CE361 Introduction to Transportation Engineering — Out: Monday 27 October 2003

Project 1 = 2 HWs — Due: Monday 10 November 2003

HIGHWAY SAFETY AND SIGNAL TIMING

Dear Consultant:

The Mythaca City Engineer is getting a lot of complaints about congestion at certain intersections. Some of the complaints may be exaggerated; some may be well-founded. To help the City Engineer diagnose the problem and propose solutions, good data are needed. Your small firm is being retained to collect and analyze data pertaining to some of the problem locations. The contract calls for your 4-5 employees to undertake the tasks below. A link to the list of personnel is on the CE361 home page. Who collects the data is up to your firm, but all members of your firm will be held accountable for being able to explain the analyses to the City Engineer's staff.

Although the data collection includes observing traffic at peak periods, there is no reason to engage in dangerous activities. You should be able to make observations from sidewalks and cross streets in a safe, legal manner. Each member of your group must sign the top page of the report you submit.

1. **Stopping sight distance.** The normal briefing by the client on this topic could not be held, but references exist to guide you. Please demonstrate your basic competence by solving these three problems:
   A. (5 points) Crest vertical curve. A road over a hill is being designed for 65 mph. In the EB direction, the uphill grade is 3 percent and the downhill grade is 1 percent. Determine the minimum length of the curve for adequate stopping sight distance. Is the curve longer or shorter than the SSD?
   B. (5 points) Sag vertical curve. A vertical curve in a rural area has G1 = -3.9 percent and G2 = +3.7 percent. It is 660 feet long. The residents nearby think the 60 mph speed limit is too high for that stretch of road. If they hire you to confirm their point of view, what calculations will you do? Were the residents right?
   C. (5 points) Horizontal curve. Trees have grown to within 22 feet of the inside edge of a 5-foot shoulder that is alongside a 2-lane road that makes a horizontal curve around the trees. The curve has length 564 feet, two 12-foot lanes, a radius of 956 feet to its centerline, and a 55 mph speed limit. Is there adequate stopping sight distance in the situation described? Use Equation 7.9 to check that L>SSD. If that check were to "fail", what would you recommend as a solution?

2. (15 points) **Signal timing form.** Choose any traffic signal along either South or Columbia Streets between 2nd and 9th Streets in downtown Lafayette. Complete a Traffic Signal Timing Form with the same format as CNotes Table 8.4. Is the signal you chose pre-timed or actuated? How did you decide this? If the signal is actuated, show the timing for one signal cycle or for an average of the cycles you observed, but make clear which it is.

3. **Time Space Diagram.**
   A. (10 points) Create a TSD for either South or Columbia Street between 2nd and 9th Streets in downtown Lafayette.
   B. (10 points) Submit your data in the formats shown in CNotes Tables 8.5, 8.6, and 8.7. Include the date of your observations.
   C. (10 points) What range of speeds, if any, will enable a driver to travel along the street you chose without ever being stopped by a red light?

4. (20 points) **Traffic Signal Logic.** Observe the intersection of Northwestern Avenue and Cherry Lane and create a summary of the Traffic Signal Logic shown in the box on CNotes page 472. Include the time(s) of your observations. Make your observations at a time when traffic is moderately heavy, not during a peak period or when traffic is very light.

5. (20 points) **Average Stopped Delay.** For each approach (all lanes combined) to the intersection of Stadium and Northwestern during the PM peak period, estimate average stopped delay using the method shown in CNotes Figure 8.18. Ten minutes of observations should be sufficient. You are permitted to change the interval between observations of stopped vehicles. If you change the interval from I = 15 seconds, explain why.