

All-Red Interval Inquiry

Question from South Dakota:

Does anyone know of any studies/guidelines that recommend limiting the all-red time to 2 seconds due to increased red-light running and increased crash experience associated with longer all-red intervals? We recently started calculating the all-red clearance interval in accordance with NCHRP Report 731 and the draft ITE "Guidelines For Determining Traffic Signal Change and Clearance Intervals," and using these methods, wider intersections may have a calculated all-red time of 2.5 – 3.5 seconds. We are now encountering resistance to implementing anything longer than 2-seconds based on concerns of increasing crashes. Thank you in advance for any insights you can pass along.

Summary of AASHTO SCOTE Responses to All Red Inquiry

State	Response	Limit to 2 sec?	Links/ Attachments
Alabama	Not aware of more current research or guidance that what was cited. In Alabama, our Traffic Signal Timing Manual limits the all red to 3.0 seconds unless the Area Traffic Engineer using engineering judgment determines a longer interval is appropriate.	No	
Alaska	Knows there has been controversy over this issue; not in favor of extended all red intervals.	Yes	http://community.ite.org/communities/community-home/viewthread?GroupId=133&MID=18488&tab=digestviewer&CommunityKey=d04ead71-64dc-4b03-98fc-120353eef4d9
Arizona	ADOT Traffic Engineering Guidelines and Processes (TGP) 621 and 622 define all-red clearance intervals for signalized intersections operated by ADOT. As noted in TGP 622, all-red intervals of up to 6 seconds are permitted - these are typically used if appropriate at large or complex intersections such as single-point diamond interchanges, where the distance from the stop line to the far side of the intersection or ramp can be 150 feet or more.	No, 6 sec	http://www.azdot.gov/business/engineering-and-construction/traffic/traffic-guidelines-and-processes-(tgp)/guidelines-and-processes
Colorado	In Colorado we use the ITE formula as well. That said, we are undergoing a statewide re assessment of our timings to better improve consistency. We will if needed use a longer all red time based upon intersection geometrics.	No	

Connecticut	<p>Connecticut is in the process of reviewing the clearance intervals of all our state owned traffic signals (2500+). Before the start of our project, we reviewed NCHRP 731 and it references a study on the effects of increasing a red clearance interval, but the study was inconclusive as to whether it resulted in positive or negative safety benefits. I am not aware of any other studies. For red clearance interval calculation, we use a method similar to the ITE "width" method, but our method measures both entering and clearing distances, while the ITE method just measures the "width" of the intersection (see pg 6-6 at the link). Our method produces very similar results, ours might be slightly more conservative (i.e. slightly longer red clearance interval times). Under our clearance interval project, we have seen that the wider, larger, offset, and/or otherwise not "typical" intersections are having red times calculated higher than 2 seconds, sometimes up to around 3.5 seconds. We have been double checking any clearance value that was "much higher" than the existing clearance interval value, but if it appears the higher value is the proper calculation, that is what we have been using.</p>	No	http://www.ct.gov/dot/lib/dot/documents/dtrafficdesign/sigmanapproved2009.pdf
Delaware	<p>I am aware of no studies showing longer all-red intervals result in more red light running or increased crashes. I specifically recall Kevin Lacy talk about NC's dynamic all-red and that they were not seeing increases in red light running or crashes due to that program, but I'm not sure how well they have that documented. I'll be interested in the results of your survey. For reference, we use 2.0 seconds as our minimum all-red interval in Delaware.</p>	If 4 sec calc, do field observations	http://www.deldot.gov/information/pubs/forms/manuals/traffic_design/2015/2015_chapter_4.pdf
	<p>We recently adopted a new method for calculating the all-red interval as described in our Traffic Design Manual starting on page 100. This calculation results in very long all-reds for low-speed, wide intersections – sometime 5 to 6 seconds. I don't know if we've formally documented our process yet, but for any all-red calcs of 4 or more seconds, we now do actual field observations of vehicular speeds and the critical values in the conflict equation, which them usually results in us being able to reduce the all-red to a more reasonable value. Also note that we've found that the equation we are using is usually resulting is a shorter all-red than the ITE equation. I believe we have lengthened our all-red at several locations where we have red light running cameras, so we should be able to pull good data as to whether the increases in all-red had any resulting change in red light running.</p>		http://www.deldot.gov/information/pubs/forms/manuals/traffic_design/2015/Traffic_Design_Directive.pdf

