1. An ice skating rink is located in a building where the air is at $T_{\text{air}} = 20^0\text{C}$ and the walls are at $T_w = 25^0\text{C}$. The convection heat transfer coefficient between the ice and the surrounding air is $h = 10 \text{ W/m}^2\text{K}$. The emissivity of ice is $\varepsilon = 0.95$. The latent heat of fusion of ice is $h_{\text{if}} = 333.7 \text{ kJ/kg}$ and its density is $920 \text{ kg/m}^3$.

   a) Calculate the refrigeration load of the system necessary to maintain the ice at $T_s = 0^0\text{C}$ for an ice rink of 12 m by 40 m.

   b) How long would it take to melt 3 mm of ice from the surface of the rink if no cooling is supplied and the surface is considered insulated on the back side?

2. During its manufacture, plate glass at $600^0\text{C}$ is cooled by passing air over its surface such that the convection heat transfer coefficient is $h = 5 \text{ W/m}^2\text{K}$. To prevent cracking, it is known that the temperature gradient must not exceed $15^0\text{C/mm}$ at any point in the glass during the cooling process. If the thermal conductivity of the glass is $1.4 \text{ W/mK}$ and its surface emissivity is 0.8, what is the lowest temperature of the air that can initially be used for the cooling? Assume that the temperature of the air equals that of the surroundings.