

University of Al-Maarif  
College of Engineering  
Department of Civil Engineering



# TRAFFIC ENGINEERING

## ELEVENTH LECTURE

Lecture r :  
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# MULTILANE HIGHWAYS

## Introduction:

Increasing traffic flow has forced engineers to increase the number of lanes of highways in order to provide good manoeuvring facilities to the users. The main objectives of this lecture is to analyze LOS which is very important factor for a traffic engineer because it describes the traffic operational conditions within a traffic stream. Also, we are going to study the characteristics and capacity for multilane highways. Free-flow speed is an important parameter that is being used extensively for capacity and level-of- service analysis of various types of highway facilities.

A highway is a public road especially a major road connecting two or more destinations. A highway with at least two lanes for the exclusive use of traffic in each direction, with no control or partial control of access, but that may have periodic interruptions to flow at signalized intersections not closer than 3.0 km is called as multilane highway. They are typically located in suburban areas leading to central cities or along high-volume rural corridors that connect two cities or important activity centers that generate a considerable number of daily trips.

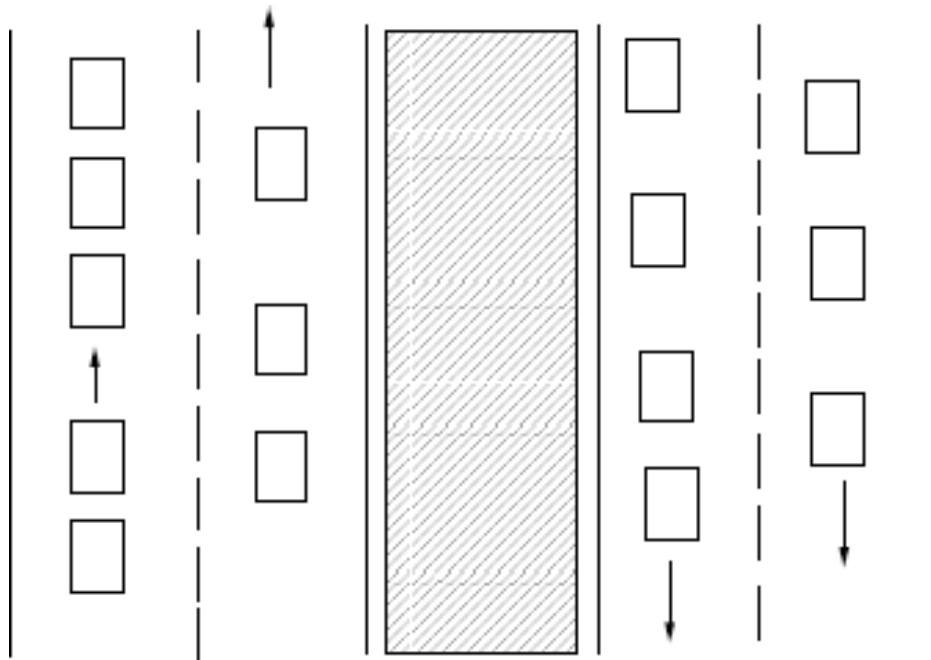
