CE 572 – Spring 2015

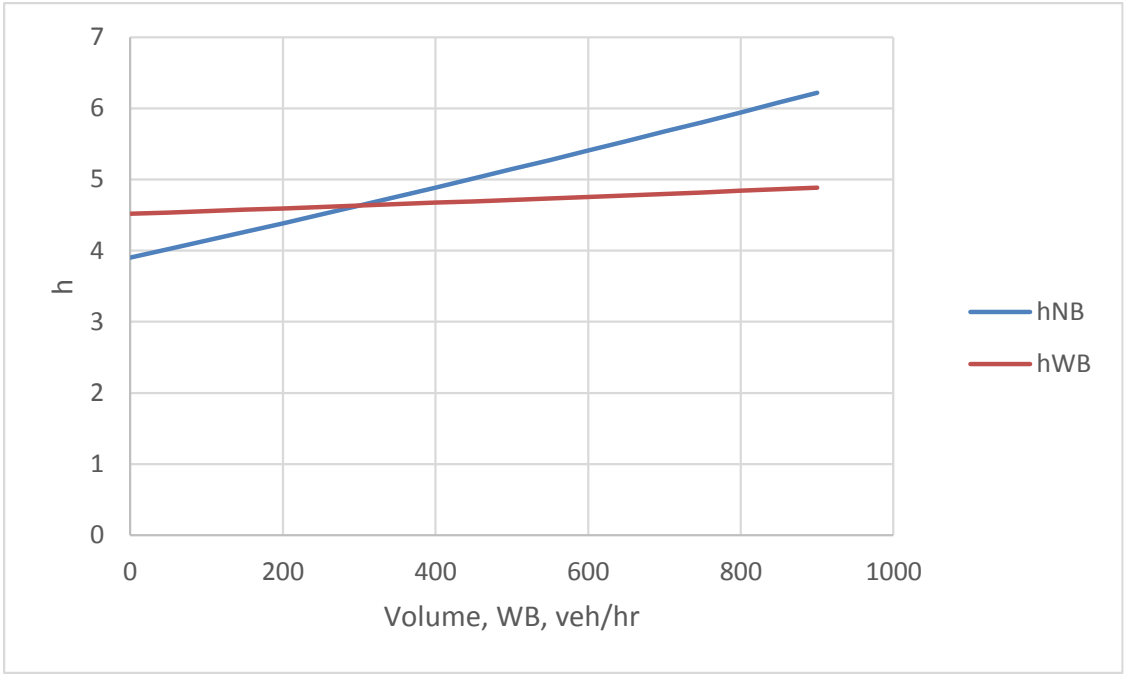
Intersection Traffic Operations

Class 03

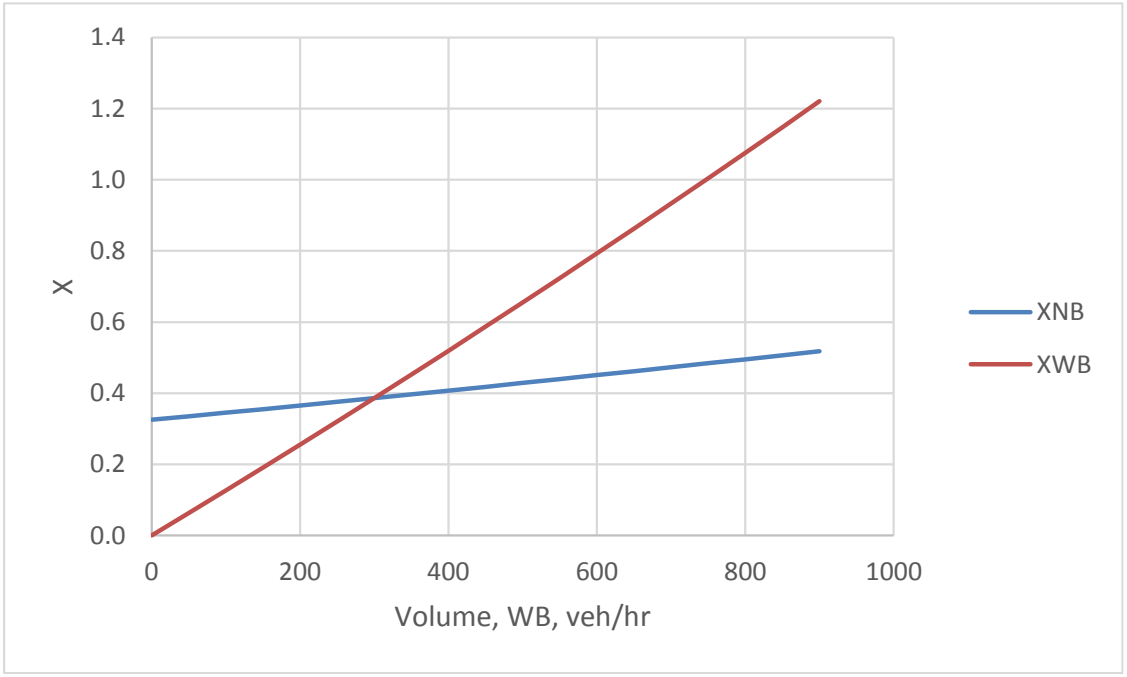
23 January 2015

- What does the term "degree of conflict" mean?
- Describe the probability of occurrence for case 2 and case 5.
