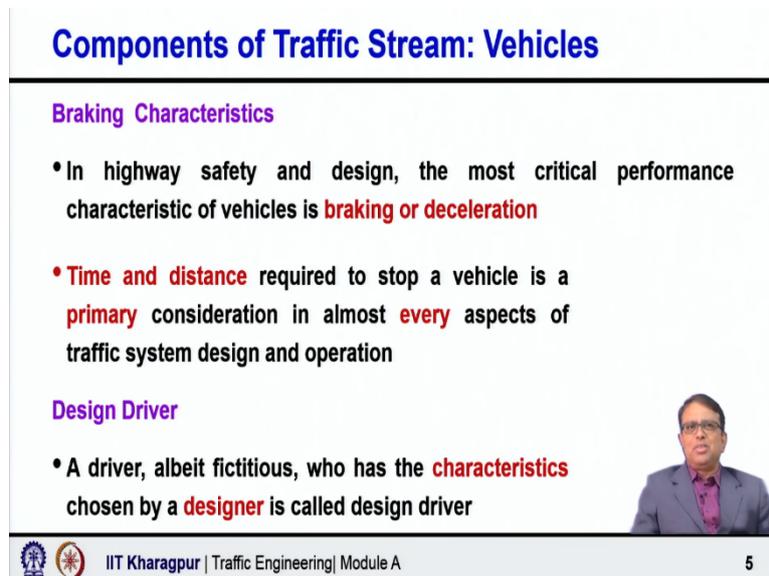
Design vehicles are used to determine a variety of geometric features of highways such as I mean if the this is the width, height, dimension we are talking and then we are also talking the acceleration deceleration characteristics. So, design vehicles are used to design a variety of geometric features of highway such as lane width, what would be the extra widening on curves because it depends on the length of the vehicle, width, length everything, then minimum corner radius, what should be the required clearance sites. All these are decided based on the design vehicle characteristics.

So, once we say that this is the design vehicle and these are the corresponding characteristics for the purpose of road design those characteristics are used as input. That means we will assume that if we can satisfy the requirement of design vehicles then our purposes/ job is done.

Next acceleration characteristics, very important. Heavier vehicles have lower rates of acceleration than the passenger cars and there is difference in acceleration capability of different types of vehicle in a major and this is a major cause of inefficiency in mixed traffic

streams. The slow moving vehicle, small vehicle, big vehicle, power weight ratio, acceleration deceleration capabilities they actually create heterogeneous environment speed environment. So, this difference in acceleration capability is a major cause of inefficiency in the mixed traffic stream.

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Components of Traffic Stream: Vehicles

Braking Characteristics

- In highway safety and design, the most critical performance characteristic of vehicles is **braking or deceleration**
- **Time and distance** required to stop a vehicle is a **primary** consideration in almost **every** aspects of traffic system design and operation

Design Driver

- A driver, albeit fictitious, who has the **characteristics** chosen by a **designer** is called design driver

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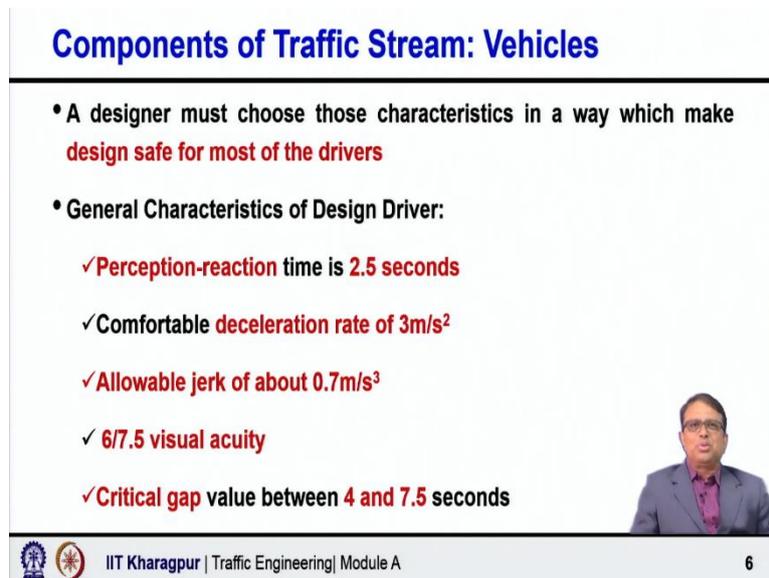
Next, coming to the braking characteristics. In highway safety and design, the most critical performance characteristics of vehicles is braking or deceleration. If the driver finds an object and it is necessary to stop the vehicle then how the braking or deceleration is working that is a major consideration in the context of road safety.