# MULTILANE HIGHWAYS

## Highway Classification:

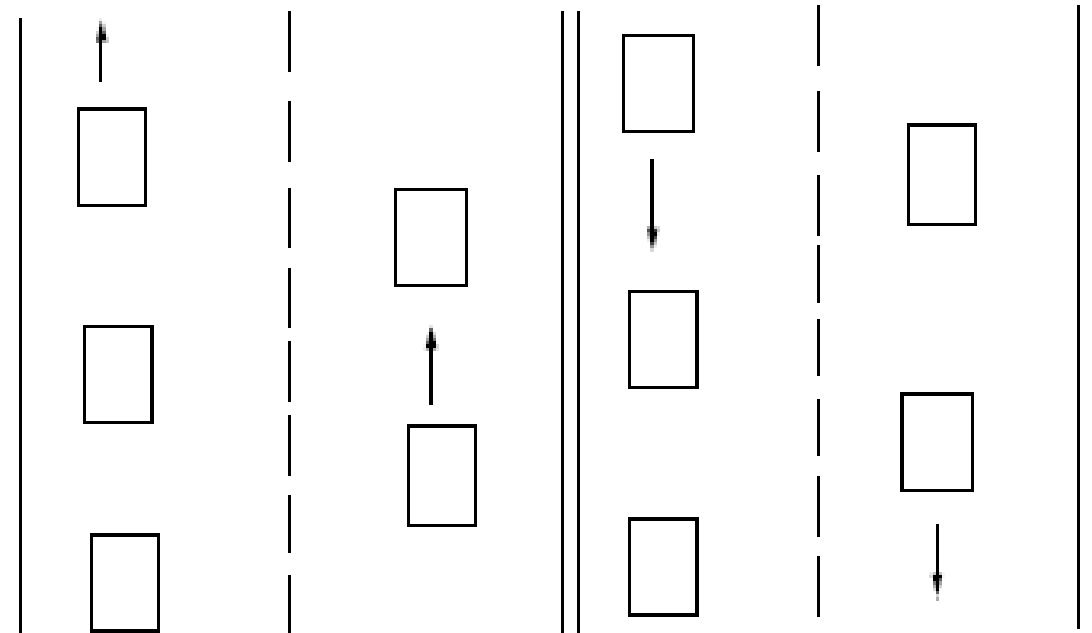
There are various ways of classification of highways; we will see classification of highways according to number of lanes.

- Two lane highways.
- Multilane highways

Divided multilane highway



Undivided multilane highway



# MULTILANE HIGHWAYS

## Highway Capacity:

An important operation characteristic of any transport facility including the multi lane highways is the concept of capacity. Capacity may be defined as the maximum sustainable flow rate at which vehicles or persons reasonably can be expected to traverse a point or uniform segment of a lane or roadway during a specified time period under given roadway, traffic, environmental, and control conditions; usually expressed as vehicles per hour, passenger cars per hour, or persons per hour.

**Table 1: Free flow speed and capacity for Multilane highway**

Types of facility	Free flow speed(kmph)	Capacity (pcphpl)
Multilane	100	2200
	90	2100
	80	2000
	70	1900

# MULTILANE HIGHWAYS

## Level of Service:

Level of service (LOS) is a qualitative term describing the operational performance of any transportation facility. The qualitative performance measure can be defined using various quantitative terms like:

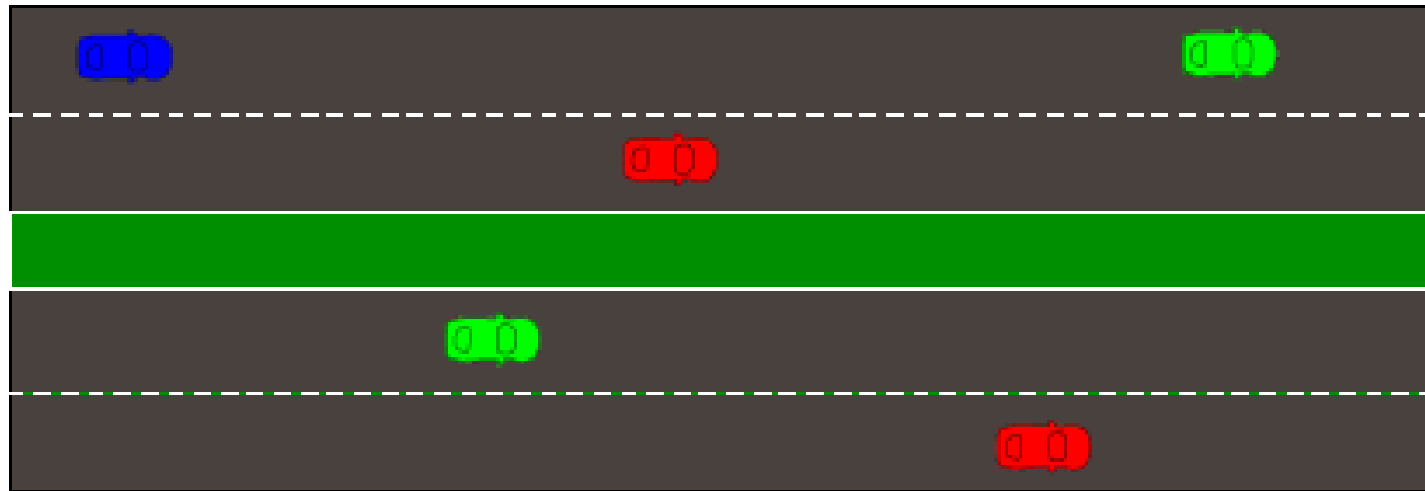
1. Volume to capacity ratio,
2. Mean passenger car speed,(in km/h)
3. Density, (in p/kmln).

