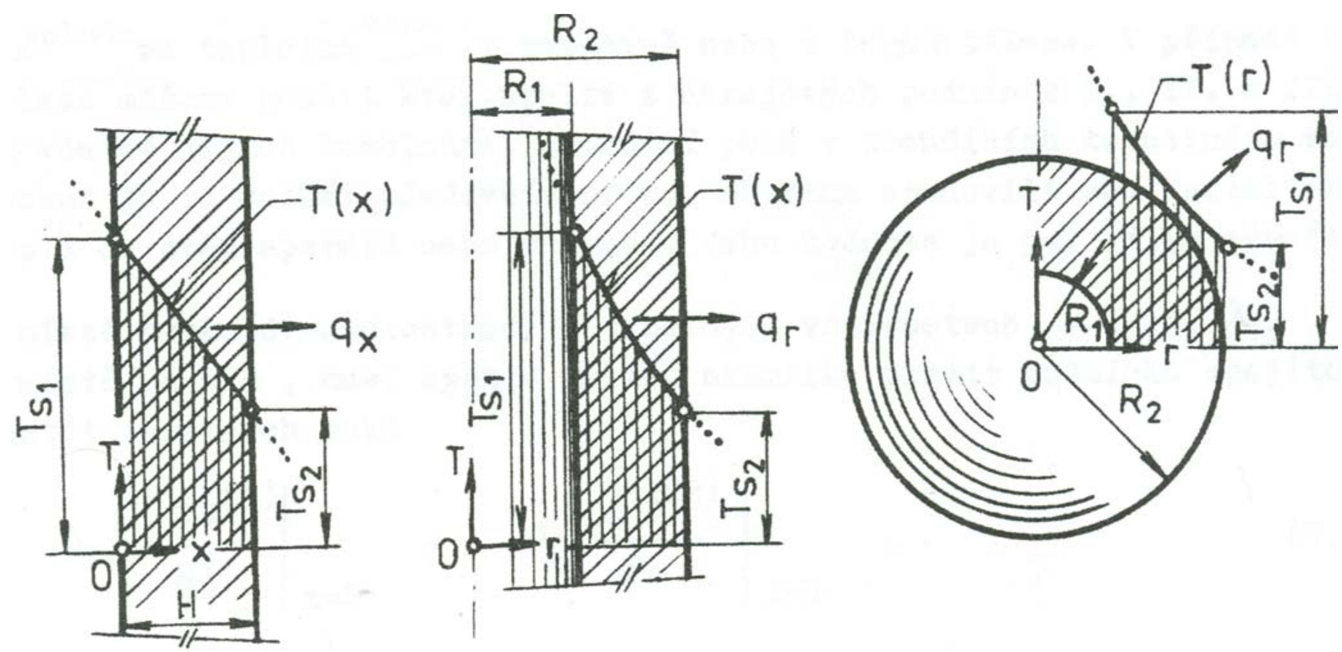
STACIONÁRNÍ VEDENÍ TEPLA
bez vnitřního obj. zdroje tepla

$$\rho\, c_p \left(\cancel{\frac{\partial T}{\partial t}} + \cancel{\vec{u} \bullet \nabla T} \right) = \lambda \nabla^2 T + \cancel{2\mu \vec{\vec{\Delta}} : \vec{\vec{\Delta}}} + \cancel{\dot{Q}^{(g)}}$$