So, the time and distance required to stop a vehicle is a primary consideration in almost every aspect of traffic system design and operation. So, this is very important that what is braking characteristics. So, we need to understand the acceleration characteristics vehicle characteristics first and then acceleration characteristics also then braking or deceleration characteristics.

Then the next part is design driver. As there are variations in the vehicle characteristics, similarly, the driver characteristics also do vary, not all drivers are same. So, as we bring the concept like design vehicle, similarly, the concept comes as design driver that means a driver maybe not a real driver, not mister X or mister Y. But the characteristics of that design driver is chosen by the designer for all design purpose. So, that is what is the concept of design driver.

The whole thing is as we say that vehicle, its wide range drivers wide range in variation but when we design the road, we have to select or design it considering certain values, acceleration deceleration, width, height, driver's perception reaction time. So, the concept of design vehicle, the concept of design drivers, they are all coming.

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Components of Traffic Stream: Vehicles

- A designer must choose those characteristics in a way which make **design safe for most of the drivers**
- General Characteristics of Design Driver:
 - ✓ Perception-reaction time is **2.5 seconds**
 - ✓ Comfortable deceleration rate of **3m/s²**
 - ✓ Allowable jerk of about **0.7m/s³**
 - ✓ **6/7.5 visual acuity**
 - ✓ **Critical gap value between 4 and 7.5 seconds**

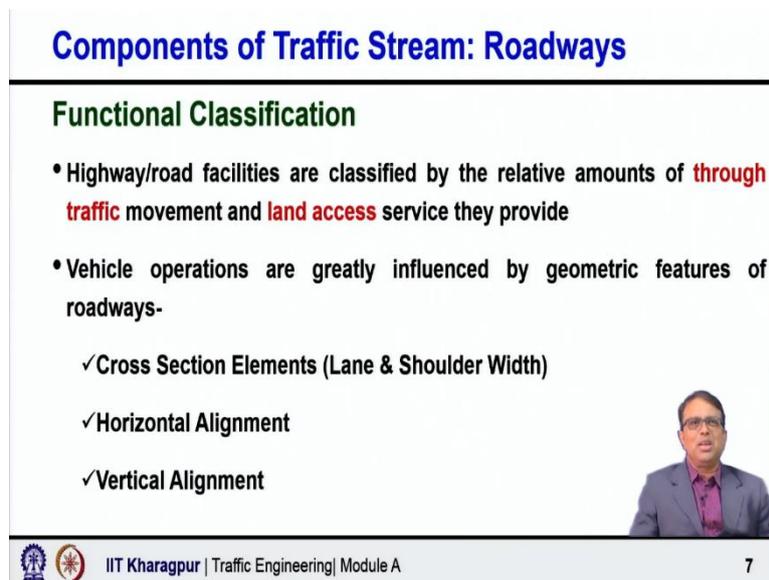
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A designer must choose those characteristics in the context of design driver we are saying in a way which make the design safe for most of the drivers. Obviously, if you want to take the when you are selecting the characteristics, if you take the extreme one that 100 percent drivers under 100 percent conditions, this condition will satisfy, then your design requirement will be much higher right.

So, what is being done that choose those characteristics in a way which make the design safe for most of the drivers. Next, general characteristics of design driver. What we then take? These are some of the characteristics I have mentioned, I do not want to read out say some accepted perception reaction time, some comfortable deceleration rate, allowable jerk, visual acuity, the critical gap in a range.

So, all these are assumed to represent the design driver. So, the design is done considering this design driver and the requirements.

