CE 572 – Spring 2015
Class 37

2015.04.22

14	Class 36 (4.20) HCM Applications Guide Class notes HCMAG overview Assigned: • Assignment 43 (HCMAG) • Assignment 44 (Project)	Class 37 (4.22) HCM Applications Guide HCMAG discussion Exam #2 review	Class 38 (4.24) HCM Applications Guide HCMAG presentations
15	Class 39 (4.27) HCM Applications Guide Project proposal due (A44, Task 1) Peer review of proposal	Class 40 (4.29) HCM Applications Guide Project discussion and review	Class 41 (5.01) HCM Applications Guide No class meeting (Expo!)
16	Class 42 (5.04) HCM Applications Guide HCS results (A44, Task 2)	Class 43 (5.06) HCM Applications Guide Project discussion and review	Class 44 (5.08) HCM Applications Guide Draft review due (A44, Task 3)
17	Final exam period (Tuesday, 5.12, 10 am-12 noon) Final report due Project presentations		

Assignment 43 - HCMAG Presentations

The purpose of this assignment is to review one case study from the HCM Applications Guide and make a presentation on your findings. The content of the HCMAG will serve as an example for the final project (Assignment 44) that you will complete by the end of the semester. For this current assignment:

1. Read the HCMAG Research Results Digest from the Resources page.
2. Read the Introduction chapter from the HCMAG.
3. Read the case study from the HCMAG that you have been assigned.
4. Identify the primary problem that the case study is intended to address. Identify the scope of the analysis, the goals of the evaluation or analysis, and the specific problems that are used to address or illustrate the original problem.
5. Through discussions with your partner, prepare a list of things that you learned about traffic analysis as a result of reading this case study.
6. Based on items 2 and 3, prepare a presentation (10-15 minutes duration) that you will make to the rest of the class (with a partner) on Friday, April 24th. The presentation should show your understanding of the case study and what it is intended to accomplish. It should also include what you have learned about conducting an operational analysis of an intersection.

The case study assignments are as follows:

- Case study 1. US 95 corridor (Arman, Ben)
- Case study 2. Route 146 corridor (Brett, Marvin, Maged)
- Case study 5. Museum Road (Riannon, Kushel)

Case Study 4. Alternate Route 7

Albany, New York

This case study focuses on a three-mile section of New York State Route 7 (NY-7) just north of Albany, NY (see Exhibit 4-1). Called Alternate Route 7 by the locals (because it replaced a more southerly parallel suburban arterial), it has become a very busy highway. NYSDOT (New York State Department of Transportation) thinks this freeway and its adjacent interchanges need to be studied because of traffic congestion issues.

Key issues…

Exhibit 4-1. Alternate Route 7

- capacity of the mainline sections of NYS-7, both eastbound and westbound
- adequacy of the weaving sections throughout the network
- performance of the ramps at all of the interchanges
- queuing and the potential hazards caused by long queues spilling back onto the freeway, if and where that arises
- speed changes, especially significant ones that might arise at the merge and diverge areas of the ramps, and the impacts of these speed changes on safety

Case Study 4. Alternate Route 7

Albany, New York

We're going to consider these issues and others through a series of five problems. Each one illustrates different facets of the deficiency analysis. Each one also illustrates how the various traffic analysis tools in the *Highway Capacity Manual* can be applied to assist traffic analysts, engineers, planners, and decision-makers in making sound investment decisions regarding changes to a transportation system.

Learning outcomes…

- Determine the appropriate analyses required to address a problem similar to what is presented in this case study. This includes the physical scope of the area to be included in the analysis and selecting the appropriate analysis.
- Understand what input data are required and the assumptions that are commonly made regarding default values for the HCM procedures for these facilities.
- Understand when and how to apply the methodologies for basic freeway sections, weaving sections, ramps, and freeway systems.
- Understand the limitations of the HCM procedures and when it is appropriate to use other models or computational tools.
- Know how to reasonably interpret the results from an HCM analysis and how these results can be used to support a particular decision regarding changes to a transportation system.

