

Example

FFS on Freeway Given: Six-lane urban freeway (3 in each direction) Lane width = 11 ft Right-side lateral clearance = 2 ft from the pavement edge Commuter traffic (regular users), and a total ramp density of 3 ramps/mile. What is the free-flow speed of this freeway?

Solution:

The free-flow speed of a freeway may be estimated as below:

$$FFS = 75.4 - f_{LW} - f_{LC} - 3.22TRD^{0.84}$$

$$F_{LW} = 1.9 \text{ mile/hr}$$

$$F_{LC} = 1.6 \text{ mile/hr}$$

$$TRD = 3 \text{ ramps/mile}$$

$$\begin{aligned} FFS &= 75.4 - 1.9 - 1.6 - 3.22(3)^{0.84} \\ &= 63.8 \text{ mile/hr} \end{aligned}$$

Example

FFS on Multilane Highway

- Four lane undivided multilane highway
- Posted speed limit=50mi/hr
- 11ft lanes
- Frequent obstructions located 4 ft from the right pavement edge
- 30 access points/mile on the right side of the facility

What is the free flow speed?

Solution:

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

The base free flow speed for multilane highway taken as 60mile/hr as a default or may be related to the posted speed limit. In the latter case, for a posted speed limit

of 50 mile /hr, the base free-flow speed may be taken to be 5 mile /hr more than the limit,

$$\text{BFFS} = 50 + 5 = 55 \text{ mile/hr}$$

$$f_{LW} = 1.9 \text{ mile/hr}$$

$$f_{LC} = 0.4 \text{ mile/hr}$$

$$f_M = 1.6 \text{ mile/hr}$$

$$f_A = 7.5 \text{ mile/hr}$$

Then:

$$\text{FFS} = 55 - 1.9 - 0.4 - 1.6 - 7.5 = 43.6 \text{ mile/hr}$$

Example

Determine the level of service (LOS) for a freeway section, 4-lane with the following characteristics:

- ✚ 10 ft lane width.
- ✚ Lateral obstruction at 0 ft at the roadside.
- ✚ Total ramp density is 4.5 ramps/mile.
- ✚ Rolling terrain.
- ✚ Peak demand volume of 3500 veh/hr.
- ✚ PHF=0.95.
- ✚ No truck, busses and recreational vehicles in traffic stream.

Solution:

$$v_p = \frac{V}{PHF * N * f_{HV} * f_p}$$

$$V = 3500 \text{ veh/hr}$$

$$PHF = 0.95$$

$$N = 2 \text{ lanes}$$

$$f_{HV}=1.00$$

$$f_p=1.0 \text{ assumed all driver are commuter}$$

$$v_p = \frac{3500}{0.95 * 2 * 1.00 * 1.00}$$

$$= 1842 \text{ pc/hr/lane}$$

$$FFS = 75.4 - 6.6 - 3.6 - 3.22(4.5)^{0.84}$$

$$= 53.8 \text{ mile/hr}$$

Because this value lies between 52.5 and 57.5 mile/hr, the 55 mile /hr speed-flow curve is used to represent base conditions

From figure, we find LOS is D

The density on the freeway may be estimated as:

$$\text{Density (D)} = 1842/54.9$$

$$= 33.6 \text{ pc/mile/lane}$$