

TYPES OF FINS

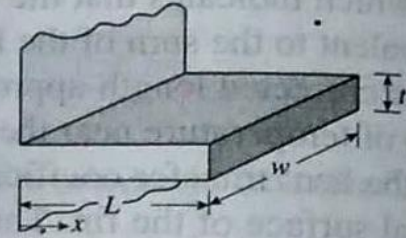
Straight rectangular fins

$$m = \sqrt{2h/kt}$$

$$L_c = L + t/2$$

$$A_{fin} = 2wL_c$$

$$\eta_{fin} = \frac{\tanh mL_c}{mL_c}$$

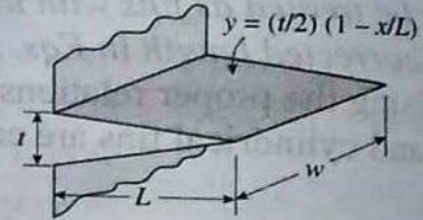


Straight triangular fins

$$m = \sqrt{2h/kt}$$

$$A_{fin} = 2w\sqrt{L^2 + (t/2)^2}$$

$$\eta_{fin} = \frac{1}{mL} \frac{l_1(2mL)}{l_0(2mL)}$$



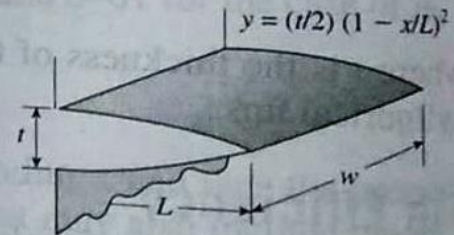
Straight parabolic fins

$$m = \sqrt{2h/kt}$$

$$A_{fin} = wL[C_1 + (L/t)\ln(t/L + C_1)]$$

$$C_1 = \sqrt{1 + (t/L)^2}$$

$$\eta_{fin} = \frac{2}{1 + \sqrt{(2mL)^2 + 1}}$$



Circular fins of rectangular profile

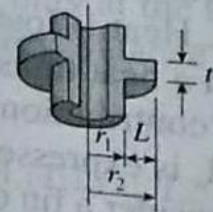
$$m = \sqrt{2h/kt}$$

$$r_{2c} = r_2 + t/2$$

$$A_{fin} = 2\pi(r_{2c}^2 - r_1^2)$$

$$\eta_{fin} = C_2 \frac{K_1(mr_1)I_1(mr_{2c}) - I_1(mr_1)K_1(mr_{2c})}{I_0(mr_1)K_1(mr_{2c}) + K_0(mr_1)I_1(mr_{2c})}$$