- Define the term "departure headway".
- Describe in your own words the meaning of equation 20-11.

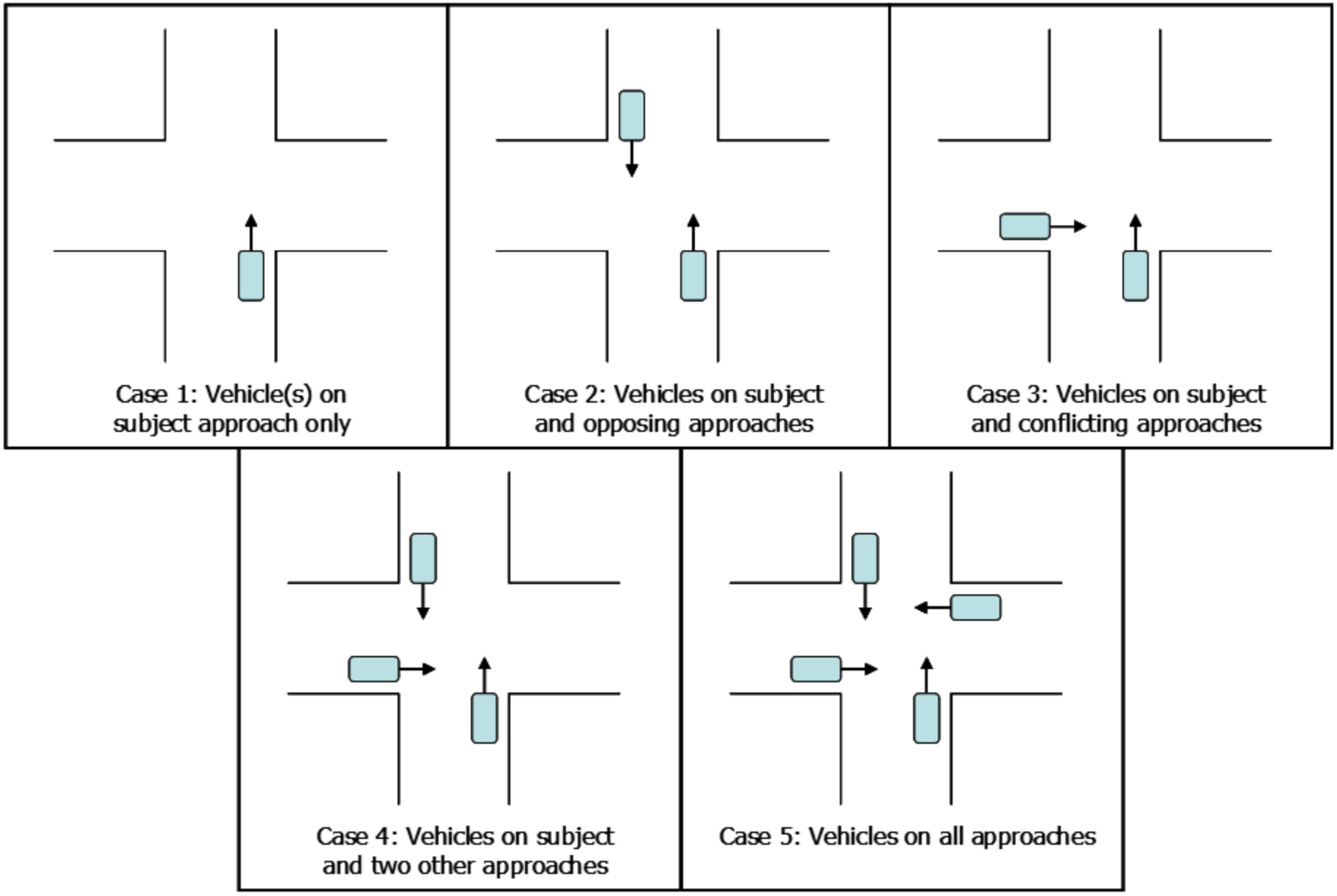
$$h_d = \sum_{i=1}^{5} P(C_i) h_{si}$$



Departure headway as a function of volume on WB approach.



