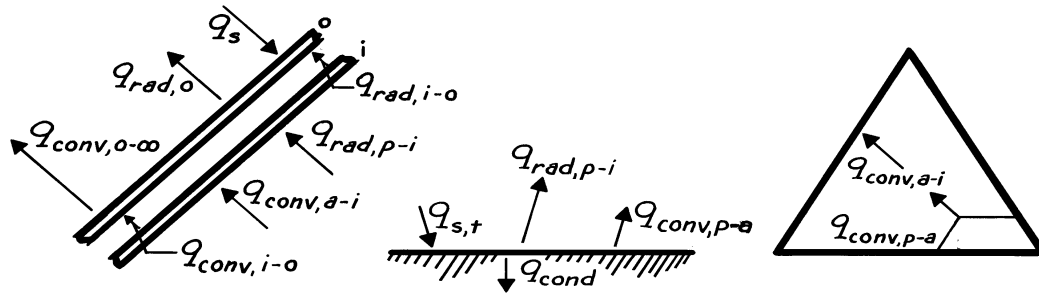


PROBLEM 1.63(c)

KNOWN: Configuration of a solar collector used to heat air for agricultural applications.

FIND: Relevant heat transfer processes.

SCHEMATIC:



Assume the temperature of the absorber plates exceeds the ambient air temperature. At the *cover plates*, the relevant processes are:

- $q_{\text{conv},a-i}$ Convection from inside air to inner surface,
- $q_{\text{rad},p-i}$ Net radiation transfer from absorber plates to inner surface,
- $q_{\text{conv},i-o}$ Convection across airspace between covers,
- $q_{\text{rad},i-o}$ Net radiation transfer from inner to outer cover,
- $q_{\text{conv},o-\infty}$ Convection from outer cover to ambient air,
- $q_{\text{rad},o}$ Net radiation transfer from outer cover to surroundings, and
- q_s Incident solar radiation.

Additional processes relevant to the *absorber plates* and *airspace* are:

- $q_{s,t}$ Solar radiation transmitted by cover plates,
- $q_{\text{conv},p-a}$ Convection from absorber plates to inside air, and
- q_{cond} Conduction through insulation.