

C.1 公路之服務水準

Level of Service	Controlled Access Highways	Multilane Rural without Access Control	Two Lanes	Urban and Suburban Arterials
A	Free flow. Operating speeds at or greater than 60 mph. Service volume of 1,400 passenger cars per hour on two lanes, one direction. Each additional lane serves volume of 1,000-vph lane.	Operating speed 60 mph or greater. Under ideal conditions, volume is limited to 600 passenger cars per lane per hour or 30 percent of capacity. Average speeds are likely to be influenced by speed limits.	Operating speeds of 60 mph or higher. 75 percent of passing maneuvers can be made with little or no delay. Under ideal conditions, a service volume of 400 passenger vph, total two-way, can be achieved.	Average overall travel speed of 30 mph or more. Free flowing with volume/capacity ratio of 0.60. Load factor at intersections near the limit of the 0.0 range. Peak-hour factor at about 0.70.
B	Higher speed range of stable flow. Operating speed at greater than 55 mph. Service volume on two lanes in one direction not greater than 2,000 passenger vph. Each additional lane above two in one direction can serve 1,500 vph.	Beginning of stable flow area. Volume at which actions of preceding vehicle will have some influence on following vehicles. Volume will not exceed 50 percent of capacity of 1,000 passenger vehicles per lane per hour at a 55 mph operating speed under ideal conditions.	Operating speeds of 50 mph or higher. Volumes may reach 45 percent of capacity with continuous passing sight distance. Volumes of 900 passenger cars per hour, total two-way, can be carried under ideal conditions.	Average overall speeds drop due to intersection delay and inter-vehicular conflicts, but remain at 25 mph or above. Delay is not unreasonable. Volumes at 70 percent of capacity and peak-hour factor approximately 0.80. Load factor at intersections approximately 0.1.
C	Operation still stable, but becoming more critical. Operating speed of 50 mph. Service flow on two lanes in one direction at 75 percent of capacity or not more than 5-min flow rate of 3,000 passenger cars per hour. Under ideal conditions each additional lane above two in one direction would serve 1,800 vph.	Stable flow to a volume not exceeding 75 percent of capacity or 1,500 passenger cars per lane per hour, under ideal conditions, maintaining at least a 45-mph operating speed.	Flow still stable. Operating speeds of 40 mph or above with total volume under ideal conditions equal to 70 percent of capacity with continuous passing sight distance, or 1,400 passenger vph total two-way.	Service volumes about 0.80 of capacity. Average overall travel speeds of 20 mph. Operating conditions at most intersections approximate load factor of 0.3. Peak-hour factor approximately 0.85. Traffic flow still stable with acceptable delays.

Table II-5. Level-of-service characteristics by highway type.

HG Table II-5 in 7/8:

Level of Service	Controlled Access Highways	Multilane Rural without Access Control	Two Lanes	Urban and Suburban Arterials
D	Lower speed range of stable flow. Operation approaches instability and is susceptible to changing conditions. Operating speeds approx. 40 mph. Service flow rates at 90 percent of capacity. Peak 5-min flow under ideal conditions cannot exceed 3,600 vph for two-lanes, one direction; 1,800 vph for each added lane.	Approaching unstable flow at volume up to 90 percent of capacity or 1,800 passenger cars per hour at an operating speed of about 35 mph under ideal conditions.	Approaching unstable flow. Operating speeds approximately 35 mph. Volumes, two-direction, at 85 percent of capacity with continuous passing opportunity, or 1,700 passenger cars per hour total two-way under ideal conditions.	Beginning to tax capabilities of street section. Approaching unstable flow. Service volumes approach 90 percent of capacity. Average overall speeds down to 15 mph. Delays at intersections may become extensive with some cars waiting two or more cycles. Peak-hour factor approximately 0.90; load factor of 0.7.
E	Unstable flow. Overall operating speeds of 30-35 mph. Volumes at capacity or 2,000 vph lane under ideal conditions. Traffic flow metered by design constructions and bottlenecks, but long backups do not normally develop upstream.	Flow at 100 percent of capacity or 2,000 passenger cars per lane per hour under ideal conditions. Operating speeds of about 30 mph or less.	Operating speeds in neighborhood of 30 mph but may vary considerably. Volumes under ideal conditions, total two-way, equal to 2,000 passenger vph. Level E may never be attained. Operation may go directly from Level D to Level F.	Service volumes at capacity. Average overall traffic variable, but in area of 15 mph. Unstable flow. Continuous backup on approaches to intersections. Load factor at intersections in range between 0.7 and 1.0. Peak-hour factor likely to be 0.95.
F	Forced flow. Freeway acts as a storage for vehicles backed up from downstream bottleneck. Operating speeds range from near 30 mph to stop-and-go operation.	Forced flow, congested condition with widely varying volume characteristics. Operating speeds of less than 30 mph.	Forced, congested flow with unpredictable characteristics. Operating speeds less than 30 mph. Volumes under 2,000 passenger cars per hour, total two-way.	Forced flow. Average overall traffic speed below 15 mph. All intersections handling traffic in excess of capacity with storage distributed throughout the section. Vehicular backups extend back from signalized intersections, through unsignalized intersections.

