Length-meters
Furrow Spacing = 0.75m

Intake Family 0.3
F_n = 75mm
S = 0.004m/m
n = 0.04

FIG. 13.4 Furrow irrigation design chart (USDA, 1979)

Find:

Design inflow time required, T_1
Surface runoff, RO
Deep percolation, DP
Application efficiency, AE

Solution:
Advance time

$$\beta = \frac{(1.904 \times 10^{-4})275}{0.6\sqrt{0.004}} = 1.38$$

$$T_T = \frac{275}{7.61} e^{1.38} = 143.6 \text{ min} \dots\dots\dots\dots \text{(equation [13.35])}$$

Adjusted wetted perimeter

$$P = 0.265 (0.6 \times 0.04/\sqrt{0.004})^{0.425} + 0.227 = 0.40 \text{ m}$$

$$\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{(equation [13.34])}$$

Net opportunity time

$$T_n = \left\{ \left[(75 \times 0.75/0.40) - 7.0 \right] /0.925 \right\}^{1/0.720} = 999 \text{ min}$$

$$\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{(equation [13.41])}$$

Design inflow time (sum of T_T and T_n)

$$T_1 = 143.6 + 999 = 1143 \text{ min}$$

Gross application

$$F_g = \frac{60(0.6)(1143)}{(0.75)(275)} = 200 \text{ mm} \dots\dots\dots \text{(equation [13.39])}$$

Average opportunity time

$$T_{(0-L)} = 1143 - \frac{0.0929}{7.61(275)\left[\frac{(0.305)(1.38)}{275} \right]^2} (1.38-1)(e^{1.38}+1)$$

$$= 1143 - 47.6 = 1095 \text{ min} \dots\dots\dots \text{(equation [13.38])}$$