Basically, any two of the following three performance characteristics can describe the LOS for a multilane highway. Each of these measures can indicate how well the highway accommodates the traffic demand since speed does not vary over a wide range of flows, it is not a good indicator of service quality. Density which is a measure of proximity of other vehicles in the traffic stream and is directly perceived by drivers and does not vary with all flow levels and therefore density is the most important performance measure for estimating LOS. Based on the quantitative parameter, the LOS of a facility can be divided into six qualitative categories, designated as LOS A,B,C,D,E,F The definition of each level of service, is given below:

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## Level of Service A:

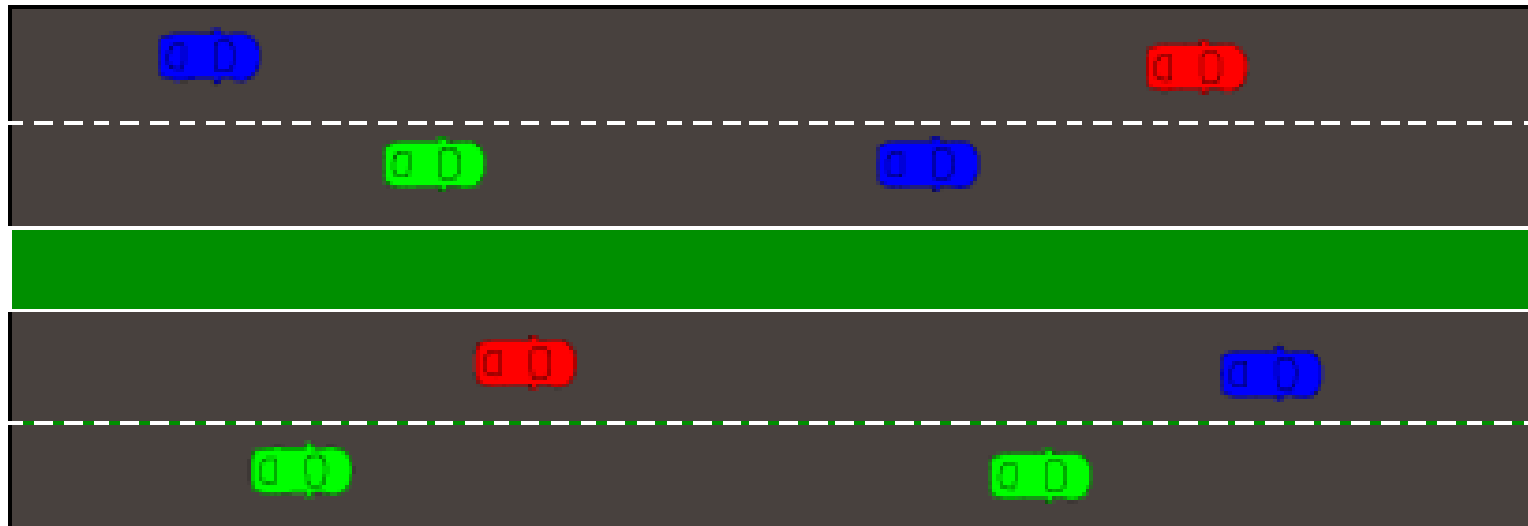
Travel conditions are completely free flow. The only constraint on the operation of vehicles lies in the geometric features of the roadway and individual driver preferences. Lane changing, merging and diverging manoeuvre within the traffic stream is good, and minor disruptions to traffic are easily absorbed without an effect on travel speed. Average spacing between vehicles is a minimum of 150 m or 24 car lengths. Figure below shows LOS A.



