DÉFINITION DES NIVEAUX DE SERVICE POUR LES CARREFOURS CONTRÔLÉS PAR FEUX DE CIRCULATION

Le niveau de service est défini en termes de retard. Le retard moyen est une mesure agrégée de l'inconfort, de la frustration des conducteurs, et donne un indice de la consommation d'essence et des pertes de temps reliées aux déplacements automobiles. Les niveaux de service sont exprimés en termes de perte de temps associée aux arrêts que subit un véhicule durant une période d'observation de 15 minutes.

Niveau de service	Description
A	Retard moyen très court, moins de 10 secondes par véhicule. Ces conditions sont extrêmement favorables et la plupart des véhicules arrivent durant la phase verte du feu. Des cycles de feux courts contribuent à cet état. La plupart des véhicules n'arrêtent pas.
B	Retard moyen entre 10 et 20 secondes par véhicule. La circulation reste fluide et les cycles de feux courts contribuent à cet état. Plus de véhicules arrêtent au niveau B qu'au niveau A, ce qui engendre un retard moyen légèrement plus élevé.
C	Le retard moyen se situe entre 20 et 35 secondes par véhicules. Cette augmentation du retard peut résulter d'un débit de circulation plus élevé qu'aux niveaux de service précédents ou de cycles de feux plus longs. Le nombre de véhicules qui arrêtent est significatif même si plusieurs arrivent à passer l'intersection sans arrêter.
D	Retard moyen entre 35 à 55 secondes par véhicule. La congestion se fait sentir. Le retard moyen plus long peut être le résultat d'un rapport débit/capacité élevé et/ou de cycles de feux longs. Plusieurs véhicules arrêtent, et la proportion de véhicules qui passent sans arrêter diminue rapidement. Plusieurs cycles n'arrivent pas à écouler leurs files d'attente.
E	Le retard moyen se situe entre 55 et 80 secondes par véhicule, ce qui est considéré comme la limite acceptable de retard. Ce retard élevé est le résultat d'un rapport débit/capacité très élevé et/ou de longues durées de cycles de feux. La congestion est forte. Plusieurs cycles n'arrivent pas à écouler leurs files d'attente.
F	Le retard moyen par véhicule dépasse 80 secondes. Cette condition est considérée inacceptable par la majorité des conducteurs. Il y a sursaturation : le flot de véhicules qui arrive excède la capacité du carrefour. La majorité des cycles est déficitaire. Un cycle trop long et/ou une géométrie inadéquate du carrefour peuvent en être la cause.

Niveaux de service pour carrefours à feux

Niveau de service	Retard moyen (s)
A	0 – 10
B	> 10 – 20
C	> 20 – 35
D	> 35 – 55
E	> 55 – 80
F	> 80

Source : Highway Capacity Manual, 2000.

DÉFINITION DES NIVEAUX DE SERVICE POUR LES CARREFOURS CONTRÔLÉS PAR ARRÊTS

Niveau de service pour carrefours à arrêts

Niveau de service	Retard moyen (s)
A	0 – 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

Source : Highway Capacity Manual, 2000.

Note: Pour les carrefours contrôlés par arrêt, le logiciel Synchro n'indique pas de niveau de service pour l'ensemble du carrefour. La lettre U (*uncontrolled*) y est ainsi indiquée.

TABLE 4 - 1
GENERALIZED **ANNUAL AVERAGE DAILY** VOLUMES FOR FLORIDA'S **URBANIZED AREAS***

UNINTERRUPTED FLOW HIGHWAYS

Level of Service

Lanes	Divided	A	B	C	D	E
2	Undivided	2,000	7,000	13,800	19,600	27,000
4	Divided	20,400	33,000	47,800	61,800	70,200
6	Divided	30,500	49,500	71,600	92,700	105,400

STATE TWO-WAY ARTERIALS

Class I (>0.00 to 1.99 signalized intersections per mile)

Level of Service

Lanes	Divided	A	B	C	D	E
2	Undivided	**	4,200	13,800	16,400	16,900
4	Divided	4,800	29,300	34,700	35,700	***
6	Divided	7,300	44,700	52,100	53,500	***
8	Divided	9,400	58,000	66,100	67,800	***