Case Study 4. Alternate Route 7

Albany, New York

"Each problem illustrates something important for a traffic engineer to do to find solutions to the facility's problems…"

- The first problem focuses on Route 7 itself, the freeway segment between I-87 and I-787. We use this problem to show you how the basic freeway analysis methodology in the HCM can be used to look at issues ranging from whether the difference in the number of lanes by direction is reasonable (2 eastbound and 3 westbound) to the extent to which the facility's performance varies across the year.
- The second problem looks at Exits 6 and 7 on I-87 and the NY-9 exit on NY-7 (see Exhibit 4-3). We show you how to examine questions about the design of the interchange and how to increase capacity and reduce delays.
- The third problem looks at the I-787 interchange complex. In a fashion similar to the second problem, we show how to determine whether design enhancements might increase the capacity of several ramps and weaving sections.
- In the fourth problem, we use the freeway systems analysis methodology to assess the performance of NY-7 in both directions.
- In the fifth and final problem, we use VISSIM, a microscopic simulation model, to show you how to assess the performance of the system as a whole: the interchanges on the western and eastern ends as well as the basic freeway section in-between.

For your Case Study for Assignment 43:

- You've developed an outline of the case study
- Spend 10 minutes discussing the outline and what you've learned about the case study thus far.
  - Identify the major reason for this case study: what does it try to do?
  - Document how the problems illustrate some of the key HCM issues and insights
- Report your results to the class

Assignment 44 - Contents

Your report and presentation should be based on the structure of the HCMAG and should include the following sections:

- Overview (what the problem is about, issues that will be explored)
- Introduction (description of area and facility)
- Getting Started (scope, stakeholders, goals and objectives, what analyses to perform)
- Problems (how to address various aspects of the problem using HCM methods)

