8.3 SIGNAL TIMING

Some adjustments to signal timing may be required where cyclists will be a primary user of the corridor. These changes are necessary because of different operating characteristics compared to motor vehicles. Bikes typically operate at lower speeds than motor vehicles, and have a shorter stopping distance and time.

Potential timing changes include:

- **Adjustments to all-red/yellow times** – Because of lower operating speeds, if a bicycle enters the intersection just before or during the yellow display, the all-red clearance interval may be insufficient. Because alterations to the yellow time are generally discouraged, the additional time for cycling clearance may be incorporated through adjustments to the all-red time, based on the formula in Exhibit 8-3

  The decision to adjust the all red phase is based on professional judgement. Even if no adjustment is made to the all-red time, the OTC Bicycle Traffic Signal Guide notes that "the Ontario Highway Traffic Act makes more than one provision for a situation in which a vehicle or pedestrian which has legally entered the intersection but has not completed their movement retains the right of way over conflicting traffic even if that conflicting traffic is presented with a green indication". (p. 10)

Exhibit 8-3. Clearance Interval Calculations

Amber + All-red = PRT + V/(2d) + (W + L)/V

Where:

Amber = PRT + V/(2d) and
All-red = (W + L)/V

Specifically, the following values are suggested:

d = bicycle deceleration rate ($3.0\ m/sec^2$)

V = typical cyclist speed, generally 14-20km/hr

W = intersection width, measured from stop bar to far crosswalk line or equivalent if not present

L = bicycle length, assumed to be 1.8 m

PRT = Perception Reaction Time. 1 second minimum

Source: OTM Book 12A

- **Minimum green time** – Cyclists are slower to accelerate than motor vehicles, which can impact the time they need to cross through an intersection. In almost all cases operating in mixed traffic, the minimum green time will accommodate a cyclist because the walk time + flashing don't walk time will govern the signal timing, and will be longer than a cycling clearance time. One exception to this may be side streets on major roadways where the pedestrian phase is not activated. In these cases, the minimum green time may need to be adjusted to allow cyclists sufficient time to cross the intersection, based on the formula in Exhibit 8-4.
- In all cases where the signal is for cyclists and pedestrians only, timing should be calculated specifically for bicycles.

Exhibit 8-4. Minimum green time

Gmin + Y + Rclear => SU + TCLEAR

Where:

Gmin is the length of the minimum green interval (seconds)

Y is the length of the amber interval (seconds)

Rclear is the length of the red clearance interval (seconds)

SU is a start-up constant incorporating both perception-reaction time and acceleration to normal speed (seconds), typically 6 seconds

TCLEAR is the time required to finish the crossing after accelerating to normal cycling speed, which in the simplified formula does not consider the distance covered during start-up acceleration = (W+L)/V

The complete formula is:

Gmin=>SU + ((W+L)/V) - (Y+AR)

Source: OTM Book 12A