CHAPTER 6

SYMBOLS

This chapter lists and defines the symbols and abbreviations used in the manual, along with their units if applicable. If the same symbol has more than one meaning, the chapter or chapters of the specific use are cited in parentheses ( ) following the definition.

A—CF

A .....1. Passenger waiting area size, m^2 (27). 2. Access points (21).
a .....1. Adjustment factor for two-stage gap acceptance (17). 2. Coefficient for estimating base percent time spent following (20). 3. Weaving intensity factor calibration constant (24). 4. Adjacent-lane impedance factor (27).
AADT .....Annual average daily traffic, veh/day
AC .....Urban street class
AI .....Added initial time per actuation, s
$a_n(t)$ .....Acceleration of nth vehicle at time t
a_p .....Design pedestrian area occupancy, m^2/p
A_{pbT} .....Permitted phase adjustment for pedestrian/bicycle blockage
AT .....Arrival type
ATS .....Average travel speed for both directions of travel combined on two-lane highways, km/h
ATS_c .....Average travel speed for all two-lane highway directional segments combined, km/h
ATS_d .....Average travel speed in the analysis direction for the entire segment without the passing lane, km/h
ATS_{pl} .....Average travel speed for the entire segment including the passing lane, km/h
AVM .....Adjusted vehicle minimum time, s
AVO .....Average vehicle occupancy
AWDT .....Average weekday daily traffic, veh/day
B .....1. Begin platoon event time; the time that the dispersing platoon begins to pass through the subject two-way stop-controlled intersection (17). 2. Bus lane vehicle capacity, buses/h (27).
b .....1. Bunching factor (16). 2. Coefficient for estimating base percent time spent following (20). 3. Weaving intensity factor calibration constant (24).
B(a) .....Sum of gradients for counted segments
B_{bb} .....Maximum number of buses per berth per hour, buses/h
BFFS .....Base free-flow speed, km/h
BPTSF .....Base percent time-spent-following, %
$BPTSF_d$ .....Base percent time-spent-following in the analysis direction, %
B_s .....Maximum number of buses per bus stop per hour, buses/h
C .....1. Signal cycle length, s. 2. Capacity, veh/h (30).
c .....1. Total lane group capacity, veh/h. 2. Two-way segment capacity, normally 3,200 pc/h for a two-way segment and 1,700 pc/h for a directional segment (20). 3. Weaving intensity factor calibration constant (24).
C(a) .....Sum of square of gradients for counted segments
c_a .....Approach capacity at roundabouts, veh/h
CAF .....Capacity adjustment factor
c_b .....1. Capacity of bicycle lane, bicycle/h (19). 2. Bus capacity, buses/h (27).
CBD .....Central business district
CF .....Acceleration/deceleration correction factor

c_I ..... Capacity for Stage I of two-stage gap acceptance
c_{II} ..... Capacity for Stage II of two-stage gap acceptance
c_L ..... 1. Lane group capacity per lane, veh/h (16). 2. Capacity of major-street left-turn lane, veh/h (30).
$c_{m,x}$ ..... Movement capacity of Minor Movement x, veh/h
C_{max} ..... Maximum cycle length, s
C_{min} ..... Minimum cycle length, s
Cost ..... Out-of-pocket cost for trip, cents
$c_{p,x}$ ..... Potential capacity of Minor Movement x, veh/h
c_r ..... Capacity of right turns at specific intersection, veh/h
CS ..... Sum of critical phase volumes, veh/h
c_s ..... Capacity of stop-controlled approach, veh/h
c_{SH} ..... Capacity of a shared lane, veh/h
c_T ..... Available capacity in the analysis period, veh/h
$c_{T,x}$ ..... Total capacity for Movement x considering a two-stage gap acceptance, veh/h
CV ..... Critical phase volume, veh/h
c_v ..... Coefficient of variation of headways of transit serving a particular route arriving at a stop
CVS ..... Sum of critical volume to saturation flow rate ratio
D ..... 1. Density, veh/km, pc/km/h, or veh/km/ln (7). 2. Proportion of peak-hour traffic in peak direction (8). 3. Total initial queue delay due to an initial queue incurred in the average cycle, s (16). 4. Density of all vehicles in the weaving segment, pc/km/ln (24). 5. Diverge from traffic at an interchange (26). 6. Movement at a downstream intersection (26). 7. Number of doors available in the peak hour (27). 8. Mean delay for subject lane group, s/veh (30). 9. Node delay for link, s (30).
d ..... 1. Control delay, s/veh (11, 15, 16). 2. Demand, veh/h (22). 3. Weaving intensity factor calibration constant (24). 4. Mean trip delay, s/person (29). 5. Direction of analysis index (29).
d_1 ..... Uniform delay, s/veh
d_2 ..... Incremental delay, s/veh
d_3 ..... Initial queue delay, s/veh
D_a ..... Mean delay for subject approach, s/veh
d_A ..... Approach delay, s/veh
d_{ad} ..... Acceleration/deceleration correction delay, s
d_b ..... Control delay, s/bicycle
D_c ..... Number of doors per car
d_{CI} ..... Combined interchange delay, s/veh
DDHV ..... Directional design-hour volume, veh/h
DF ..... Adjustment factor for progression to compute zero-flow control delay at signalized intersection
DHV ..... Design-hour volume, bicycles/h
D_i ..... Delay incurred by vehicles in the initial queue, s/veh
d_I ..... Intersection control delay, s/veh
d_i ..... 1. Lane group delay, s/veh (16). 2. Average control delay for Lane Group i, s/veh (26).
$diff_i$ ..... Computed differences for the entry legs
$diff_j$ ..... Computed differences for the exiting legs
d_{INT} ..... Average control delay per vehicle for the interchange, s/veh
D_j ..... Jam density, veh/km or veh/km/ln
d_j ..... 1. Pedestrian control delay at Intersection j, s (18). 2. Average bicycle delay at Intersection j, s (19).

