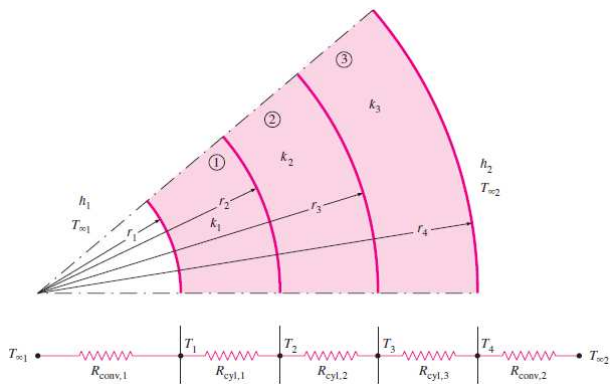


$$R_{\text{total}} = R_{\text{conv},1} + R_{\text{wall},1} + R_{\text{wall},2} + R_{\text{conv},2}$$

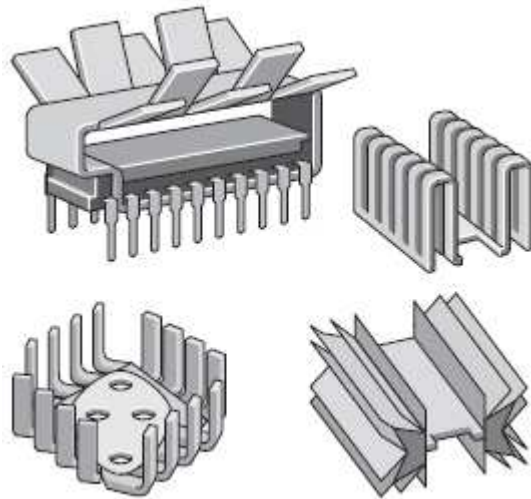
$$= \frac{1}{h_1 A} + \frac{L_1}{k_1 A} + \frac{L_2}{k_2 A} + \frac{1}{h_2 A}$$



$$R_{\text{total}} = R_{\text{conv},1} + R_{\text{cyl},1} + R_{\text{cyl},2} + R_{\text{cyl},3} + R_{\text{conv},2}$$

$$= \frac{1}{h_1 A_1} + \frac{\ln(r_2/r_1)}{2\pi L k_1} + \frac{\ln(r_3/r_2)}{2\pi L k_2} + \frac{\ln(r_4/r_3)}{2\pi L k_3} + \frac{1}{h_2 A_4}$$

Some Fin Designs:



Fin Efficiency:

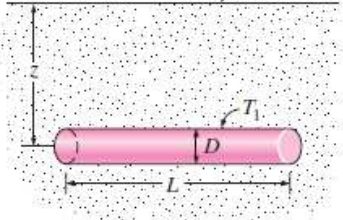
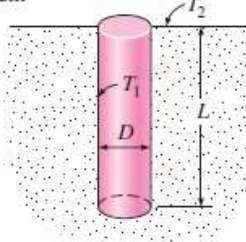
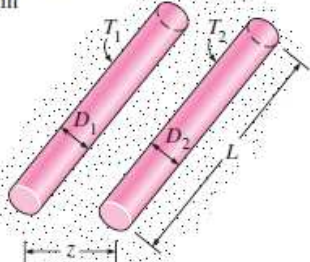
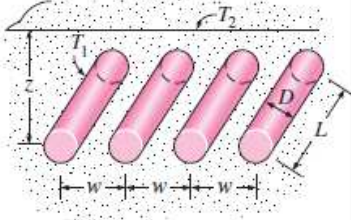
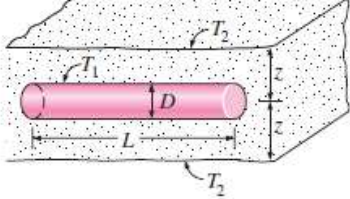
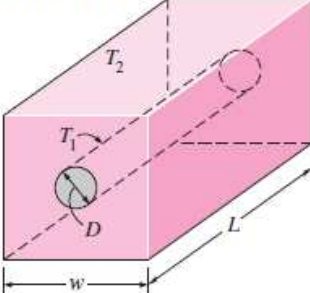
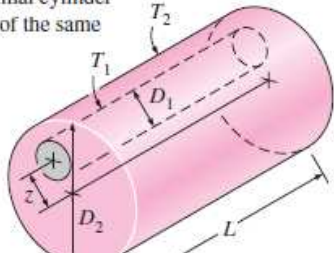
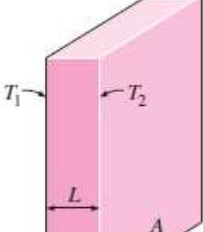
$$\eta_{\text{fin}} = \frac{q_{\text{fin}}}{q_{\text{fin,max}}}$$