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Components of Traffic Stream: Roadways

Functional Classification

- Highway/road facilities are classified by the relative amounts of **through traffic** movement and **land access** service they provide
- Vehicle operations are greatly influenced by geometric features of roadways-
 - ✓ Cross Section Elements (Lane & Shoulder Width)
 - ✓ Horizontal Alignment
 - ✓ Vertical Alignment

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Next, coming to functional classification, so, we are going to the next components. So, that is the next one of the component of the traffic system is roadways. So, we discussed about road users, we discussed about vehicles, concept of design vehicle, design driver, the characteristics of design vehicle, the characteristics of design drivers. Why we say? We bring down the, you know you want to reduce the variation and consider a single set of values for the design purpose which will satisfy the requirements of most of the vehicles and most of the drivers.

So, most of the vehicles means we take the characteristics of design vehicle, most of the drivers means we take the characteristics of design driver. Now, we come to the roadways, that is the next component. So, you have in a traffic system you have road users, you have vehicles, you also have the road system. So, functional classification of road system is very important in this context because highway road facilities are classified by the relative amounts of through movement and land access service they provide because any road you know it has got primarily two functions.

One is providing accessibility, giving the connectivity. A road is passing through an area and it provides connectivity to the village. If somebody wants to go to the village can travel through that road and get connected. So, giving connections is one function, we can call it generally as accessibility function.

The other is for development of highways, one major emphasis is on enhancing the mobility. We want faster movement of goods and services. So, that is why so much investment is done to build the roads and develop the infrastructure because you can place the order in no time

using internet, using mobile and all sorts of advanced communications and platforms but the physical delivery of goods is also very important.

So, especially highways which are primarily to cater the long distance traffic, the primary focus is or primary function is the mobility not providing the connections. So, there the of course, it always any road connects places but providing connectivity to adjacent land is not the purpose primary purpose, the primary purpose is to ensure that the through traffic moves in an uninterrupted manner as far as possible.

So, based on that the whole functional classification stands and vehicle operations are greatly influenced by the geometric features of the roadway. For example, the cross-section elements what should be the lane widths, what should be the shoulder widths and what should be the median width and so on.

Then the horizontal alignment, the curves, the transition part, the extra widening part, horizontal alignment, super elevation, then the vertical alignment, design of summit curve, vertical curve, design the length of the what is the acceptable grade, what is the critical length of grade, how you provide other facilities like improve even the passing opportunities, climbing lanes and such kind of emergency escape ramps, so many things are there.

So, all these together so cross-section elements, horizontal alignment, vertical alignment, all these are decided.

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Components of Traffic Stream: Roadways

Classification of Urban Roads (IRC:69-1977)

- ✓ Expressways
- ✓ Arterial Roads
- ✓ Sub-arterial Roads
- ✓ Collector Streets
- ✓ Local Streets

The diagram shows a hierarchy of road types: Freeways (top), Arterials/Sub-Arterials, Collectors, and Local Streets (bottom). A small video inset of a speaker is visible in the bottom right corner of the slide.

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Urban roads and rural roads both are classified under certain categories based on how much you expect them to serve accessibility function and how much you want them to serve

mobility function. Remember that we cannot get both 100 percent like it maybe you can generally consider its total is 100 percent. So, now it is up to you how this 100 percent you can distribute between the accessibility function and the mobility function.

So, that way the classification is done. If you come to the urban roads as per Indian Roads Congress Guideline, the highest standard of urban road is called expressway which is completely access controlled. The second mobility function is still higher. So, expressway, it is all access controlled. So, the primary function is 100 percent focus is on mobility not the accessibility. This road is not to provide access to adjacent land right, its purpose is the through traffic movement and mobility 100 percent.

Arterial roads again primary focus is mobility not providing access to adjacent land. Then slightly lower sub-arterial then collector street then goes to the local street. Local street is the road when you come out of your home in the residential locality, the road you use is the local road.

What is the purpose of that? Very fast movement of traffic? No, that purpose is basically to give you connections so that you can from your home you can come out and then you can go get connected to the collector street, through collector street you can again access to sub-arterial or arterial like that.

