

Memorandum

City of San Mateo
 Director of Public Works
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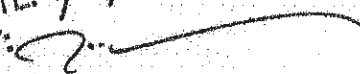
Date: January 21, 2015

To: Officer Matthew Pangalos
 San Mateo Police Department

From: Gary Heap, Engineering Manager ~~GA~~

Cc: Tracy Scramaglia, Senior Engineer
 Trieu Tran, Assistant Engineer
 Tom Farrankop, Engineering Technician II
 Chron/File

Re: **AMBER LIGHT TIMINGS**

... POLICE DEPT.
 RECEIVED
 DATE: 1/23/15
 BY: 

The City of San Mateo Department of Public Works Traffic Engineering Division hereby certifies that the amber timing set in the traffic signal controller at the following locations meet or exceed the minimum amber light change interval timing as specified in Section 4D.26 and Table 4D-102(CA) (see attachment) of the 2014 California MUTCD (FHWA's MUTCD 2009, as amended for use in California). Additionally, Section 4D.26 also states that the values as shown in Table 4D-102(CA) shall be used for the determination of the minimum amber light change interval for through movements. Any protected left-turn or right-turn phases shall have a minimum amber light change interval of 3.0 seconds.

The current amber timings are as follows:

Intersection	Direction	Movement	Posted Speed Limit	Existing Interval
E. Hillsdale/Saratoga	NB	Through	30 mph	3.2 sec
● E. Hillsdale/Saratoga	EB*	Left	35 mph	3.2 sec
E. Hillsdale/Saratoga	EB*	Through	35 mph	3.8 sec
● E. Hillsdale/Saratoga	SB*	Through	30 mph	3.4 sec
E. Hillsdale/Saratoga	WB	Left	35 mph	3.2 sec
E. Hillsdale/Saratoga	WB	Through	35 mph	3.8 sec
E. Hillsdale/S. Norfolk	NB	Through	25 mph	3.0 sec
● E. Hillsdale/S. Norfolk	EB*	Left	35 mph	3.2 sec
● E. Hillsdale/S. Norfolk	EB*	Through	35 mph	3.8 sec
E. Hillsdale/S. Norfolk	SB	Through	25 mph	3.0 sec
● E. Hillsdale/S. Norfolk	WB*	Left	35 mph	3.2 sec
● E. Hillsdale/S. Norfolk	WB*	Through	35 mph	3.8 sec
E. 4 th /S. Humboldt	NB	Through	25 mph	3.0 sec
● E. 4 th /S. Humboldt	EB*	Through	30 mph	3.6 sec
E. 4 th /S. Humboldt	SB	Through	25 mph	3.0 sec

* Denotes movement monitored by red-light cameras

C. If the approach has one or more exclusive turn lanes in addition to the shared left-turn/right-turn lane and there is a conflict with a signalized vehicular or pedestrian movement, and flashing YELLOW ARROW signal indications are used in place of CIRCULAR GREEN signal indications on the approach, the signal faces for the approach shall be as described in Items B.1 and B.2, except that flashing YELLOW ARROW signal indications shall be used in place of the GREEN ARROW signal indications for the turning movement(s) that conflicts with the signalized vehicular or pedestrian movement.

Support:

05 Figure 4D-20 illustrates application of these Standards on approaches that have only a shared left-turn/right-turn lane, and on approaches that have one or more exclusive turn lanes in addition to the shared left-turn/right-turn lane.

Option:

06 If the lane-use regulations on an approach are variable such that at certain times all of the lanes on the approach are designated as exclusive turn lanes and no lane is designated as a shared left-turn/right-turn lane:

- A. During the times that no lane is designated as a shared left-turn/right-turn lane, the left-turn and right-turn movements may start and terminate independently, and the left-turn and right-turn movements may be operated in one or more of the modes of operation as described in Sections 4D.17 through 4D.24; and
- B. If a protected-permissive mode is used, the shared left-turn/right-turn signal face provided in Paragraph 4 may be modified to include a dual-arrow signal section capable of displaying both a GREEN ARROW signal indication and a flashing YELLOW ARROW signal indication for a turn movement(s) in order to not exceed the maximum of five sections per signal face provided in Section 4D.08.

