CE 361 Introduction to Transportation Engineering — Out: Fri. 22 October 2004

Homework 6 (HW 6) Solutions — Due: Fri. 29 October 2004

VEHICLES, DRIVERS, AND GEOMETRIC DESIGN

1. (15 points) **Stopping Sight Distance (SSD) on Vertical Curves.** FTE Problem 7.6.

(a) Use $h_1 = 3.5$ ft and $h_2 = 2$ ft. From Table 7.4: for 50mph, SSD = 425 ft. A = |-3 – 2| = 5 percent. Apply equations 7.17:

$$L_{min} = \frac{A \times SSD^2}{2158} = 418.5\,\text{ft} \quad \text{for } L < SSD$$

$$L_{min} = 850 - \frac{2158}{5} = 418.4\,\text{ft} \quad \text{for } L > SSD$$

SSD>L, so use L_{min} = 418.4 ft. Curve now has L = 400 ft, so curve does not have sufficient SSD.
(b) Curve now has K = L/A = 400/5 = 80. In Table 7.6, K=61 for 45 mph and K=84 for 50 mph. 45 mph meets min SSD standards; 50 mph does not.

2. (15 points) **Horizontal Sight Distance.** FTE Problem 7.13. 1650 feet is the radius of the curve.

In Table 7.4, SSD = 820 ft corresponds to a design speed of 75 mph.
Two 12-foot lanes, so $R_v = R - ½(12\text{ ft}) = 1650 - 6 = 1644$ ft.
M_s in Figure 7.17 = 35 ft + 6 ft = 41 ft from center of inner lane to trees.

(7.19) $$M_S = R_V\left(1 - \cos\frac{90 \times SSD}{\pi \times R_V}\right) = 1644\left(1 - \cos\frac{90 \times 820}{\pi \times 1644}\right) = 1644\,(1 - 0.9691) = 50.86\text{ ft.}$$

Need to cut back trees 50.86 – 41 = 9.86 ft.

3. (20 points) **Critical Approach Speed.** FTE Problem 8.2.

(a) Draw a line from 10 mph on the B scale in Figure 8.6 through point "(b,a)" to the A scale. The value on the A scale is 49 mph.
(b) No change in (b,a), but (c,d) is (34,45). (b,a) still governs. Use yield sign.
(c) (b,a) still governs. CAS = 11 mph. Yield sign still appropriate.
(d) (b,a) = (40,22) → CAS = 9 mph. Stop sign is needed.