

**GENERAL**  
**empirical**

- 1 Program name and version number** **ESP-r 11.3**
- 2 Name of organization performed the simulations** **ESRU,  
University of Strathclyde**
- 3 Name of person performed simulations and contact information** **Paul Strachan  
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tel: +44 141 548 2041**
- 4 Program status**
- ☒ Freeware (Open Source)  
☐ Commercial  
☐ Other, please specify
- 5 Time convention for weather data: first interval in the weather input lasts 00:00-01:00, climate is assumed constant over the sampling interval**
- ☐ Yes  
☒ No, please specify: Solar data is hour centred (i.e. covers period 00:00-01:00) in these simulations. Linear interpolation is carried out for sub-hourly simulations

**CALCULATION OF BOUNDARY CONDITIONS**

- 6 Please specify the solar model for calculation of incident solar radiation**  
See report. Perez 1990 is used for the anisotropic diffuse sky model.
- 7 Transmission of the direct solar radiation into zone 1**
- ☐ Calculated with the constant solar heat gain coefficient (g-value)  
☐ Calculated with the g-value as a function of incidence (function of incidence is fixed within code)  
☐ Calculated with the g-value as a function of incidence (function of incidence is user defined)  
☒ Other, please specify See report - transmittance is an input optical property as are layer absorptances. The convection and radiation are calculated explicitly at the glazing system boundaries. g-values are not used.
- 8 Transmission of the direct solar radiation into zone 2**
- ☐ Treated as diffuse solar radiation and calculated with the constant g-value  
☐ Calculated with the g-value as a function of incidence (function of incidence is fixed within code)  
☐ Calculated with the g-value as a function of incidence (function of incidence is user defined)  
☒ Other, please specify As above
- 9 Transmission of the diffuse solar radiation into zone 1**
- ☐ Calculated with the solar heat gain coefficient at the solar incidence 60°  
☒ Other, please specify As above; incident angle assumed to be 51 degrees
- 10 Distribution of solar radiation to the surfaces in the zone 1**
- ☐ Distributed equally to all surfaces  
☐ Calculated according surface area weighting  
☒ Calculated according to solar path and view factors  
☐ Other, please specify
- 11 Distribution of solar radiation to the surfaces in the zone 2**
- ☐ Distributed equally to all surfaces  
☐ Calculated according surface area weighting  
☒ Calculated according to solar path and view factors

☐ Other, please specify

### **MODEL DEFINITIONS**

**12 Air temperature in the zone 1 is calculated as:**

- ☒ One node temperature (for DSF100 case only)  
☒ Few zones are stacked on the top of each other and the air temperature in each of zones is calculated, please specify number of stacked zones 3  
☐ Other, please specify

**13 Air temperature in the zone 2 is calculated as:**

- ☒ One node temperature  
☐ Few zones are stacked on the top of each other and the air temperature in each of zones is calculated, please specify number of stacked zones  
☐ Other, please specify

### **HEAT EXCHANGE WITH EXTERIOR**

**14 External heat transfer coefficients**

- ☒ Split radiative/convective  
☐ Combined radiative/ convective  
☐ Other, please specify

**15 External heat transfer coefficients are calculated with identical assumptions for all surfaces (window frame, window glazing, walls etc.)**

- ☒ Yes  
☐ No, please specify

**16 External convection**

- ☐ Constant coefficients fixed within code  
☐ User-specified constant coefficients  
☐ Calculated within code as a function of orientation  
☐ Calculated within code as a function of wind speed  
☒ Calculated within code as a function of wind speed and direction  
☐ Other, please specify

**17 External radiative heat exchange**

- ☐ Assumed to be ambient temperature  
☐ Assumed to be sky temperature  
☒ Other, please specify Sky and ground surface temperatures, depending on viewfactors

### **HEAT TRANSFER WITHIN ZONES**

**18 Internal heat transfer coefficients**

- ☒ Split radiative/convection  
☐ Combined radiative/ convective  
☐ Other, please specify

**19 Internal heat transfer coefficients are calculated with identical assumptions in all zones and for all surfaces (window frame, window glazing, walls etc.)**

- ☒ Yes (with exception of mechanically ventilated case – see report)  
☐ No, please specify

**20 Internal convection**

- ☐ Constant coefficients fixed within code
- ☐ User-specified constant coefficients
- ☐ Calculated within code as a function of orientation (vertical/horizontal)
- ☒ Calculated within code as a function of temperature difference
- ☐ Calculated within code as a function of air velocity in the zone
- ☐ Calculated within code as a function of surface finishes
- ☐ Other, please specify

**21 Longwave radiation exchange within zone**

- ☐ Constant linearized coefficients
- ☒ Linearized coefficients based on view factors
- ☒ Linearized coefficients based on surface emissivities
- ☐ Nonlinear treatment of radiation heat exchange
- ☐ Other, please specify

**WINDOW**

**22 Window**

- ☒ Window frame and glazing are modelled as separate elements of construction
- ☐ Window frame and glazing are modelled as separate elements of construction, but the total U-value is calculated within the code
- ☐ Window frame and glazing are modelled as separate elements of construction, but the total U-value and g-value are calculated within the code
- ☐ Other, please specify

**23 Glazing temperature**

- ☐ Calculated for 1 nodal point on the basis of fixed resistance
- ☒ Calculated dynamically, using the same scheme as for opaque elements
- ☐ Other, please specify

**AIRFLOW MODEL**

**24 Discharge coefficient**

- ☐ Fixed within the code
- ☒ User-specified fixed value
- ☐ Calculated by code, please specify what are the parameters involved in code calculations
- ☐ Other, please specify

**25 Pressure difference coefficients**

- ☐ Fixed within the code, identical for all openings sharing the same surface
- ☐ User-specified, identical for all openings sharing the same surface
- ☒ User-specified for every opening
- ☐ Other, please specify

**26 Calculated mass flow rate in the model is a function of**

- ☒ Buoyancy force
- ☒ Wind pressure
- ☐ Wind turbulence
- ☐ Other, please specify

