Notice to Suffolk County

Suffolk County is in violation of Title 7, Article 24, § 1115-b*5 (o).

We hereby affirm to the best of our knowledge, that all certificates dispensed by the Suffolk County photo-enforcement program or by the police to vehicle owners or drivers over the matter of red light violations are null and void. The yellow traffic signal indication has been malfunctioning since the erection of the traffic signal. These malfunctions cause reasonably-perceptive drivers to inadvertently run red lights for common speed limits.

"It shall be a defense to any prosecution for a violation of subdivision (d) of § 1111 of this article pursuant to a local law or ordinance adopted pursuant to this section that such traffic-control indications were malfunctioning at the time of the alleged violation."

Definition of Malfunction: Literally "bad function". mal – function; mal: bad, badly, **wrong**
In Context of Ordinance: The malfunction causes a person to violate **§ 1115-b*5** inadvertently

---

1. Your traffic engineers use the **malfunction *Y()*** to set the yellow indication change interval **Y** causing drivers to run red lights inadvertently:

$$Y = t_p + \left[\frac{v}{2a + 2\mathrm{G}g}\right]$$

The correct function is:

$$Y_{mia} = t_p + \frac{v_c}{[a + \Gamma]} \quad \Gamma = \begin{cases} gsin(\tan^{-1} G), & G \leq -0.1 \\ gG, & -0.1 < G < 0 \\ 0, & G \geq 0 \end{cases}$$

By using the malfunction, even though it is the federal guideline, traffic engineers consider only drivers going straight through the intersection. Traffic engineers neglect turning and impeded drivers. The malfunction causes turning and impeded drivers to inadvertently run red lights. The malfunction can short a left-turn yellow by 3 seconds on a 45 mph level road. The malfunction can short a straight-through yellow by 3 seconds on a 45 mph level road if the approaching driver has to slow down for a car entering the roadway from a business or side-street, a pedestrian or any obstacle in front of him.

---

2. Your traffic engineers use the **malfunction *v()*** to set the velocity of turning vehicles approaching the intersection.

$$\boldsymbol{v = 20\ mph}, \text{for protected left and right turn lanes}$$

Traffic engineers in Suffolk County use approximately 20 mph to plug into the Y malfunction for protected left or right turn lanes. This results in a yellow change interval of 3 seconds. By setting v to 20 mph, the traffic engineers give all approaching drivers the stopping distance of a 20 mph car. That is 90 feet or 5 car lengths. To stop from 45 mph within 90 feet is physically beyond the emergency braking capabilities of any vehicle. Engineers apply this v() malfunction to the yellow change interval malfunction Y()—a double error.

The correct function is:

$$\boldsymbol{v \geq speed\ limit, and}\ \text{preferably the 85th pecentile as measured at the critical distance}$$

The function of the critical distance **c** is:

$$\boldsymbol{c = t_p v_c + \frac{v_c^2}{2[a + \Gamma]}} \quad \boldsymbol{\Gamma = \begin{cases} gsin(\tan^{-1} G), & G \leq -0.1 \\ gG, & -0.1 < G < 0 \\ 0, & G \geq 0 \end{cases}}$$

All drivers are allowed to go the speed limit regardless of lane. Setting v lower than the speed limit withholds the necessary warning a law-abiding citizen needs to stop from the speed limit.

