

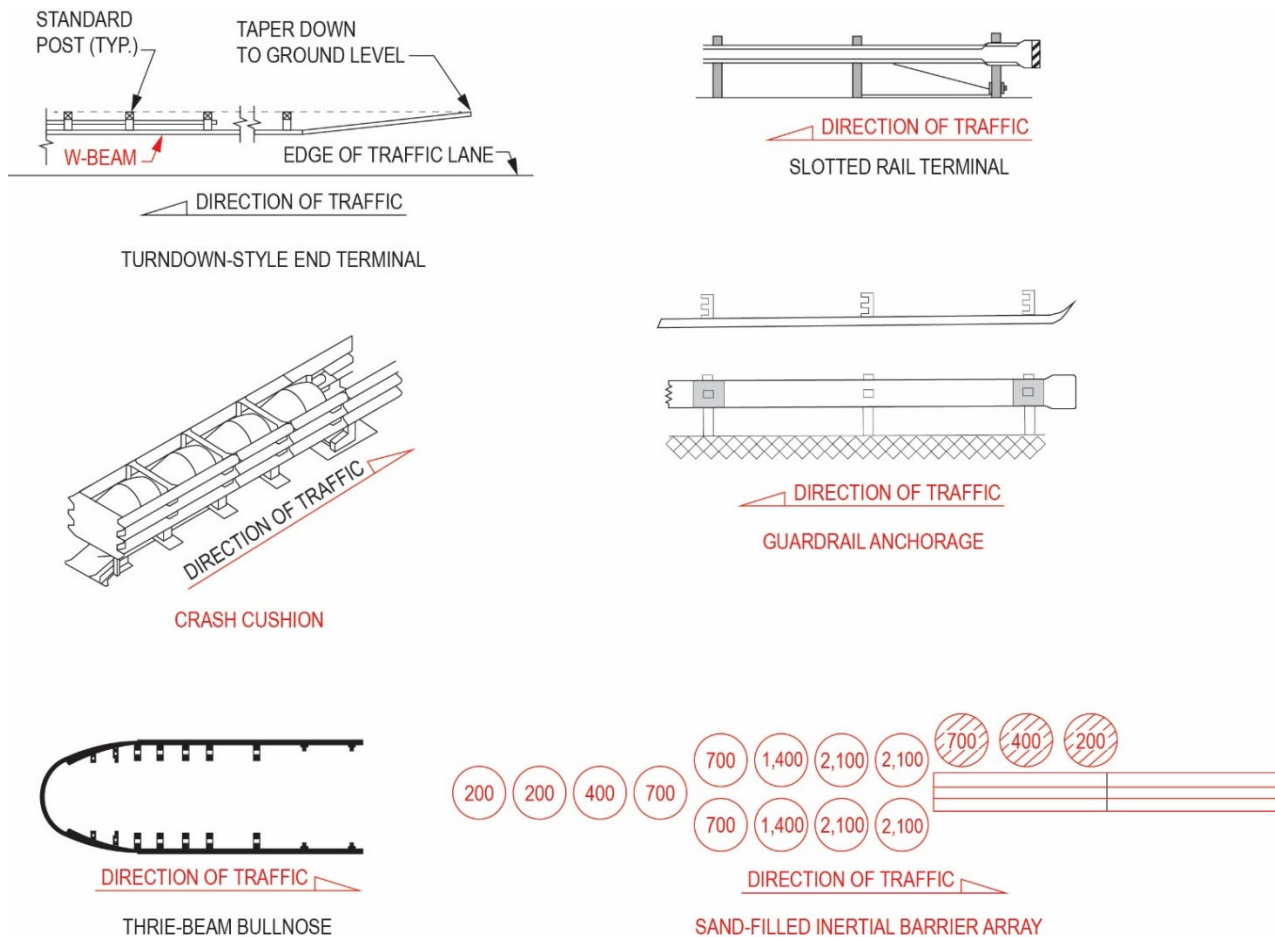
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Revisions are shown in red.