DL ..... Detector length, m
D_I ..... Estimated delay for left turns, s/veh
D_m ..... Delay per person-trip for modal subsystem, s
d_n ..... Distance to subject vehicle n
d_{n-1} ..... Distance from subject vehicle n to vehicle ahead n – 1
D_o ..... 1. Optimum density, veh/km or veh/km/ln (7). 2. Zero-flow control delay at signalized intersection, h (30).
d_p ..... Average pedestrian delay, s
D_p ..... Delay per person-trip for Point p, s
D_{ped} ..... Pedestrian density, p/m^2
DQ ..... Total delay due to excess demand or queuing delay, veh-h
D_R ..... Density of flow within the ramp influence area, pc/km/ln
D_r ..... Estimated delay for right turns, s/veh
d_{rank1} ..... Average control delay to Rank 1 vehicles, s/veh
DS ..... Detector setback, m
D_s ..... 1. Intermediate speed determination variable for diverge area (25). 2. Delay per person-trip for segment, s (28).
d_s ..... 1. Storage density, veh/km/ln (7, 29, 30). 2. Saturated delay, s (16). 3. Deceleration rate, m/s^2, also used as a surrogate for twice the average acceleration from zero to maximum velocity (27).
d_{sep} ..... Average control delay for the separate lane case, s/veh
d_{SH} ..... Average control delay for the shared lane case, s/veh
D_{so} ..... Oversaturation delay corresponding to a zero initial queue, s/veh
D_t ..... Estimated delay for through vehicles, s/veh
d_T ..... Delay for transit passengers, h
du ..... Dwelling unit
d_u ..... Undersaturated delay, s
d_{vq} ..... Time-in-queue per vehicle, s
D_x ..... Delay per person-trip for Segment x, s
E ..... 1. End platoon event time; the time that the dispersing platoon completes passage through the subject two-way stop-controlled intersection. 2. East intersection (26).
e ..... Extension of green time, s
EB ..... Eastbound approach or movement
E_{L1} ..... Through-car equivalents for permitted left turns
E_{L2} ..... Through-car equivalents for opposing movements of permitted left turns
e_o ..... Unit extension time setting, s
E_R ..... Passenger-car equivalent for recreational vehicles
E_T ..... 1. Passenger-car equivalent for heavy vehicles in the lane group (16). 2. Passenger-car equivalent for trucks; sometimes includes buses (20, 21, 22, 23, 24, 25)
E_{TC} ..... Passenger-car equivalent for trucks that use crawl speeds
EW ..... Sum of the volume to saturation flow rate ratio for the critical phase pair for the east-west street
F ..... 1. A parameter for basic dispersion model calculated as $[1 + (t_a)^{-1}]$ (17). 2. Total number of events on the path, events/h (18, 19).
f_A ..... Adjustment to account for effect of access points on base free-flow speed
f_a ..... Adjustment factor for area type
FAR ..... Floor area ratio
f_b ..... Bus-bus interference adjustment factor
$f_{B\%}$ ..... Percentile back of queue factor

f_{bb} ..... Adjustment factor for the blocking effect of local buses that stop within the intersection area
$f_{d/np}$ ..... Adjustment for the combined effect of directional distribution of traffic and the percentage of no-passing zones on percent time-spent-following, %
f_{DL} ..... Planning left-turn adjustment factor
FFS ..... Free-flow speed, km/h
FFS_d ..... Free-flow speed in the analysis direction, km/h
f_G ..... Grade adjustment factor for two-lane highways
f_g ..... Adjustment factor for approach grade
f_{HV} ..... Heavy-vehicle adjustment factor
f_{ID} ..... Adjustment for interchange density, km/h
f_k ..... Impedance adjustment factor
f_l ..... Bus stop location factor for bus lane capacity
f_{LC} ..... Adjustment for lateral clearance, km/h
f_{Lpb} ..... Pedestrian adjustment factor for left-turn movements
f_{LS} ..... Adjustment to base free-flow speed to account for effect of lane width and shoulder width, km/h
f_{LT} ..... Adjustment factor for left turns in the lane group
f_{LU} ..... Adjustment factor for lane utilization
f_{LUo} ..... Lane utilization factor for the opposing flow of permitted left turns
f_{LW} ..... Adjustment for lane width, km/h
F_m ..... Number of opposing events, events/h
f_M ..... Adjustment for median type, km/h
f_m ..... 1. Left-turn adjustment factor applied only to the lane from which left turns are made (16). 2. Mixed traffic adjustment factor (27).
f_{min} ..... Minimum left-turn adjustment factor applied only to the lane from which left turns are made
f_N ..... Adjustment for number of lanes, km/h
f_{np} ..... Adjustment to account for the effect of percentage of no-passing zones on free-flow speed
F_p ..... Number of passing events, events/h
f_p ..... 1. Adjustment factor for the existence of parking lane and parking activity adjacent to the lane group (10, 16). 2. Driver population factor (21, 23, 25, 30). 3. Bus-passing activity factor (27).
f_{PA} ..... Supplemental adjustment factor for platoon arrival during the green
f_{pb} ..... Pedestrian blockage factor, or the proportion of time that one lane on an approach is blocked during one hour
f_{pl} ..... Factor for the effect of a passing lane on percent time-spent-following and average travel time
f_q ..... Queue calibration factor for randomness in arrivals
f_r ..... Right-turn adjustment factor for bus lane capacity
f_{Rpb} ..... Pedestrian/bicycle adjustment factor for right-turn movements
f_{RT} ..... Adjustment factor for right turns in the lane group
f_s ..... Skip-stop speed adjustment factor
f_W ..... Adjustment factor for lane width
f_x ..... A capacity adjustment factor for Movement x that accounts for the impeding effects of higher-ranked movements
G ..... 1. Approach grade, % (16). 2. Green time, s (16). 3. Percent grade divided by 100 (17). 4. Green time for phase, if WALK + FDW is not installed, s (18).
g ..... 1. Effective green time for lane group or for movement, s (15). 2. Effective green time for pedestrians, s (18).
$g(a)$ ..... Gradient of a segment (29)