Exam #2 –Results

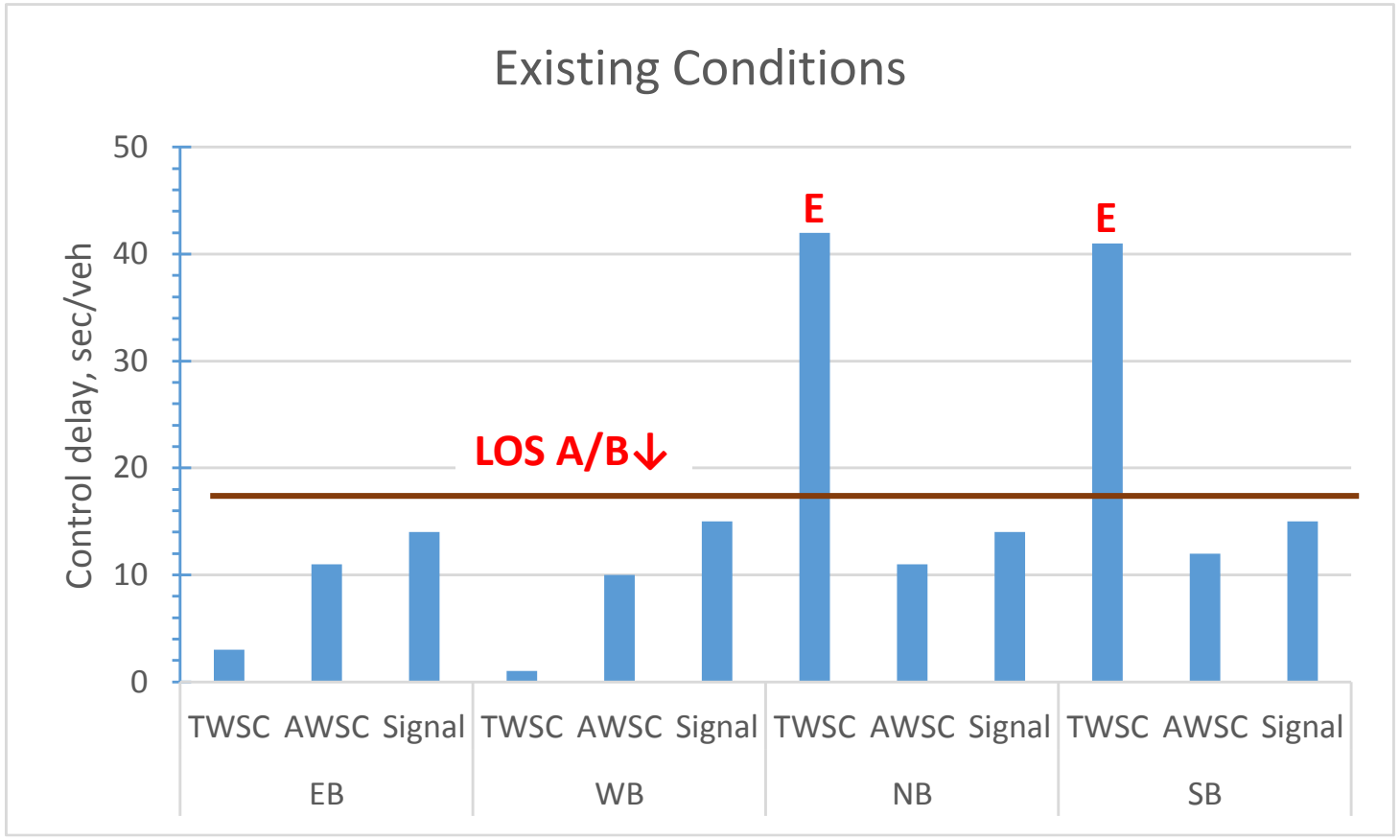
- Mean: 92
- Range: 83-95

Exam #2 – Problem 1 – HCS Results

Approach	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	1	2	3	4	5	6	7	8	9	10	11	12
Flow rate	125	225	50	75	175	125	50	125	50	25	150	75
Capacity		1273			1300		110	284		129	312	
v/c ratio		.1			.1		.5	.6		.2	.7	
Queue		.3			.2		2	4		1	5	
Delay		8			8		63	36		40	41	
LOS		A			A		F	E		E	E	