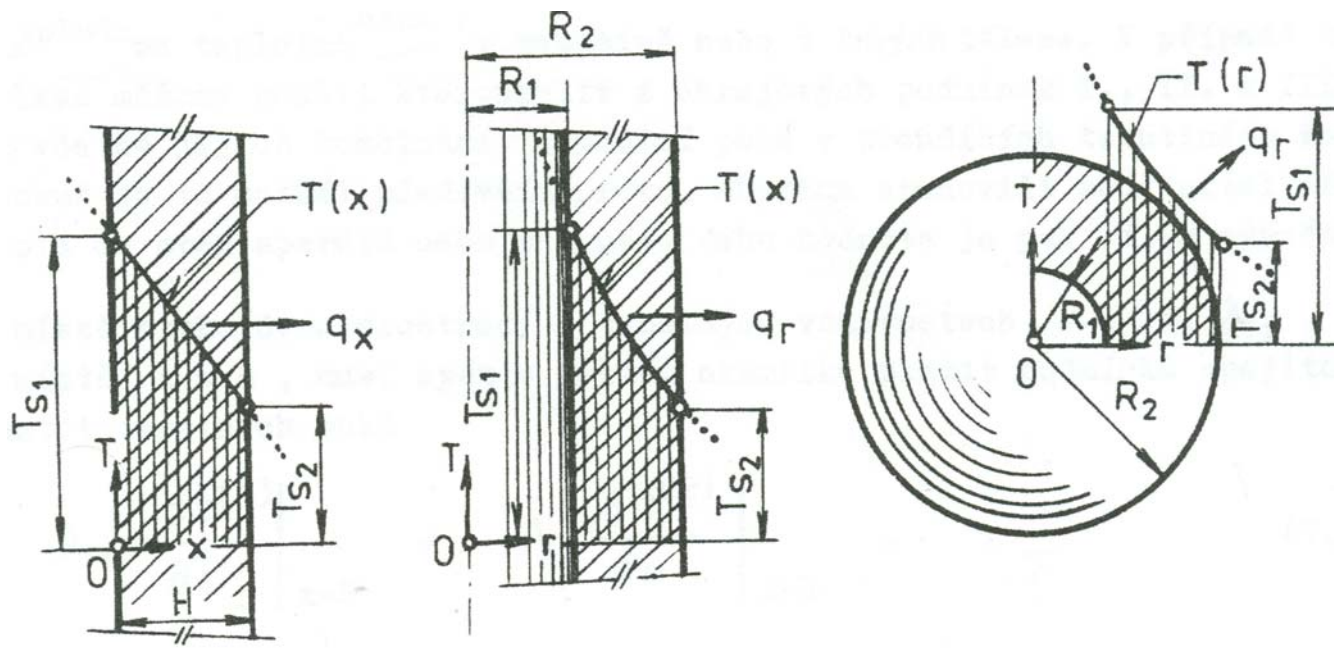
$$\boxed{\nabla^2 T = 0}$$

$$\boxed{\nabla^2 T = 0}$$

$$\frac{\mathrm{d}^2 T}{\mathrm{d}x^2} = 0 \qquad \frac{\mathrm{d}}{\mathrm{d}r}\left(r\frac{\mathrm{d}T}{\mathrm{d}r}\right) = 0 \qquad \frac{\mathrm{d}}{\mathrm{d}r}\left(r^2\frac{\mathrm{d}T}{\mathrm{d}r}\right) = 0$$



$$T(x) = C_1 x + C_2 \qquad T(r) = C_1 \ln r + C_2 \qquad T(r) = \frac{C_1}{r} + C_2$$



$$T(x) = -(T_{s1} - T_{s2})\frac{x}{H} + T_{s1}$$

$$\frac{T(r) - T_{s2}}{(T_{s1} - T_{s2})} = \frac{\ln r/R_2}{\ln R_1/R_2}$$

$$\frac{T(r) - T_{s2}}{(T_{s1} - T_{s2})} = \frac{1/R_2}{\dfrac{1}{R_1} - \dfrac{1}{R_2}}\left(1 - \frac{R_2}{r}\right)$$

$$q_x = -\lambda \frac{\mathrm{d}T}{\mathrm{d}x} = \frac{\lambda}{H}(T_{s1} - T_{s2})$$

$$q_r = -\lambda \frac{\mathrm{d}T}{\mathrm{d}r} = \frac{\lambda}{\ln R_2/R_1}(T_{s1} - T_{s2})\frac{1}{r}$$

