GLAZING

- **REAPING THE BENEFITS**
- **AVOIDING THE PITFALLS**

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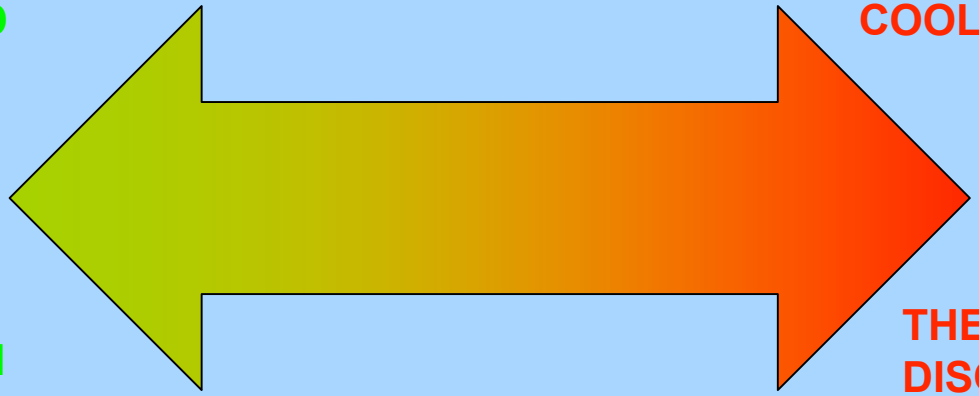
0bjectives

- Show that glazing
  - is important for occupant well being and productivity
  - can reduce energy consumption
  - can lead to thermal & visual discomfort
- Give guidelines on design of glazing

The Balancing Act

PASSIVE SOLAR HEATING AND DAYLIGHT

VIEW OUT / IN



EXCESSIVE COOLING/HEATING

THERMAL DISCOMFORT AND GLARE

Well-Being

- View Out
- Preference for Natural Light

Well-Being

- Feel Valued
- In touch with outside world
- Photophysiological Effects

Well-Being

- Increase in Productivity

Daylight

About 100 Lumens per Watt

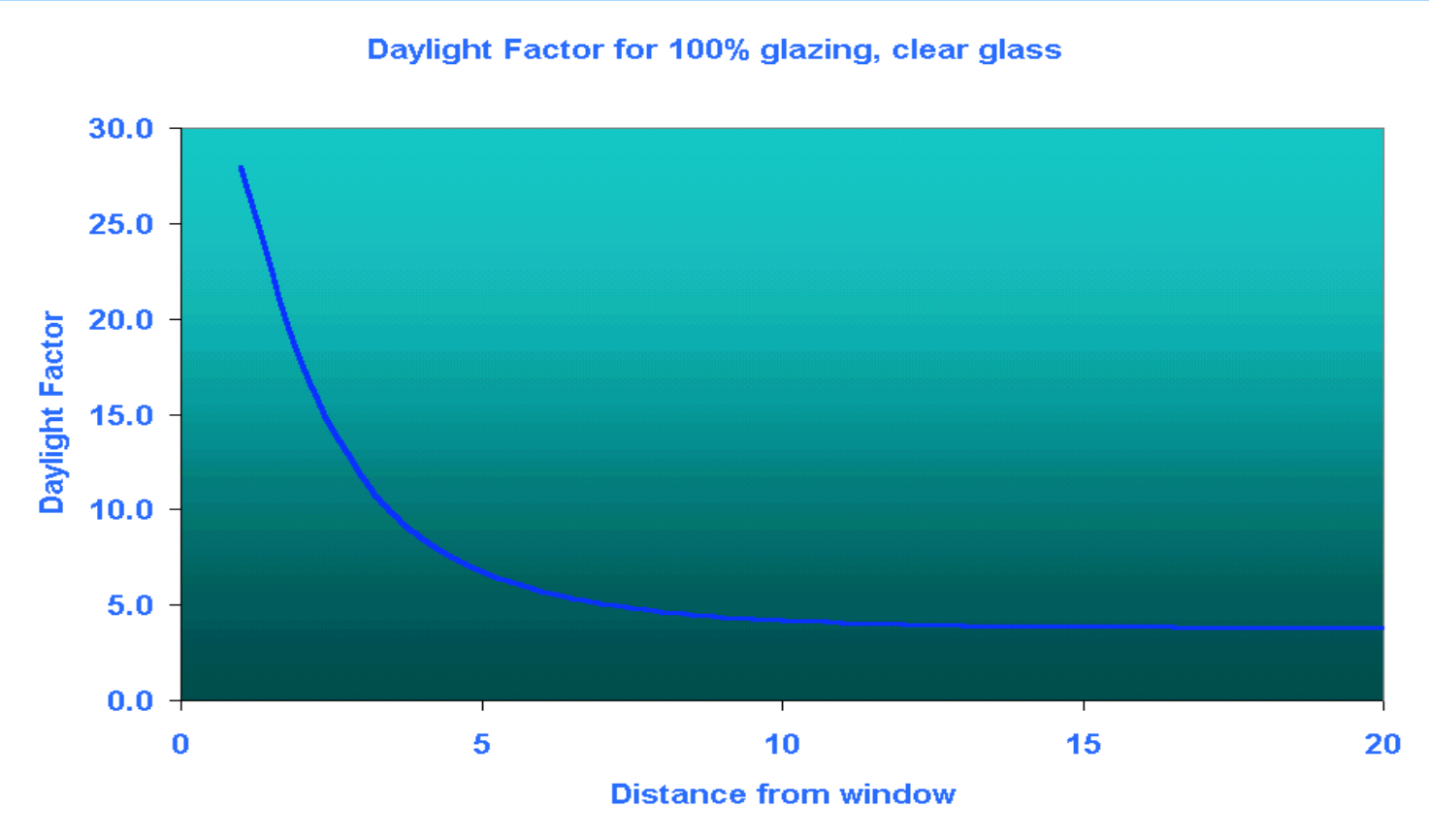
– (artificial lighting = 50 Lm/W)

