Traffic Engineering (CIVIL-349)
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Exercise 9
Traffic Signal Design
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Problem 1: Pre-timed traffic signal design

Develop a signal design and timing for the intersection shown in Figure 1 below. In each case, accommodate both vehicular and pedestrian movements. Use the following values for the problem (note that some parameters are shown inside the figure with the intersection topology):

Description	Value
Speed limit	40 mph
Deceleration rate speed	11 ft/sec^2
Driver reaction time	1.4 sec
Pedestrian walking speed	4 ft/sec
Pedestrians	5 per direction
Length of a vehicle	20 ft
Crosswalk width	10 ft
Lane width	12 ft
Saturation flow	1800 veh/hr/lane
Total lost time (start-up and clearance)	4 sec/phase
Slope	0

Cycle time should be rounded to the nearest 5 sec (e.g. 65, 70, 75 sec etc.). Every signal interval must be rounded to 0.5 sec (e.g. 10 or 10.5 sec are allowed, 10.2 sec is not allowed).

To solve the exercise, follow the steps of the traffic signal design process that were presented in class:

1. Step 1: Design signal phasing and calculate critical lane volume
2. Step 2: Determine cycle time
3. Step 3: Determine (effective) green allocation
4. Step 4: Determine Yellow (Y) and All-Red (AR) duration per phase according to the formulas described in slides
5. Step 5: Check minimum green times to accommodate pedestrian movements (formula given)

Hint: Keep in mind that the topology of the network is capable of showing the channalization, protected left turns, and distances that vehicles need to cross during yellow light.

6. Step 6: Create the signal diagram showing the timing for Green, Yellow and Red sign for every stream (move) of vehicles.

Figure 1: Isolated intersection. Note: Flows per approach are given in veh/h.