2.2. Effective Green Time

The HCM uses the both the upper case G and lower case g to represent green time. The displayed green time, G, for any movement is defined as the total number of seconds per cycle that the green indication is actually displayed to that movement. The effective green time, g, is the equivalent length of time in any cycle that may be utilized at the saturation flow rate.

The traffic stream is unable to discharge across the stop line at the steady state headway at the beginning of the green because of the transient effect of starting up a previously stopped queue. Using the field data from the saturation flow rate study already described, we must concentrate on the elapsed time measured between the start of green and the passage of the fourth vehicle, or t(4). This represents the time required for the signal to accommodate these vehicles. The startup lost time, L1, is the difference between t(4) and the time that would have been required if the vehicles were discharging at the steady-state headway. The example at the right shows that, under these conditions, the startup lost time would be 3.2 sec.

The termination of the phase also creates a period of time when the flow rate drops below the satflow rate. The ending lost time, L2, is the result of less than full use of the intergreen (yellow plus all red) interval. The ending lost time is generally much lower than the starting lost time. It is also much more difficult to measure. It may be zero if the intergreen time is fully utilized, or if traffic is light, and no vehicles are affected by the end of the green. On the other hand, it may be significant if the yellow or all red intervals are very long.

The combined effect of L1 + L2 is generally called the “lost time”, L, and for most practical purposes may be considered to be in the range of 4 sec/cycle. For most purposes, the lost time may be simply be subtracted from the total green plus intergreen time to estimate the effective green time. Some exceptions to this rule occur in complex phasing situations an in the microscopic treatment of traffic-actuated operation.
The units of lost time are seconds per cycle. Each movement has its own lost time, so the total amount of time lost from any cycle must be computed as the sum of the lost times for the critical movements for each phase. For example, consider a typical two-phase operation in which all of the north-south movements proceed on the first phase, followed by all of the east-west movements on the second phase. If all movements had a lost time of 4 sec/cycle, then the total lost time per cycle would be 8 seconds.

More complex cases will be examined later during the discussion of signal phasing decisions in Session 7.