

Example Problem 6D-1_3: Intersection with a Four-lane Expressway

Calculate the required intersection sight distance need for a truck to turn left from a minor road approach to a rural expressway.

Given:

Local road intersecting a 4-lane rural expressway

Design speed of the expressway = 70 mph

Median width = 64 feet

Design vehicle = Combination truck

Assume the vehicle will turn into the outside lane

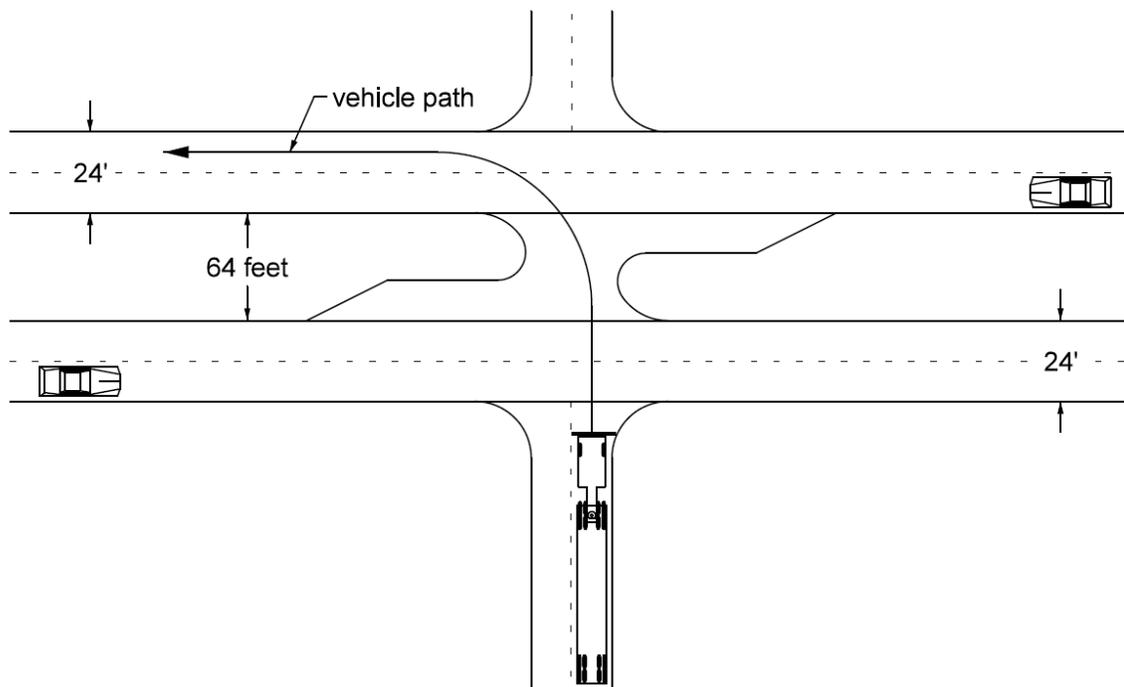


Figure 1: Intersection between a local road and expressway.

Solution:

1. Sight triangle to the left:

Using the time gap acceptance value for combination trucks from Table 3 and Equation 6D-1_4, determine the required intersection sight distance:

$$L = 1.47 \times 70 \times 10.5 = 1080.5 \text{ ft} \approx 1085 \text{ ft}$$

2. Sight triangle to the right:

Calculate the time gap acceptance value required for the combination truck to cross near lanes, median, and far lane.

To cross the near lanes, add 0.7 seconds for the additional 12' lane

To cross the median:

Covert the median width to equivalent 12' lanes:

$$\frac{64}{12} = 5.3 \text{ lanes}$$

$$\text{Time to cross the median} = (5)(0.7) + \left(\frac{3}{12}\right)(0.7) = 3.7 \text{ seconds}$$

To cross the far lane, add 0.7 seconds.

$$\text{Gap acceptance time} = 11.5 + 0.7 + 3.7 + 0.7 = 16.6 \text{ seconds}$$

Using the calculated gap acceptance time and Equation 6D-1_4, determine the required intersection sight distance:

$$L = 1.47 \times 70 \times 16.66 = 1708.1 \text{ ft} \approx 1710 \text{ ft}$$

3. Construct departure sight triangles:

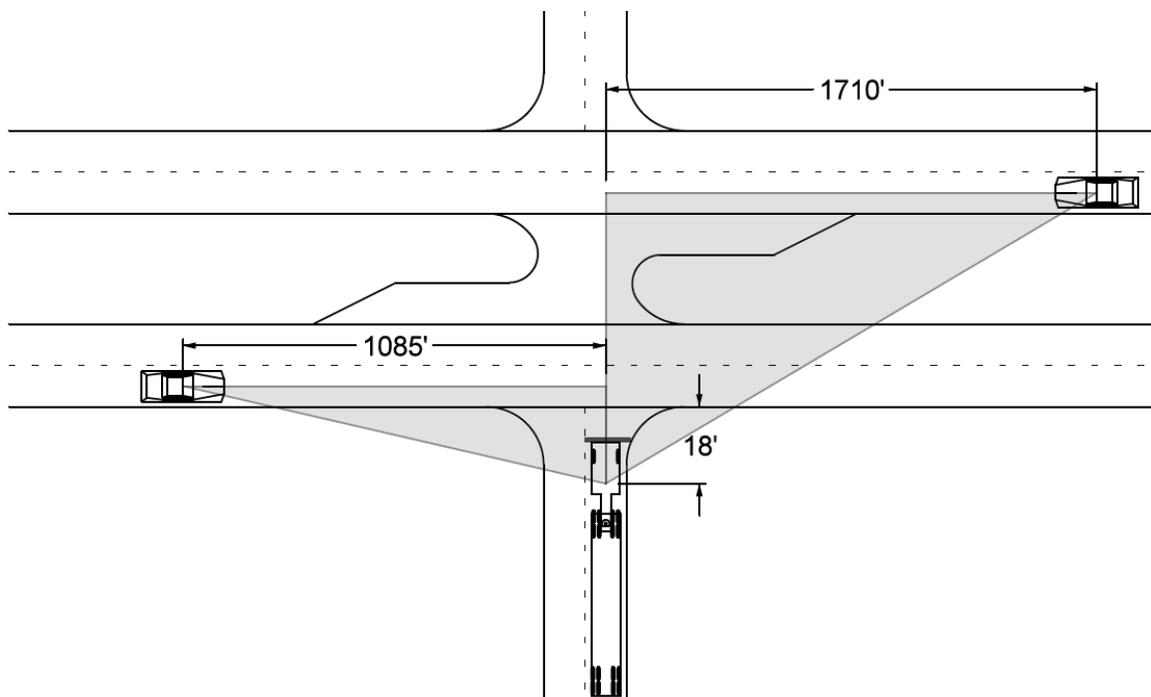


Figure 2: Intersection sight triangle.

4. Vertical alignments:

The elevations of the driver in the truck and the drivers in the passenger cars need to be derived from the profiles. If the designer determines that the driver's cannot see one another, the profiles need to be adjusted to provide the recommend sight distances calculated.

Discussion:

In some instances, intersection sight distance for a combination truck to complete a left turn or crossing maneuver without stopping in the median can be difficult to provide. For these instances, it is desirable to provide intersection sight distance for a single-unit truck stopped within the median should be provided.

Sight triangle to the right for a single-unit truck:

Using the time gap acceptance value for a single-unit truck from Table 3 and Equation 6D-1_4, determine the required intersection sight distance:

$$L = 1.47 \times 70 \times 9.5 = 977.6 \text{ ft} \approx 980 \text{ ft}$$

Construct departure sight triangle:

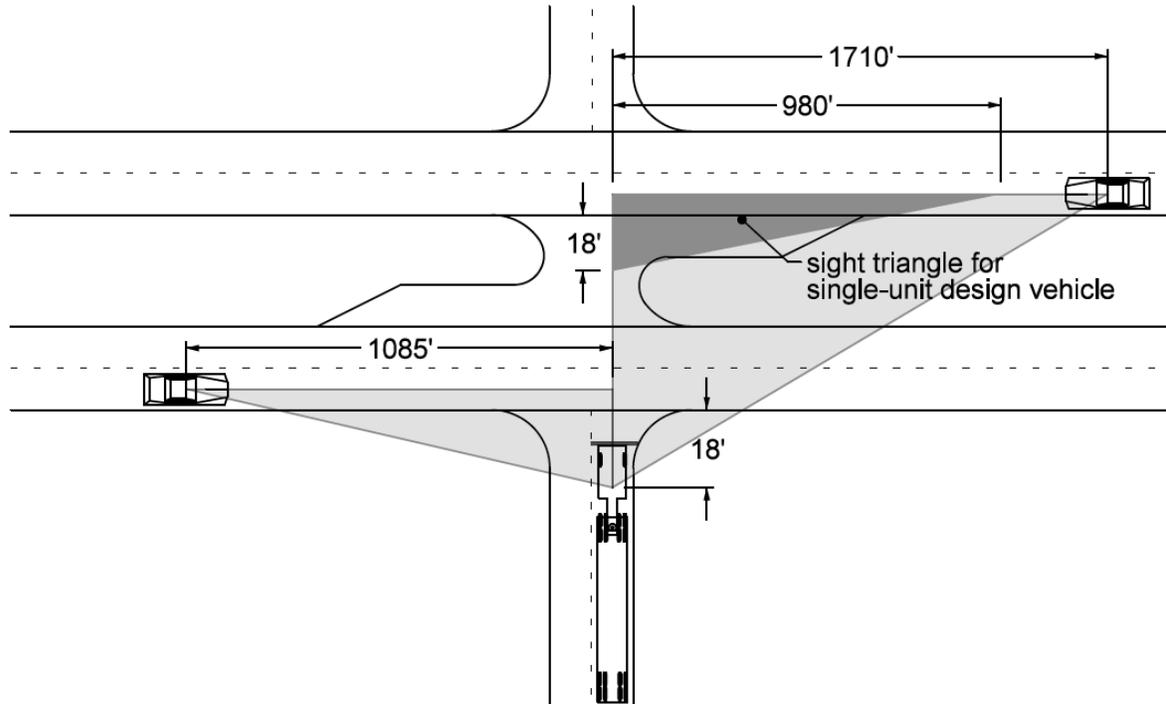


Figure 3: Intersection sight triangle.