Delay							42			41		
LOS							E			D		

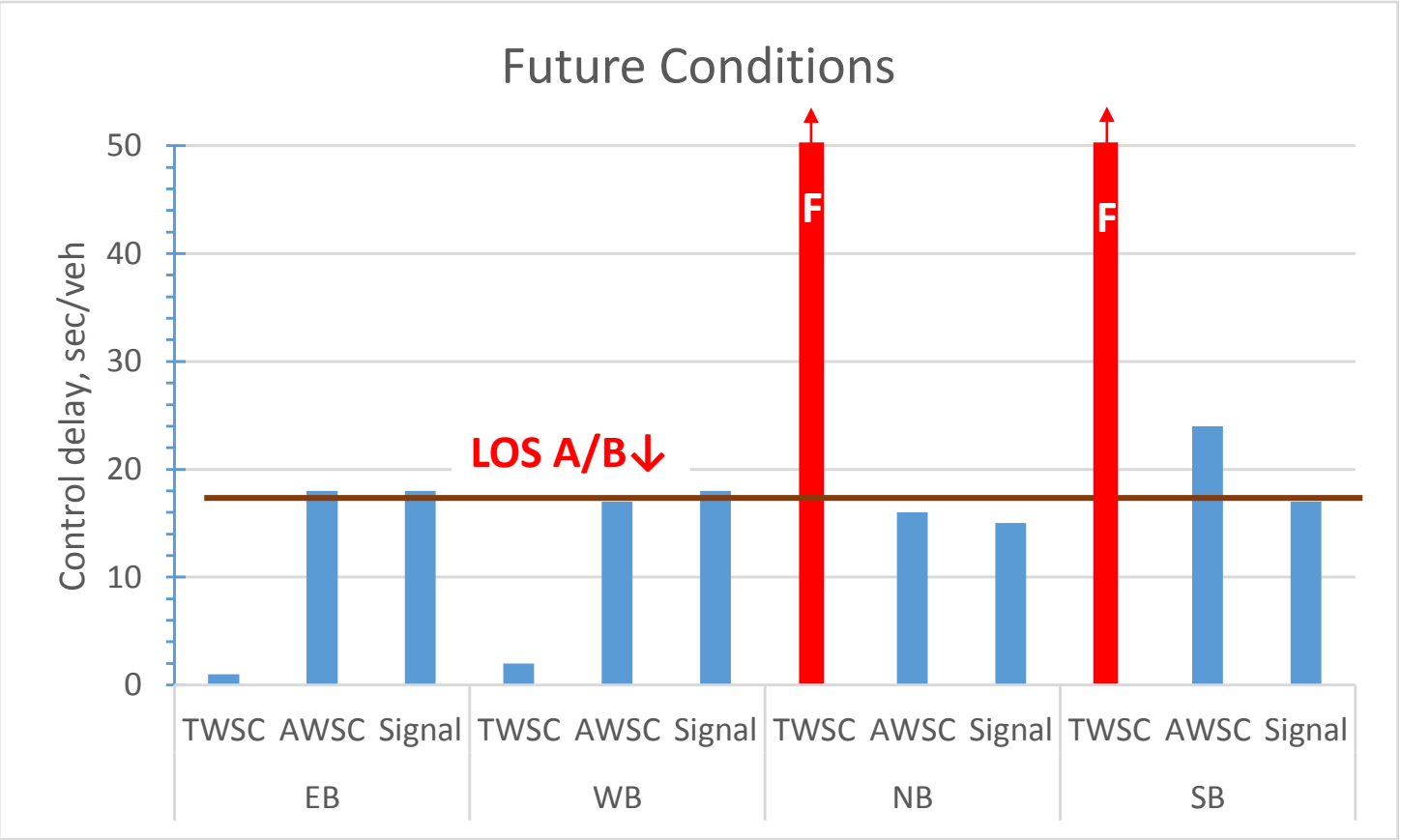
1. Major street should operate with no problems
2. Sufficient capacity for minor street approaches
3. Moderate to long delays (LOS E, F) for NB and SB approaches
4. Low to moderate queue lengths (1-5 vehicles) for NB and SB approaches
5. What do you notice about relative volume distribution on the four approaches?