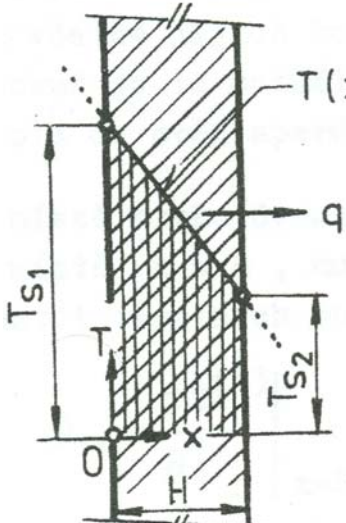
$$q_r = -\lambda \frac{\mathrm{d}T}{\mathrm{d}r} = \frac{\lambda(T_{s1} - T_{s2})}{\dfrac{1}{R_1} - \dfrac{1}{R_2}}\frac{1}{r^2}$$

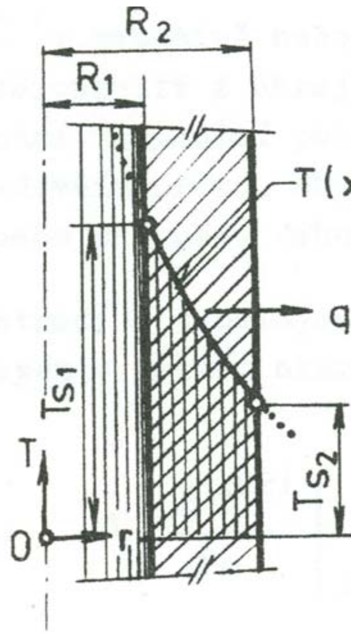
$$\dot{Q} = q_x S = \frac{\lambda}{H} S(T_{s1} - T_{s2})$$

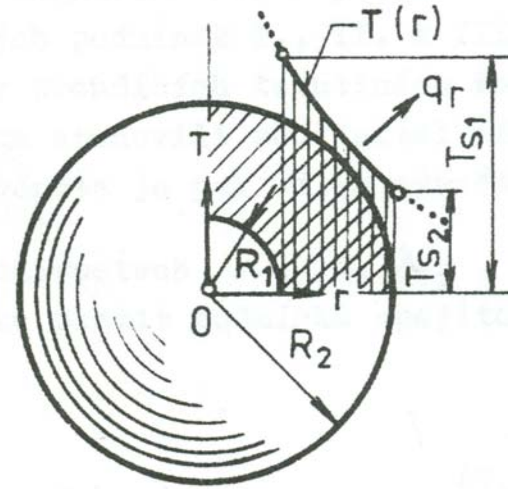
$$\dot{Q} = q_r S = \frac{2\pi L\lambda}{\ln R_2/R_1}(T_{s1} - T_{s2})$$

$$\dot{Q} = q_r S = \frac{\pi\lambda(T_{s1} - T_{s2})}{\dfrac{1}{2}\left(\dfrac{1}{D_1} - \dfrac{1}{D_2}\right)}$$