So, the primary function of the local street is accessibility, not the mobility. We expect pedestrians to use such road, more number of pedestrians maybe sometimes children may play also in the residential areas. So, the mobility is not the important thing, speed is not the primary consideration and we do not want actually higher speed there. So, the primary function for local roads is the accessibility.

Primary function of expressway, arterial roads mobility and as you come down from expressway to arterial to sub-arterial to collector street to local street, the mobility function is reduced, accessibility function is increased. So, please understand that this is very, very fundamental, we develop the road not all roads are for mobility purpose, we do not want that.

A good road does not mean we need always a high speed, the function of the road is very important. And here the intended function and the actual function both are important because maybe the intended function is something but the actual function is different. So, we should actually care for how the actual function in reality what the road is serving; whether there is any conflict?

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Components of Traffic Stream: Roadways

Expressways

- Provides **100 % through movement** or mobility with **no accessibility** to abutting lane is permitted

Arterials

- **Primarily** designed for **through** movement but **some accessibility is permitted**

Sub-Arterials

- **Lower level of mobility** than arterial roads



Expressways



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Similarly, I have just described it as I said expressway 100 percent is focus is on mobility, no accessibility to abutting land is permitted you cannot just simply come out of your home even if your house is in the nearby area you cannot simply come out of your house and directly enter into expressway. It is not possible. Arterials primarily designed again for through traffic movement. Sub-arterial, little bit less of mobility function, accessibility function, slightly getting into it.

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Components of Traffic Stream: Roadways

Collector Streets

- An **intermediate** facility between **arterials and local roads**

Local Streets

- **Primarily** designed for **access to abutting** lands with **minor** mobility function



Arterial Roads Collector Street Local Street



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Next collector Street, it is an intermediate facility between arterials and local roads, it is actually connecting collectors. It is getting all the local streets getting connected to it, then it is further getting connected to higher order road which is the arterial or sub-arterial.

Local streets primarily designed to access the abutting lands with minor mobility function. Mobility function is not the primary function and we do not want high mobility because we actually it is intended for high accessibility. So, if the out of 100, if majority is accessibility, the mobility cannot be more. As I said, remember accessibility plus mobility together maybe 100 percent.

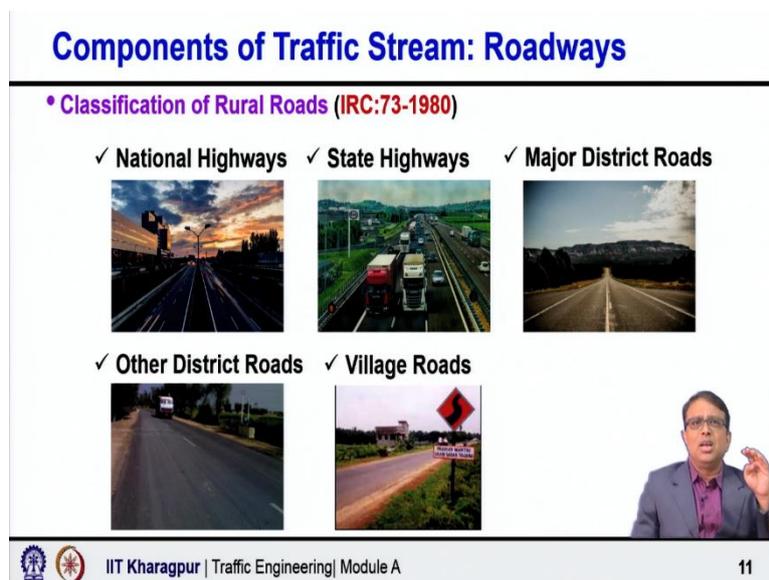
So, if we are increasing one or if we want more in one component, we have to compromise on the other part. If we try to achieve both then the conflict will happen, the road safety issues will come up more and more. You develop the highway, widen the road connect every village to the highway. Trying to achieve both, you will only create conflict and the you will find a lot of accidents are happening.

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Components of Traffic Stream: Roadways

• **Classification of Rural Roads (IRC:73-1980)**

- ✓ **National Highways**
- ✓ **State Highways**
- ✓ **Major District Roads**
- ✓ **Other District Roads**
- ✓ **Village Roads**



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Similarly, the rural routes also as classified based on accessibility mobility, the highest order in Indian condition is called national highways, then state highways, national state highways both are primarily for the mobility purpose.