$$C_2 = \frac{2r_1/m}{r_{2c}^2 - r_1^2}$$



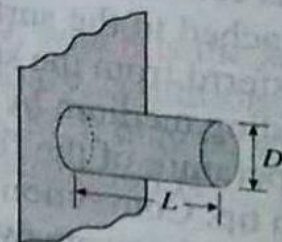
Pin fins of rectangular profile

$$m = \sqrt{4h/kD}$$

$$L_c = L + D/4$$

$$A_{fin} = \pi DL_c$$

$$\eta_{fin} = \frac{\tanh mL_c}{mL_c}$$



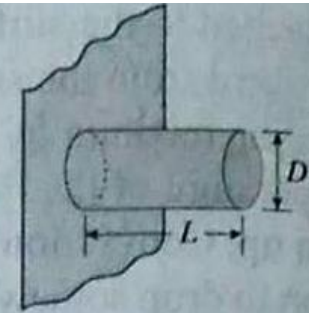
Pin fins of rectangular profile

$$m = \sqrt{4h/kD}$$

$$L_c = L + D/4$$

$$A_{fin} = \pi D L_c$$

$$\eta_{fin} = \frac{\tanh mL_c}{mL_c}$$



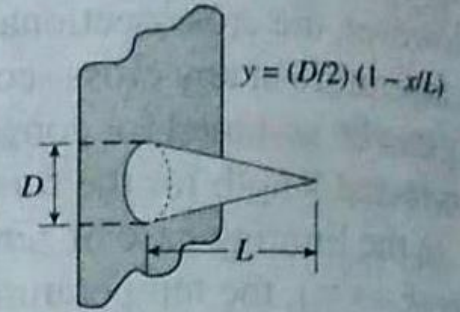
Pin fins of triangular profile

$$m = \sqrt{4h/kD}$$

$$A_{fin} = \frac{\pi D}{2} \sqrt{L^2 + (D/2)^2}$$

$$\eta_{fin} = \frac{2 I_2(2mL)}{mL I_1(2mL)}$$

$$I_2(x) = I_0(x) - (2/x)I_1(x) \text{ where } x = 2mL$$



Pin fins of parabolic profile

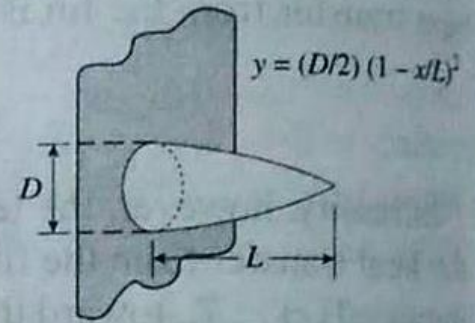
$$m = \sqrt{4h/kD}$$

$$A_{fin} = \frac{\pi L^3}{8D} [C_3 C_4 - \frac{L}{2D} \ln(2DC_4/L + C_3)]$$

$$C_3 = 1 + 2(D/L)^2$$

$$C_4 = \sqrt{1 + (D/L)^2}$$

$$\eta_{fin} = \frac{2}{1 + \sqrt{(2mL/3)^2 + 1}}$$

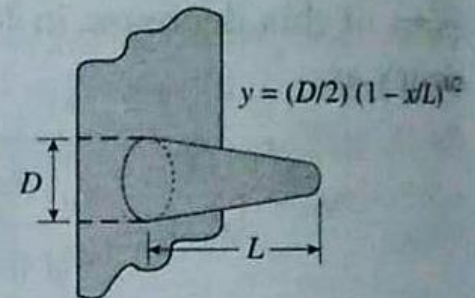


Pin fins of parabolic profile (blunt tip)