g_{diff} ..... The larger of (a) the difference between g_q and g_f and (b) zero, s
g_e ..... Extension to the protected green time that occurs while the controller waits for a gap in the arriving traffic long enough to terminate the phase, s
g_{eff} ..... Effective green time of a signalized intersection upstream of a two-way stop-controlled intersection, s
g_f ..... Portion of the green time in which a through vehicle in a shared lane would not be blocked by a left-turn vehicle waiting for the opposing movement to clear, s
G_i ..... Green time, s
g_i ..... Effective green time, s
$G(i,j)$ ..... Gradient matrix for corridor analysis (29)
G_{max} ..... Maximum gradient, or the largest absolute ratio of the gradient to the estimated number of trips (29)
g_o ..... Effective green time for the opposing flow, s
G_p ..... Minimum pedestrian green time, s
g_p ..... Pedestrian green time (Walk + Don't Walk), s
g_{prot} ..... Protected phase effective green time, s
g_q ..... 1. Portion of the permitted green time blocked by a queue of opposing vehicles, s (16). 2. Total time to discharge the queue at a signalized intersection upstream of a two-way stop-controlled intersection, s (17).
g_{q1} ..... The time to discharge the vehicles that arrive during red at a signalized intersection upstream of a two-way stop-controlled intersection, s
g_{q2} ..... The time to discharge the vehicles that arrive during green and join the back of queue at a signalized intersection upstream of a two-way stop-controlled intersection, s
GR ..... Gap reduction rate
g_s ..... Portion of the protected green time required to service the queue of vehicles that accumulated on the previous phase, s
g_u ..... Portion of the permitted green time not blocked by a queue of opposing vehicles, s
H ..... Number of hours in analysis period
h ..... 1. Saturation headway, s (7). 2. Time period index (29).
h ..... hour
h_{adj} ..... Headway adjustment to account for the proportion of left turns, right turns, and heavy vehicles, s
h_{bs} ..... Minimum block-signaled section train headway, s
h_d ..... Departure headway, s
H_i ..... Duration of congestion for Link i, h
h_{min} ..... Minimum train headway, s
h_{os} ..... Minimum on-street section train headway, s
h_s ..... Scheduled headway, s
h_{si} ..... Saturation headway for degree of conflict Case i
h_{st} ..... Minimum single-track section train headway, s
HV ..... Percent heavy vehicles, %
I ..... 1. Incremental delay adjustment for the filtering or metering by upstream signals (10, 15, 16). 2. Survey count interval for field control delay study (16). 3. Adjustment factor for type, intensity, and location of the work activity to compute capacity on freeway facilities, pc/h/ln (22).
i ..... Vehicle movements subscript of Rank 1
I_s ..... Interval between vehicle-in-queue counts, s
IVT ..... In-vehicle time, min

J ..... Calibration parameter
j ..... Vehicle movements subscript of Rank 2
K ..... 1. The proportion of annual average daily traffic occurring in the analysis period. 2. Adjustment factor to utilize bus stops fully in a skip-stop operation (27). 3. Parameter (30).
k ..... 1. Incremental delay adjustment factor for the actuated control (10, 15, 16). 2. Vehicle movements subscript of Rank 3 (17). 3. Constant to adjust degree of conflict case probability to account for interdependence of headways (17).
k_B ..... Second term queued vehicles adjustment factor related to early arrivals
kg ..... kilogram
k_i ..... Sum of known trips originating at i
k_j ..... Sum of known trips destined to j
km ..... kilometer
k_{min} ..... Minimum factor to compute incremental delay adjustment for actuated signal
kW ..... kilowatt
L ..... 1. Length of a highway segment, km (7). 2. Lost time per cycle or total lost time, s (10, 16). 3. Urban street segment or section length, km (15). 4. Crosswalk length, m (16, 18). 5. Length of weaving segment, m (24). 6. Length of the link (i-j) from the upstream stop line to the downstream stop line, m (26). 7. Left-side movement at an interchange (26). 8. Train length, m (27). 9. Analysis section length, km (27). 10. Length of segment, km (29). 11. Link length, km (30).
l ..... 1. Vehicle movements subscript of Rank 4 (17). 2. Queue storage length per vehicle, veh (26). 3. Segment index (29).
L_1 ..... Distance for one-block stop pattern, m
l_1 ..... Start-up lost time, s
L_2 ..... Distance for multiple-block stop pattern, m
l_2 ..... Clearance lost time, s
L_A ..... Total length of the acceleration lane, m
L_a ..... Available queue storage distance, m
L_{A1} ..... Length of first acceleration lane on a two-lane on-ramp, m
L_{A2} ..... Length of second acceleration lane on a two-lane on-ramp, m
L_{aa} ..... Length of added approach lane, km
L_{ad} ..... Length of added departure lane, km
L_{Aeff} ..... Length of effective acceleration lane on a two-lane on-ramp, m
LC_L ..... Width of lateral clearance from the left edge of travel lanes to obstructions in the roadway median, m
LC_R ..... Width of lateral clearance from the right edge of travel lane to roadside obstruction, m
L_D ..... Length of deceleration lane, m
L_d ..... 1. Detector length, m (16). 2. Length of two-lane highway downstream of the passing lane and beyond its effective length, km (20).
L_{D1} ..... Length of first deceleration lane on a two-lane off-ramp, m
L_{D2} ..... Length of second deceleration lane on a two-lane off-ramp, m
L_{de} ..... Downstream length of two-lane highway within the effective length of the passing lane, km
L'_{de} ..... Actual distance from end of passing lane to end of analysis segment, km
L_{Deff} ..... Length of effective deceleration lane on a two-lane on-ramp, m
L_{down} ..... Distance from the subject ramp to the downstream adjacent ramp, m