Daylight Factor

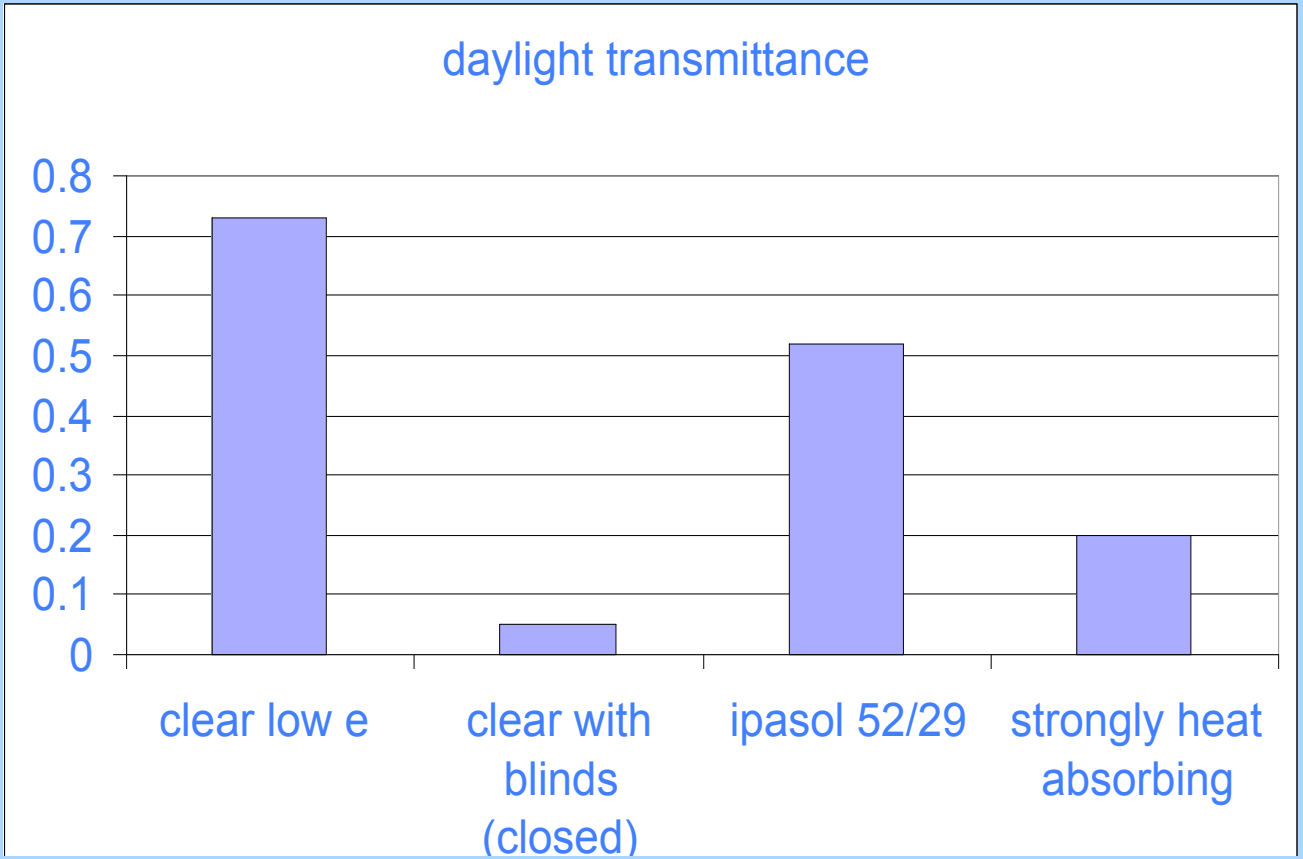
Indoor Illuminance

Outdoor Illuminance

Daylight

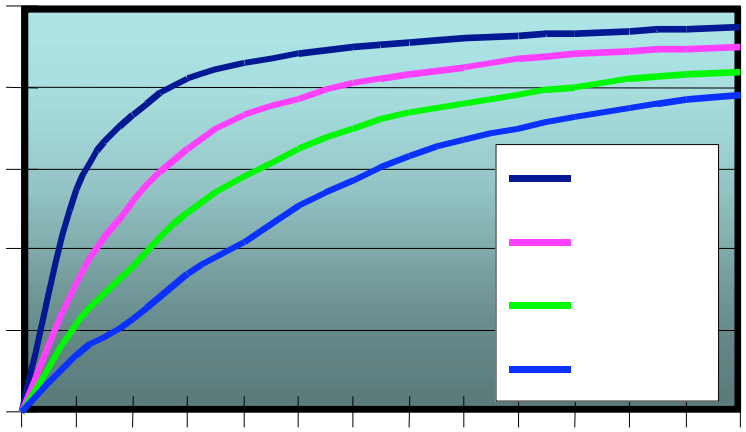

Daylight Factor for 100% glazing, clear glass