Table II-5. Continued.

5.2.3 影響公路容量之因素：

道路情況：線形、車道與路肩寬、車道數、側向淨空、坡度、路面狀況、鄰近車道

交通情況：車輛組成、流量、流向分佈、平面交叉點交通中斷、交通干擾

環境情況及氣候情況

交通管制情況：

1. 車道寬之調查係數
2. 重型車輛所占百分比之調查係數
[小客車當量與小客車單位]
3. 中央分隔帶之調查係數
4. 路肩寬度及側空淨空之調整係數

5.2.4 雙車道公路之公路容量

理想狀況(美國公路容量手冊)：

- (a) 設計速率 $\geq 96\text{kph}$
- (b) 車道寬 $\geq 3.6\text{m}$
- (c) 在路肩寬 1.8m 範圍內無任何阻礙
- (d) 無禁止超車區
- (e) 車流內僅有小客車
- (f) 雙向交通量分佈為 50/50
- (g) 無交通管制及轉彎車輛影響的不干擾交通流
- (h) 地勢平坦

- ➔ 理想條件之公路容量，雙車道兩向車道合計為 2,800 (pcph)
- ➔ 我國公路容量手冊初稿建議採用最大小時流量 2,900 pcu 為雙車道之基本容量

1. 平坦路段之服務流量(雙車道公路)

$$SF_i = 2800(V / C)_i (f_d)(f_w)(f_{hv})$$

$$f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1) + P_B(E_B - 1)}$$

表 5.2 一般雙車道公路之服務水準

表 5.3 方向分佈之調整係數

表 5.4 車道寬與路肩寬調整係數

表 5.5 各型車之小客車當量換算係數

$$v = \frac{V}{PHF}$$

表 5.6 尖峰小時係數

[例題 5.1]

[例題 5.2]

5.2.5 多車道公路之公路容量

理想狀況(美國公路容量手冊)：

- (a) 地勢平坦，坡度不超過 1~2%
- (b) 車道寬 $\geq 3.6\text{m}$
- (c) 車道邊緣之側向淨空大於 3.6m
- (d) 公路沿線無直接進口點或入口處
- (e) 具中央分隔帶之多車道公路
- (f) 雙向交通量分佈為 50/50
- (g) 車流內僅有小客車
- (h) 自由車速 $\geq 96\text{kph}$

→ 多車道公路服務水準依下列 3 個步驟決定：

1. 決定自由車速
2. 公路容量調整
3. 決定服務水準

表 5.10 多車道公路服務水準規定

→ 理想條件之公路容量，自由車速=96 kph 時為 2,200(pcphpl)、自由車速=88 kph 時為 2,100(pcphpl)、自由車速=80 kph 時為 2,000(pcphpl)、自由車速=72 kph 時為 1,900(pcphpl)

→ 我國公路容量手冊初稿建議國內一般公路四車道之基本容量為每一車道 2100 pcphpl

2. 坡道路段之服務流量(雙車道公路)

$$SF_i = 2800(V/C)_i(f_d)(f_w)(f_g)(f_{hv})$$

$$f_g = \frac{1}{1 + 0.02P_p(E - E_0)}$$

$$f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1) + P_B(E_B - 1)}$$

$$E_{HV} = 1 + (0.25 + P_{T/HV})(E - 1)$$

$$P_{T/HV} = \frac{P_T}{P_T + P_R + P_B}$$

表 5.7 上坡平均速率、坡度及禁止超車路段之 V/C 比值

表 5.8 特定坡度之方向分佈調整係數 f_d

表 5.9 雙車道公路特定坡道之小客車當量 E、 E_0 係數

$$v = \frac{V}{PHF}$$

[例題 5.3]

[例題 5.4]