# MULTILANE HIGHWAYS

## Level of Service B:

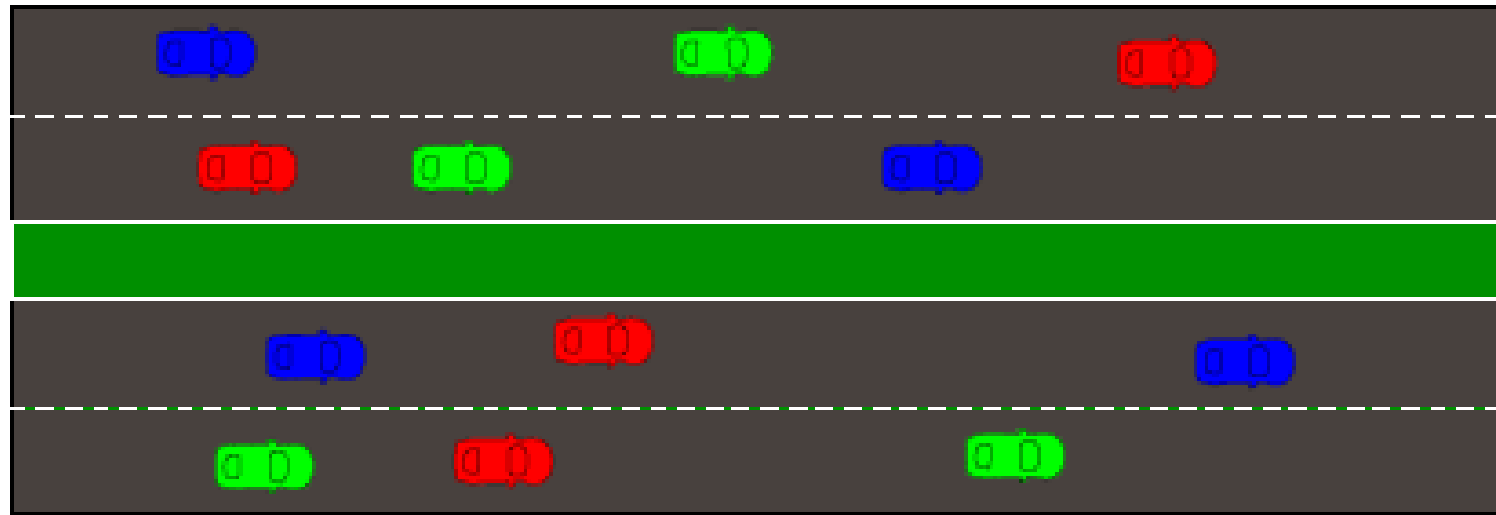
Travel conditions are at free flow. The presence of other vehicles is noticed but it is not a constraint on the operation of vehicles as are the geometric features of the roadway and individual driver preferences. Minor disruptions are easily absorbed, although localized reduction in LOS are noted. Average spacing between vehicles is a minimum of 150 m or 24 car lengths. Figure below shows LOS B.



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## Level of Service C:

Traffic density begins to influence operations. The ability to manoeuvre within the traffic stream is affected by other vehicles. Travel speeds show some reduction when free-flow speeds exceed 80 km/h. Minor disruptions may be expected to cause serious local deterioration in service, and queues may begin to form. Average spacing between vehicles is a minimum of 150 m or 24 car length. Figure below shows LOS C.