**Question 8:**

3 diamond interchanges in 6 miles

**Question 21:**



- A. Turndown-style end terminal
- B. Slotted rail terminal
- C. Crash cushion
- D. Guardrail anchorage
- E. Thrie-beam bullnose
- F. Sand-filled inertial barrier array

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**Question 26:**

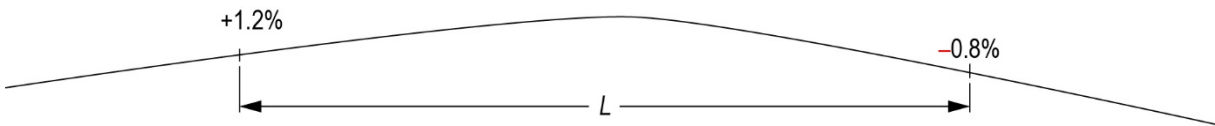
PI station = 12+40.00

Degree of curve (arc) =  $10^\circ$

Deflection angle =  $12^\circ 30'$

**Question 43:**

A crest vertical curve originally designed to provide passing sight distance is experiencing drainage issues due to the high  $K$  value of the curve. If the two-lane, 50-mph design speed roadway is modified to provide only stopping sight distance, the decrease in length  $L$  (ft) of the curve is \_\_\_\_\_.



**Question 58:**

Delineators are to be placed on the outside of a horizontal roadway curve of  $5^\circ$  (arc). The approximate spacing (ft) for the delineators along the curve is most nearly:

**Solution 7:**

Alternatively, from economic factor tables available in various references,  
capital recovery factor (CRF) = 0.06401

$$\begin{aligned} A &= P(A/P, 4\%, 25) \\ &= (\$6,987,500)(0.06401) \\ &= \$447,269.88 \end{aligned}$$

**Solution 12:**

Reference: FHWA, *Manual on Uniform Traffic Control Devices*, 2009, Section 2B.12.

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**Solution 16:**

where

$v_p$  = pedestrian unit flow rate (p/ft/min)

$v_{15}$  = peak 15-min flow (p/h)

$W_E$  = effective walkway width (ft)

$$v_p = \frac{1,200}{15(6.5)} = \frac{1,200}{97.5} = 12.3$$

**Solution 21:**

The turndown-style W-beam rail is not found in the *Roadside Design Guide*, because it is not crashworthy. This type of end terminal may result in vaulting over the tapered end at high speeds.

The slotted rail terminal is explicitly shown in Table 8-2 as meeting TL-3 Crash Test Criteria.

The crash cushion is addressed by Table 8-6 with corresponding test level approvals.

The guardrail anchorage is noted as not crashworthy in Section 8.0.

The thrie-beam bullnose is addressed in Section 8.4.2.1.1 and noted to have passed appropriate test levels.

The inertial barrier array is addressed in Table 8-8.

**THE CORRECT ANSWERS ARE: A, D**

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**Solution 26:**

$$R = 5,729.648/D_a^\circ$$

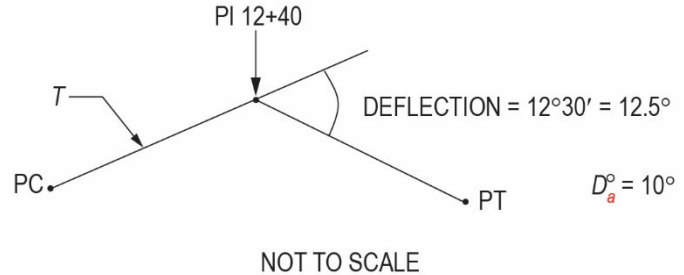
$$= 5,729.648/10 = 572.96 \text{ ft}$$

$$T = R \tan\left(\frac{1}{2}\Delta\right) = R \tan(6.25^\circ)$$

$$= 572.96 (\tan 6.25^\circ)$$

$$= 572.96 (0.1095178)$$

$$= 62.75 \text{ ft}$$



$$\text{Station PC} = \text{Station PI} - T$$

$$= (12 + 40) - 62.75$$

$$= 11 + 77.25$$

$$\text{Station PT} = \text{Station PC} + \text{length of curve}$$

$$\text{Length of curve} = L = 100 \Delta/D_a^\circ$$

$$= 100(12.5)/10 = 125 \text{ ft}$$

$$\text{Station PT} = \text{Station PC} + 125 \text{ ft} = (11 + 77.25) + 125 = 13 + 02.25$$

**Solution 43:**

Stopping sight distance at 50 mph per Table 3-35 = 425 ft,  $K$  value = 84, which is under the typical drainage maximum of 167.

**Solution 58:**

$$R = \frac{5,730}{D_a} = \frac{5,730}{5} = 1,146 \text{ ft}$$

**Solution 65:**

Reference: AASHTO, *Mechanistic-Empirical Pavement Design Guide*, 2022, Table 9-8, p. 127.