Fiery furnace

The wall thickness of a furnace is to be minimised for steady-state conditions, considering the following boundary conditions for the steady-state case: The material for the wall can be chosen from the table below. The outer surface of the oven should comprise a 8 mm thick steel plate to act as a mechanical shield. The furnace wall's outer temperature must never exceed $T_{\mathrm{st}} = 60\,°\mathrm{C}$, while its inner surface must never exceed $T_i = 1000\,°\mathrm{C}$. The maximum permissible loss heat flux is $\dot{q}'' = 1.5\,\mathrm{kW/m^2}$.

The following table list the two possible cases (A) and (B) for the material combinations:

Known quantities:

Material	permissible temperature	thermal conductivity λ [W/m K]					
		Case (A)			Case (B)		
		60 °C	800 °C	1200 °C	60 °C	800 °C	1200 °C
Firebrick	1500 °C	0.9	1.3	1.5	0.9	1.3	1.5
Refractory brick	1200 °C				0.4	0.6	0.7
Insulating stone	800 °C	0.2	0.25				
Steel		45			45		

Task:

Determine the wall structure and thickness of each wall layer for both cases while observing the condition of minimising the necessary total thickness.