National highway is actually developed and maintained by government of India, whereas, the state governments are actually maintaining the state highways but both are primarily for the mobility purpose, then you have major district road, other district roads which are somewhere in-between some mobility some accessibility and then you come to the village road, the whole purpose is the connectivity, the access.

So, here we again do not expect vehicle to travel at a very high speed, they are not high-speed facilities. Their primary function is the mobility. So, we need good roads, you can see all over

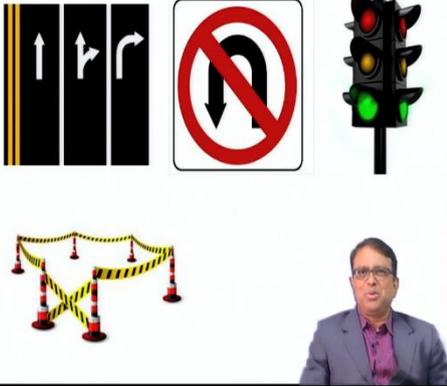
India wherever you go, you will see this PMGSY logo Pradhan Mantri Gram Sadak Yojana. It is you know, all over India wherever you go, you will see the rural roads are getting developed. So, primary purpose is the connectivity access, access or connectivity.

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Components of Traffic Stream: Traffic Control Devices

• Communication of traffic laws and regulations to drivers by means of control device

- ✓ Road Markings
- ✓ Traffic Signs
- ✓ Road Delineators
- ✓ Traffic Signals



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So, now, if you go to the traffic control devices, this is the fourth component but all are equally important. So, in the traffic systems we have road users, we have vehicles, we have roads or infrastructure then the traffic control devices because traffic control devices actually is establishing that control. How the road users, vehicles roads they will interact?

Now, we come to the next component of the traffic system that is traffic control devices. So, we discussed about road users then the vehicles then the roadways and how they are interacting with each other that is through the traffic control devices. So, traffic control devices is the next or the fourth components of the traffic system. The whole traffic system is divided into four major components and traffic control system is the one of those.

So, traffic control devices establish communication of traffic laws and regulations to driver by means of control devices. Four major types of control devices we use. One, road markings. Second, traffic sign. Third, road delineators. Fourth, traffic signals. All are extremely important and all are important to communicate the traffic laws and regulations to drivers, what we want them to interact.

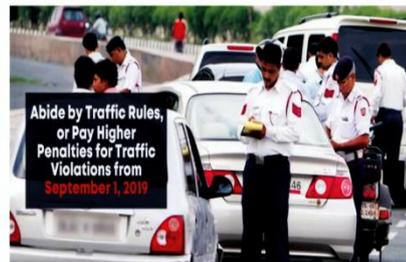
You might be might have decided that this should here the speed limit should be this, here this road should be one way, here the vehicle should stop and allow other vehicles to move on a priority. How you communicate? The communication to drivers and road users is extremely

important. That part is taken care by the control devices and road marking, road sign, road delineator, traffic signals all of them individually and collectively take that very important role. Communication to drivers and road users that is very important.

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Components of Traffic Stream: Traffic Control Devices

- Control devices are the **only** measures of transmitting **operational** rules to drivers: Must be **clear, easily interpreted and commanding of attention**
- **Regulatory aspects** of traffic control must be **enforced**



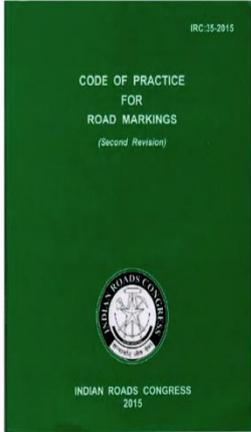
So, control devices are only measures of transmitting operational rules as I said one way, speed limit, no right turn, compulsory left. So, transmitting operational rules to drivers. Therefore, we expect them to be very clear easily interpreted and commanding in action. You have a traffic light but along with that there are so many lights of that kind maybe because of the advertisement then there is the traffic signal cannot really command but it should command. So, it should be clear, easily interpreted and commanding in attention.