L_{EQ} ..... Equilibrium distance between upstream or downstream ramp and the subject ramp, m
L_h ..... Average queue spacing in a stationary queue, m
L_i ..... Length of Segment i, m
l_l ..... Total start-up lost time, s
ln ..... lane
L_{pl} ..... Length of the passing lane including tapers, km
L_s ..... Length of left- or right-lane storage bay, m
L_{st} ..... Length of single-track section, m
LT ..... Left turn
L_T ..... Total length of the urban street under analysis, m
L_t ..... Total length of the analysis segment, km
LTC ..... Left-turn vehicles per cycle, veh
L_u ..... Length of two-lane highway upstream of the passing lane, km
L_{up} ..... Distance from the subject ramp to the upstream adjacent ramp, m
L_v ..... Vehicle length, m
LW ..... Lane width, m
M ..... 1. Circulation area per pedestrian or pedestrian space, m^2/p (11, 18). 2. Median type (21). 3. Merge with traffic at an interchange (26).
m ..... 1. Number of vehicles that can be stored in median of intersection during two-stage gap acceptance, veh (17). 2. Move-up time, s (17).
m ..... meter
MF ..... Mainline flow rate, veh/h
min ..... minute
MnA ..... Minimum allowable gap, s
MnV ..... Minimum vehicle phase time, s
M_s ..... Intermediate speed determination variable for merge area
MxG ..... Maximum green time, s
MxI ..... Maximum initial interval, s
N ..... 1. Number of lanes. 2. Last vehicle in queue (7). 3. Number of through lanes at an intersection (15). 4. Number of lanes open through the short-term work zone (22). 5. Total number of lanes in the weaving segment (24). 6. Number of stops or stations in the analysis section (27).
n ..... 1. Number of travel times observed (7). 2. Minimum number of observations to meet accuracy goal of mean (9). 3. Fractional added through lane (10). 4. Maximum number of opposing vehicles that could arrive during g_{diff} (16). 5. Number of vehicles that can be stored in flared right-turn approach, veh (17).
N(i) ..... Node i with the upstream segment numbered segment (i – 1) and the downstream segment numbered (i)
N_B ..... Local buses stopping at intersection, buses/h
NB ..... Northbound approach or movement
N_c ..... 1. Size of typical pedestrian crossing platoon, p (11, 18). 2. Number of cycles surveyed (16). 3. Number of cars per train (27).
N_{cd} ..... Number of channels per door for moving passengers
N_{eb} ..... Number of effective loading areas
N_i ..... Number of analysis subperiods
N_{LG} ..... Number of lanes in the lane group
N_{LT} ..... Number of exclusive left-turn lanes
N_m ..... Parking activity per hour, maneuvers/h
n_{Max} ..... The maximum value of n, the number of vehicles that can be stored in the flared right-turn approach, above which it will operate like a separate lane

N_{nw} ..... Number of lanes used by nonweaving vehicles
N_O ..... Number of outside lanes in one direction (not including acceleration or deceleration lanes or Lanes 1 and 2)
N_o ..... Number of opposing lanes
N_p ..... 1. Spatial distribution of pedestrians, p-m (18). 2. Number of buses making the maneuver from the curb lane to the adjacent lane (27).
N_{ped} ..... Number of pedestrians crossing during an interval, p
N_{rec} ..... Number of cross-street receiving lanes
N_{RT} ..... Number of exclusive right-turn lanes
NS ..... Sum of the volume to saturation flow rate ratio for the critical phase for the north-south street
N_s ..... 1. Number of alternating skip stops in sequence (27). 2. Number of stations on single-track section (27).
N_{TH} ..... Number of through lanes
N_{turn} ..... Number of turning lanes
N_{tv} ..... Number of vehicles during the green phase, veh
N_w ..... Number of lanes used by weaving vehicles if unconstrained operation is to be achieved
$N_w(max)$ ..... Maximum number of lanes that can be used by weaving vehicles for a given configuration
OCC_{bicg} ..... Average bicycle occupancy
OCC_{pedg} ..... Average pedestrian occupancy
OCC_{pedu} ..... Pedestrian occupancy after the opposing queue clears
OCC_r ..... Relevant average pedestrian and bicycle occupancy
$OFRF$ ..... Off-ramp flow rate, veh/h
$ONRF$ ..... On-ramp flow rate, veh/h
OVT ..... Out-of-vehicle travel time, min
P ..... 1. Proportion of all vehicles arriving during green (15, 16, 26). 2. Primary phase (16). 3. Bicycle or pedestrian directional split (19). 4. Maximum single-track capacity in passengers per peak-hour direction (27). 5. Total number of person trips (29). 6. Number of transit passengers onboard, p (29). 7. Length of subperiod, h (30).
p ..... pedestrian, passenger, or person
p ..... Proportion of total flow rate traveling in the subject direction
p' ..... Adjustment to the major-street left turn, minor-street through movement impedance factor
p'' ..... Product of the probabilities of queue-free states of Rank 1 and Rank 2 vehicles
$p^*_{o,x}$ ..... A factor indicating the probability there will be no queue in the shared lane for major-street Movements 1 and 4, where x is the particular movement being considered
P_{15} ..... Passenger volume during the peak 15 min
p_1 ..... First parameter for percentile back of queue factor
p_2 ..... Second parameter for percentile back of queue factor
p_3 ..... Third parameter for percentile back of queue factor
P_a ..... 1. Alighting passengers per bus through the busiest door during the peak 15 min, p (27). 2. Proportion of travelers preferring Option a (28).
P_{adj} ..... Adjusted probability of degree of conflict
P_b ..... Boarding passengers per bus through the busiest door during the peak 15 min, p
$P_{b1}...P_{bn}$ ..... Boarding passenger volume per transit vehicle for each route served by the waiting area during the peak 15 min, p
P_c ..... Maximum allowed passenger load per car, p

