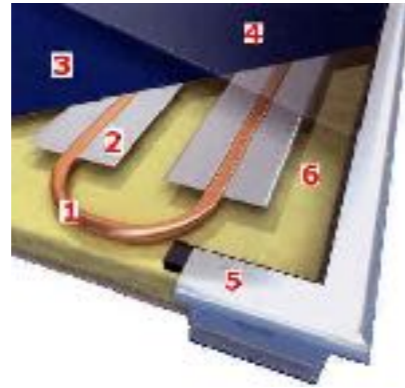
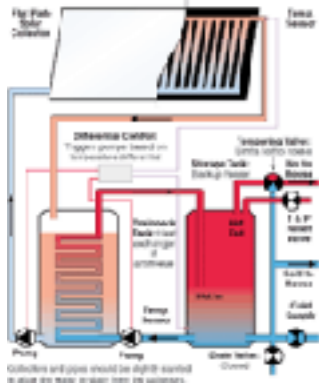


The solar heater problem



How many showers can you take per week with a 10 m² solar water heater ?

- The solar constant is 1300 W/m²
- In France, number of hours of sunshine is between 1500 and 3000 (between 17 and 34% of the time)
- The power collected on a 10m² solar heater is on average between 2200 and 4400 W
- estimate the Rayleigh number for thermal convection outside the collector, deduce the relevant Nusselt number and estimate the heat flux due to thermal convection

Physical properties of air :

density 1 kg/m³

Prandtl number : 0.7

kinematic viscosity 1.5 10⁻⁵ m²/s

coefficient of thermal expansion : 3.5 10⁻³