Regulatory aspects of traffic control must be enforced. So, you should communicate to them. But then who will enforce it? It is the police department, enforcement is the job of the police. So, the police department, traffic police department should ensure that this regulatory aspect what is must.

Some may be information that also we need but there is something like as I say that you must stop or you must take right turn, it is a one way street, the movement from the other direction is not permitted, this must be enforced because these are regulatory aspects. This relate to efficiency and safety of the overall traffic streams and road users. So, this must be enforced by the police.

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Components of Traffic Stream: Traffic Control Devices



Road Markings

- Made of **lines, words, symbols or reflectors** and are intended to **regulate, control, warn or guide** road users
- Code: **IRC:35-2015**
- Provided to ensure **smooth** and **orderly** flow of traffic



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Coming to road marking, the code which is followed by all of us in Indian scenario is that IRC, Indian Roads Congress guideline IRC 35-2015 or maybe over a period of time new versions will come but this particular code, IRC 35, whatever is the latest addition, that must be followed for anything related to road marking, it is a code which is very exhaustive and I cannot really cover each and every aspect of this detailed guidelines but a few important thing I want to mention, then it is up to you, you can always refer to this code and get more details. Even the specific dimension what specification and many other detail thing.

So, what is basically road markings? Made of lines, words, symbols are and reflectors and are intended to regulate to control to one or guide road users. So, anything lines, words, symbols which are there and which are intended to regulate control one and guide road users. Now, these are provided to ensure smooth and orderly flow of traffic, also for safety purposes.

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Components of Traffic Stream: Traffic Control Devices

- To signify the **delineation of traffic path** and its **lateral clearance from traffic hazards** for safe movement of traffic

Classification

- ✓ Longitudinal Marking (LM)
- ✓ Arrow Marking (AM)
- ✓ Transverse Marking (TM)
- ✓ Directional Marking (DM)
- ✓ Hazard Marking (HM)
- ✓ Facility Marking (FM)
- ✓ Block Marking (BM)



They signify the delineation of traffic path and its lateral clearance how much when I am traveling in a lane means how much what are my boundaries? So, lane marking actually indicates that and lateral clearance from traffic hazards for safe movement of traffic.

Marking can be classified in so many ways there are so many classifications for longitudinal marking transverse marking, hazard marking, block marking, arrow marking, direction marking or directional marking, then facility marking so many different types of markings are there. Again you can make refer to that Indian Roads Congress guideline to no more but these are all different types of markings which are used.

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Components of Traffic Stream: Traffic Control Devices

Color

- ✓ White: Widely used because of **good visibility** and **good contrast**
- ✓ Yellow: Used in **longitudinal marking** where it is **not permitted to cross the marking** and also in **parking restriction areas**
- ✓ Blue: Used to indicate **dedicated bus lanes** and other **special markings** which is not conventional
- ✓ Green: Used to give **priority to cyclists** and **pedestrians** to cross the road near **intersection**



Multiple colours are permitted traditionally earlier only yellow, black and white. This was the three colours, these are the three colours which were used but now many other colours are also permitted or introduced in this code. First, traditionally also white was used. White widely used because of the good visibility and good contrast. Most of the roads in our case are bituminous road black. So, against black the white is very, very visibility is very good.

Then the yellow, normally used in longitudinal marking where it is not permitted to cross the marking and also in parking restriction area. Yellow is restrictive. Parking is not allowed. So, colour becomes yellow you are you cannot cross the line, centre line. That becomes yellow, restrictive in nature.

Third blue used to indicate dedicated bus lanes and other special markings which is not conventional. Indian cities are now developing dedicated bus lane, BRTS corridor. So, how you indicate that? So, the blue is introduced for that purpose.

Next green, it indicates the priority to cyclists and pedestrians to cross the road near intersection. So, the green is related to vulnerable reducer particularly pedestrians and cyclists for their movement to give indicate that there is a priority for movement of pedestrians and cyclists to cross the road near intersection. So, that there the colour indicates something.