Exam #2 – Problems 2/3 – HCS Results



1. TWSC minor TH approaches operate at LOS E; NBL movement operates at LOS F
2. All movements under AWSC and signal control operate at LOS B or better
3. While major street delays increases somewhat when control type is changed from TWSC, overall the intersection operates much better with AWSC or signal control

Exam #2 – Problems 2/3 – HCS Results



1. TWSC minor TH approaches operate at LOS F; delay estimates beyond model range
2. All movements under AWSC and signal control operate at LOS B or better (nearly so)
3. Delays are intolerable under TWSC
4. Both AWSC or signal control results in acceptable operation

Exam #2 – Problem 4 – TWSC Intersection Model Limitations

Example Responses:

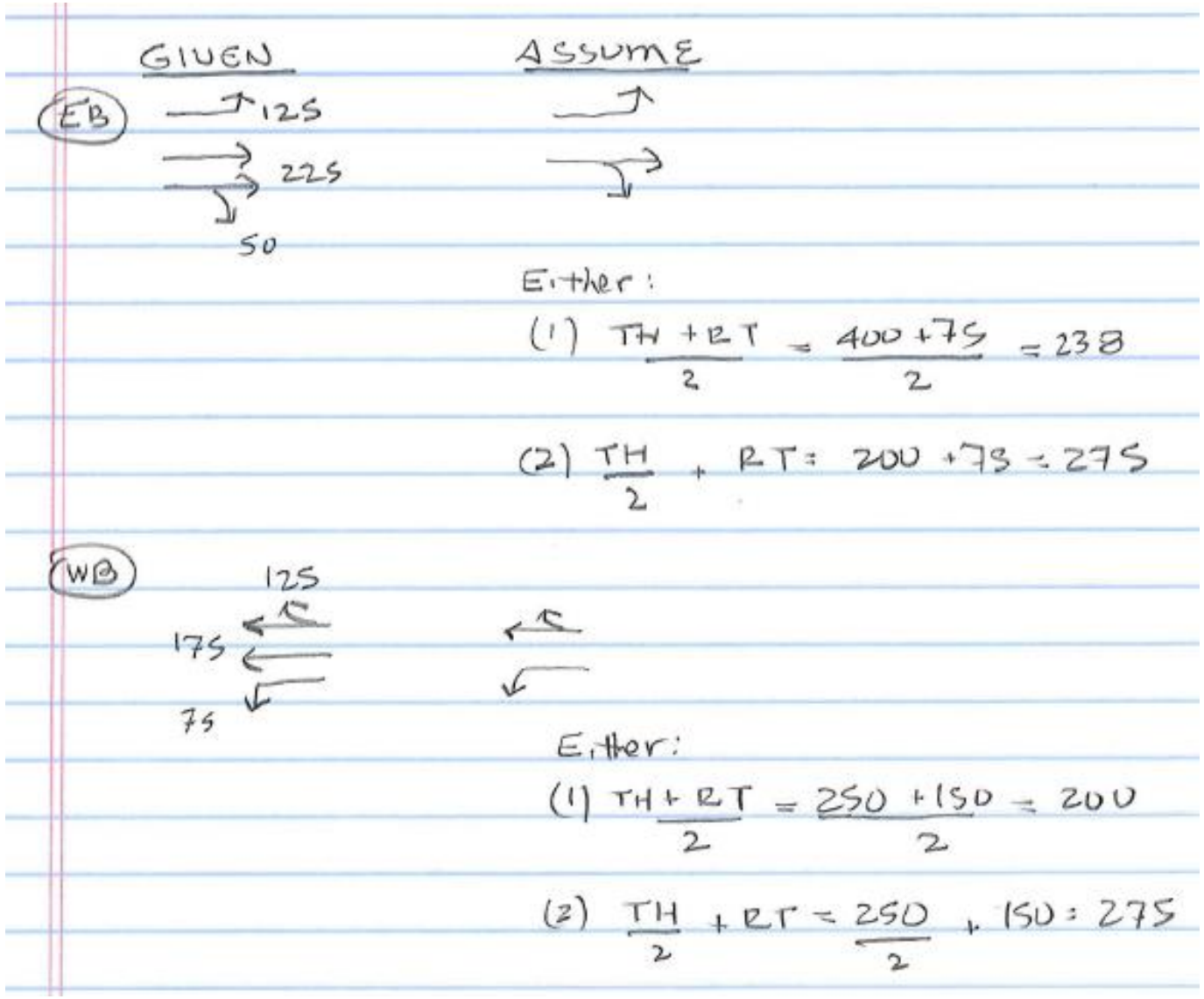
1. Model boundary: when capacity is computed to be zero, delay is not reported
2. No delay calculated for major street TH/RT (rank 1) movements
3. Only three lanes allowed on each approach (not limitation for this problem)
4. Performance measures not reported for intersection

Exam #2 – Problem 5 – AWSC Intersection Model Limitations

Primary issue:

- HCS limits two lanes on each approach
- Two possible configurations and reduced volumes for analysis with HCS

