EWC- 352
Transportation Engineering Sessional

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EXPERIMENT NO: 07
DETERMINATION OF ROADWAY CAPACITY

The capacity of a roadway is its ability to accommodate traffic. It is usually expressed as the number of vehicles that can pass a given point in a certain time at a given speed.

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3

Level of service denotes any of an infinite number of differing combinations of operating conditions that can occur on a given lane or roadway when it is accommodating various traffic volumes. Six levels of service (LOS), Level A through F, define full range of driving conditions from the best to worst in that order.

Level of service "A" represent free flow at low densities with no restriction due to traffic conditions. Level "B", the lower limit of which is often used for the design of rural highways, is the zone of stable flow with some slight restriction of driver freedom. Level "C" denotes some of stable flow with more marked restriction in driver's selection of speed and with reduced ability to pass. The conditions of level "D" reflect little freedom for driver maneuverability and condition approaches unstable flow. Level "E" area of unstable flow, is the zone of low operating speed and volume. Level "F" is the level of service provided by the familiar traffic jam, with frequent interruptions and breakdown of flow as well as volumes below capacity, coupled with low operating speed.

Determination of Roadway Capacity

4

The capacity of roadway under uninterrupted flow condition can be obtained by **modifying the capacity of the roadway under ideal conditions.** Table 7.1 shows capacity of highway **under ideal conditions** according to **Highway Capacity Manual (HCM)-1994 (USA).**

These ideal conditions comprise uninterrupted flow, with **no interference by side traffic** or obstructions, a **vehicle stream composed solely of passenger vehicles**, **12 ft. wide traffic lane,** and should be capable of providing **operation at 70 mph,** with **no restriction of passing sight distance.**

Roadway Type	Capacity (passenger Vehicle/hr)
Multi-lane Free Flow	2000 per lane
Two lane, two way	2000 total both direction
Three lane , two way	4000 total both direction

Determination of Roadway Capacity

The adjustment factors used in modifying the capacity under ideal conditions to give capacity and service volumes under prevailing conditions may be grouped under

1. Roadway factors
2. Traffic factors

Factors we have to be considered to modify capacity-

Operating speed, Passing sight distance, Lane width, Shoulder width

Determination of Roadway Capacity

Table 7.2: Operating characteristics for various levels of service on 2 lane highways and general level of service criteria during uninterrupted flow conditions as per HCM-1994

Level of Service	Traffic Flow Condition		Passing Sight Distance (%)	Basic Limiting Value for AHS* of 70 mph	Maximum service value under ideal condition
	Description	Operating Speed (mph)	>1500 ft		
A	Free Flow	≥ 60	100	0.20	400
			80	0.18	
			60	0.15	
			40	0.12	
			20	0.08	
			0	0.04	

Determination of Roadway Capacity

Table 7.3: Effect of lane width on capacity for uninterrupted flow conditions as per HCM-1994