pc ..... Passenger car
P_d ..... 1. Transit passenger volume through the busiest door during the peak 15 min, p (27). 2. Number of transit passengers experiencing delay, p (29).
$P[C_i]$ ..... Probability of degree of conflict case C_i
PF ..... Progression adjustment factor
PF_2 ..... Adjustment factor for the effects of progression in the first term queued vehicles
P_{FD} ..... An adjustment factor to compute v_{12} at diverge influence area
P_{FM} ..... An adjustment factor to compute v_{12} at merge influence area
PHD ..... Total person-hours of delay
PHF ..... Peak-hour factor
PHT ..... Person-hours of travel in corridor, veh-h
PHT_f ..... Person-hours of travel under free-flow condition, p-h
PHT_T ..... Person-hours traveled on transit, h
P_{HV} ..... Proportion of heavy vehicles
P_I ..... Proportion of the analysis period for major-street flow Regime i
PkmT ..... Person-kilometers of travel, person-km
P_L ..... Proportion of left-turning vehicles in the shared lane
P_{LT} ..... Proportion of left-turn volume in the lane group
P_{LTA} ..... Proportion of left protected green time to the total left green time
P_{LTo} ..... Proportion of left turns in opposing single-lane approach
P_m ..... Loading level, p/m
P_{ov} ..... Minimum phase time, s
$p_{o,x}$ ..... Probability that conflicting movement x will operate in a queue-free state
P_R ..... Proportion of recreational vehicles in the traffic stream
P_{RT} ..... Proportion of right-turn volume in the lane group
P_{RTA} ..... Proportion of right protected green time to the total right green time
P_T ..... Proportion of trucks in the traffic stream; also can include buses (21)
P_{TC} ..... Proportion of all trucks in the traffic stream that use crawl speeds on a specific downgrade
P_{THo} ..... Proportion of through and right-turning vehicles in opposing single-lane approach
PTSF ..... Percent time-spent-following, %
$PTSF_c$ ..... Percent time-spent-following for all segments combined, %
$PTSF_d$ ..... Percent time-spent-following in the analysis direction, %
$PTSF_{pl}$ ..... Percent time-spent-following for the entire segment including the passing lane, %
$PTSF_x$ ..... Percent time-spent-following for Segment x, %
Q ..... 1. Average number of vehicles in queue, veh (7, 16). 2. Queue left over at end of previous time period, veh (29). 3. Capacity of basic freeway segment, multilane highway, or two-lane highway, pc/h/ln (30).
q ..... Vehicle arrival rate throughout the cycle, veh/s
$Q_{\%}$ ..... Percentile back of queue, veh
Q'_p ..... Queue size at the end of the permitted green period adjusted with sneakers, veh
Q'_t ..... Vehicles arriving at the subject location during Time Slice t
Q_1 ..... First term queued vehicles, veh
Q_2 ..... Second term queued vehicles, veh
Q_{95} ..... 95th-percentile queue at a two-way stop-controlled intersection, veh
Q_a ..... Queue at beginning of a green arrow, veh
q_a ..... Arrival rate, veh/s

Q_b—R_{po}

Q_b ..... Initial queue at the start of the analysis period, veh
Q_{bL} ..... Lane group initial queue at the start of the analysis period per lane, veh
Q_f ..... Left-turn movement free queue or queue size at the end of the interval g_f, veh
Q_g ..... Flow departing from upstream signalized intersection during green phase
q_g ..... Green arrival time, veh/s
Q_{ga} ..... Queue size at the beginning of the protected green (green arrow) period, veh
QL ..... Queue length, km
Q_M ..... Maximum queue length, veh
Q_{ob} ..... Bicycle flow rate in the opposing direction, bicycles/h
Q_p ..... Queue size at the end of the permitted green period, veh
Q_Q ..... Average queue length while queue is present, veh
Q_q ..... Queue size at the end of the interval g_q, veh
Q_r ..... Residual queue or queue at the end of the effective green time, veh
q_r ..... Red arrival time, veh/s
qr_o ..... Opposing queue ratio, the proportion of opposing flow rate originating in opposing queues
Q_{sb} ..... Bicycle flow rate in the same direction, bicycles/h
Q_{sep} ..... Average queue length for the separate lane case for flared right-turn calculations, veh
Q_{SH} ..... Average queue length for the shared-lane case for flared right-turn calculations, veh
Q_t ..... Vehicles departing from an upstream signalized intersection during time slice t
Q_{tco} ..... Total time spent by pedestrians waiting to cross the minor street during one cycle, p-s
Q_{tdo} ..... Total time spent by pedestrians waiting to cross the major street during one cycle, p-s
Q_u ..... Queue at beginning of unsaturated green, veh
$Queue(0)$ ..... Initial queue remaining from the preceding time period
R ..... 1. Radius of corner curb, m (18). 2. Adjustment for ramps to compute capacity on freeway facilities, veh/h (22). 3. Weaving ratio; the ratio of the smaller weaving flow to total flow in the weaving segment (24). 4. Right-side movement at an interchange (26). 5. Segment traversal time, h (29). 6. Link traversal time, h (30). 7. Parameter (30).
r ..... 1. Effective red time, s (7, 10, 16). 2. Segment rank used in algorithms to adjust for excess demand (29). 3. Ratio of off-peak demand to peak demand rate (30).
R_c ..... Link traversal time when demand equals capacity, h
R_d ..... Ratio of busiest door usage to average door usage
R_f ..... Segment free-flow traversal time, h
R_i ..... 1. Ratio of desired to actual entering volume for Entry Leg i (10). 2. Red time, s (10).
r_j ..... Effective red time, s
R_j ..... Ratio of desired to actual exiting volume for Exit Leg j
R_{mi} ..... The minor-street red phase, or the Don't Walk phase for pedestrian signals, s
R_{mj} ..... The major-street red phase, or the Don't Walk phase for pedestrian signals, s
R_o ..... Link travel time at free-flow link speed, h
R_p ..... Platoon ratio
R_{po} ..... Platoon ratio for the opposing flow based on opposing arrival type

