



Given: Square abutment

Profile-grade El. at front face abutment: 903.33

Lane width: 12 ft

Lane cross slope: 2%

Paved-shoulder width: 11 ft

Usable-shoulder width: 13 ft

Shoulder cross slope: 4%

Toe-of-slope El. at end of wing: 893.33

Determine the following.

Break-point El.

$$903.33 [12(0.02) + (11 + 2)(0.04)] = 903.33 (0.24 + 0.52) = 902.57$$

Horizontal distance from break point to toe of slope, S

$$3(902.57 - 893.33) = 27.72 \text{ ft}$$

Wing length, L

$$X_2 = W_f \tan\left(\frac{\alpha}{2}\right) = 1 \tan 15^\circ = 0.27 \text{ ft}$$

$$S - X_2 - W_f = 27.72 - 0.27 - 1 = 26.45 \text{ ft}$$

$$L = \frac{(S - X_2 - W_f) \sin 45^\circ}{\sin(90^\circ - \alpha + 45^\circ)} = \frac{(26.45) \sin 45^\circ}{\sin 105^\circ} = 19.36 \text{ ft}$$

Horizontal distance from end of wing to toe of slope, Y

$$X_2 = L \cos \alpha = 19.36 \cos 30^\circ = 16.77 \text{ ft}$$

$$Y = (S - X_2 - W_f) - X_3 = 26.45 - 16.77 = 9.68 \text{ ft}$$

End-wing El. at toe of slope

$$\text{El.} = \left(\frac{Y}{3}\right) + (\text{Toe-of-slope El.}) = \left(\frac{9.68}{3}\right) + 893.33 = 3.23 + 893.33 = 896.56$$

End-wing El. required

$$\text{El.} = (\text{End-wing El. at toe of slope}) + 0.50 = 896.56 + 0.50 = 897.06$$

FLARED-WING LENGTHS AND ELEVATIONS EXAMPLE

Figure 67-2B