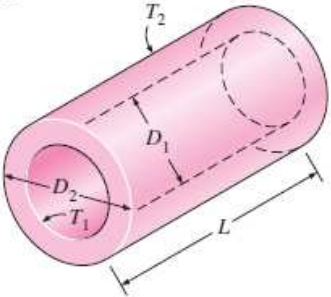
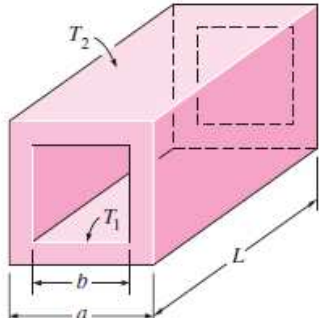
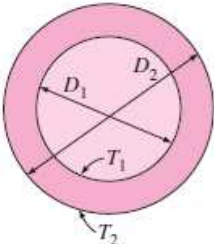
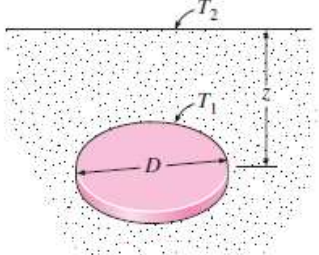
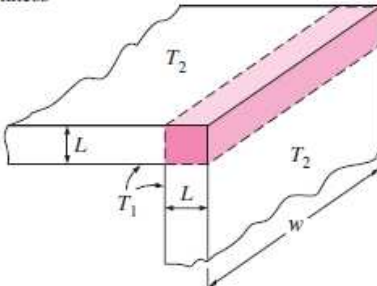
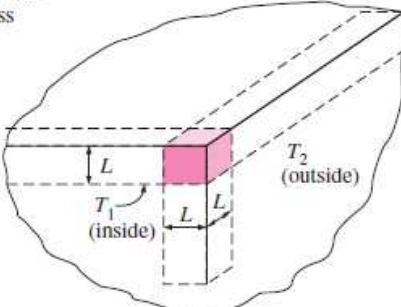
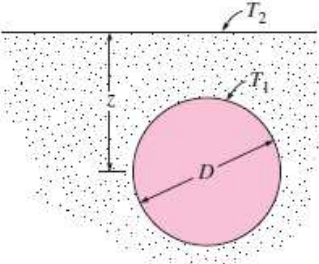
=  $\frac{\text{Actual heat transfer rate from the fin}}{\text{Ideal heat transfer rate from the fin if the entire fin were at the base temperature}}$

Fin Effectiveness:

$$\epsilon_{\text{fin}} = \frac{q_{\text{fin}}}{q_{\text{no fin}}} = \frac{q_{\text{fin}}}{hA_b(T_b - T_\infty)}$$

=  $\frac{\text{Heat transfer rate from the fin of base area } A_b}{\text{Heat transfer rate from the surface of area } A_b}$

<p>(1) Isothermal cylinder of length <math>L</math> buried in a semi-infinite medium</p>	<p>(2) Vertical isothermal cylinder of length <math>L</math> buried in a semi-infinite medium</p>
<p>(1) Isothermal cylinder of length <math>L</math> buried in a semi-infinite medium (<math>L \gg D</math> and <math>z &gt; 1.5D</math>)</p> $S = \frac{2\pi L}{\ln(4z/D)}$ 	<p>(2) Vertical isothermal cylinder of length <math>L</math> buried in a semi-infinite medium (<math>L \gg D</math>)</p> $S = \frac{2\pi L}{\ln(4L/D)}$ 
<p>(3) Two parallel isothermal cylinders placed in an infinite medium (<math>L \gg D_1, D_2, z</math>)</p> $S = \frac{2\pi L}{\cosh^{-1}\left(\frac{4z^2 - D_1^2 - D_2^2}{2D_1D_2}\right)}$ 	<p>(4) A row of equally spaced parallel isothermal cylinders buried in a semi-infinite medium (<math>L \gg D, z</math> and <math>w &gt; 1.5D</math>)</p> $S = \frac{2\pi L}{\ln\left(\frac{2w}{\pi D} \sinh \frac{2\pi z}{w}\right)}$ (per cylinder) 
<p>(5) Circular isothermal cylinder of length <math>L</math> in the midplane of an infinite wall (<math>z &gt; 0.5D</math>)</p> $S = \frac{2\pi L}{\ln(8z/\pi D)}$ 	<p>(6) Circular isothermal cylinder of length <math>L</math> at the center of a square solid bar of the same length</p> $S = \frac{2\pi L}{\ln(1.08w/D)}$ 
<p>(7) Eccentric circular isothermal cylinder of length <math>L</math> in a cylinder of the same length (<math>L &gt; D_2</math>)</p> $S = \frac{2\pi L}{\cosh^{-1}\left(\frac{D_1^2 + D_2^2 - 4z^2}{2D_1D_2}\right)}$ 	<p>(8) Large plane wall</p> $S = \frac{A}{L}$ 

<p>(9) A long cylindrical layer</p> $S = \frac{2\pi L}{\ln(D_2/D_1)}$ 	<p>(10) A square flow passage</p> <p>(a) For <math>a/b &gt; 1.4</math>,</p> $S = \frac{2\pi L}{0.93 \ln(0.948a/b)}$ <p>(b) For <math>a/b &lt; 1.41</math>,</p> $S = \frac{2\pi L}{0.785 \ln(a/b)}$ 
<p>(11) A spherical layer</p> $S = \frac{2\pi D_1 D_2}{D_2 - D_1}$ 	<p>(12) Disk buried parallel to the surface in a semi-infinite medium (<math>z \gg D</math>)</p> $S = 4D$ <p>(<math>S = 2D</math> when <math>z = 0</math>)</p> 
<p>(13) The edge of two adjoining walls of equal thickness</p> $S = 0.54w$ 	<p>(14) Corner of three walls of equal thickness</p> $S = 0.15L$ 
<p>(15) Isothermal sphere buried in a semi-infinite medium</p> $S = \frac{2\pi D}{1 - 0.25D/z}$ 	<p>(16) Isothermal sphere buried in a semi-infinite medium at <math>T_2</math> whose surface is insulated</p> $S = \frac{2\pi D}{1 + 0.25D/z}$ 