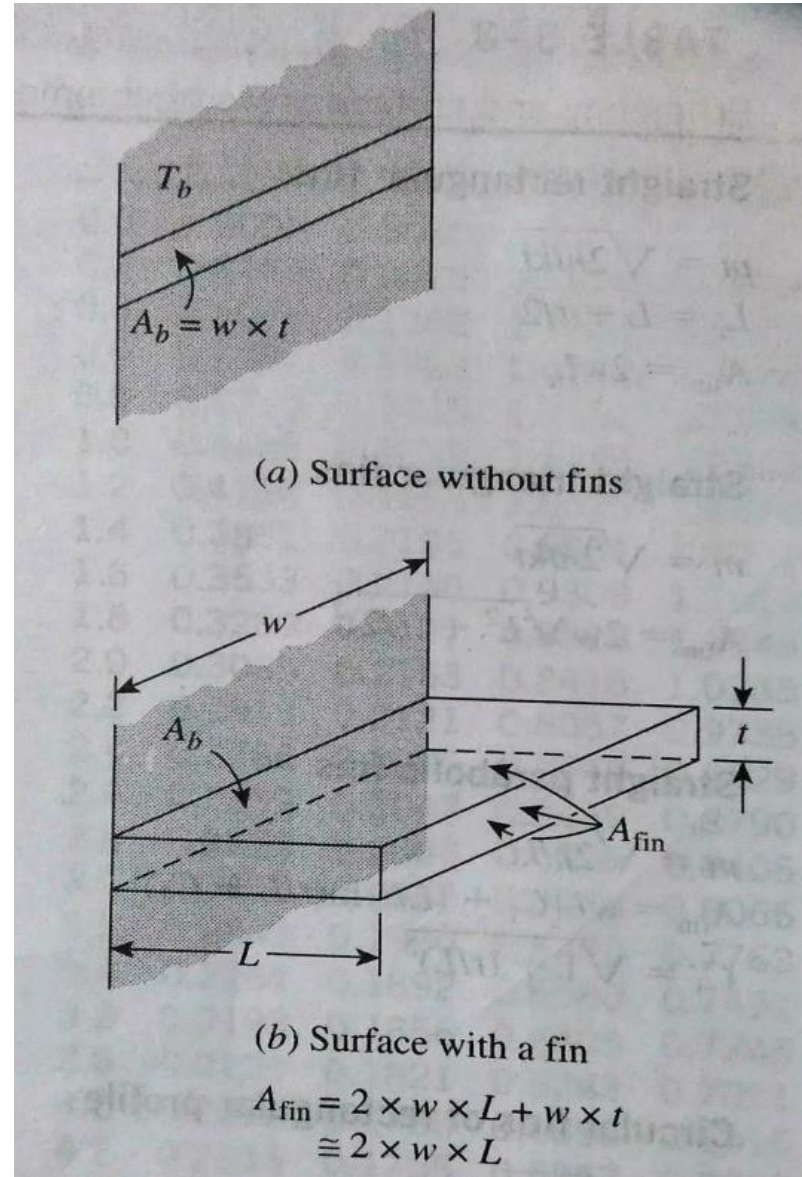
$$m = \sqrt{4h/kD}$$

$$A_{fin} = \frac{\pi D^4}{96L^2} \left\{ [16(L/D)^2 + 1]^{3/2} - 1 \right\}$$

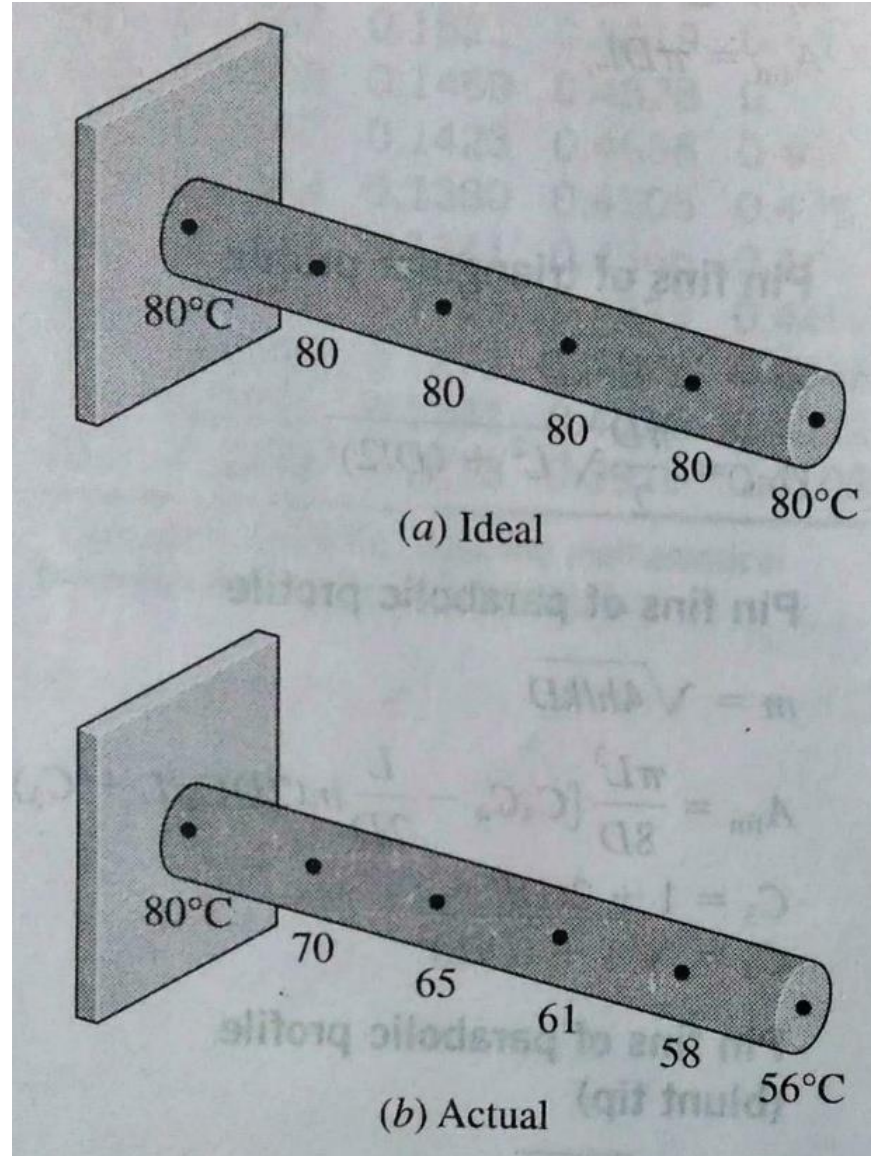
$$\eta_{fin} = \frac{3 I_1(4mL/3)}{2mL I_0(4mL/3)}$$