R_Q ..... Average queue storage ratio
r_q ..... Queue at the end of effective red time, veh
$R_{Q\%}$ ..... Percentile queue storage ratio
RS ..... Reference sum flow rate, veh/h
RT ..... Right turn
RTOR ..... Right turn on red
S ..... 1. Average travel speed, km/h (7). 2. Pedestrian speed, m/min (18). 3. Average passenger-car travel speed, km/h (21, 23). 4. Space mean speed of all vehicles in the weaving segment, km/h (24). 5. Space mean speed of the ramp influence area, km/h (25). 6. Mean segment speed, km/h (29). 7. Link speed, km/h (30).
s ..... 1. Saturation flow rate, veh/h or veh/h/ln. 2. Estimated standard deviation for the sample (9). 3. Adjusted saturation flow per through lane, veh/h (15).
s ..... second
S_A ..... 1. Average travel speed of through vehicles in the segment or the entire section, km/h (15). 2. Approach speed at a signalized intersection, km/h (16). 3. Average pedestrian travel speed, m/s (18).
S_{ats} ..... Bicycle travel speed, km/h
SB ..... Southbound approach or movement
S_b ..... Mean bicycle speed on the path, m/s
s_b ..... Saturation flow rate of the bicycle lane, bicycles/h
SC ..... Urban street class
S_f ..... 1. Speed for a given flow rate, km/h (7). 2. Free-flow speed of train, km/h (27). 3. Segment free-flow speed, km/h (29).
S_{FF} ..... Free-flow speed of the freeway approaching the merge or diverge area, km/h
S_{FM} ..... Mean speed of traffic measured in the field, km/h
S_{FR} ..... The free-flow speed of the ramp at the point of the merge area, km/h
S_{FT} ..... Free-flow speed of transit on facility, km/h
S_i ..... 1. Pedestrian walking speed over Segment i, m-s (18). 2. Bicycle running speed over Segment i, km/h (19). 3. Mean speed of Link i, km/h (30).
s_i ..... Saturation flow rate, veh/h
SL ..... Urban street section length, km
s_L ..... Lane group saturation flow rate, veh/h
s_l ..... Adjusted saturation flow rate per lane, veh/h
s_{LT} ..... Filter saturation flow rate of permitted left turns, veh/h/ln
SM ..... Speed margin (constant)
S_{max} ..... 1. Maximum speed reached, m/s (11). 2. Maximum speed expected in a weaving segment, km/h (24).
S_{min} ..... Minimum speed expected in a weaving segment, km/h
s_N ..... Northbound approach service time to all-way stop-controlled intersection, s
S_{nw} ..... Space mean speed of nonweaving vehicles in the weaving segment, km/h
S_O ..... 1. Space mean speed of vehicles traveling in outer lanes, km/h (25). 2. Base bus speed, km/h (27).
S_o ..... 1. Optimum speed, km/h (7). 2. Link free-flow speed, km/h (30).
s_o ..... Base saturation flow rate, pc/h/ln
S_p ..... Average pedestrian speed, m/s; mean pedestrian speed on the path, m/s (18)
s_p ..... Protected phase departure rate, veh/s
S_{ped} ..... Pedestrian speed, m/min

S_{prog} ..... Platoon speed from upstream signalized intersection to two-way stop-controlled intersection, m/s
S_R ..... 1. Space mean speed, km/h (7). 2. Space mean speed of vehicles within the ramp influence area, km/h (25).
s_s ..... Permitted phase departure rate, veh/s
S_T ..... 1. Time mean speed, km/h (7). 2. Actual speed of transit on facility including all delays, km/h (29).
ST ..... Urban street section (or segment) travel time, s
S_t ..... 1. Bus travel speed, km/h (27). 2. Train travel speed, km/h (27).
s_{TH} ..... Saturation flow rate of through traffic, veh/h/ln
s_W ..... 1. Westbound approach service time to all-way stop-controlled intersection, s (17). 2. Space mean speed of weaving vehicles in the weaving segment, km/h (24).
T ..... 1. Duration of analysis period, h. 2. Total crosswalk occupancy time, p-s (18). 3. Through movement (26). 4. Maximum number of trains per hour (27). 5. Duration of analysis subperiod, h (29). 6. The expected duration of the demand, h (30).
t ..... 1. Duration of initial queue in the analysis period, h (16). 2. Total crossing time for pedestrians, s (18). 3. Mean trip time, min/p (29).
t' ..... Length of time during which dispersing platoon passes the subject two-way stop-controlled intersection
$t_{3,LT}$ ..... Critical gap adjustment factor for intersection geometry (T-intersection)
t_a ..... 1. Average travel time over a length of a highway segment, h (7). 2. Travel time from the upstream signalized intersection to the subject two-way stop-controlled intersection, s (17). 3. Passenger alighting time, s/p (27).
t_b ..... Passenger boarding time, s/p
t_{br} ..... Operator and braking system reaction time, s
T_c ..... Time to clear initial queue present at the start of analysis period, s
t_c ..... 1. Single pedestrian critical gap, s (11, 18). 2. Vehicular critical gap time at a two-way stop-controlled intersection, s (17). 3. Clearance time between successive buses or trains, s (27).
$t_{c,base}$ ..... Base critical gap, s
$t_{c,G}$ ..... Critical gap adjustment for approach grade, s
$t_{c,HV}$ ..... Critical gap adjustment for heavy vehicles, s
$t_{c,T}$ ..... Critical gap adjustment for each part of a two-stage gap acceptance process
t_d ..... Dwell time, s
t_f ..... Follow-up time, or the time span between the departure of one vehicle from the minor street and the departure of the next vehicle, s
$t_{f,base}$ ..... Base follow-up time, s
$t_{f,HV}$ ..... Follow-up time adjustment for heavy vehicles, s
t_G ..... Group critical gap, s
TH ..... Through
T_i ..... Number of trips originating at Point i
t_i ..... 1. Travel time of the ith vehicle to traverse the section, h (7). 2. Start-up lost time for ith vehicle, s (7).
T_{ij} ..... Number of trips going from Origin Point i to Destination Point j
T'_{ij} ..... Estimated number of trips between Origin Zone i and Destination Zone j (29)
T_j ..... Number of trips leaving Destination j
t_{jl} ..... Jerk limiting time, s
TL ..... Total intersection lost time, s