$$\boxed{R_T\big|_\lambda = \frac{\left(T_{s1} - T_{s2}\right)}{\dot{Q}}}$$







$$R_T\big|_\lambda = \frac{H}{\lambda S}$$

$$R_T\big|_\lambda = \frac{\ln R_2 / R_1}{2\pi L \lambda}$$

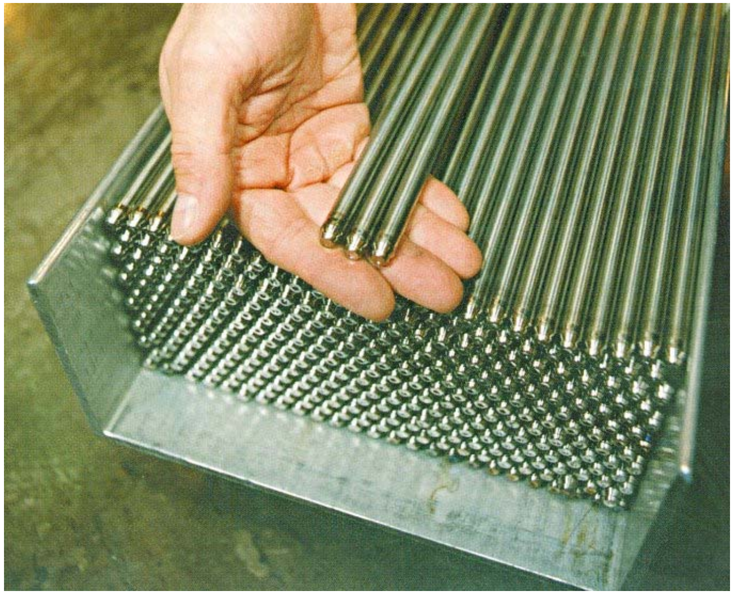
$$R_T\big|_\lambda = \frac{\left(\frac{1}{D_1} - \frac{1}{D_2}\right)}{2\pi\lambda}$$

$$R_T\big|_\alpha = \frac{1}{\alpha S}$$

STACIONÁRNÍ VEDENÍ TEPLA s vnitřním obj. zdrojem tepla

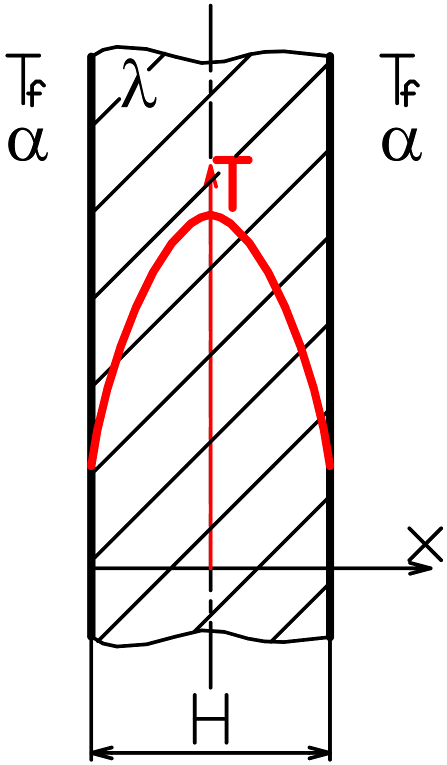
$$\rho c_p \left(\cancel{\frac{\partial T}{\partial t}} + \cancel{\vec{u} \bullet \nabla T} \right) = \lambda \nabla^2 T + \cancel{2\mu \vec{\vec{\Delta}} : \vec{\vec{\Delta}}} + \dot{Q}^{(g)}$$

$$\boxed{0 = \nabla^2 T + \frac{\dot{Q}^{(g)}}{\lambda}}$$



Neomezená deska

$$\frac{\mathrm{d}^2 T}{\mathrm{d}x^2} + \frac{\dot{Q}^{(g)}}{\lambda} = 0$$



Okrajové podmínky (symetrie, III. druhu)

OP1:

$$T\Big|_{x=0} = \max \Rightarrow \frac{\mathrm{d}T}{\mathrm{d}x}\Big|_{x=0} = 0$$

OP2:

$$-\lambda \frac{\mathrm{d}T}{\mathrm{d}x}\Big|_{x=H/2} = \alpha\left(T\Big|_{x=H/2} - T_f\right)$$

