3.4. Practical Complications

The simple example presented in this session introduced the basic principles of signal timing for pretimed signals. At this point you should understand what data are required and relationship between the traffic volumes, saturation flow rates, cycle length and phase time allocation.

You will not, however, find many (or perhaps any) intersections in the real world configured as simply as this example. There are, for example several site-specific factors that influence the saturation flow rate. Interference from pedestrian conflicts with right turns, for example can have a significant effect. Bus stops can also impede the flow of traffic in the curb lane to a large extent. Usually the most significant effect on saturation flow rate stems from conflict between left turns and through traffic.

All of these considerations are covered in the Highway Capacity Manual. Chapter 9 of the HCM, which deals with signalized intersections, prescribes a procedure for adjusting the saturation flow rate to compensate for these factors and a few others. We will take a closer look at the HCM methodology in a later session.

Left turn conflicts also create the need for special phases in addition to reducing the saturation flow rate. There are many decisions to be made in the selection of the best phasing for a given situation. This subject will be covered in Session 7.

One important consideration is the need to display a minimum green time for each phase. The minimum duration of a phase is governed by pedestrian crossing time requirements on phases that accommodate pedestrians. Phases that do not accommodate pedestrians (e.g., left turn phases) are subject to minimum times based on driver expectancy. Most agencies lean towards a minimum green interval of 7-10 seconds for minor movements and 15 to 20 seconds for arterial through movements.

The minimum pedestrian crossing time depends on the width of the street being crossed. The normally accepted pedestrian walking speed for signal timing purposes is 4 ft/sec. This will govern the length of the DON’T WALK pedestrian clearance interval. The MUTCD suggests minimum WALK intervals of 4 to 7 seconds, and most agencies prefer the longer end of this range. If pedestrian signals are not present at a crossing, the minimum phase time (including intergreen) is usually based on the pedestrian crossing time plus approximately 5 seconds to allow a group of pedestrians to enter the roadway.
Minimum phase times were not a consideration in our simple example because the phase times dictated by the traffic volumes were well above the minimum requirement. The shortest phase was 37 seconds long because the traffic volumes were reasonably balanced.

A common problem for minimum greens occurs at intersection on wide arterial roads with long pedestrian minimum crossing times and relatively low traffic volumes. The question is what to do when an attempt to balance the v/c ratios produces a cross street green time that fails to meet the minimum requirement. This often calls for a solution based on judgement. All of the signal timing software products must recognize this problem in some way, otherwise they would not produce implementable timing plan designs.