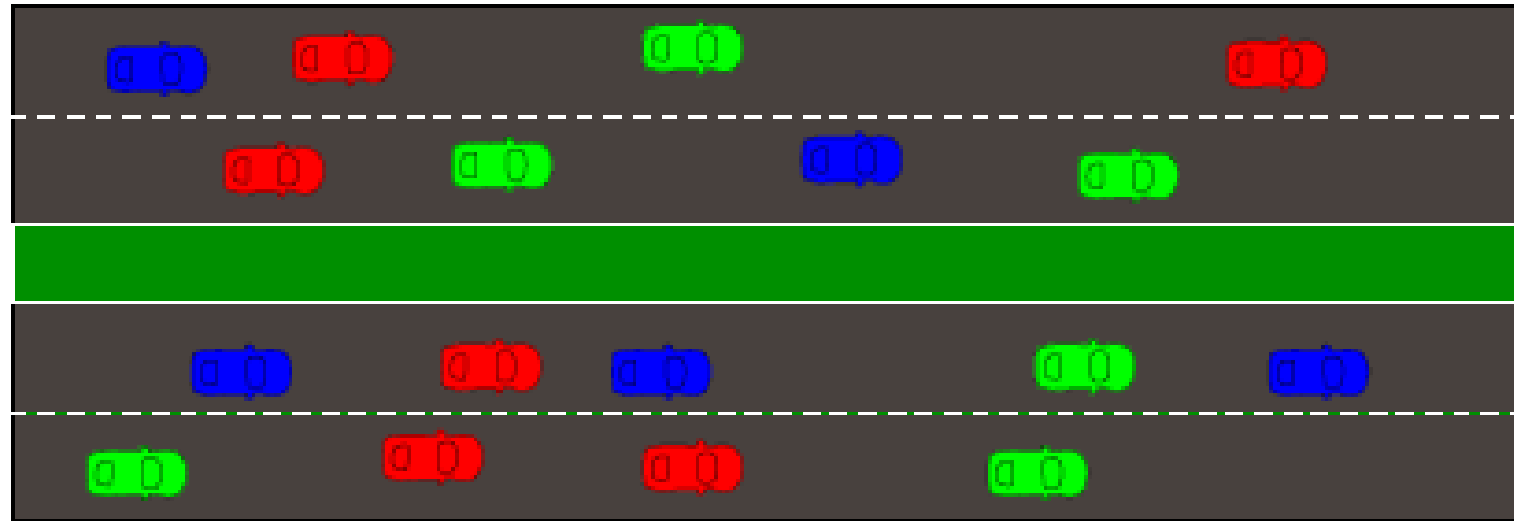




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## Level of Service D:

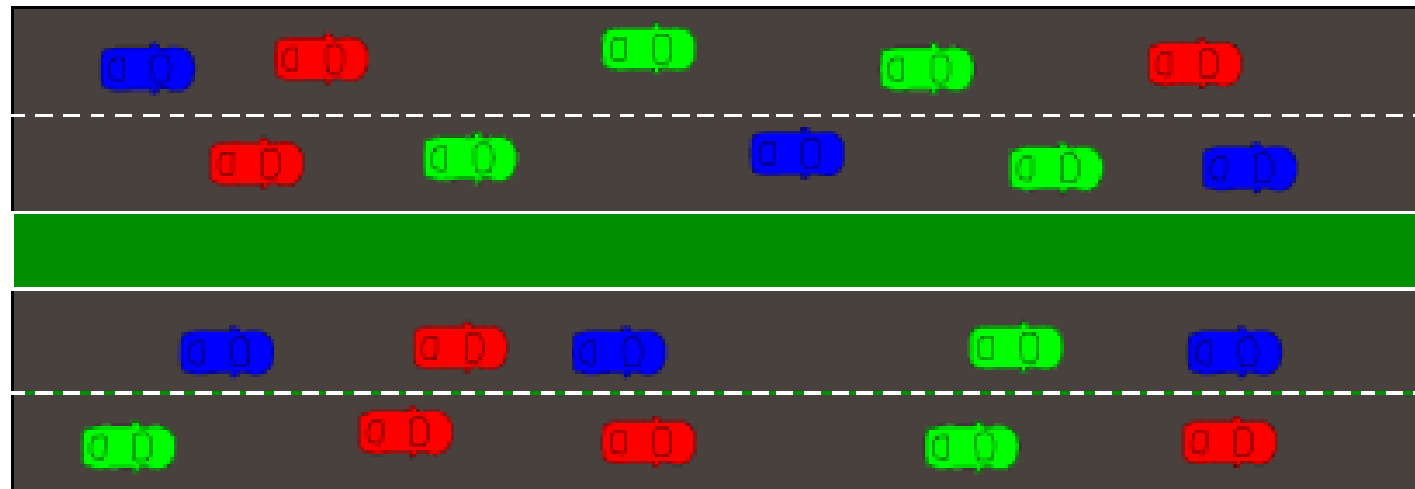
The ability to manoeuvre is severely restricted due to congestion. Travel speeds are reduced as volumes increase. Minor disruptions maybe expected to cause serious local deterioration in service, and queues may begin to form. Average spacing between vehicles is a minimum of 150 m or 24 car length. Figure below shows LOS D.