Class II (2.00 to 4.50 signalized intersections per mile)

Level of Service

Lanes	Divided	A	B	C	D	E
2	Undivided	**	1,900	11,200	15,400	16,300
4	Divided	**	4,100	26,000	32,700	34,500
6	Divided	**	6,500	40,300	49,200	51,800
8	Divided	**	8,500	53,300	63,800	67,000

Class III (more than 4.5 signalized intersections per mile and not within primary city central business district of an urbanized area over 750,000)

Level of Service

Lanes	Divided	A	B	C	D	E
2	Undivided	**	**	5,300	12,600	15,500
4	Divided	**	**	12,400	28,900	32,800
6	Divided	**	**	19,500	44,700	49,300
8	Divided	**	**	25,800	58,700	63,800

Class IV (more than 4.5 signalized intersections per mile and within primary city central business district of an urbanized area over 750,000)

Level of Service

Lanes	Divided	A	B	C	D	E
2	Undivided	**	**	5,200	13,700	15,000
4	Divided	**	**	12,300	30,300	31,700
6	Divided	**	**	19,100	45,800	47,600
8	Divided	**	**	25,900	59,900	62,200

NON-STATE ROADWAYS

Major City/County Roadways

Level of Service

Lanes	Divided	A	B	C	D	E
2	Undivided	**	**	9,100	14,600	15,600
4	Divided	**	**	21,400	31,100	32,900
6	Divided	**	**	33,400	46,800	49,300

Other Signalized Roadways
(signalized intersection analysis)

Level of Service

Lanes	Divided	A	B	C	D	E
2	Undivided	**	**	4,800	10,000	12,600
4	Divided	**	**	11,100	21,700	25,200

Source: Florida Department of Transportation 02/22/02
Systems Planning Office
605 Suwannee Street, MS 19
Tallahassee, FL 32399-0450
http://www11.myflorida.com/planning/systems/sm/los/default.htm

FREEWAYS

Interchange spacing ≥ 2 mi. apart

Level of Service

Lanes	A	B	C	D	E
4	23,800	39,600	55,200	67,100	74,600
6	36,900	61,100	85,300	103,600	115,300
8	49,900	82,700	115,300	140,200	156,000
10	63,000	104,200	145,500	176,900	196,400
12	75,900	125,800	175,500	213,500	237,100

Interchange spacing < 2 mi. apart

Level of Service

Lanes	A	B	C	D	E
4	22,000	36,000	52,000	67,200	76,500
6	34,800	56,500	81,700	105,800	120,200
8	47,500	77,000	111,400	144,300	163,900
10	60,200	97,500	141,200	182,600	207,600
12	72,900	118,100	170,900	221,100	251,200

BICYCLE MODE

(Note: Level of service for the bicycle mode in this table is based on roadway geometrics at 40 mph posted speed and traffic conditions, not number of bicyclists using the facility.) (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Level of Service

Paved Shoulder/ Bicycle Lane Coverage	A	B	C	D	E
0-49%	**	**	3,200	13,800	>13,800
50-84%	**	2,500	4,100	>4,100	***
85-100%	3,100	7,200	>7,200	***	***

PEDESTRIAN MODE

(Note: Level of service for the pedestrian mode in this table is based on roadway geometrics at 40 mph posted speed and traffic conditions, not number of pedestrians using the facility.) (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Level of Service

Sidewalk Coverage	A	B	C	D	E
0-49%	**	**	**	6,400	15,500
50-84%	**	**	**	9,900	19,000
85-100%	**	2,200	11,300	>11,300	***

BUS MODE (Scheduled Fixed Route)

(Buses per hour)

(Note: Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.)