	<p>As Mark mentioned, we're now formalizing a directive regarding field evaluation procedures for calculated 5-sec and 6-sec red clearance intervals. Coincidentally, we conducted internal training on this topic last week (attached for your use/information). In particular, Slide 17 contains the preferred in-field evaluation of motorists' red clearance needs based on site-specific conditions. A supplemental PDF containing the corresponding data for three in-field evaluations is attached. Lastly, we also attached DeIDOT's Excel worksheet for determining various controller intervals ("phase data").</p>		<p>DeIDOT New Yellow-Red timesheet training.pdf</p>
<p>Illinois</p>	<p>We are not aware of any studies or recommendations to limit all-red clearances to 2 seconds. When I was the signal engineer for our district 6 office, I routinely used all-red clearances in the 2-3 sec range for larger intersections. I know our Peoria district has programmed some all-reds over 3 seconds for dual-left turning movements across 3 through lanes because the shorter all-reds were causing issues. Is the concern that regular commuters at these intersections figure out over time that the red clearances are long and thus be more likely to try and sneak through a red? I would be more concerned with being able to regularly and adequately clear traffic that legally enters the intersection.</p>	<p>No</p>	<p>Signal Timesheet 2015 - DeIDOT.pdf</p> <p>Red Time Field Verification - DeIDOT.pdf</p>

Iowa	<p>Iowa uses the ITE formula to calculate the all-red, and we have not put a limit on it. I have been in some areas of the country where I have seen drivers use the longer all-red to “jump” the green. An opposing left-turner would start their left-turn prior to the light turning green to beat the opposing through movement at the start of green, when it is a permissive left-turn. The first time it happened to me, my start-up at the green was a little slower than usual as I was trying to figure out what just happened. Iowa State University completed a study of the all-red for Minnesota some years ago, 2003. They were researching the safety benefits of the all-red and found a somewhat interesting result – This research evaluated the safety effect of all-red clearance intervals at low speed urban 4 way intersections in the City of Minneapolis. The study included a review of literature and assessment of Midwestern state and local practice related to the use of all-red phasing. A cross-section analysis using four years of data was presented, which does not substantiate any safety benefit of all-red phasing at study area intersections. Several regression models (generalized linear mixed models with Poisson error distribution and log link function and linear mixed models with transformed data) were also presented. The models also point to no safety benefit. A before and after analysis using 11 years of data was conducted to evaluate both short and long term effects. While results indicated short-term reductions in crash rates (approximately one year after the implementation), long-term reductions were not observed.</p>	No	http://www.intrans.iastate.edu/research/projects/detail/?projectID=574
Kentucky	<p>Not aware of any studies. KY policy states: Values obtained from the equation should be rounded up to the nearest tenth of a second. Red clearance intervals should normally be between 1.0 and 3.0 seconds. However, some situations (such as offset intersections, single point interchanges, etc.) may require red clearance intervals longer than 3.0 seconds based on engineering judgment</p>	No	
Louisiana	<p>This is LADOTD’s photo enforcement policy. We discuss the clearance intervals.</p>		http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/Traffic_Engineering/Photo%20Enforcement/Forms/AllItems.asp X

Maine	In Maine we have adopted the ITE clearance intervals, but are making a conscious decision to max at 3 seconds. I have read articles in the past on increase crashes with longer intervals, but my problem is I have had a historic issue of red light running doing things the old way. We need something, I don't have enough information yet to discern whether we have made things better or worse as of yet	3 sec	
Massachusetts	I do not believe that there are any restrictions/guidelines on the length of the all-red clearance. This topic came up on an ITE discussion board awhile back and I'm fairly certain the conclusion was that there were no known studies that show longer all-red phases are associated with an increase in crashes.	No	
Michigan	Michigan DOT has similarly implemented yellow and red times per the NCHRP report beginning around 2013. This spreadsheet will automatically highlight if a calculated yellow exceeds 6 seconds or if a calculated red exceeds 4 seconds. Our current guidelines indicate to contact our office if the calculated Y or R times exceed these values. We have many intersections where the side street red exceeds 2 seconds, and a few that exceed 4 seconds (low speed side street with lots of logging trucks crossing/turning onto a divided highway).	No	http://mdotcf.state.mi.us/public/tands/Details_Web/y & r & ped%20timing.xls
	We have NOT done a safety study to try to determine the effects of these changes. Isolating the effect of the all red might be difficult because we also made some changes to the yellow calculations (we used to cap the yellow at 5 seconds, and we used to throw excess red time to the yellow in some cases). I personally prefer to provide a rationally calculated all red time rather than provide timing based on speculation of how drivers will react if/when they don't need the full calculated red time. I am certainly open to any research on this issue. I also recall the NCHRP report suggests you can subtract 1 s from the calculated red time to allow for startup time for the conflicting movement, but we don't typically do this.		http://mdotcf.state.mi.us/public/tands/Details_Web/electronic_traffic_control_device_guidelines.pdf
Mississippi	I'm not aware of any such studies. Similar to others, we try to limit the red clearance time to 1 to 2 seconds; however, we have a few that require longer times due to larger intersections or those with unusual layouts.	1-2 sec with a few exceptions	
New Jersey	Know of no such research or guidelines. In NJ, our minimum standard is 2 seconds but will go as high as necessary to accommodate unusual intersection geometries.	No	

