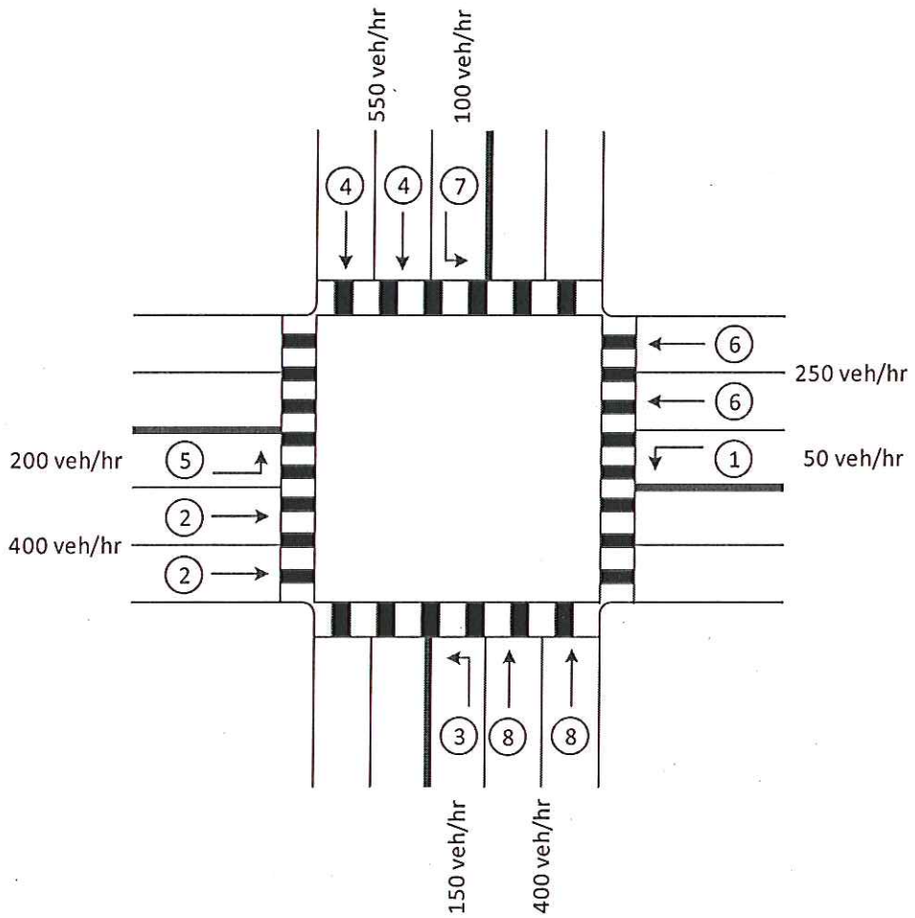
Critical Movement Analysis – CE 572 - Class 14

In Class Problem

Given the following traffic volume data and lane configuration. Based on the critical degree of saturation, would you recommend protected or permitted LT phasing? Comment on the relative performance of the two left turn phasing plans.



Assume:

- Saturation flow rates of 1900 veh/hr/lane for protected LT or TH movements, ~~or 450 veh/hr/lane for permitted LT movements~~.
- Cycle length = 60 seconds

In-class problem
solution

2015.02.20

Problem 24

Critical Movement Analysis Worksheets (Protected Left Turns)

Step 1: Compute the flow ratio Y for each movement present at the intersection.

		East-West Concurrency Group				North-South Concurrency Group			
Ring 1	v_1	50	v_2	400	v_3	150	v_4	550
	s_1	1900	s_2	3800	s_3	1900	s_4	3800
	Y_1	0.026	Y_2	0.105	Y_3	0.079	Y_4	0.145
Ring 2	v_5	200	v_6	250	v_7	100	v_8	400
	s_5	1900	s_6	3800	s_7	1900	s_8	3800
	Y_5	0.105	Y_6	0.066	Y_7	0.053	Y_8	0.105

Step 2: Determine the flow ratio sums for the phase sequences in each ring for each concurrency grouop (for the case of protected left turns only)

		East-West Concurrency Group				North-South Concurrency Group			
Ring 1	v_1	50	v_2	400	v_3	150	v_4	550
	s_1	1900	s_2	3800	s_3	1900	s_4	3800
	Y_1	0.026	Y_2	0.105	Y_3	0.079	Y_4	0.145
	Y_{EW1}	0.132			Y_{NS1}	0.224		
Ring 2	v_5	200	v_6	250	v_7	100	v_8	400
	s_5	1900	s_6	3800	s_7	1900	s_8	3800
	Y_5	0.105	Y_6	0.066	Y_7	0.053	Y_8	0.105
	Y_{EW2}	0.171			Y_{NS2}	0.158		

Step 3: Within each concurrency group, identify the movements with the maximum flow ratio sum (for protected left turns). These movements represent the critical movements for each concurrency group.

		East-West Concurrency Group				North-South Concurrency Group			
Ring 1	v_1	50	v_2	400	v_3	150	v_4	550
	s_1	1900	s_2	3800	s_3	1900	s_4	3800
	Y_1	0.026	Y_2	0.105	Y_3	0.079	Y_4	0.145
	Y_{EW1}	0.132			Y_{NS1}	0.224		
Ring 2	v_5	200	v_6	250	v_7	100	v_8	400
	s_5	1900	s_6	3800	s_7	1900	s_8	3800
	Y_5	0.105	Y_6	0.066	Y_7	0.053	Y_8	0.105
	Y_{EW2}	0.171			Y_{NS2}	0.158		
	$Y_{EW\text{-}critical}$	0.171			$Y_{NS\text{-}critical}$	0.224		

Step 4: Determine the critical degree of saturation (X_c) for the intersection.

$Y_{EW\text{-}critical}$		0.171
$Y_{NS\text{-}critical}$		0.224
C		60
L		16
X_c		0.538

Step 5: Determine the sufficiency of capacity