Level of Service

Sidewalk Coverage	A	B	C	D	E
0-84%	**	>5	≥4	≥3	≥2
85-100%	>6	>4	≥3	≥2	≥1

ARTERIAL/NON-STATE ROADWAY ADJUSTMENTS

DIVIDED/UNDIVIDED
(alter corresponding volume by the indicated percent)

Lanes	Median	Left Turns Lanes	Adjustment Factors
2	Divided	Yes	+5%
2	Undivided	No	-20%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

ONE-WAY FACILITIES

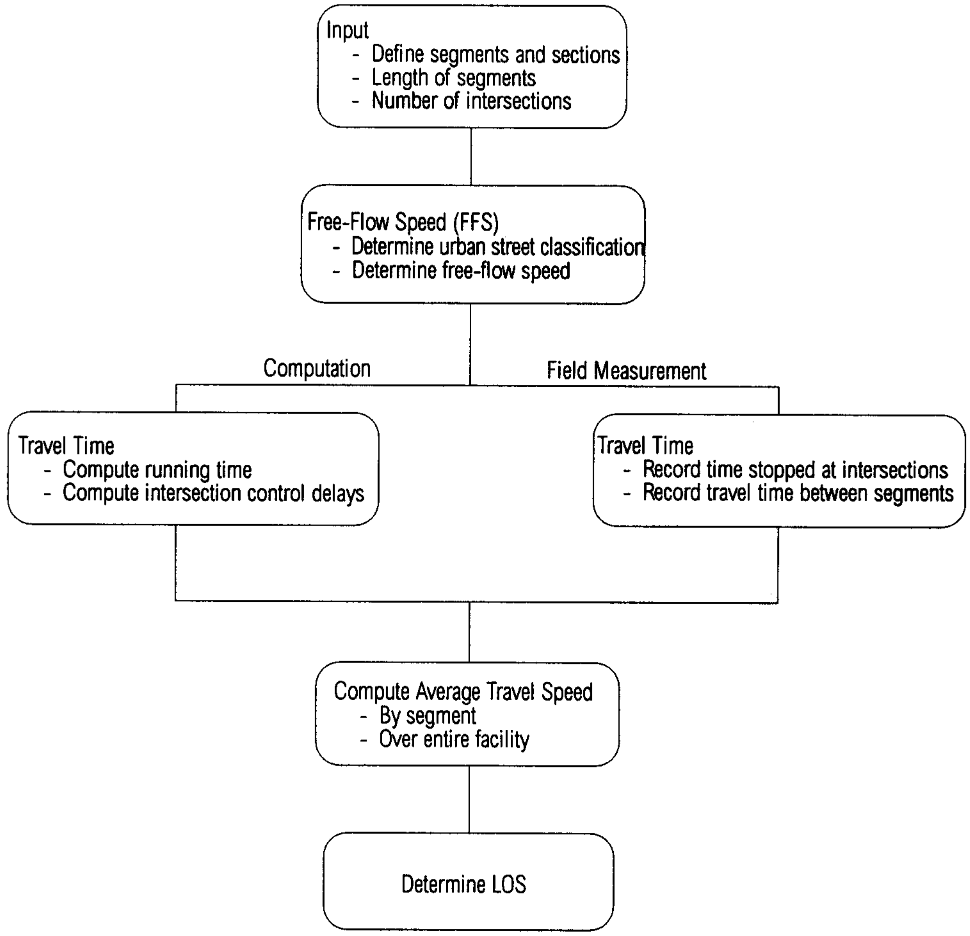
Decrease corresponding two-directional volumes in this table by 40% to obtain the equivalent one directional volume for one-way facilities.

*This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Values shown are two-way annual average daily volumes (based on K_{100} factors) for levels of service and are for the automobile/truck modes unless specifically stated. Level of service letter grade thresholds are probably not comparable across modes and, therefore, cross modal comparisons should be made with caution. Furthermore, combining levels of service of different modes into one overall roadway level of service is not recommended. The table's input value defaults and level of service criteria appear on the following page. Calculations are based on planning applications of the Highway Capacity Manual, Bicycle LOS Model, Pedestrian LOS Model and Transit Capacity and Quality of Service Manual, respectively for the automobile/truck, bicycle, pedestrian and bus modes.

**Cannot be achieved using table input value defaults.

***Not applicable for that level of service letter grade. For automobile/truck modes, volumes greater than level of service D become F because intersection capacities have been reached. For bicycle and pedestrian modes, the level of service letter grade (including F) is not achievable, because there is no maximum vehicle volume threshold using table input value defaults.

