Signal Timing Information

Many who oppose the use of red light enforcement cameras often argue that signal timing is incorrectly calculated at the enforced intersection. This presentation provides the public with information on signal timing for all of the Virginia Beach red light photo enforced intersection approaches. VDOT Memo TE-306.1 provides guidance for the calculation of signal timing at photo enforced intersections in the state of Virginia.
46.2-833 Green indicates the traffic shall move in the direction of the signal and remain in motion as long as the green signal is given, except that such traffic shall yield to other vehicles and pedestrians lawfully within the intersection.

46.2-833 Steady amber indicates that a change is about to be made in the direction of the moving of traffic. When the amber signal is shown, traffic which has not already entered the intersection, including the crosswalks, shall stop if it is not reasonably safe to continue, but traffic which has already entered the intersection shall continue to move until the intersection has been cleared. The amber signal is a warning that the steady red signal is imminent.

46.2-833 Steady red indicates that moving traffic shall stop and remain stopped as long as the red signal is shown, except in the direction indicated by a lighted green arrow. Flashing red indicates that traffic shall stop before entering an intersection.

46.2-835 Right Turn on Red…except where signs are placed prohibiting turns on steady red, vehicular traffic facing a steady red signal, after coming to a full stop, may cautiously enter the intersection and make a right turn. Such turning traffic shall yield the right-of-way to pedestrians lawfully within an adjacent crosswalk and to other traffic using the intersection.
Frequently Asked Question: What does the Yellow and Red signals mean to drivers?

The presentation of the yellow signal provides drivers with a warning that a change in intersection right of way is about to occur. When properly calculated, the length of the yellow signal will provide drivers with an adequate amount of time and distance to bring their vehicle safely to a stop before the signal changes to red. When the yellow is shown, traffic which has not already entered the intersection should slow to a stop in anticipation of the red signal.

The presentation of the red signal directs drivers to stop. RED MEANS STOP!

The red clearance interval or “all red” is a period in which all approaches are red at the same time. The red clearance period is an important crash prevention countermeasure because it provides for the safe exit of vehicles that enter the intersection as (or shortly after) the signal turns red. The red clearance period is completed before the opposing or conflicting traffic gets a green signal.
§ 15.2-968.1 Use of photo-monitoring systems to enforce traffic light signals

Virginia Law on the Calculation of Traffic Signal Timing at Photo Enforced Intersections

K. Before the implementation of a traffic light signal violation monitoring system at an intersection that addresses signal timing and other, the locality shall complete an engineering safety analysis location-specific safety features.

The length of the yellow phase shall be established based on the recommended methodology of the Institute of Transportation Engineers. Please visit the VDOT web site to obtain a copy of the TE-306.1.

All traffic light signal violation monitoring systems shall provide a minimum 0.5-second grace period between the time the signal turns red and the time the first violation is recorded.

Virginia Law on the use of Violation Monitoring System Signs

M. Any locality that uses a traffic light signal violation monitoring system to enforce traffic light signals shall place conspicuous signs within 500 feet of the intersection approach at which a traffic light signal violation monitoring system is used. There shall be a rebuttable presumption that such signs were in place at the time of the commission of the traffic light signal violation.

Note: Additional signs have been placed at the enforced right turn stop bars.
Signal timing calculations at Virginia Beach intersections are in accordance with guidelines provided by the Virginia Department of Transportation. VDOT Memorandum TE-306.1 dated January 7, 2013 provides that yellow and red clearance intervals be calculated using equations A and B below.

**Yellow Change Interval**

The yellow change interval \((Y)\) is calculated using Equation A:

\[
Y = t + \frac{1.47V}{2a+64.4g} \tag{Equation A}
\]

Where:

\[
egin{align*}
t &= \text{PRT (s); set at 1.0 seconds} \\
a &= \text{deceleration rate (ft/s}\^2; \text{ set at 10 ft/s}\^2) \\
V &= \text{85th percentile approach speed (mph)} \\
g &= \text{approach grade (percent divided by 100, negative for downgrade)}
\end{align*}
\]

**Red Clearance Interval**

The red clearance interval \((R)\) is calculated using Equation B:

\[
R = \frac{W+L}{1.47V} - 1 \tag{Equation B}
\]

Where:

\[
egin{align*}
W &= \text{intersection width measured from the back/upstream edge of the approaching movement} \\
L &= \text{length of vehicle (ft); set at 20 feet} \\
V &= \text{85th percentile approach speed (mph)}
\end{align*}
\]

Note: Signal timing at the Virginia Beach photo enforced intersections was implemented using the VDOT guidelines at 5 pm on January 10, 2013.

Yellow timing calculations are provided for review on the next slide. \(V= \text{posted speed limit +7}\).

Virginia Beach all red clearance interval timing is an engineering countermeasure and an important crash reduction strategy. The existing Red Clearance Intervals are based on engineering judgment using intersection data and driver behavior.
There are three posted speed limits associated with the enforcement of Virginia Beach intersections. They are:

- 35 mph + 7 = 42 mph
- 45 mph + 7 = 52 mph
- 50 mph + 7 = 57 mph

Note: VDOT TE-306.1

\( V = \text{Speed Limit} + 7 \)

All approaches have a flat grade which = 0 in the calculation formula.

The standard perception reaction time for this calculation is 1.0 as determined by Virginia Beach and VDOT Traffic Engineers.
<table>
<thead>
<tr>
<th>Intersection Approach</th>
<th>Post Speed Limit</th>
<th>Adjusted Speed Limit</th>
<th>Grade</th>
<th>Width of Intersection</th>
<th>Yellow Interval</th>
<th>All Red Interval</th>
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</thead>
<tbody>
<tr>
<td>Baxter Rd (East) at Independence Blvd</td>
<td>45</td>
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<td>4.81</td>
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<td>4.81</td>
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<td>level</td>
<td>176 ft</td>
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</table>

*Reference VDOT Traffic Engineering Division Memorandum TE-306.1 dated January 7, 2013*
The chart below provides 3 years of Virginia Beach red light running data. It is represents the number of violations occurring up to 3 seconds after the light was red.

Virginia Beach all red clearance timing provides for the safe exit of vehicles that are traveling at the posted speed limits.

Note: The majority of left turn and straight through violations occur within the first 2 seconds of red.
According to the Federal Highway Administration, the solution to the red light running problem involves a combination of engineering, education, and enforcement measures. Interconnected signal systems provide coordination between adjacent signals and are proven to reduce stops, reduce delays, decrease accidents, increase average travel speeds, and decrease emissions. If drivers are given the best signal coordination practical, they may not be as compelled to beat or run a red signal.

Our City’s signal coordination project is reflected on this map along with the location of our photo enforcement cameras. All signal heads used at photo enforced intersections are LED.

LED units are used for three reasons:
(1) they are energy efficient
(2) they are brighter than incandescent bulbs
(3) have a longer service life

All signal heads are 12 inches in diameter and have back plates to improve signal visibility.

Signal ahead signs are used at all photo enforced locations.
One of the main goals of the PHOTO Safe program is public education and awareness. The information provided in this document is based on the inquiry of citizens who have requested information specific to the City of Virginia Beach automated enforcement program’s signal timing calculations. Always remember, RED MEANS STOP!

Please email any questions on signal timing to VBPDphotosafe@vbgov.com. The PHOTO Safe program coordinator, traffic engineer, or the supervisor of traffic signal operations will address any concerns with the Virginia Beach signal timing calculations.