University of Al-Maarif

College of Engineering
Department of Civil Engineering

TRAFFIC ENGINEERING

TWELFTH LECTURE

L e c ture r :
Ass.Lec. Noor Jabbar Mahdi

DETERMINATION OF LEVEL OF SERVICE

The determination of level of service for a multilane highway involves three steps:

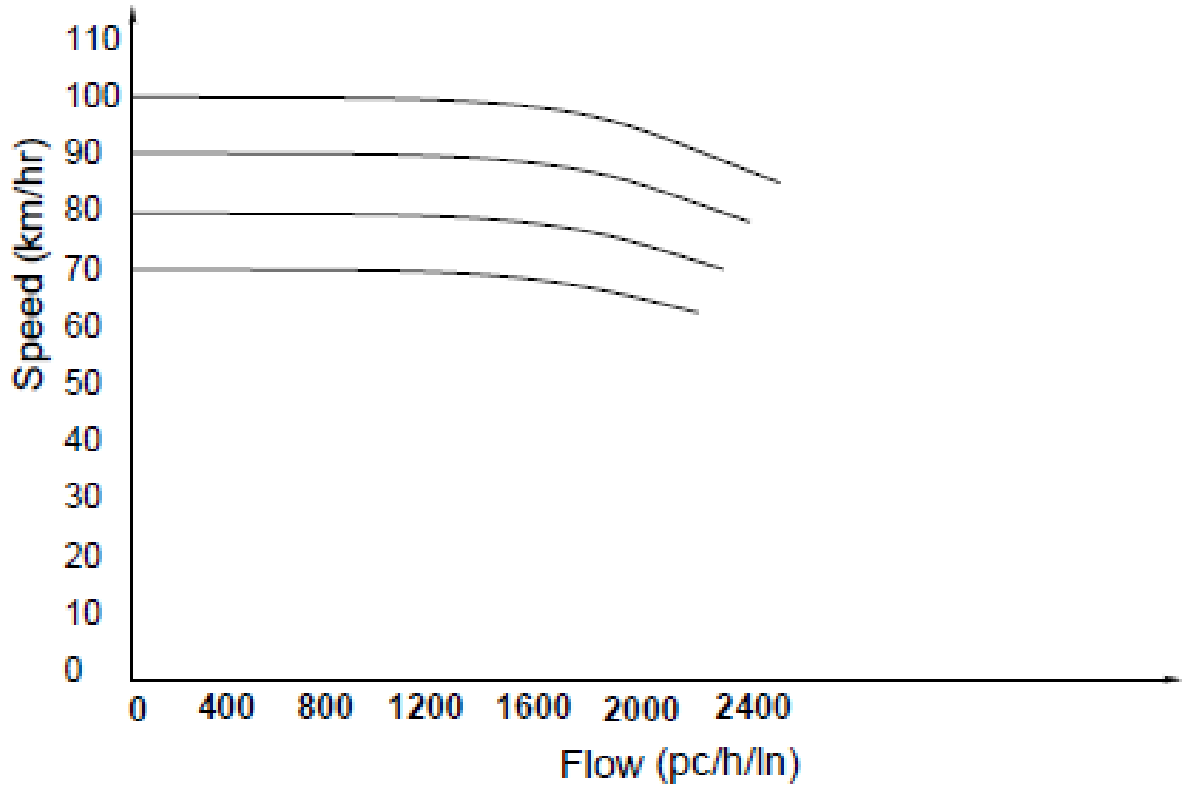
1. Determination of free-flow speed
2. Determination of flow rate
3. Determination of level of service

FREE-FLOW SPEED:

Free-flow speed is the theoretical speed of traffic density, when density approaches zero. It is the speed at which drivers feel comfortable travelling under the physical, environmental and traffic conditions existing on an uncongested section of multilane highway. In practice, free-flow speed is determined by performing travel-time studies during periods of low-to-moderate flow conditions. The upper limit for low to moderate flow conditions is considered 1400 passenger cars per hour per lane (pc/h/ln) for the analyses.

