

الحل:

تصميم الخط ٢ - ١:

$$A = 1.55 \times 10^{-2} \text{ km}^2 = 15500 \text{ m}^2$$

$$t = 10 \text{ min}$$

$$i = \frac{2880}{t+20} = \frac{2880}{10+20} = 96 \text{ mm/hr} = 0.096 \text{ m/hr}$$

$$Q = C \cdot i \cdot A = 0.40 \times 0.096 \times 15500 = 595.2 \text{ m}^3/\text{hr} = 0.1653 \text{ m}^3/\text{s}$$

$$S = \frac{94-93}{90} = 0.011$$

بتطبيق معادلة ماننق، يمكن حساب قطر الخط وسرعة تدفق المياه فيه:

$$Q = \frac{0.312}{n} D^{\frac{8}{3}} S^{\frac{1}{2}}$$

$$0.1653 = \frac{0.312}{0.013} D^{\frac{8}{3}} (0.011)^{\frac{1}{2}}$$

$$D_{1-2} = (0.0654)^{3/8} = 0.36 \text{ m} = 360 \text{ mm}$$

$$V_{1-2} = \frac{0.397}{n} D^{\frac{2}{3}} S^{\frac{1}{2}} = \frac{0.397}{0.013} (0.36)^{\frac{2}{3}} (0.011)^{\frac{1}{2}} = 1.63 \text{ m/s}$$

تصميم الخط ٣ - ٢:

$$A = 1.55 \times 10^{-2} + 1.40 \times 10^{-2} = 2.95 \times 10^{-2} \text{ km}^2 = 29500 \text{ m}^2$$

$$t = 10 + \frac{90}{1.63} \times \frac{1}{60} = 10.92 \text{ min} \cong 11 \text{ min}$$

$$i = \frac{2880}{t+20} = \frac{2880}{11+20} = 92.9 \text{ mm/hr} = 0.0929 \text{ m/hr}$$

$$Q = C \cdot i \cdot A = 0.40 \times 0.0929 \times 29500 = 1096.22 \text{ m}^3/\text{hr} = 0.3045 \text{ m}^3/\text{s}$$

$$S = \frac{93-92}{90} = 0.011$$

$$Q = \frac{0.312}{n} D^{\frac{8}{3}} S^{\frac{1}{2}}$$

$$0.3045 = \frac{0.312}{0.013} D^{\frac{8}{3}} (0.011)^{\frac{1}{2}}$$

$$D_{2-3} = (0.1204)^{3/8} = 0.453 \text{ m} \cong 450 \text{ mm}$$