Let: $\begin{cases} A \equiv WH & \text{(end area)} \\ P = 2(W+H) \end{cases}$

1D Conduction:

$$q\Big|_x A = q\Big|_{x+dx} \cdot A + h(T\big|_x - T_\infty)\cdot P\,dx$$

$$-kA\frac{dT}{dx}\Big|_x = -kA\frac{dT}{dx}\Big|_{x+dx} + h(T\big|_x - T_\infty)P\,dx$$

$$= -kA\left[\frac{dT}{dx}\Big|_x + \frac{d^2T}{dx^2}\Big|_x \cdot dx\right] + h(T\big|_x - T_\infty)P\,dx$$

so: $$-kA\frac{d^2T}{dx^2} + hP(T-T_\infty) = 0$$

i.e.: $$\frac{d^2T}{dx^2} - \left(\frac{hP}{kA}\right)(T-T_\infty) = 0$$

B.C.: $\begin{cases} T\big|_{x=0} = T_0 \\ \frac{\partial T}{\partial x}\Big|_{x=L} = 0 \end{cases}$

Let: $\theta \equiv T - T_\infty$.

then: $$\boxed{\begin{aligned} &\frac{d^2\theta}{dx^2} - \left(\frac{hP}{kA}\right)\theta = 0 \\ &\text{B.C.}\begin{cases} \theta\big|_{x=0} = T_0 - T_\infty \equiv \theta_0 \\ \frac{d\theta}{dx}\Big|_{x=L} = 0 \end{cases} \end{aligned}}$$

general solution:

$$\theta(x) = C_1 e^{+\lambda x} + C_2 e^{-\lambda x} \qquad \left(\lambda^2 \equiv \frac{hP}{kA}\right)$$

From B.C.: $\begin{cases} \theta_0 = C_1 + C_2 \\ 0 = \lambda\left(C_1 e^{+\lambda L} - C_2 e^{-\lambda L}\right) \end{cases}$

so: $\theta(x) = \theta_0 \dfrac{\cosh \lambda(L-x)}{\cosh \lambda L}$

i.e.: $T(x) = T_\infty + (T_0 - T_\infty) \dfrac{\cosh \lambda(L-x)}{\cosh \lambda L}$

$$Q\Big|_{x=0} = -kA \frac{dT}{dx}\Big|_{x=0}$$

$$= -kA(T_0 - T_\infty) \frac{-\lambda \sinh \lambda(L-x)}{\cosh(\lambda L)}\Bigg|_{x=0}$$

$$= kA\lambda(T_0 - T_\infty)\tanh(\lambda L)$$

i.e.: $Q\Big|_{x=0} = \sqrt{hkAP}\,(T_0 - T_\infty)\tanh(\lambda L)$