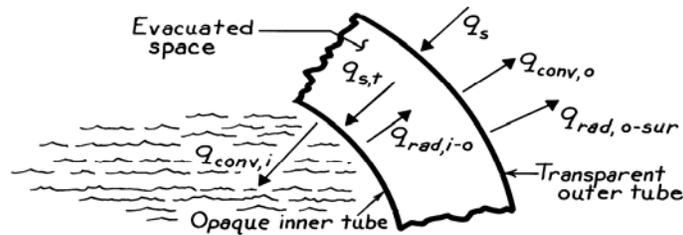


### PROBLEM 1.87(d)

**KNOWN:** Features of an evacuated tube solar collector.

**FIND:** Relevant heat transfer processes for one of the tubes.

**SCHEMATIC:**



The relevant heat transfer processes for one of the evacuated tube solar collectors includes:

- |                 |  |
|-----------------|--|
| $q_s$           | Incident solar radiation including contribution due to reflection off panel (most is transmitted),                 |
| $q_{conv,o}$    | Convection heat transfer from outer surface to ambient air,  |
| $q_{rad,o-sur}$ | Net rate of radiation heat exchange between outer surface of outer tube and the surroundings, including the panel, |
| $q_{s,t}$       | Solar radiation transmitted through outer tube and incident on inner tube (most is absorbed),                      |
| $q_{rad,i-o}$   | Net rate of radiation heat exchange between outer surface of inner tube and inner surface of outer tube, and       |
| $q_{conv,i}$    | Convection heat transfer to working fluid.   |

There is also conduction heat transfer through the inner and outer tube walls. If the walls are thin, the temperature drop across the walls will be small.