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Components of Traffic Stream: Traffic Control Devices

✓Red/Purple: Used in **hazardous** locations where different road users sharing the road





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Next, red or purple colour used in hazardous location where different road users sharing the road, multiple road users are sharing it. So, indicating that it is a hazardous location, one has to be careful. So, used in hazardous locations where different road users sharing the road.

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Components of Traffic Stream: Traffic Control Devices

Different Scenarios for Road Markings

- ✓ Normal Scenario: Adequate sight distance is available
- ✓ Warning Scenario: Visibility is more than minimum visibility distance (MVD) but less than warning sight distance (Approaches to no-overtaking scenario e.g. horizontal and vertical curves, intersections, etc.)
 - MVD: Distance at which an object of 1.05 m above the carriageway is seen by an observer
- ✓ No-overtaking Scenario: When MVD is not available



Now, road markings are done for different scenarios primarily I should say for three scenarios, normal scenarios, let us say where adequate sight distance is available. When you are traveling the road is straight, there is no issue of sight distance or visibility. Clearly the road is visible, no restriction, no issue, there the normal scenario, how then you do the centre line marking.

The next is warning scenario. What is warning scenario? The code again provides very detailed tables and values everything all these are given. I will only try to say very briefly that where the visibility is more than the minimum visibility distance, MVD, but less than the warning sign distance. What is the minimum visibility distance? Distance at which an object of 1.05 meter above the carriageway is seen by an observer.

So, two persons at certain distance depending on the speed they are standing and they are able to see each other that is the in essence, that is the way the MVD is established actually. What should be the MVD value? Depends on the speed. So, the people take 85th percentile operating speed and there are a table. So, in the guideline it tells you what is the MVD, what is the also for corresponding the warning sight distance corresponding to that speed.

So, you can determine eighty fifth percentile speed and then the go to the table given in the guidelines and accordingly will tell you what is the MVD, what is the warning sight distance. So, it is a case where visibility is more than the MVD but less than that WST, warning sign distance.

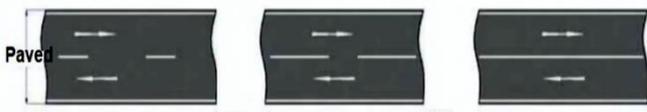
Essentially, let me tell you, where you have no overtaking scenario, sharp curves where the visibility, minimum visibility distance is not available vehicles coming from opposite directions cannot see each other maintaining safe visibility or safe distance that is not available.

So, there you will give no overtaking scenario, you will give a solid line probably indicating that you cannot cross the road and this is before you give the no overtaking scenario before that the warning scenario is given just to warn you that you are approaching actually an overtaking scenario not that normal to suddenly you come no overtaking. So, this is something in-between to give a kind of warning to the drivers that you are now approaching no overtaking scenario.

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Components of Traffic Stream: Traffic Control Devices

Centre Line Markings Under Different Scenarios



✓Normal vs Warning: **Length** and **spacing** is different (a minimum of 7 warning line segments before no-overtaking)

✓No-Overtaking: **Continuous line** and sometimes **yellow hatching** may be provided when **no crossing** is allowed

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So, just one small example of how the centre line marking is there, you can say normal condition, warning condition both cases the lines are break but the length and spacing is different. You can see as you are going from normal to warning situation the length is becoming longer but still it is not a continuous there is a break.

So, both normal and warning, there is a break but the length and the spacing is different. And normally, as I said seven warning line segments are used before no overtaking. So, there is normal then you have no overtaking in-between seven warning line segments minimum 7 warning line segments to be given.

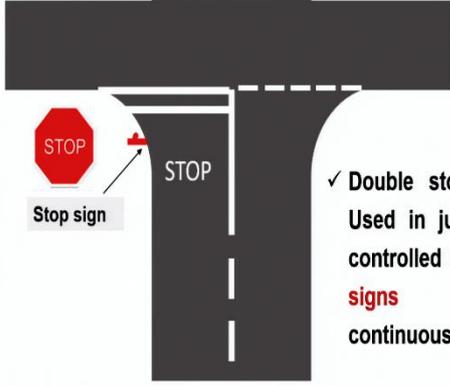
So, how you indicate how you communicated to the driver? Just by the length, the way the marking is done. And when you come to know no overtaking obviously it is solid line

continuous solid line indicating you cannot cross that line. It may be even yellow, sometimes double line you use it indicates different levels of restrictions.