FIN EFFECTIVENESS

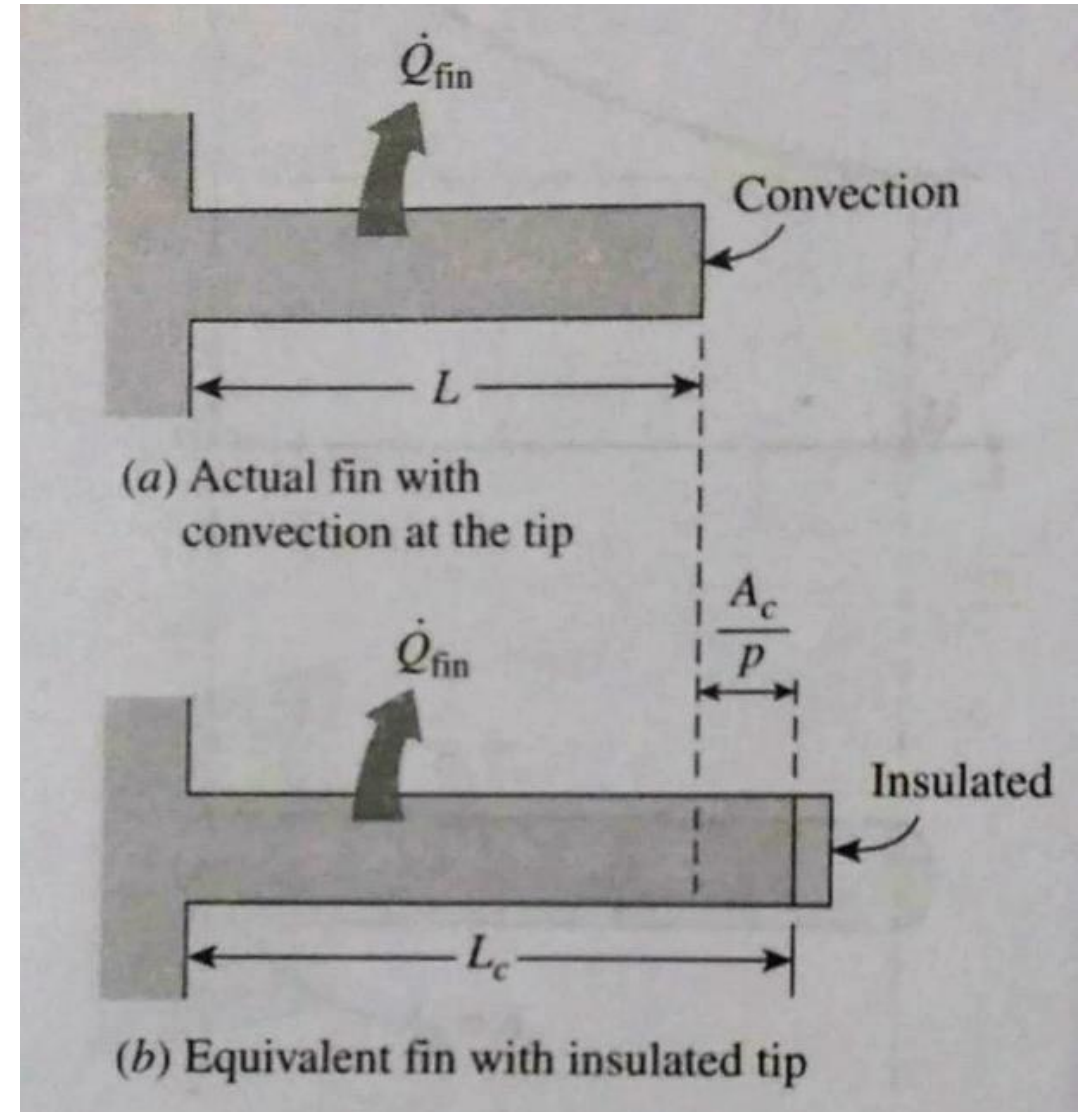


FIN EFFICIENCY

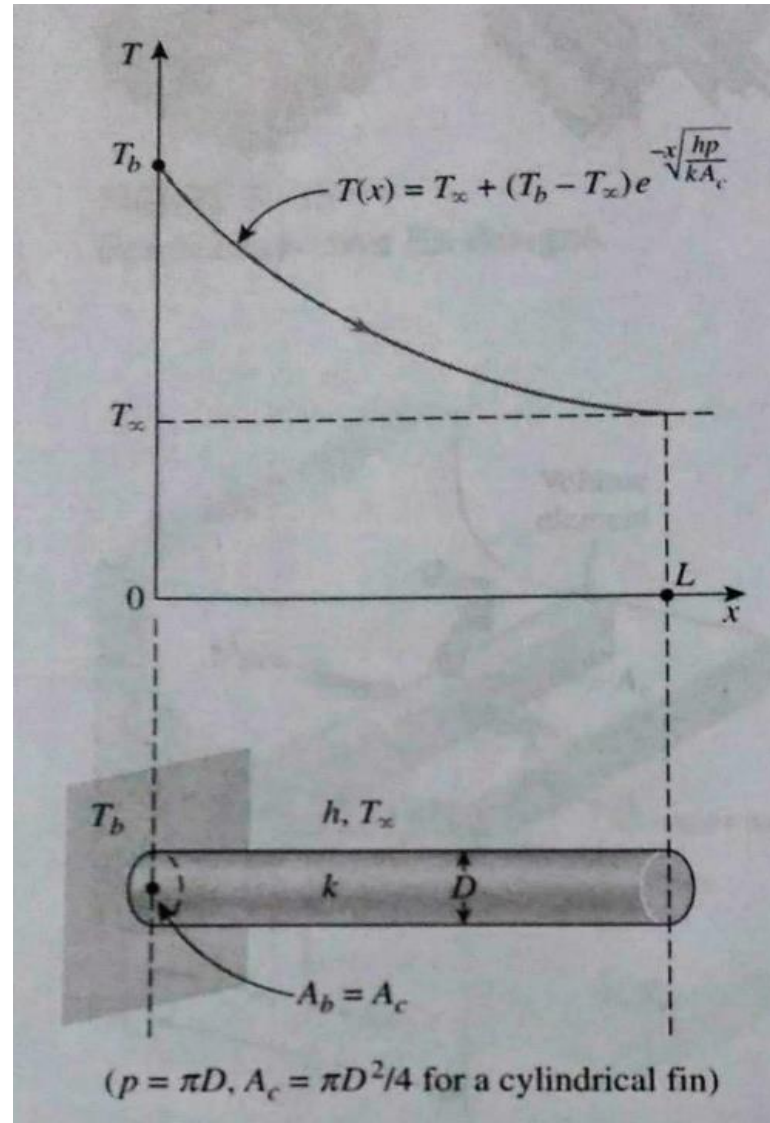


CORRECTED LENGTH

Corrected fin length L_c is defined such that heat transfer from a fin of length L_c with insulated tip is equal to heat transfer from the actual fin of length L with convection at the fin tip.