t_L ..... Lost time per phase or movement lost time, s
TLC ..... Total lateral clearance, m
t_o ..... Time duration the detector is occupied by a passing vehicle, s
t_{oc} ..... Door opening and closing time, s
t_{om} ..... Operating margin time, s
T_p ..... Number of person-trips using Point p
t_{pf} ..... Passenger flow time, s/p
$t_{p,i}$ ..... Duration of the blocked period for either the through movement or the protected left-turn movement to a two-way stop-controlled intersection, s
t_Q ..... Time duration of queue, s
T_R ..... Total running time on all segments, in a defined urban street section, s
t_r ..... Running time, s
$t_{r,0}$ ..... Base bus running time, min/km
$t_{r,1}$ ..... Bus running time losses, min/km
TS ..... Available time-space, m^2-s
T_s ..... Number of person-trips using Segment s
t_s ..... 1. Service time, s (17). 2. Pedestrian start-up time, s (11, 18).
TS_c ..... Total time-space available for circulating pedestrians, m^2-s
TS_E ..... Effective time-space, m^2-s
t_{st} ..... Time to cover single-track section, s
TS_{tv} ..... Time-space occupied by turning vehicles, m^2-s
TT ..... Urban street field travel time, s
T_t ..... Platoon travel time from upstream signalized intersection to subject two-way stop-controlled intersection, s
t_t ..... Total travel time, s
TT_{15} ..... Total travel time for all vehicles on the analysis segment during the peak 15-min period, veh-h
TT_x ..... Total travel time for Segment x, veh-h
$TWLTL$ ..... Two-way left-turn lane
T_x ..... Number of person-trips using Segment x
U ..... Movement at an upstream intersection
u ..... Initial queue delay parameter
U_a ..... Utility function valued for Option a
U_j ..... Utility function valued for Option j
$Utility$ ..... Measure of the traveler's perceived value of an alternative
V ..... Hourly volume, veh/h or veh/h/ln
v ..... 1. Vehicular flow rate for peak 15-min period, veh/h or veh/h/ln. 2. Pedestrian unit flow rate, p/min/m (18). 3. Pedestrian volume on the subject roadway, p/15-min (18). 4. Total bicycle flow rate, both directions, bicycles/h (19). 5. Arrival flow rate at the downstream intersection, veh/h (26). 6. Demand rate for current time period (29).
v_5 ..... Anticipated approach flow rate in Lane 5 of the freeway, pc/h
v_{12} ..... Flow rate entering Lanes 1 and 2 immediately upstream of the merge influence area or at the beginning of the deceleration lane in the diverge influence area, pc/h
V_{15} ..... Volume during the peak 15 min of the peak hour, veh/15-min
v_{15} ..... Peak 15-min pedestrian flow rate, p/15-min
$v(a)$ ..... Counted volume for Segment a
$v'(a)$ ..... Estimated volume for Segment a
v_A ..... Approach flow rate, veh/h
v_a ..... Approach flow rate at roundabouts, veh/h
V_b ..... Bicycle hourly volume, bicycles/h
v_b ..... 1. Bicycle flow rate, bicycles/h (19). 2. Bus flow rate, buses/h (27).

v_{bic} ..... Approach bicycle volume, bicycles/h
v_{bicg} ..... Bicycle flow rate during the green interval for 1 h, bicycles/h
v_{bo} ..... Flow rate of bicycles in the opposing direction, bicycles/h
v_{bs} ..... Flow rate of bicycles in the subject direction, bicycles/h
v/c ..... Volume to capacity ratio
v_c ..... Circulating flow rate at roundabouts, veh/h
V_{CL} ..... Critical lane flow rate, veh/h
v_{co} ..... Number of pedestrians waiting to cross the minor street during one cycle, p/cycle
$v_{c,x}$ ..... The conflicting flow rate for Movement x, that is, the total flow rate conflicting with Movement x, veh/h or p/h
v_D ..... Total flow rate on the downstream adjacent ramp from the subject ramp, pc/h
v_d ..... Passenger-car equivalent flow rate for the peak 15-min period in the analysis direction, pc/h
v_{do} ..... Number of pedestrians waiting to cross the major street during one cycle, p/cycle
veh ..... vehicle
v_{ep} ..... Flow rate in the separate lanes on minor street approach; used to compute capacity for flared right-turn approach
V_f ..... Observed flow rate for the period when field data were obtained, veh/h
v_F ..... Maximum total flow rate approaching a merge or diverge area on the freeway, pc/h or pc/h/ln
v_{F4eff} ..... Effective approaching flow rate for a four-lane freeway segment, pc/h
v_{FO} ..... Maximum total flow rate departing from a merge or diverge area on the freeway, pc/h
v_g ..... Unadjusted flow rate for the lane group, veh/h
v_{g1} ..... Unadjusted flow rate on the single lane in the lane group with the highest volume
VHD ..... Vehicle-hours of delay, h
VHT ..... Vehicle-hours of travel, veh-h
v_i ..... 1. Adjusted flow rate for Lane Group i, veh/h (10). 2. Incoming pedestrian volume for the subject crosswalk, p/cycle (18). 3. Flow rate for Movement i under base conditions during peak 15 min, pc/h (25). 4. Demand flow rate for Lane Group i, veh/h (26).
V_{iq} ..... Total vehicles in queue for field control delay study
$VkmT$ ..... Vehicle-kilometers of travel, veh-km
$VkmT_{15}$ ..... Total travel on the analysis segment during the peak 15-min period, veh-km
$VkmT_{60}$ ..... Total travel on the analysis segment during the peak hour, veh-km
$VkmT_x$ ..... Total travel for Segment x, veh-km
V_L ..... Left-turn movement volume, veh/h
v_L ..... 1. Lane group flow rate per lane, veh/h (16). 2. Minor left-turn flow rate, veh/h (17).
v_l ..... Lane group flow rate including initial queue, veh/h
v_{LS} ..... Left-turn movement maximum sneakers, veh
V_{LT} ..... Left volume per lane, veh/h/ln
v_{LT} ..... Adjusted left-turn flow rate, veh/h
v_m ..... Maximum flow rate, veh/h or veh/h/ln
V_n ..... Desired speed for Vehicle n
$v_n(t)$ ..... Speed of nth vehicle at time t
V_{n-1} ..... Vehicle ahead of subject Vehicle n
v_{nw} ..... Total nonweaving flow in the weaving segment, pc/h

