Institute of Transportation Engineers Authority in Question

Most traffic engineers regard the Institute of Transportation Engineers (ITE) as an authoritative source of engineering guidance. It is wise to question authority. Below are samples where ITE made critical mistakes in the subject of the yellow light change interval.

#	Error
1	"As can be seen from the formula above [the yellow light change interval formula], slower speeds result in higher values of yellow clearance time." Institute of Transportation Engineers, *Traffic Engineering Handbook*, 6th Edition, Publication TB-010B, **412** (2010).
	Incorrect. Slower speeds result in smaller values of all-red clearance time—which is not a part of the yellow change interval formula in this edition of the ITE Traffic Engineering Handbook.
2	"Because a long yellow change interval may encourage drivers to use it as a part of the green interval, maximum care should be used when exceeding 5 sec . . . . When the calculation for yellow change interval time indicates a time longer than 5 sec., a red clearance interval typically provides the additional time." Institute of Transportation Engineers, *Traffic Engineering Handbook*, 6th Edition, Publication TB-010B, **412** (2010).
	ITE introduces a legal problem. According to ITE, it is better to have cars to run red lights than yellow lights. By opposing the formula and its claimed sound physics principles, ITE forces drivers to run red lights. ITE does not recommend increasing the all-red interval to compensate for the shortened yellow. Since ITE adds no time to the all-red, not only must cars enter the intersection on a red but also must traverse the intersection when conflicting traffic gets a green. ". . . may encourage drivers to use it as a part of the green interval . . ." was formally dismissed by the inventor of the formula in 1959, and formally debunked in a paper in 1961.
3	"$y_1 = t_p + \frac{1}{2}\left[\frac{v}{a}\right]$ where v is the approach speed." Institute of Traffic Engineers, *Traffic Engineering Handbook,* 3rd Edition, Institute of Traffic Engineers, Washington DC, **101** (1965).
	ITE transferred Denos Gazis' 1959 yellow light formula into ITE's Traffic Engineering Handbook

	3rd Edition out of context. ITE introduced three problems which propagate to this day: 1. ITE's "v" is not "v_0" in Gazis's original formula. Gazis's v_0 is the initial maximum allowable speed measured at the critical distance from the intersection. ITE redefines v_0 ambiguously as "approach speed v." Since 1965 engineers have capriciously redefined v to mean the velocity at any point along the approach, or the average of posted speed limit and the vehicle entry speed for turning. The redefinitions oppose the original intent of the formula and the physics behind the formula. 2. ITE uses the formula for turning movements. That is an oxymoron. Gazis's formula does not apply to turning movements nor could it ever. Gazis's formula only works in the case where a driver can proceed unimpeded to the intersection at the constant maximum allowable speed. Acts of deceleration; for example, slowing down to execute a turning movement, prematurely expend a formula-computed yellow time and force the driver to run a red light. 3. ITE changed >= to =. ITE's formula is an equality; Gazis's original formula is an inequality. The yellow interval has to be at least the formula value, preferably more since the formula value leaves a significant indecision zone. The removal of the ">" from its context gives the false justification to traffic engineers to systematically subject drivers to indecision zones. That is why for the last 50 years we have seen copious amounts of slamming on the brakes and beating the light.
4	"The through vehicle procedure may produce an adequate initial yellow change interval length if the normal perception-reaction time is used and if the vehicle speed used is the average of the through vehicle speed and the turn execution speed." Institute of Transportation Engineers, *Determining Vehicle Signal Change and Clearance Intervals*, Publication IT-073, **4** (1994).
	Incorrect. The Formula requires the *initial,* not the average through vehicle speed. Vehicles intending to turn left can and do legally travel at the through speed at the critical distance from the intersection and they need the distance to be able to stop from the legal speed limit. On a 45 mph level road, the critical distance is a football field's length away from the stop line.
5	$CP = t + \frac{v}{2a} + \frac{v}{20[64.4]g}$ Institute of Transportation Engineers, *Traffic Engineering Handbook*, 5th Edition, **481** (1999).
	The algebra is wrong. It is supposed to be: $CP = t + \left[\frac{v}{2a + [.644]g}\right]$

6	ITE willfully fabricates dilemma zones where drivers do not know what to do. "Dewar et. al, examined the effect of different yellow signal durations (3, 4, 5 and 6 sec.) to determine the point at which most drivers would stop rather than proceed through the intersection. The study was carried out at four urban intersections in 30-mph (50-km/hr) speed zones. Only vehicles traveling with no other vehicles within five car lengths were selected. The yellow signal was activated when the subject vehicle (traveling at no more than the speed limit) was at a distance corresponding to the travel distance to the intersection stop line that would be covered in 3, 4, 5, or 6-sec. signal. Approximately 90 percent of drivers failed to stop for the 3-sec. signal; however, a similar proportion did stop for the 6-sec signal. The theoretical point at which half the drivers would stop (the maximum dilemma) was determined to be 3.8 sec." Institute of Transportation Engineers, *Traffic Engineering Handbook*, 6th Edition, Publication TB-010B, **33** (2010).
	The ITE formula yields a 3.2 second interval for a 30-mph level road. From 3 to 6 second range where 3.8 is the worse, ITE uses 3.2 seconds. ITE recommends that engineers subject drivers to the near maximum dilemma. Instead of minimizing the dilemma zone, ITE maximizes it. Dewar's experiment also lacks the scientific method. The experiment starts with a biased initial condition. Drivers for the past 50 fifty have been conditioned to short yellow lights; that is, yellow lights that are half the time it takes a driver to stop. A driver seeing a light turn yellow on a 30 mph road from 6 seconds out has been trained to think that such a light will turn red long before he gets to the intersection. He will stop.
7	"Perception-reaction time can range from less than 1 second to 2.5 seconds, depending on the expectation of the incident. For example, a driver may expect to see a yellow signal at an intersection buy may not expect a pedestrian in the crosswalk." Institute of Transportation Engineers, *Traffic Engineering Handbook*, 6th Edition, Publication TB-010B, **403-404** (2010).
	ITE sets perception time to 1 second in the formula.