EXHIBIT 15-1. URBAN STREET METHODOLOGY



The analyst should be able to investigate the effect of signal spacing, street classification, and traffic flow on LOS. The methodology uses the signalized intersection procedure presented in Chapter 16 for the through-traffic lane group. By redefining the lane arrangement (e.g., presence or absence of left-turn lanes, number of lanes), the analyst can influence which traffic flow is in the through-traffic lane group as well as the capacity of the lane group. This redefinition, in turn, influences the street LOS by changing the intersection evaluation and possibly the street classification.

LOS

Urban street LOS is based on average through-vehicle travel speed for the segment or for the entire street under consideration. Travel speed is the basic service measure for urban streets. The average travel speed is computed from the running times on the urban street and the control delay of through movements at signalized intersections.

Control delay

The control delay is the portion of the total delay for a vehicle approaching and entering a signalized intersection that is attributable to traffic signal operation. Control delay includes the delays of initial deceleration, move-up time in the queue, stops, and re-acceleration.

Through vehicles

The LOS for urban streets is influenced both by the number of signals per kilometer and by the intersection control delay. Inappropriate signal timing, poor progression, and increasing traffic flow can degrade the LOS substantially. Streets with medium-to-high signal densities (i.e., more than one signal per kilometer) are more susceptible to these factors, and poor LOS might be observed even before significant problems occur. On the other hand, longer urban street segments comprising heavily loaded intersections can provide reasonably good LOS, although an individual signalized intersection might be operating at a lower level. The term through vehicle refers to all vehicles passing directly through a street segment and not turning.

Exhibit 15-2 lists urban street LOS criteria based on average travel speed and urban street class. It should be noted that if demand volume exceeds capacity at any point on the facility, the average travel speed might not be a good measure of the LOS. The street classifications identified in Exhibit 15-2 are defined in the next section.

Travel speed defines LOS on urban streets

EXHIBIT 15-2. URBAN STREET LOS BY CLASS

Urban Street Class	I	II	III	IV
Range of free-flow speeds (FFS)	90 to 70 km/h	70 to 55 km/h*	55 to 50 km/h	55 to 40 km/h
Typical FFS	80 km/h	65 km/h	55 km/h	45 km/h
LOS	Average Travel Speed (km/h)			
A	> 72	> 59	> 50	> 41
B	> 56–72	> 46–59	> 39–50	> 32–41
C	> 40–56	> 33–46	> 28–39	> 23–32
D	> 32–40	> 26–33	> 22–28	> 18–23
E	> 26–32	> 21–26	> 17–22	> 14–18
F	≤ 26	≤ 21	≤ 17	≤ 14

DETERMINING URBAN STREET CLASS

The first step in the analysis is to determine the urban street's class. This can be based on direct field measurement of the FFS or on an assessment of the subject street's functional and design categories. A procedure for measuring the FFS is described in Appendix B.

If the FFS measurements are not available, the street's functional and design categories must be used to identify its class. The functional category is identified first, followed by the design category. This identification uses the definitions provided in Chapter 10 and Exhibit 10-4. After determining the functional and design categories, the urban street class can be established using Exhibit 10-3.

DETERMINING RUNNING TIME

Running time is estimated using FFS, urban street classification, and arterial segment length

There are two principal components of the total time that a vehicle spends on a segment of an urban street: running time and control delay at signalized intersections. To compute the running time for a segment, the analyst must know the street's classification, its segment length, and its FFS. The segment running time then can be found by using Exhibit 15-3.

Within each urban street class there are several influences on actual running time. Exhibit 15-3 shows the effect of street length. In addition, the presence of parking, side friction, local development, and street use can affect running time. In this chapter, these also are assumed to influence the FFS. Direct observation of the FFS, therefore, includes the effect of these factors and, by implication, their effect on the running speed.

If it is not possible to observe the FFS on the actual or a comparable facility, default values are given in a note to Exhibit 15-3.

DETERMINING DELAY

Computing the urban street or section speed requires the intersection control delays. Because the function of an urban street is to serve through traffic, the lane group for through traffic is used to characterize the urban street.