

#	Formula	Meaning	Approximate Yellow for a 45 mph Vehicle on a level road.
1	$Y_{min} = t_p + \frac{v_c}{a + gG}$	From Newton's Law of Motion . This is the deterministic equation which works for all allowable traffic movements. This formula works for turning drivers, drivers performing avoidance maneuvers and straight-through unimpeded drivers.	7.4 seconds
2	$Y_{min} = \frac{t_p v_c + \frac{v_c^2}{2(a + gG)}}{v_{avg}}$	Once the driver is too close to stop, the yellow time must be at least the time it takes for him to traverse the stopping distance and enter the intersection before the light turns red. The stopping distance is the numerator . The speed which he traverses it is in the denominator. time = distance / velocity A truck driver approaches at 45 mph but slows down for a left-turning driver who crosses his path in front of him. The trucker's average velocity through the stopping distance equals 30 mph, then . . .	6.7 seconds
3	$Y_{min} = \frac{2 \left[t_p + \frac{v_c}{2(a + gG)} \right]}{(1 + v_i/v_c)}$	This form accommodates a turning driver who decelerates at the constant deceleration rate from the speed limit (v_c) to speed (v_i), e.g., 20 mph, at the intersection in order to turn. Derive equation 3 from equation 2.	5.6 seconds
4	$Y_{min} = t_p + \frac{v_c}{2[a + gG]}$	DOTs apply this formula to all traffic movements. This formula, however, works only for drivers travelling straight who proceed at constant speed v_c into the intersection. Derive equation 4 from 3 by setting $v_i = v_c$.	4.5 seconds
5	$Y_{min} = t_p + \frac{20}{2[a + gG]}$	States like North Carolina , Virginia and California further misunderstand physics. Not only do they use the wrong formula, but also think that "v" in the formula is measured at the stop bar. The NCDOT sets v to 20 mph for protected-left and right turns.	3.0 seconds

Where

6	$c = t_p v_c + \frac{v_c^2}{2[a + gG]}$	c is the distance required for a driver to stop. v_c is the velocity measured at c . t_p the perception/reaction + air brake lag time for commercial vehicles. g = Earth's gravitational acceleration G = grade of road, $ G < 10\%$
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