---

3. Your traffic engineers use **malfunction t_p()** to the set the perception-reaction time (P-R) of a driver.

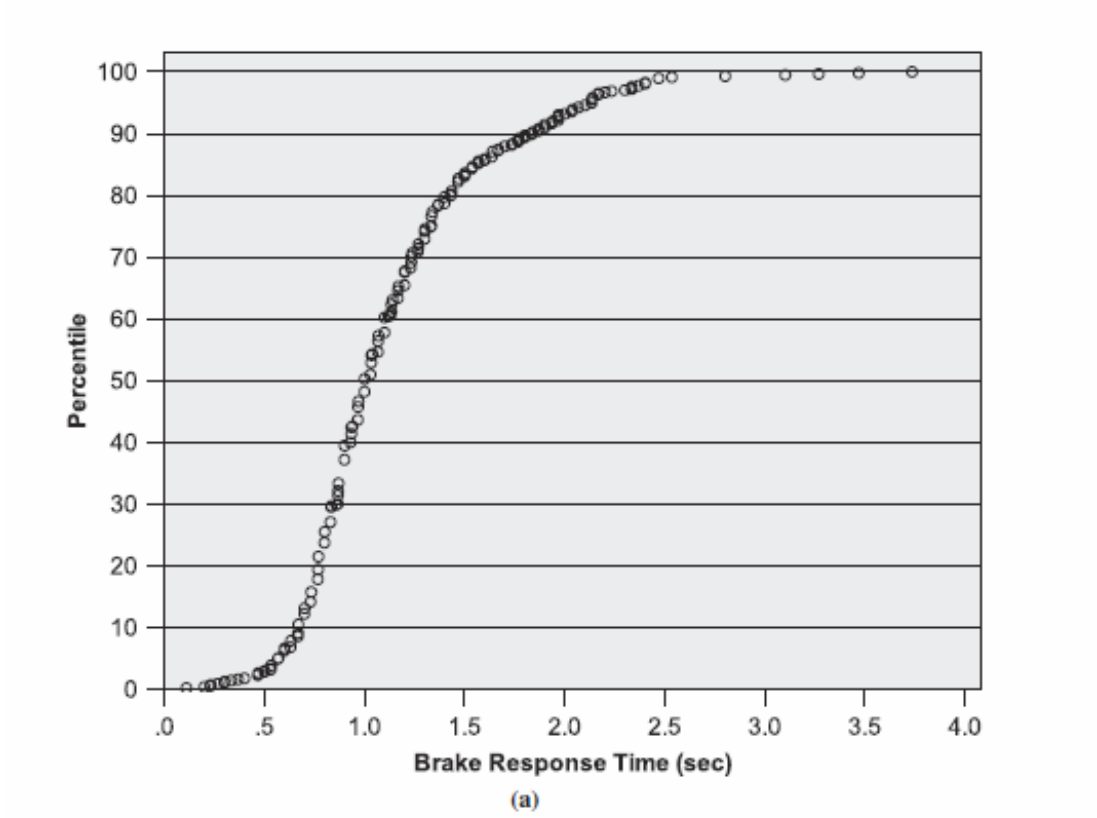
$$\boldsymbol{t_p = 50th\ percentile}, \text{typically 1 second}$$

Traffic engineers use the average perception-reaction time among all drivers for the simplest intersection. That practice is analogous to a structural engineer designing a bridge to sustain only the average weight passenger car.

The correct function is this:

$$\boldsymbol{t_p = max\ PR\ time}, \text{typically 2.5 seconds}$$

The following is the graph of the empirical data from Gates, Dilemma Zone Driver Behavior as a Function of Vehicle Type, Time of Day and Platooning, *Transportation Research Record: Journal of the Transportation Research Board, No. 2149,* Transportation Research Board of the National Academies, Washington, D.C., 2010, .p. 87.



Gates is measuring the P-R time by measuring how long it takes from the light turning yellow to the brake light coming on. "Brake-response" is the way traffic engineers measure "perception-reaction" time for braking scenarios.

Within the graph are both passenger and commercial vehicle drivers. Commercial drivers as a demographic require more P-R time, not less, than passenger car drivers.

TABLE 3 Brake Response Time Descriptive Statistics and Results of Statistical Analysis

Factor	Level	Count	Mean (s)	SD	Percentiles (s) 15th	50th	85th
Vehicle type	Car	315	1.17	0.50	0.77	1.03	1.64
	Light truck	226	1.08	0.46	0.70	0.97	1.47
	Single-unit truck	23	1.17	0.50	0.59	1.10	1.65
	Tractor trailer	8	1.18	0.61	0.57	1.02	2.13
Time of day	Peak	228	1.17	0.51	0.77	1.07	1.61
	Off-peak	344	1.11	0.47	0.72	1.00	1.54
Platoon	Platooned	185	1.14	0.47	0.77	1.03	1.60
	Not platooned	387	1.13	0.49	0.73	1.00	1.57
Speed			Not applicable				
Travel time to intersection			Not applicable				
Deceleration rate			Not applicable				
Full model[b]	All data	572	1.13	0.48	0.73	1.00	1.57

Traffic engineers assume that commercial drivers need less P-R time than a passenger car driver, citing without proof that "commercial drivers are more experienced."

In addition to more P-R time, commerical truck drivers require 0.5 seconds for air-brake pressurization time. Traffic engineers neglect that requirement too.

In addition to the deceleration malfunction, the malfunction for perception-reaction time on the part of traffic engineers is a reason why Suffolk County tickets and puts in danger a disproportionate number of commercial vehicles as seen in Suffolk County's red light camera videos. While only 1 in 100 vehicles is a commercial vehicle, half of the clips in Suffolk County's video show commercial vehicles running the red lights. The video demonstrates Timothy Gates' conclusion.

---

4. Your traffic engineers use the **malfunction a()** to the set the "safe and comfortable" deceleration of a vehicle.

$$\boldsymbol{a} = \textbf{50th percentile}, \text{typically } 10 \text{ ft}/s^2$$

When **a** = 10 ft/s^2, traffic engineers use the 50th percentile safe and comfortable deceleration for a passenger car. The smaller the value for a, the slower the vehicle's comfortable deceleration.

