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Solar Domestic Hot Water Design and Optimisation in the United Kingdom

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Nomenclature

Symbol	Meaning	Unit
A_c	Collector Area	m^2
α	Thermal Diffusivity	m^2/s
β	Collector Incidence Angle	$^\circ C$
β'	Volumetric Coefficient of Expansion	$1/K$
C_p	Specific Heat Capacity	J/kgK
ΔT	Change in Temperature	K
d_i	Inside Pipe Diameter	m
d_o	Outside Pipe Diameter	m
δ	Plate Thickness	m
ε	Collector Effectiveness	-
ε_c	Glass Emittance	-
ε_p	Plate Emittance	-
F	Heat Distribution Factors	-
g	Gravitational Constant	N/kg
G_t	Incident Radiation	W
$h_{c, p-c}$	Convective Heat Transfer Coefficient Plate to Cover	W/m^2K
h_i	Heat Transfer Coefficient Inside Pipe Wall	W/m^2K
h_o	Heat Transfer Coefficient Outside Pipe Wall	W/m^2K
$h_{r, c-a}$	Radiation Heat Transfer Coefficient Cover to Air	W/m^2K
$h_{r, p-c}$	Radiation Heat Transfer Coefficient Plate to Cover	W/m^2K
h_w	Convective Heat Transfer Coefficient Cover to Air	W/m^2K
I_t	Solar Irradiance	W/m^2
k	Thermal Conductivity	W/m^2K
L	Distance for Plat to Lower Spacing	m
\dot{m}	Mass Flow Rate	Kg/s
NTU	Number of Transfer Units	-
N_u	Nusselt Number	-
P_r	Prantle Number	-
Q	Heat Energy Transferred	J
R_a	Rayleigh Number	-
R_e	Reynolds Number	-
ρ	Density	kg/m^3
S	Solar Energy at Plate	W/m^2
σ	Stefan-Boltzmann Constant	W/m^2K^4
T_a, T_s	Ambient Temperature	K
T_c	Cover Temperature	K
T_f	Fluid Temperature at Wall	K
T_p	Plate Temperature	K
μ	Dynamic Viscosity	$Pa.s$
U_b	Back Loss Coefficient	W/m^2K
U_e	Edge Loss Coefficient	W/m^2K
U_L	Top Loss Coefficient	W/m^2K
U_T	Top Loss Coefficient	W/m^2K
ν	Kinematic Viscosity	m^2/s