V_o ..... Demand volume for the full peak hour in the opposing direction of travel, veh/h
v_o ..... 1. Opposing flow rate for permitted left turns, veh/h (16). 2. Outgoing pedestrian volume for the subject crosswalk, p/cycle (18). 3. Flow rate of bicycles in the opposing direction, bicycles/h (19). 4. Passenger-car equivalent flow rate for the peak 15-min period in the opposing direction of travel, pc/h (20). 5. Sum of approach volumes on nonsubject approaches, veh/h (30).
v_{o1} ..... Larger of the two outer, or nonweaving, flows in the weaving segment, pc/h
v_{o2} ..... Smaller of the two outer, or nonweaving, flows in the weaving segment, pc/h
v_{OA} ..... Average per lane demand related to flow in the outer lanes, pc/h/ln
v_{oe} ..... Effective opposing flow rate, veh/h
v_{olc} ..... Adjusted opposing flow rate per lane per cycle, veh
v_p ..... 1. Pedestrian flow rate, p/s (11). 2. Pedestrian unit flow rate, p/min/m (18). 3. Peak 15-min passenger-car equivalent flow rate, pc/h/ln (20, 21, 23, 24, 25).
v_{ped} ..... 1. Unit flow rate, p/min/m (11). 2. Conflicting pedestrian flow rate, p/h (16).
v_{pedg} ..... Pedestrian flow rate during the green interval for 1 h, p/h
v_{po} ..... Flow rate of pedestrians in the opposing direction, p/h
v_{prog} ..... Progressed flow rate from upstream signalized intersection to compute the effect of upstream signals
v_{ps} ..... Flow rate of pedestrians in the subject direction, p/h
V_R ..... Right-turn movement volume, veh/h
VR ..... Volume ratio; the ratio of weaving to total flow in the weaving segment
v_R ..... Total ramp flow rate, pc/h
v_r ..... Volume of right turns at a specific intersection, veh/h
v_{R12} ..... Maximum total flow entering the ramp influence area, pc/h
V_{RT} ..... Right-turn volume per lane, veh/h/ln
v_s ..... Flow rate of bicycles in the subject direction, bicycles/h
v_{SH} ..... Flow rate in the shared lanes; used to compute capacity for flared right-turn approach
V_{stop} ..... Stopped vehicles count for field control delay study
V_T ..... Through movement volume, veh/h
V_{TH} ..... Through volume per lane, veh/h/ln
V_{tot} ..... 1. Total approach volume, veh/h (10). 2. Total vehicles arriving for field control delay study (16).
v_{tot} ..... Total number of circulating pedestrians in one cycle, p/cycle
v_U ..... Total flow rate on the adjacent upstream ramp from the subject ramp, pc/h
v_w ..... Total weaving flow in the weaving segment, pc/h
v_{w1} ..... Larger of the two weaving flows in the weaving segment, pc/h
v_{w2} ..... Smaller of the two weaving flows in the weaving segment, pc/h
v_x ..... The flow rate for Movement x for vehicular flows and pedestrian flows, veh/h or p/h
W ..... 1. Average lane width, m. 2. Effective width of sidewalk, m (18). 2. West intersection (26).
w ..... Lane width, m
$WALK + FDW$ ..... Effective pedestrian green time at a signalized intersection, s
WB ..... Westbound approach or movement
WDW ..... Pedestrian Walk plus flashing Don't Walk, s
W_E ..... Effective walkway width, m

W_{nw}—φ

W_{nw} ..... Weaving intensity factor for prediction of nonweaving speed
W_o ..... Sum of widths and shy distances from obstructions on the walkway, m
W_T ..... Total walkway width, m
W_w ..... Weaving intensity factor for prediction of weaving speed
X ..... Volume to capacity ratio
x ..... 1. Mean arrival rate, veh/h (7). 2. Degree of utilization, or $vh_d/3600$ (17).
$\bar{x}$ ..... The mean value of the observation
X_b ..... Volume to capacity ratio of bicycle lanes (also termed degree of saturation)
X_c ..... Critical volume to capacity ratio for the intersection
X_{cm} ..... Critical volume to capacity ratio for planning procedure
x_i ..... The ith observation of the value
$x_n(t)$ ..... Position of nth vehicle at time t
X_{perm} ..... Permitted phase volume to capacity ratio for leading or lagging left-turn movement with protected-plus-permitted phase
X_{prot} ..... Protected phase volume to capacity ratio for leading or lagging left-turn movement with protected-plus-permitted phase
X_u ..... Degree of saturation at upstream intersection
Y ..... Yellow plus all-red change and clearance interval (intergreen), s
y ..... Mean service rate, veh/h
Y_c ..... Sum of flow ratios for critical lane groups
Y_i ..... Change and clearance interval time, s
z ..... Subject approach volume divided by 1000, veh/h/1000
Z_a ..... The area under one tail of the normal curve beyond the acceptable levels of probability that a queue will form at a bus stop (27), or failure rate (29)
α ..... 1. Platoon dispersion factor (17). 2. Constant to adjust degree of conflict case probability to account for interdependence of headways (17).
β ..... Dispersion factor, or $(1 + \alpha)^{-1}$
Δ ..... Minimum arrival (intrabunch) headway, s
Δt ..... Time interval or duration of one time step
Δv ..... Amount of change in speed
$\delta t / \delta x$ ..... First derivative of travel time with respect to volume to capacity ratio
θ_{ij} ..... Offset between through movements at Intersections i and j at interchange ramp terminal, s
λ ..... Parameter for computing green extension time, veh/s
λ_x ..... Arrival rate for approach or Lane x
ξ ..... Maximum desirable error in the estimate of the mean
φ ..... Proportion of free (unbunched) vehicles