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Components of Traffic Stream: Traffic Control Devices

Examples: Marking at intersections



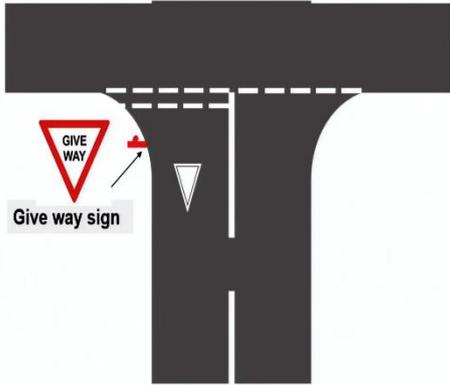
- ✓ Single stop line: Used in **traffic signal** and **pedestrian crossings**
- ✓ Double stop line: Used in junctions controlled by **stop signs** (Two continuous lines)

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These are the examples that show how the single stop line, double stop line you give where vehicles are compulsory you must stop and then look for the opportunity, suitable gap and then do the manoeuvre.

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Components of Traffic Stream: Traffic Control Devices



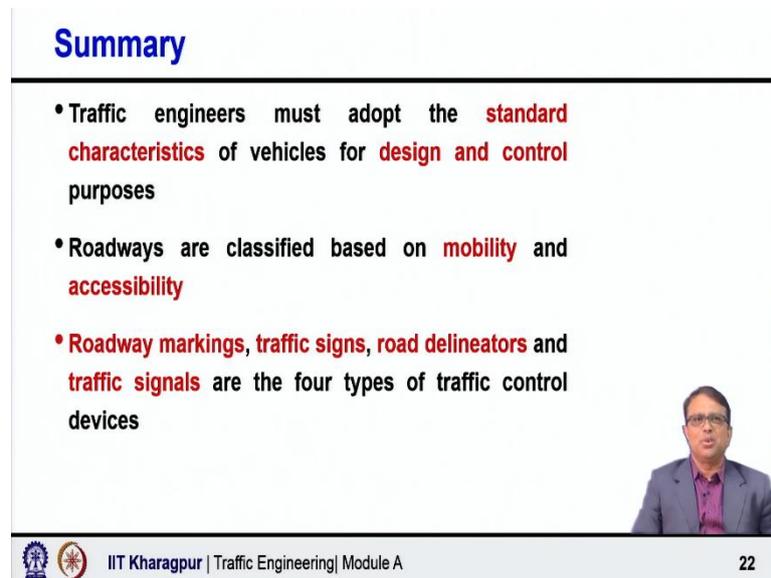
- ✓ Give way sign: Used at **minor intersections** not controlled by traffic signals, stop signs or police (Two broken lines)

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Similarly, give way sign. Give way says that if you are approaching from this minor road and that is the basically the main road, then priority is for the main road. So, you need not stop all the time but if required, you have to stop otherwise you can slow down and then if suitable gap is available you do the manoeuvre, but first case if there is a stop line, you have to stop.

You cannot only slow down, you have to stop both even give way also you may have to stop if there is no suitable gap but you can still allow to pass without stopping, you can slow down and if there is an opportunity you can pass you can do the manoeuvre. So, stop is more restrictive more stringent.

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Summary

- Traffic engineers must adopt the **standard characteristics** of vehicles for **design and control** purposes
- Roadways are classified based on **mobility** and **accessibility**
- **Roadway markings, traffic signs, road delineators** and **traffic signals** are the four types of traffic control devices

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So, in summary I would say the traffic engineers must adopt the standard characteristics of vehicle for design and control purpose, design vehicle concept, design driver concept, they are very important because those are the characteristics which we are using for design and understand that roads primary objective mobility and accessibility so that is very, very important.

And the road marking traffic signs, road delineators and traffic signals are the four major types of traffic control devices. And we discuss today specifically about road markings. So, in the next lecture, we shall talk in details about the route delineators, traffic signs and traffic signals. Thank you so much.