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Nomenclature

a	Absorption coefficient $\left(m^{-1}\right)$
A	Amplitude of wavy surface (m)
A_c	Cross-sectional area of duct $\left(m^2\right)$
A_{eff}	Effective area of absorber plate $\left(m^2\right)$
A/D_h	Relative roughness amplitude
b_r	Width of quarter-circle groove(m)
b_t	Width of half-triangular groove(m)
b_{tp}	Top width of half-trapezoidal groove(m)
b_{tpd}	Bottom width of half-trapezoidal groove(m)
C	Perimeter of duct (m)
C_p	Specific heat at constant pressure $\left(J/kgK\right)$
d	Rib diameter (m)
d/H	Relative roughness height
D_h	Hydraulic diameter (m)
D_n	Dean number
e_r	Quarter-circle groove height(m)
e_r/H	Relative quarter-circle groove height ratio
e_t	Half-triangular groove height(m)
e_t/H	Relative half-triangular groove height ratio
e_{tp}	Half-trapezoidal groove height (m)
e_{tp}/H	Relative half-trapezoidal groove height ratio
f	Friction factor
f/f_s	Friction factor enhancement ratio
g	Acceleration due to gravity $\left(m/s^2\right)$
G_b	Turbulent kinetic energy due to buoyancy $\left(J/kg\right)$
G_k	Turbulent kinetic energy due to mean velocity gradient $\left(J/kg\right)$
h	Convective heat transfer coefficient $\left(W/m^2K\right)$
H	Height of duct (m)
I	Solar irradiance $\left(W/m^2\right)$
k_a	Thermal conductivity of air(W/mK)
k_g	Thermal conductivity of glass(W/mK)
k_i	Thermal conductivity of insulation(W/mK)
L	Length of absorber plate (m)
$\dot{m}$	Mass flow rate $\left(kg/s\right)$
n	Refractive index of medium
Nu	Nusselt Number

Nu/Nu_s	Nusselt number enhancement ratio
P	Pitch of groove or rib or baffle(m)
P/e_r	Relative pitch ratio of quarter-circle groove
P/e_t	Relative pitch ratio of half-triangular groove
P/e_{tp}	Relative pitch ratio of half- trapezoidal groove
P/d	Relative arched baffle pitch
P/H	Relative roughness of pitch
ΔP	Pressure drop (N/m^2)
Pr	Prandtl number
q	Heat flux (W/m^2)
Q_u	Useful heat rate gain (W)
R_c	Curvature radius (m)
R_i	Inner radius of arched baffle (m)
R_o	Outer radius of arched baffle (m)
Re	Reynolds number
TF	Temperature factor
TI	Turbulent intensity
T_i	Inlet temperature (K)
T_o	Outlet air temperature (K)
T_m	Mean bulk temperature (K)
T_p	Absorber plate temperature (K)
T_{sky}	Sky temperature (K)
U	Mean velocity of fluid (m/s)
V_W	Wind velocity (m/s)
W	Width of SAH (m)
W/H	Aspect ratio of SAH

Greek symbols

$\alpha/90$	Relative baffle angle
α	Absorptivity
β	Curvature angle of SAH
ε	Thermal effectiveness
ϵ	Emissivity
λ	The wavelength of the wavy absorber (m)
μ	Dynamic viscosity (Ns/m^2)
η	Efficiency
ρ	Density of air (kg/m^3)
τ	Transmissivity of glass
ω	Solid angle

Subscripts

a	Air
c	Curvature
bm	Bulk mean temperature
∞	Free stream condition
g	glass cover
i	Inlet section
l	Lower channel
u	upper channel
o	Outlet section
p	absorber plate

Abbreviations

SAH	Solar air heater
TKE	Turbulent kinetic energy
SPSAH	Single-pass solar air heater
DPSAH	Double pass solar air heater
CDPSAH	Counter double -pass solar air heater