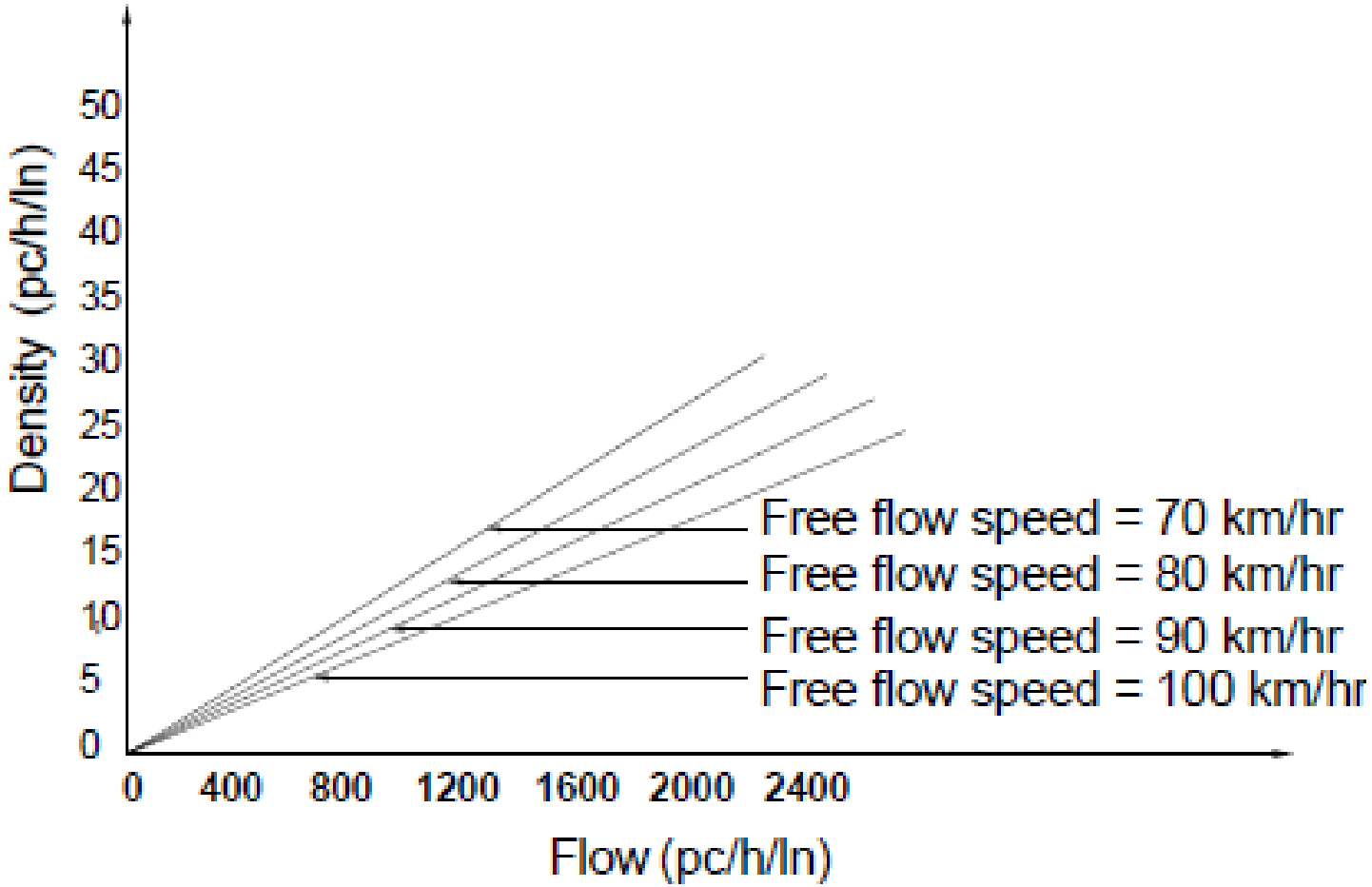
DETERMINATION OF LEVEL OF SERVICE

Figure below indicates that the speed of traffic volume up to a flow rate of 1400 pc/h/ln. It also shows that the capacity of a multilane highway under base conditions is 2200 pc/h/ln for highways with a 90 km/h free-flow speed. At flow rates between 1400 and 2200 pc/h/ln, the speed on a multilane highway drops; for example, by 8 km/h for a highways with a free-flow speed of 90 km/h.