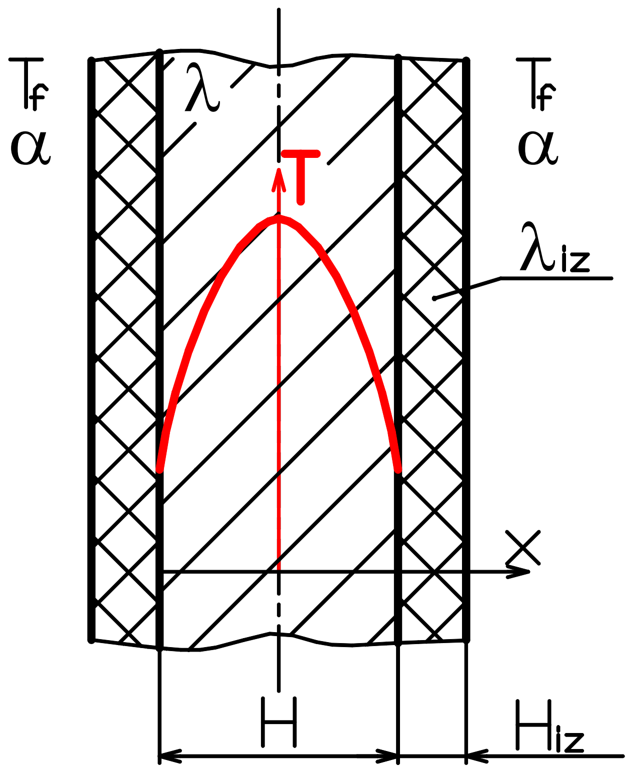
Teplotní profil

$$\boxed{T(x) - T_f = \frac{\dot{Q}^{(g)}}{2\lambda}\left(\frac{H}{2}\right)^2\left[1 + \frac{4}{Bi} - \left(\frac{x}{H/2}\right)^2\right]}$$

$$Bi = \frac{\alpha H}{\lambda}$$

Neomezená deska
(s izolací)

$$\frac{\mathrm{d}^2 T}{\mathrm{d}\,x^2} + \frac{\dot{Q}^{(g)}}{\lambda} = 0$$



Okrajové podmínky (symetrie, prostup tepla)

OP1:

$$T\big|_{x=0} = \max \Rightarrow \left.\frac{\mathrm{d}\,T}{\mathrm{d}\,x}\right|_{x=0} = 0$$

OP2:

$$-\lambda \left.\frac{\mathrm{d}\,T}{\mathrm{d}\,x}\right|_{x=H/2} = k\left(T\big|_{x=H/2} - T_f\right)$$

Teplotní profil

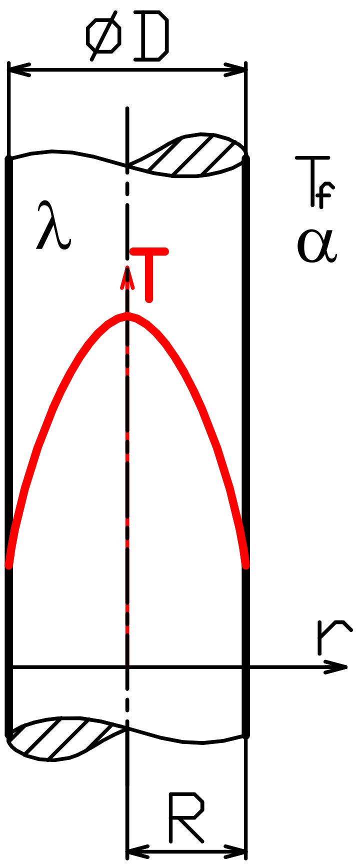
$$\boxed{T(x) - T_f = \frac{\dot{Q}^{(g)}}{2\lambda}\left(\frac{H}{2}\right)^2\left[1 + \frac{4}{Bi_m} - \left(\frac{x}{H/2}\right)^2\right]}$$

$$k = \frac{1}{\frac{H_{iz}}{\lambda_{iz}} + \frac{1}{\alpha}}$$

$$Bi_m = \frac{k\,H}{\lambda}$$

Neomezený válec

$$\frac{1}{r}\frac{\mathrm{d}}{\mathrm{d}r}\left(r\frac{\mathrm{d}T}{\mathrm{d}r}\right)+\frac{\dot{Q}^{(g)}}{\lambda}=0$$