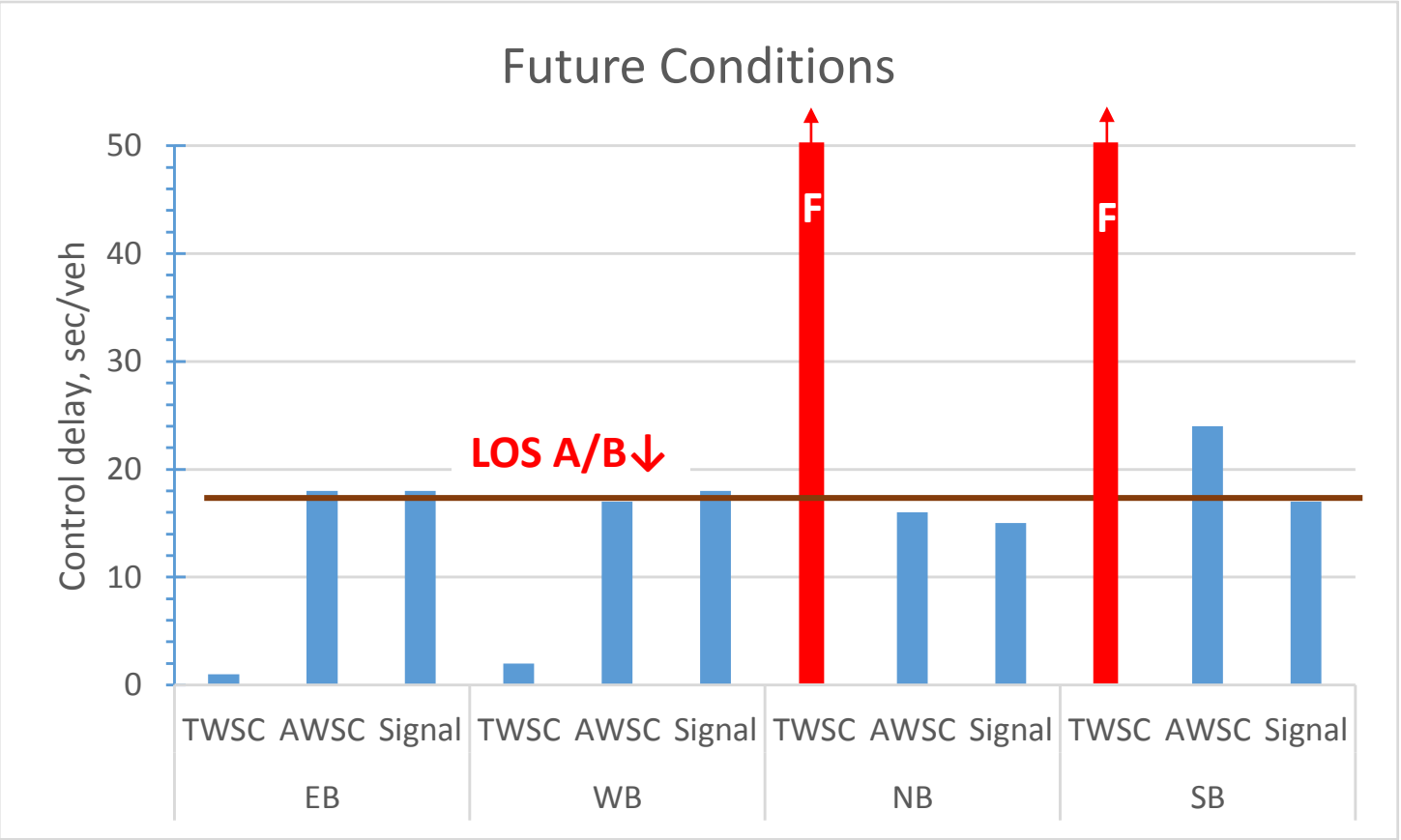
Exam #2 – Problem 5 – AWSC Intersection Model Limitations



Delay	EB	WB	NB	SB
(1)	17.5	17.1	15.8	24.1
(2)	15.3	14.0	14.6	21.3

1. Two possible assumptions on how to adapt AWSC intersection model to given conditions
2. In either case, the total volume must be reduced to account for the fewer number of lanes
3. Both assumptions lead to nearly the same results (in terms of delay)
4. Note that results are either side of LOS boundary B/C (which would be important in presenting and interpreting results)

Exam #2 – Problem 6 – Control Decision



1. TWSC should not be considered in the future because of unacceptable performance on the minor street
2. Either AWSC or signal control are feasible alternatives and produce similar approach delay predictions
3. All other factors being equal, AWSC could be chosen because of cost; actuated signal control could provide more flexibility in operation by responding to changing traffic conditions

Exam #2 – Problem 7 – AWSC Model Description

1. Adjust saturation headways based on turning movement volumes and heavy vehicle percentages
2. Compute degree of saturation through iterative process
3. Compute service time
4. Compute capacity through iterative process (until X reaches 1.0)
5. Compute delays and LOS for lane groups, approaches, and intersection

Exam #2 – Problem 8 – TWSC Model Description

1. Compute critical headway and follow up headway as a function of proportion of heavy vehicles and grade
2. Determine conflicting flow and (if appropriate) compute impedance factors
3. Compute potential capacity
4. Compute movement capacity
5. Determine shared lane capacity
6. Determine v/c ratio, queue length, and control delay

Exam #2 – Problem 9 – Signalized Intersection Model Description

1. Determine saturation flow rate (based on base and adjustments)
2. Predict green time (iterative process)
3. Compute capacity
4. Compute delay and queue length

Exam #2 – Problem 1 – HCS Results

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