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## Level of Service E:

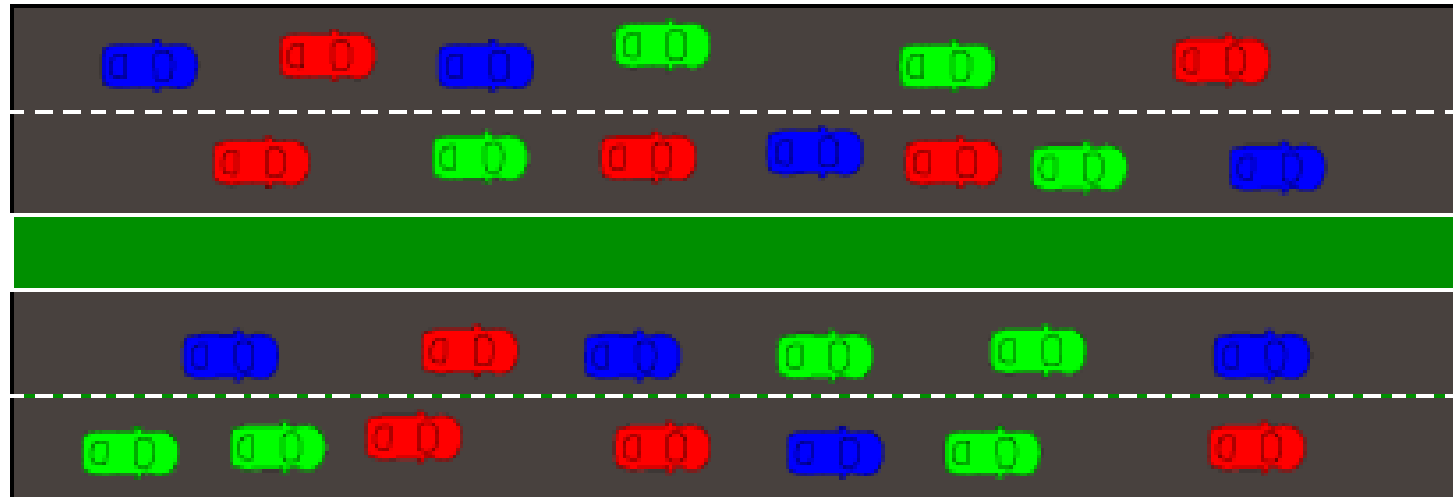
Operations are unstable at or near capacity. Densities vary, depending on the free-flow speed. Vehicles operate at the minimum spacing for which uniform flow can be maintained. Disruptions cannot be easily dissipated and usually result in the formation of queues and the deterioration of service to LOS F. For the majority of multilane highways with free-flow speed between 70 and 100km/h, passenger-car mean speeds at capacity range from 68 to 88 km/h but are highly variable and unpredictable. Average spacing between vehicles is a minimum of 150 m or 24 car length. Figure below shows LOS E.



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## Level of Service F:

A forced breakdown of flow occurs at the point where the numbers of vehicles that arrive at a point exceed the number of vehicles discharged or when forecast demand exceeds capacity. Queues form at the breakdown point, while at sections downstream they may appear to be at capacity. Operations are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages. Travel speeds within queues are generally less than 48 km/h. Note that the term LOS F may be used to characterize both the point of the breakdown and the operating condition within the queue. Figure below shows LOS F.



THANK YOU FOR  
LISTENING