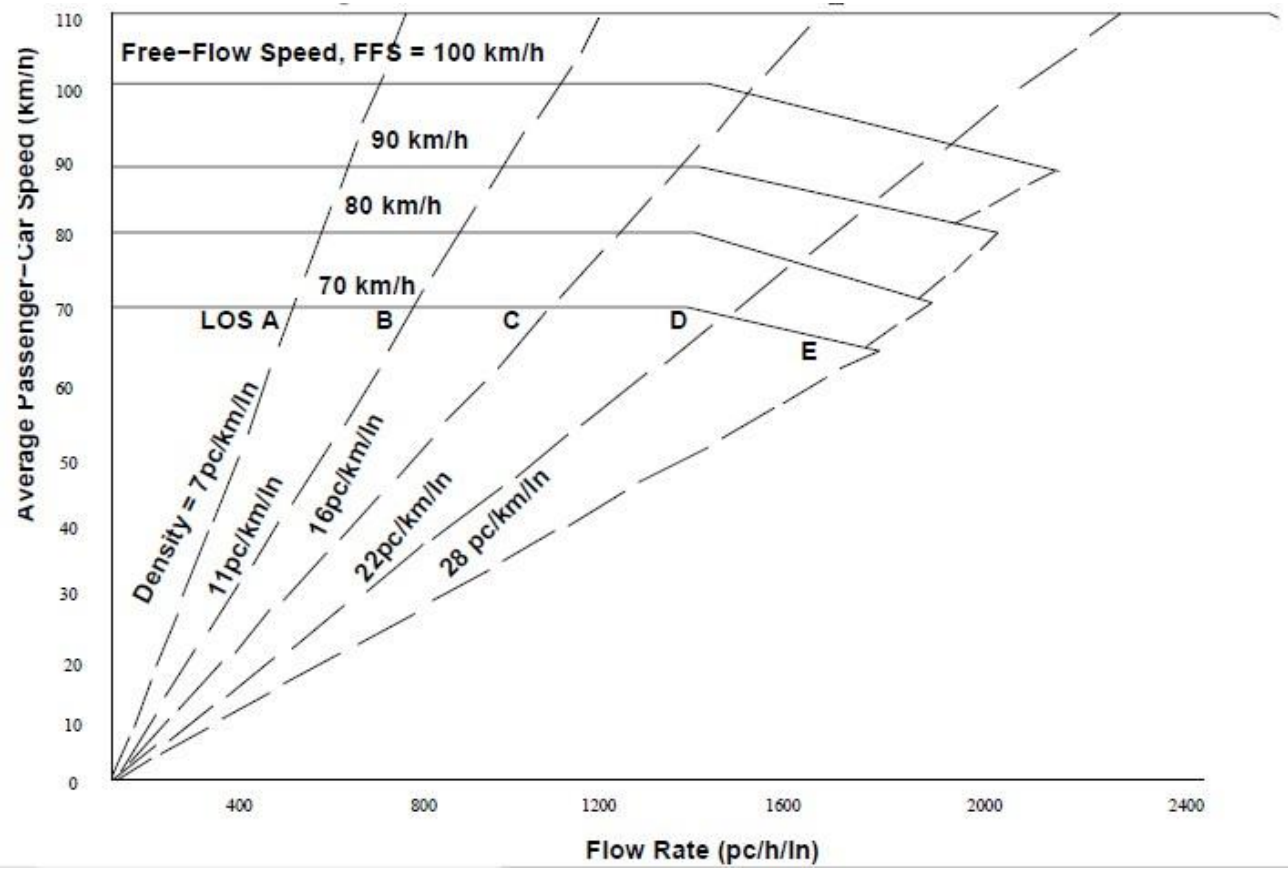
DETERMINATION OF LEVEL OF SERVICE

Figure below shows that density varies continuously throughout the full range of flow rates. The capacity value of 2200 pc/h/ln is representative of the maximum 15-min flow rate that can be accommodated under base conditions for highways with 90 km/h free-flow speed.



DETERMINATION OF LEVEL OF SERVICE

Figure below shows speed-flow curves with LOS criteria for multilane highways, here LOS is easily determined for any value of speed simply by plotting the point which is a intersection of flow and corresponding speed. Note that density is the primary determinant of LOS. LOS F is characterized by highly unstable and variable traffic flow. Prediction of accurate flow rate, density, and speed at LOS F is difficult.



DETERMINATION OF FREE-FLOW SPEED (FFS)

When field data are not available, the free-flow speed can be estimated indirectly as follows:

$$FFS = BFFS - f_{LW} - f_{LC} - f_M - f_A$$

Where,

BFFS= base FFS (km/h),

f_{LW}= adjustment for lane width, from Table 1 (km/h),

f_{LC}= adjustment for lateral clearance, from Table 2 (km/h),

f_M= adjustment for median type, from Table 3 (km/h), and

f_A= adjustment for access points, from Table 4 (km/h).

DETERMINATION OF FREE-FLOW SPEED (FFS)

Table 1: Adjustment for lane width f_{LW}

Lane Width (m)	Reduction in FFS(km/h)
3.6	0.0
3.5	1.0
3.4	2.1
3.3	3.1
3.2	5.6
3.1	8.1
3.0	10.6

Table 2: Adjustment for lateral clearance f_{LC}

Four-Lane Highways		Six-Lane Highways	
Total Lateral Clearance a (m)	Reduction in FFS (km/h)	Total Lateral Clearance a (m)	Reduction in FFS (km/h)
3.6	0.0	3.6	0.0
3.0	0.6	3.0	0.6
2.4	1.5	2.4	1.5
1.8	2.1	1.8	2.1
1.2	3.0	1.2	2.7
0.6	5.8	0.6	4.5
0.0	8.7	0.0	6.3

DETERMINATION OF FREE-FLOW SPEED (FFS)

Table 3: Adjustment to free flow speed for median type f_M

Median Type	Reduction in FFS (km/h)
Undivided highways	2.6
Divided highways	0.0

Table 4: Adjustment to free flow speed for Access-point density f_A

Access Points/Kilometer	Reduction in FFS (km/h)
0	0.0
6	4.0
12	8.0
18	12.0
≥ 24	16.0

DETERMINATION OF FREE-FLOW SPEED (FFS)

Table 3: Adjustment to free flow speed for median type f_M

Median Type	Reduction in FFS (km/h)
Undivided highways	2.6
Divided highways	0.0

Table 4: Adjustment to free flow speed for Access-point density f_A

Access Points/Kilometer	Reduction in FFS (km/h)
0	0.0
6	4.0
12	8.0
18	12.0
≥ 24	16.0

THANK YOU FOR LISTENING