New Mexico	I have included our design directive that addresses yellow change and all red intervals. ITE Traffic Signal Timing Manual typical practice was used to incorporate red clearances ranging from 0.5 seconds to 2.0 seconds. Table 1 in this directive covers most occasions. But there are exceptions like on single point interchanges that 2 seconds might not be sufficient for all red intervals. Then we seek appropriate intervals calculated with ITE method or NCHRP 731. But we will review it in the field and adjust.	Certain situations 2 sec is not sufficient	IDD-2011-05 - New Mexico.pdf
New York	New York uses the ITE formula with a minimum of 1.0 seconds all red. Typically, we cap it at 2.0 seconds, but will extend it if necessary. I did some comparisons last year to see how some of our standard all red timings would be affected by the draft ITE formula. Definitely saw a pattern of longer all reds at wider intersections.	Typ. 2 sec.	
North Carolina	In late 2004, North Carolina Department of Transportation formed a Task Force to investigate and recommend design practices for determining yellow change and all-red clearance intervals. The Task Force was announced through the North Carolina Section Institute of Transportation Engineers (NCSITE) and consisted of state, local and consulting engineers that design traffic signals in NC. As our urban intersections got wider, we were concerned with excessively long all-red clearance intervals. The recommendations from the Task Force include measures to mitigate long all-red intervals	Recalc eqn if over 3 sec	Calculation of Yellow Change and All-Red Clearance Intervals - The North Carolina Experience - FINAL.pdf
Ohio	Ohio uses the ITE formula to calculate the all-red. We typically do try to keep those times at 2 seconds, however at larger or non traditional intersections we will go higher into the 2.5-3.5 second range. We currently do not have any crash data available that would show any positive or negative impacts of the longer all-red.	Typ. keep at 2 sec; will go 2.5- 3.5	
Pennsylvania	Not aware of any studies. Follow the ITE recommendations for calculating red times.	No	

Virginia	<p>We are unaware of any research specifically addresses your question. VDOT issued its new change/clearance interval policy (TE-306.1) in January 2013. This policy is based primarily on NCHRP 731 with VDOT-specific elements. Like the NCHRP document, TE-306.1 does not include a maximum length of the red clearance interval. The resulting red clearance intervals have increased compared to those calculated by our previous 2001 policy methodology, especially for left turns. It is not uncommon for VDOT to have red clearance intervals of 4, 5, or 6 seconds, particularly for left-turns at the larger/wider intersections. VDOT applies engineering judgment to make justifiable changes to the parameters used to calculate yellow and red times. To provide flexibility to our field practitioners, my staff recently released a FAQ document (attached) to aid these engineering judgement applications. This FAQ documented was created with much assistance of our consultant VHB who also wrote NCHRP 731 and our policy TE-306.1, as well as the Virginia Transportation Research Council. This FAQ includes an alternate method to determine the all red clearance interval based on field observations, consistent with the intent of the formula in NCHRP 731. This method was tested on several of our exceptionally wide intersections and justified red clearance intervals 1 to 2 seconds shorter than those calculated by the default parameters of the NCHRP 731 formula. You will find this alternate methodology described in FAQ No. 9, which starts on Page 13 of the attached FAQ. Although we have not specifically studied the situation, we have no reason to believe that our new policy and longer red clearance intervals are increasing crashes.</p>	No	Virginia Yellow & Red Interval FAQs
West Virginia	<p>I am not aware of any studies that support the limiting of all-red clearance phases due to an increase in red-light running or crash experience. The old 1998 version of the Manual of Traffic Signal Design cautioned against the use of excessively long change intervals due to the detrimental effects on level of service. It also states that local drivers tend to use more of the change interval when they know from experience that it is longer than normal. Again, I don't know of any research to substantiate this claim, and the Manual does not put a numerical value on "excessively long".</p>		