Section 4D.26 Yellow Change and Red Clearance Intervals

Standard:

01 A steady yellow signal indication shall be displayed following every CIRCULAR GREEN or GREEN ARROW signal indication and following every flashing YELLOW ARROW or flashing RED ARROW signal indication displayed as a part of a steady mode operation. This requirement shall not apply when a CIRCULAR GREEN, a flashing YELLOW ARROW, or a flashing RED ARROW signal indication is followed immediately by a GREEN ARROW signal indication.

02 The exclusive function of the yellow change interval shall be to warn traffic of an impending change in the right-of-way assignment.

03 The duration of the yellow change interval shall be determined using engineering practices.

Support:

04 Section 4D.05 contains provisions regarding the display of steady CIRCULAR YELLOW signal indications to approaches from which drivers are allowed to make permissive left turns.

Guidance:

05 When indicated by the application of engineering practices, the yellow change interval should be followed by a red clearance interval to provide additional time before conflicting traffic movements, including pedestrians, are released.

Standard:

06 When used, the duration of the red clearance interval shall be determined using engineering practices.

Support:

07 Engineering practices for determining the duration of yellow change and red clearance intervals can be found in ITE's "Traffic Control Devices Handbook" and in ITE's "Manual of Traffic Signal Design" (see Section 1A.11).

Standard:

08 The durations of yellow change intervals and red clearance intervals shall be consistent with the determined values within the technical capabilities of the controller unit.

09 The duration of a yellow change interval shall not vary on a cycle-by-cycle basis within the same signal timing plan.

10 Except as provided in Paragraph 12, the duration of a red clearance interval shall not be decreased or omitted on a cycle-by-cycle basis within the same signal timing plan.

Table 4D-102 (CA). Minimum Yellow Change Interval Timing

Yellow Time = $\frac{\text{Detector Setback Distance}}{\text{Speed}}$

$T = \frac{D}{V}$ = The minimum yellow change interval (sec)

V = Speed (ft/sec)

d = Deceleration Rate (10 ft/sec²)

t_R = Reaction Time (1 sec)

Reaction Distance = Vt_R

Deceleration Distance = $\frac{1}{2}dt^2$ or $\frac{1}{2}Vt$ or $\frac{V^2}{2d}$

D = Detector Setback = Deceleration Distance + Reaction Distance = $\frac{V^2}{2d} + Vt_R$

$$T = \frac{\frac{V^2}{2d} + Vt_R}{V}$$

$$T = \frac{V}{2d} + t_R$$

a - For Speed determined by 85th Percentile

SPEED (Determined by 85th Percentile Speed)*	MINIMUM YELLOW INTERVAL
mph	Seconds
25 or less	3.0
30	3.2
35	3.6
40	3.9
45	4.3
50	4.7
55	5.0
60	5.4
65	5.8

*See Section 4D.23 Standard under paragraph 14b

b - For Posted or Prima Facie Speed

POSTED SPEED or UNPOSTED PRIMA FACIE SPEED	MINIMUM YELLOW INTERVAL*	MINIMUM YELLOW INTERVAL*
mph	Seconds	Seconds
15	N/A	3.0
20	N/A	3.2
25	N/A	3.6
30	3.7	N/A
35	4.1	N/A
40	4.4	N/A
45	4.8	N/A
50	5.2	N/A
55	5.5	N/A
60 or higher	5.9	N/A

*Speed values for Table 4D-102b (CA) are inclusive of the 7 MPH added for speeds equal to 30 MPH or higher and 10 MPH for speeds equal to or lower than 25 MPH for determining the minimum values of the yellow intervals.