Ans Solar Collectors ⇒ Solar Collectors are used to Collect the Solar Energy and Convert this Energy into the thermal Energy by absorbing them.

* This thermal energy is further used for heating a Collector fluid such as water, oil or air

* Solar Collector Surface is designed for High absorption and low emission

Solar Collectors are Classified in two types
(i) Non-Concentrating Collectors
(ii) Concentrating Collectors.

* material for Solar Collectors ⇒

Steel and polyethylene are Common packaging material. the use of latent Heat Storage is Especially Suited to the Storage of Solar Collection efficiency, which can mean that Solar Collector area can be Reduced by 30%.

* Performance of Flate Collecton

Performance of Solar Collecton depend on the following factons-

(a) Fin Efficiency Facton (F_c) ⇒ It is depend as the Ratio of actual Rate of Heat transferred to the Heat that would be transferred, if entire fins (plate area)

$$F_c = \frac{Q_{actual}}{A_c[\alpha_o \tau_o I_t - U_L(T_p - T_a)]}$$

Q_{actual} = Actual Rate of heat transferred to the tube base
A_c = Collecton Area
I_t = Incidint total Radiations
U_L = Overall heat loss Coefficent
T_p = Plate temperature
T_a = Ambient temperature
α_o = Absorptivity and
τ_o = Transmittivity

(B) Collecton efficiency Facton (F_c) ⇒

It is defined as the Ratio of useful Heat Removed by flowing fluid in the tube to the Rate of Heat transferred to the fluid if the fin is at local fluid temperature.

$$F_R = \frac{Q_u}{A_c\left(\alpha_0 \tau_0 I_t - (U_L)[T_F - T_a]\right)}$$

Q_u = useful Heat Removed by flowing fluid in the tubes

T_F = Local fluid temperature.

③ Collecton Heat Removal Factor ⇒

It is defined as the Ratio of actual useful energy gain by fluid to the Rate of heat transfered to the fluid, if the fin is at inlet fluid temperature.

$$F_H = \frac{Q_u}{A_c\left(\alpha_0 \tau_0 I_t - U_L(T_{Fi} - T_a)\right)}$$

or $$F_H = \frac{m C_F (T_{Fo} - T_{Fi})}{A_c\left(\alpha_0 \tau_0 I_t - U_L(T_{Fi} - T_a)\right)}$$

where-

m = mass flow Rate of fluid per unit area of Collecton

C_F = Specific heat of fluid

T_{Fo} = outlet fluid temperature

T_{Fi} = Inlet fluid temperature.

4) Collecton Efficiency (η_c) ⇒ It is the Ratio of useful energy absorbed by collecton to the incident Solar energy over it

$$\eta_c = \frac{Q_u}{A_c I_t}$$

$$\eta_c = \frac{F_R A_c (\alpha_o \tau_o I_t - U_L (T_{Fi} - T_a))}{A_c I_t}$$

$$\because Q_u = F_R A_c (\alpha_o \tau_o I_t - U_L (T_{Fi} - T$$

$$\eta_c = F_R \alpha_o \tau_o - \frac{F_R U_L (T_{Fi} - T_a)}{I_t}$$

$$y = mx + c$$

$$m = -F_R U_L$$

$$x = \frac{(T_{Fi} - T_a)}{I_t}$$

and

$$c = F_R \alpha_o \tau_o \quad (\text{Effective optic}$$