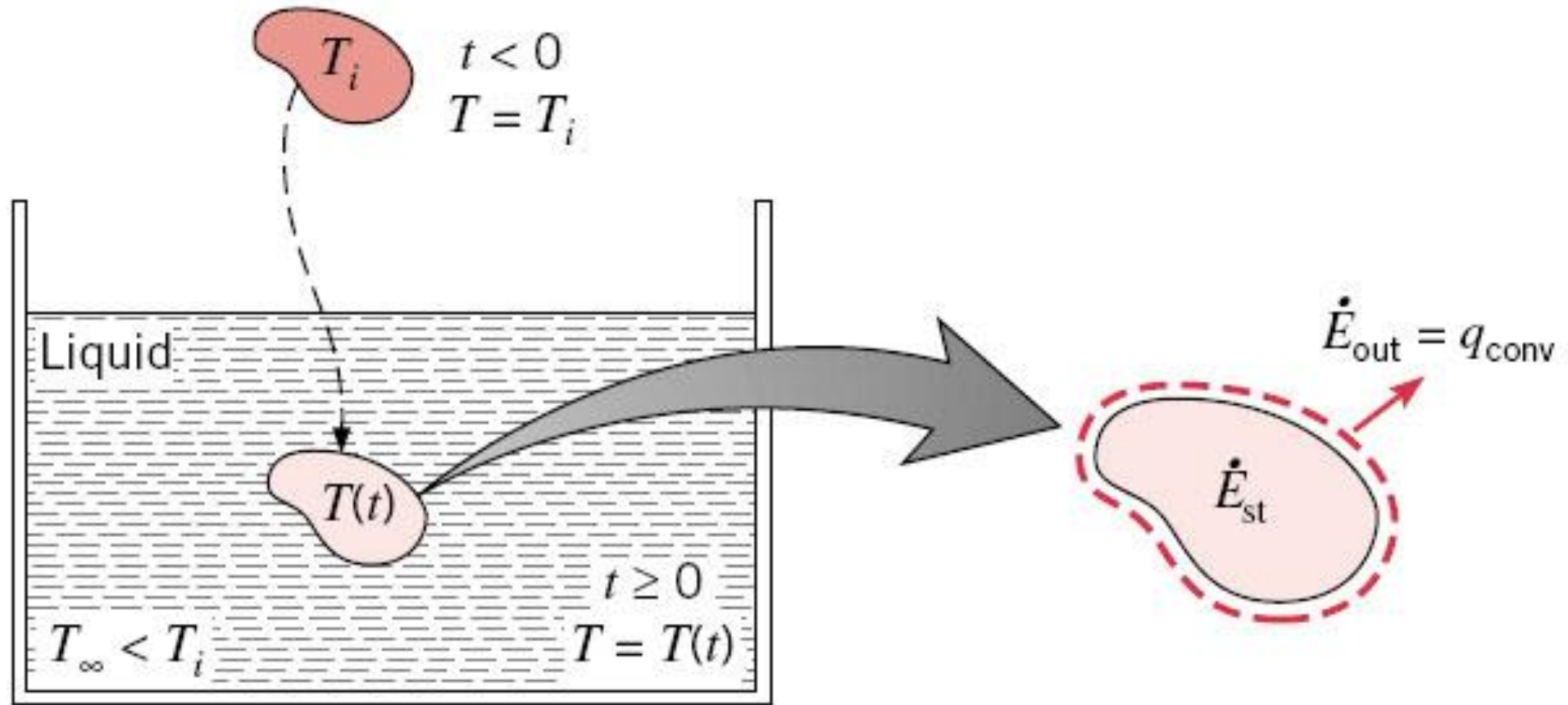


Temp. Distribution-Infinitely long Fin



TRANSIENT HEAT CONDUCTION

Lumped Capacitance Analysis



Transient temperature response