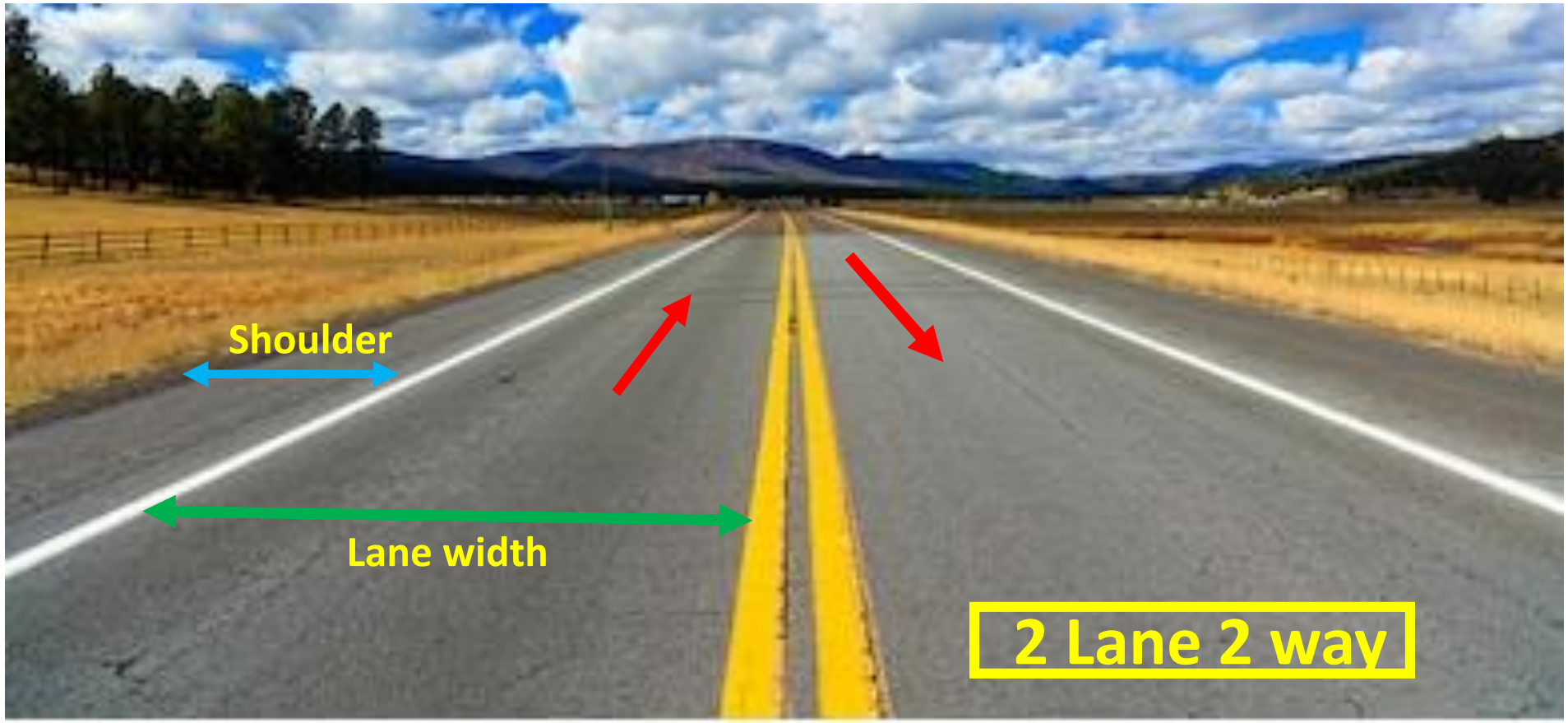
Lane Width (ft)	Capacity %	
	Two-lane Roadways	Multi Lane Roadways
12	100	100
11	88	97
10	81	91
09	76	81

Determination of Roadway Capacity

Table 7.4: Effective roadway width due to restricted lateral clearance under uninterrupted flow as per HCM-1994

Clearance from Pavement to Observation, Both Sides (ft)	Effective Width of Two 12-ft lane (ft)	Capacity of Two 12-ft Lanes (%)
6	24	100
4	22	92
2	20	83
0	17	72

Determination of Roadway Capacity



Determination of Roadway Capacity

EXAMPLE

Find the capacity of a roadway section for the following data:

1. Roadway pattern : Two lane two way
2. Lane width : 11 ft
3. Shoulder condition: 4 ft on both side of roadway smooth and well maintained
4. Operating speed : 40 mph
5. % of passing sight distances: 80
6. Level of service C

Determination of Roadway Capacity

Level of Service	Traffic Flow Condition		Passing Sight Distance (%)	Basic Limiting Value for AHS* of 70 mph	Maximum service value under ideal condition
	Description	Operating Speed (mph)	>1500 ft		
C	Approaching unstable flow	≥40	100	0.70	1400
			80	0.68	
			60	0.65	

Determination of Roadway Capacity

Table 7.3: Effect of lane width on capacity for uninterrupted flow conditions as per HCM-1994

Lane Width (ft)	Capacity %	
	Two-lane Roadways	Multi Lane Roadways
12	100	100
11	88	97
10	81	91
09	76	81

Determination of Roadway Capacity

Clearance from Pavement to Observation, Both Sides (ft)	Effective Width of Two 12-ft lane (ft)	Capacity of Two 12-ft Lanes (%)
6	24	100
4	22	92
2	20	83
0	17	72

Capacity of two lane two way road = 2000 veh/hour

Actual roadway capacity = 2000 x 0.68 x 0.88 x 0.92 veh/hour

= 1101 passenger vehicle/hour in both direction

Determination of Roadway Capacity

Table 7.5: PCU values for different types of vehicles

Vehicle Type	Passenger Car Unit (PCU) Value
Truck	3
Bus	3
Mini-bus	2
Passenger car	1
Utility	1
C.N.G, Baby taxi	0.75
Motorcycle	0.5
Bicycle	0.5
Cycle Rickshaw	2

Determination of Roadway Capacity



Determination of Roadway Capacity

In 15 mins vehicle passes-

20 buses x 3	= 60
8 truck x 3	= 24
25 car x 1	= 25
8 CNG x 0.75	= 6
16 Motor-cycle x 0.5	= 8

