

Problem 1

A rural section of a four-lane (two lanes in each direction) freeway that is 3.2 km long and has a sustained grade of **G** is to be improved to carry on a regular weekday a heavy volume of **Q**, consisting of 85% passenger cars, 10% trucks, 2% buses, and 3% recreational vehicles. The PHF is 0.95. Determine the additional number of 3.6-m lanes required in each direction if the road is to operate at level of service B. The base free-flow speed is **BSFF**, there is a lateral obstruction 1.5 m from the pavement on the right side of the road, and interchange spacing is 1.6 km.

Data for Pb #1

| Student ID (last 2 digits) | G [%] | Q [veh/h] | BFFS [km/h] |
|---------------------------------------|--------------|------------------|--------------------|
| 00 - 24 | 4.2 | 3000 | 115 |
| 25 - 49 | 5.5 | 2700 | 110 |
| 50 - 74 | 3.9 | 3200 | 120 |
| 75 - 99 | 2.5 | 3100 | 105 |

Problem 2

A four-lane urban freeway (two lanes in each direction) operates at capacity during the peak hour. It has 3.4-m lanes and 1.2-m shoulders. The freeway has only regular users and there are 8% large trucks and buses (no recreational vehicles), and the freeway is on rolling terrain with a peak-hour factor of **PHF**. There is one interchange every 3.2 km. It is known that a certain percentage, **P**, of the AADT occurs in the peak hour and that the directional factor is **D**. What is the freeway's AADT?

Data for Pb #2

| Student ID (last 2 digits) | P [%] | D | PHF |
|---------------------------------------|--------------|----------|------------|
| 00 - 24 | 12.2 | 0.60 | 0.85 |
| 25 - 49 | 9.8 | 0.55 | 0.92 |
| 50 - 74 | 13.7 | 0.62 | 0.80 |
| 75 - 99 | 11.5 | 0.58 | 0.98 |