Degree of saturation as a function of volume on WB approach.


Case 1: Vehicle(s) on subject approach only
Case 2: Vehicles on subject and opposing approaches
Case 3: Vehicles on subject and conflicting approaches
Case 4: Vehicles on subject and two other approaches
Case 5: Vehicles on all approaches

Degree-of-Conflict Case	Approach			Probability of Occurrence
	Opp	Con-L	Con-R	
1	N	N	N	$(1 - x_O)(1 - x_{CL})(1 - x_{CR})$
2	Y	N	N	$(x_O)(1 - x_{CL})(1 - x_{CR})$
3	N	Y	N	$(1 - x_O)(x_{CL})(1 - x_{CR})$
3	N	N	Y	$(1 - x_O)(1 - x_{CL})(x_{CR})$
4	Y	N	Y	$(x_O)(1 - x_{CL})(x_{CR})$
4	Y	Y	N	$(x_O)(x_{CL})(1 - x_{CR})$
4	N	Y	Y	$(1 - x_O)(x_{CL})(x_{CR})$
5	Y	Y	Y	$(x_O)(x_{CL})(x_{CR})$

Note: Opp = opposing approach, Con-L = conflicting approach from the left, Con-R = conflicting approach from the right, N = no, Y = yes.

Case	No. of Veh.	Group 1	Base Saturation Headway (s) Group 2	Group 3a	Group 3b	Group 4a	Group 4b	Group 5	Group 6
1	0	3.9	3.9	4.0	4.3	4.0	4.5	4.5	4.5
2	1	4.7	4.7	4.8	5.1	4.8	5.3	5.0	6.0
	2							6.2	6.8
	≥3								7.4
3	1	5.8	5.8	5.9	6.2	5.9	6.4	6.4	6.6
	2							7.2	7.3
	≥3								7.8
4	2	7.0	7.0	7.1	7.4	7.1	7.6	7.6	8.1
	3							7.8	8.7
	4							9.0	9.6
	≥5								12.3
5	3	9.6	9.6	9.7	10.0	9.7	10.2	9.7	10.0
	4							9.7	11.1
	5							10.0	11.4
	≥6							11.5	13.3

Assignment 06 - AWSC Intersection Computational Engine for Simplified Scenario #2

The objective of this assignment is to construct a spreadsheet that computes the capacity for a four-leg single-lane approach AWSC intersection. The spreadsheet should satisfy the following requirements:

- Accepts the flow rates on each approach as inputs.
- Computes lambda (veh/sec) for each approach.
- Computes the x_s, x_o, x_{cl}, and x_{cr} for each approach iteratively.
- Computes $P[C_i]$ for each of the five degree of conflict cases for each approach iteratively.
- Computes the departure headway h_d for each approach iteratively.

Once you have completed the spreadsheet that meets the above requirements, complete the following tasks:

- Assume an intersection with 300 veh/hr on each approach. Use the spreadsheet to determine the capacity of the NB approach.
- What should be the sum of $P[C_i]$ for each approach?
- What should be the maximum value of X in rows 13-16? Why?
- What could be the maximum value of X in row 27? Why?

Notes:

- Your spreadsheet will have a circular reference. You may need to use the re-calculation key (F9) to obtain convergence of the departure headway.
- The likelihood of a vehicle present on an approach can never exceed one. How do you control for this in the spreadsheet tool that you are developing?

	A	B	C	D	E
1	**AWSC Intersection Model - 4 Legs**				
2					
3	**Given Conditions**	**Volume**			
4	NB				
5	SB				
6	EB				
7	WB				
8					
9	**Calculations**	**NB**	**SB**	**EB**	**WB**
10	Volume				
11	Lambda				
12					
13	xS				
14	xO				
15	xCL				
16	xCR				
17					
18	P[C1]				
19	P[C2]				
20	P[C3]				
21	P[C4]				
22	P[C5]				
23					
24	**Results**	**NB**	**SB**	**EB**	**WB**
25	Departure headway				
26	Degree of utilization				
27					

X is constrained

X is not constrained