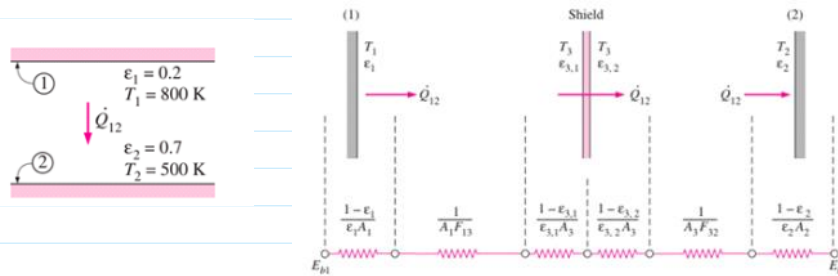


Task 1

Considering the same example you solved in the previous assignment (radiative heat transfer between two parallel plates), how many shields with epsilon = 0.1 should you add in order to have the new heat transfer rate to be 1% of the case without shields?



Answer:

without shield $\epsilon_1 = 0.2$ and $\epsilon_2 = 0.7$,

$$Q_{12} = \frac{E_{b1} - E_{b2}}{\frac{1-\epsilon_1}{A\epsilon_1} + \frac{1}{A_1F_{12}} + \frac{1-\epsilon_2}{A\epsilon_2}} = \frac{A\sigma(T_1^4 - T_2^4)}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1}$$

with N shield $\epsilon_3 = 0.1$

$$Q_{12N\text{shield}} = \frac{E_{b1} - E_{b2}}{\frac{1-\epsilon_1}{A\epsilon_1} + \frac{1}{A_1F_{13}} + \frac{1-\epsilon_3}{A\epsilon_3} + N \left(\frac{1-\epsilon_3}{A\epsilon_3} + \frac{1}{A_3F_{33}} + \frac{1-\epsilon_3}{A\epsilon_3} \right) + \frac{1-\epsilon_3}{A\epsilon_3} + \frac{1}{A_3F_{32}} + \frac{1-\epsilon_2}{A\epsilon_2}}$$

$$\Rightarrow \frac{A\sigma(T_1^4 - T_2^4)}{\left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_3} - 1\right) + N\left(\frac{1}{\epsilon_3} + \frac{1}{\epsilon_3} - 1\right) + \left(\frac{1}{\epsilon_3} + \frac{1}{\epsilon_2} - 1\right)} = \frac{A\sigma(T_1^4 - T_2^4)}{\left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1\right) + (N+1)\left(\frac{1}{\epsilon_3} + \frac{1}{\epsilon_3} - 1\right)}$$

$$\frac{Q_{12N\text{shields}}}{Q_{12}} = \frac{\left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1\right) + (N+1)\left(\frac{1}{\epsilon_3} + \frac{1}{\epsilon_3} - 1\right)}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1} = 1 + (N+1) \frac{\frac{1}{\epsilon_3} + \frac{1}{\epsilon_3} - 1}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1} = 100$$

$$\Rightarrow N = 99 \times \frac{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1}{\frac{1}{\epsilon_3} + \frac{1}{\epsilon_3} - 1} - 1 = 99 \times \frac{\frac{1}{0.2} + \frac{1}{0.7} - 1}{\frac{1}{0.1} + \frac{1}{0.1} - 1} - 1 \approx 27.3$$

in End 27 shield can be added between them.

Task 2

I had problem organizing the pictures I set note about process. In first stage I did made the building by set the veiw to top and then make it and then offset it and then make it 3 lvl and next I add shader by not adding north angel which is less then 360. then we add some information with openstudio and then we add weather data and then we process with it and our resualt is done

