

ISO 15099:2003-11 (E)

Thermal performance of windows, doors and shading devices - Detailed calculations

Contents		Page
Foreword		iv
Introduction		v
1	Scope	1
2	Normative references	1
3	Symbols	2
3.1	General	2
3.2	Symbols and units	2
3.3	Subscripts	4
4	Determination of total window and door system properties	5
4.1	Thermal transmittance	5
4.2	Total solar energy transmittance	9
4.3	Visible transmittance	10
5	Vision area properties	10
5.1	Glazing layer optics	10
5.2	Glazing system optics	11
5.3	Vision area heat transfer	13
6	Frame effects	20
6.1	Area and lineal thermal transmittance	20
6.2	Governing equations for calculating thermal transmittance	20
6.3	Geometric representation and meshing	20
6.4	Solid materials	23
6.5	Effective conductivity -- Glazing cavities	23
6.6	Effective conductivity -- Unventilated frame cavities	23
6.7	Ventilated air cavities and grooves	30
7	Shading devices	31
7.1	Definitions	31
7.2	Optical properties	32
7.3	Slat type of shading	34
7.4	Ventilation	39
7.5	Total solar energy transmittance and thermal transmittance	50
8	Boundary conditions	50
8.1	General	50
8.2	Reference boundary conditions	50
8.3	Convective heat transfer	51
8.4	Longwave radiation heat transfer	55
8.5	Combined convective and radiative heat transfer	58
8.6	Prescribed density of heat flow rate	59
Annex A (informative) Solution technique for the multi-layer solar optical model		60
Annex B (normative) Thermophysical fill gas property values		62
Annex C (informative) Examples of calculated values for optical properties of slat type of shading devices		64
Bibliography		69