Okrajové podmínky (symetrie, III. druhu)

OP1:

$$T\Big|_{r=0}=\max \Rightarrow \frac{\mathrm{d}T}{\mathrm{d}r}\Big|_{r=0}=0$$

OP2:

$$-\lambda\frac{\mathrm{d}T}{\mathrm{d}r}\Big|_{r=R}=\alpha\left(T\Big|_{r=R}-T_f\right)$$

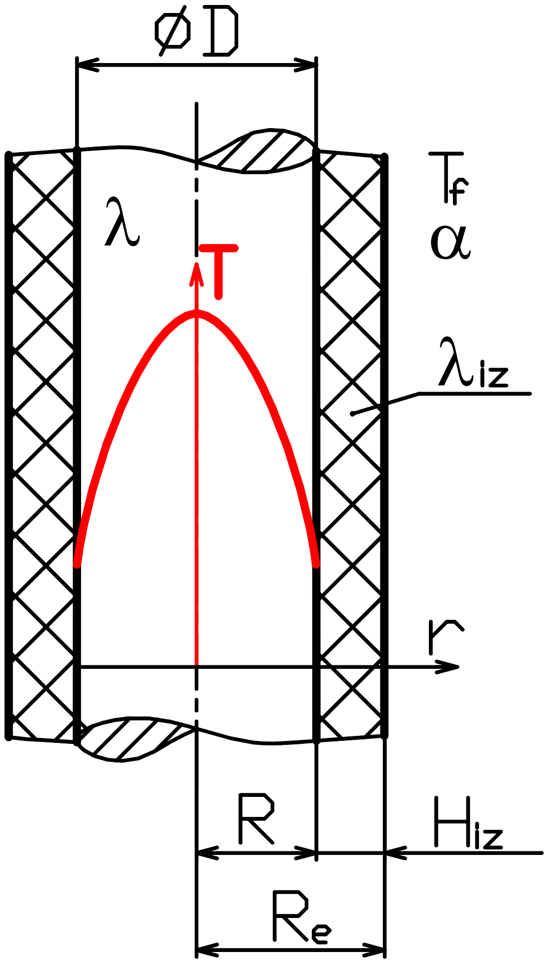
Teplotní profil

$$\boxed{T(r)-T_f=\frac{\dot{Q}^{(g)}}{4\lambda}R^2\left[1+\frac{4}{Bi}-\left(\frac{r}{R}\right)^2\right]}$$

$$Bi=\frac{\alpha D}{\lambda}$$

Neomezený válec
(s izolací)

$$\frac{1}{r}\frac{\mathrm{d}}{\mathrm{d}r}\left(r\frac{\mathrm{d}T}{\mathrm{d}r}\right)+\frac{\dot{Q}^{(g)}}{\lambda}=0$$



Okrajové podmínky (symetrie, prostup tepla)

OP1:

$$T\Big|_{r=0}=\max\Rightarrow\frac{\mathrm{d}T}{\mathrm{d}r}\bigg|_{r=0}=0$$

OP2:

$$-\lambda\frac{\mathrm{d}T}{\mathrm{d}r}\bigg|_{r=R}=k_i\left(T\Big|_{r=R}-T_f\right)$$

Teplotní profil

$$\boxed{T(r)-T_f=\frac{\dot{Q}^{(g)}}{4\lambda}R^2\left[1+\frac{4}{Bi_m}-\left(\frac{r}{R}\right)^2\right]}$$

$$k_i=\frac{1}{\frac{R}{\lambda_{iz}}\ln\frac{R_e}{R}+\frac{R}{R_e}\frac{1}{\alpha}}$$

$$Bi_m=\frac{k_i D}{\lambda}$$