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The Institute of Transportation Engineers (ITE) [Yellow Change Interval Formula](#) is a math equation which engineers use to calculate the duration of the yellow light. There are problems with how traffic engineers use it. The flaw is not the formula itself but rather that 1) engineers apply the formula to traffic movements the formula does not fit and 2) engineers plug the wrong numbers into the formula. The problem creates yellows too short by several seconds. That creates a systematic defect called dilemma zones. Dilemma zones subject innocent drivers to inadvertently run red lights. The problem is so pervasive that a handful of red light cameras in just a few years will issue more tickets than a city's population. The problem causes crashes as well. Here are some facts:

1. Traffic engineers use the formula<sup>1</sup> universally but the formula works only for one special case.
2. Traffic engineers plug the wrong approach speed into the equation.
3. Traffic engineers misapply stochastic methods. Given Wisconsin's [TEOPs manual, 4-2, page 4](#), at best engineers input perception-reaction time (1.0 s) and deceleration (10 ft/s<sup>2</sup>) values for the average passenger car driver. By using *average*, the engineer de facto forsakes half of the driving population. TEOPs allows engineers to use 15 ft/s<sup>2</sup> for deceleration too--an egregious error dating back decades.
4. Traffic engineers misapply an analytic solution to a physical solution. Engineers misapply grade term  $Gg$  to uphill traffic.
5. Traffic engineers omit the calculation of the tolerance of the yellow change interval. Engineers set the red-light camera grace period to 0.3 seconds (less time than the blink of an eye), but the tolerance for a properly-applied formula exceeds 2 seconds. Currently 70% of camera revenue comes from vehicles entering intersections within 1 second of the light turning red.
6. Because engineers misapply the physical and mathematical sciences to yellow change intervals, the change intervals violate Wisconsin Statute § [84.02\(4\)e](#). The yellows do not conform to the Wisconsin Manual of Uniform Traffic Control Devices (WisMUTCD). [WisMUTCD 4D.26\(3\)](#) requires change intervals to be determined by engineering practices. Wisconsin Engineering Statute [443.01\(7\)](#) which requires engineers to apply, not misapply, mathematics and the physical sciences.

Solution: <http://talussoftware.com/download/yellow-change-intervals> Video: <https://youtu.be/N1Fle9TB8FE>

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<sup>1</sup>Engineers invoke the name of the "federal guidelines" to justify using the ITE formula. TEOPS admits that the ITE formula is not a federal standard or guideline. Also, ITE does not even recommend the ITE formula. The formula only appears in a book referenced by a MUTCD *option*. Options and guidance are used at the engineer's discretion and personal responsibility. Engineers often invoke [MUTCD 4D.26\(14\)](#), guidance, to justify a 3-second yellow for any speed limit or turning lane. But the MUTCD states the 3-second yellow is a minimum to be used only for slower approaches--25 mph or slower in consonance with the ITE formula. As for turning lanes, turning yellows should be longer, not shorter, than straight-through yellows. The ITE formula always shorts a turning yellow by several seconds, that according to the laws of physics.