The correct function is this:

$$\boldsymbol{a} = \boldsymbol{min}, \text{typically } 7.0 \text{ ft}/s^2$$

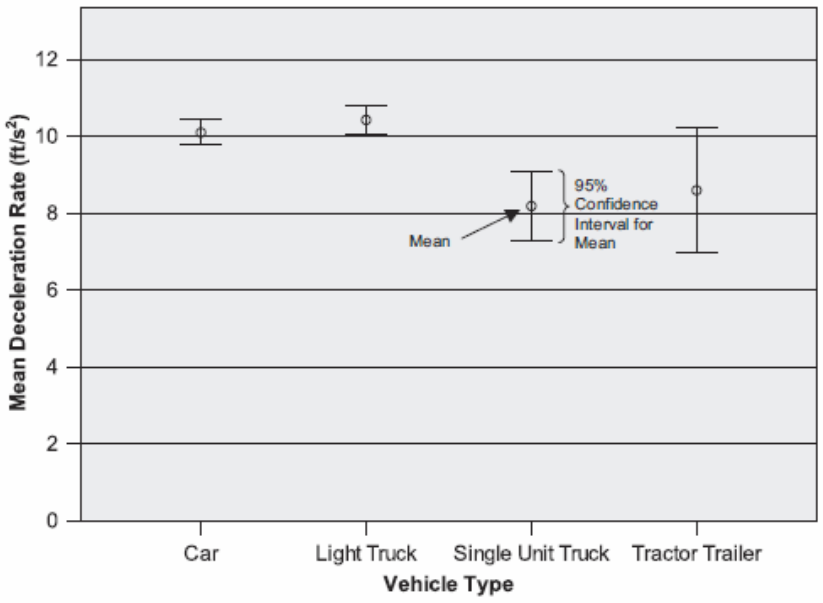


FIGURE 4 Mean and 95% confidence interval for deceleration rate by vehicle type.

---

5. Your traffic engineers use the **malfunction D()** to the set the delay-time for red light camera system.

$$\boldsymbol{D = 0}$$

A red light running event will not occur unless the driver enters the intersection after time D has passed since the light turned red. Your traffic engineers assume drivers can comply to the yellow indication change interval with absolute precision. Some jurisdictions set the delay to <= 0.3 seconds. 0.4 seconds is the duration of a blink of an eye. The engineer error in the calculation of the yellow change interval is about 2.3 seconds for straight-through movements and 3.4 seconds for turning movements as computed by the mathematical technique of error propagation. The technique was developed by several mathematicians in the mid-1700s and has been used as a standard in physics and engineering ever since.

The correct function for a straight-through lane:

$$\boldsymbol{D = \Delta t_p + \frac{v_c}{2a^2}\Delta a}$$

The correct function for a turn lane is:

$$\boldsymbol{D} = \left|\frac{\boldsymbol{2v_c}}{\boldsymbol{v_c} + \boldsymbol{v_e}}\Delta\boldsymbol{t_p}\right| + \left|\frac{\boldsymbol{v_c}^{\boldsymbol{2}}}{\boldsymbol{a^2}(\boldsymbol{v_c} + \boldsymbol{v_e})}\Delta\boldsymbol{a}\right| + \left|\left(\frac{\boldsymbol{2v_c}\left(\boldsymbol{t_p} + \frac{\boldsymbol{v_c}}{\boldsymbol{2a}}\right)}{(\boldsymbol{v_c} + \boldsymbol{v_e})^{\boldsymbol{2}}}\right)\Delta\boldsymbol{v_i}\right|$$

These correct functions compute a delay of 2.3 and 3.4 seconds respectively for a 45 mph road. Because there are uncertainties in the constituent values for P-R time, deceleration and intersection entry velocity, the uncertainties propagate to the yellow change interval. In engineering parlance, the uncertainty is called the engineering tolerance and/or engineering error in the dimension. By not setting D to approximately 3.0 seconds, Suffolk County literally punishes drivers for engineering error. If Suffolk County is setting the delay to 0.3 seconds, Suffolk County is setting the delay to 1/10th of the duration it should be. Suffolk County is committing yet another malfunction associated with the yellow indication, this malfunction in the red light camera delay time for the yellow signal indication.

REFERENCES

From http://talussoftware.com:

Brian Ceccarelli: Yellow Change and All-Red Clearance Equations of Physics

> A summary of the equations, where they come from, and when they apply. Complete with links to other white papers.

Chiu Liu: Determination of Left-Turn Yellow and All-Red Clearance Intervals
Gazis, Herman, Maradudin: The Problem of the Amber Signal Light in Traffic Flow
Gates: Dilemma Zone Driver Behavior as a Function of Vehicle Type, Time of Day and Platooning

From http://redlightrobber.com:

Maradudin: Letter Condemning the ITE for Wrongly Using his Equations
Maradudin: Letter to CalTrans Enumerating Cases When the Equation Malfunctions