Total = 123 PCU/15 min

= 492 PCU/hr in one direction

= 984 PCU/hr in **both direction**

Determination of Roadway Capacity

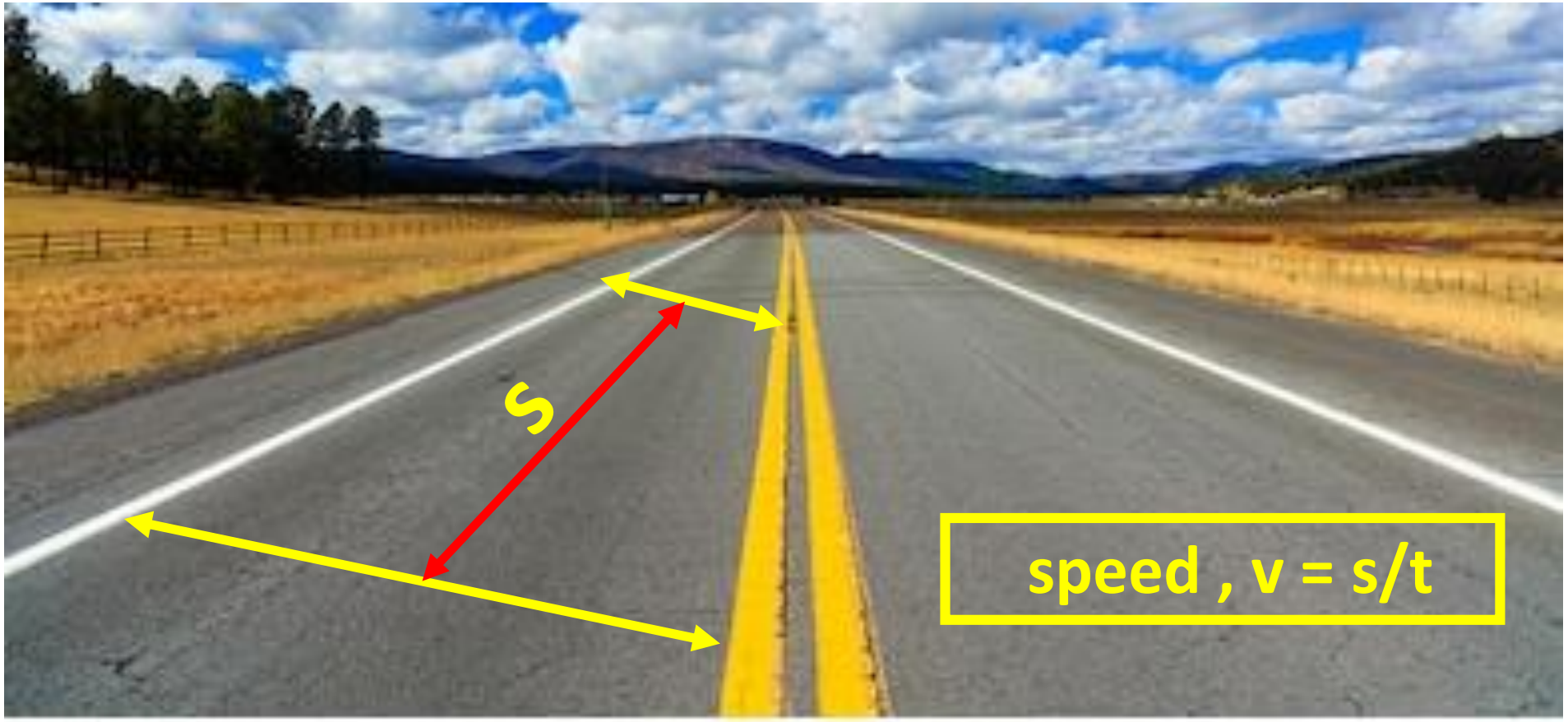
Vehicle type	No. of vehicle in 15 mins	No. of vehicle in 1 hour	Equivalent PCU	Total PCU in 1 hour	Speed (mph)
Bus	20	80	3	240	40
Truck	8	32	3	96	35
Car	25	100	1	100	30
CNG	8	32	.75	24	25
Motor-cycle	16	64	0.5	32	35
Total				492	

Operating speed = (240 x 40 + 96 x 35 + 100 x 30 + 24 x 25 + 32 x 35)/ 492 mph

= 35.93 mph

Determination of Operating Speed

How to determine speed of a particular vehicle?



Determination of Roadway Capacity

Experiment No: 07
Determination of Roadway Capacity

Name : **Student No:**

Find the capacity of a roadway section for the following data:

1. **Roadway pattern :**
2. **Lane width :**
3. **Shoulder condition :**
4. **Operating speed :**
5. **% of passing sight distances :**
6. **Level of service :**

Calculation:

Determination of Roadway Capacity

1. Select a suitable two way road.
2. Determine road width, shoulder width and assume passing sight distance.
3. Determine roadway capacity and current demand.
4. Determine operating speed of the road.
5. Submit a lab report and a group presentation.



Any Question?