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Daylight Factor
0
5
10
15
20
Distance from window

Daylight and glazing

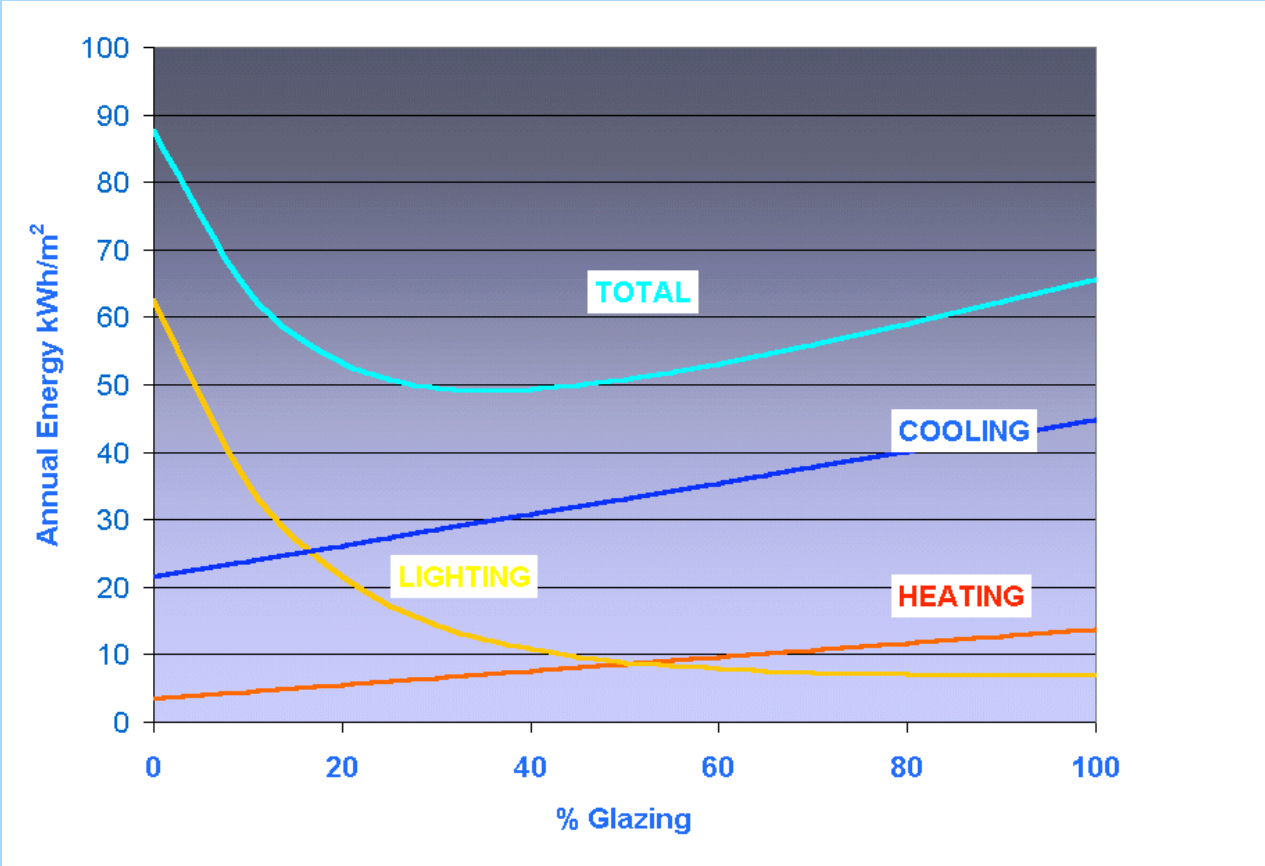


Lighting Energy

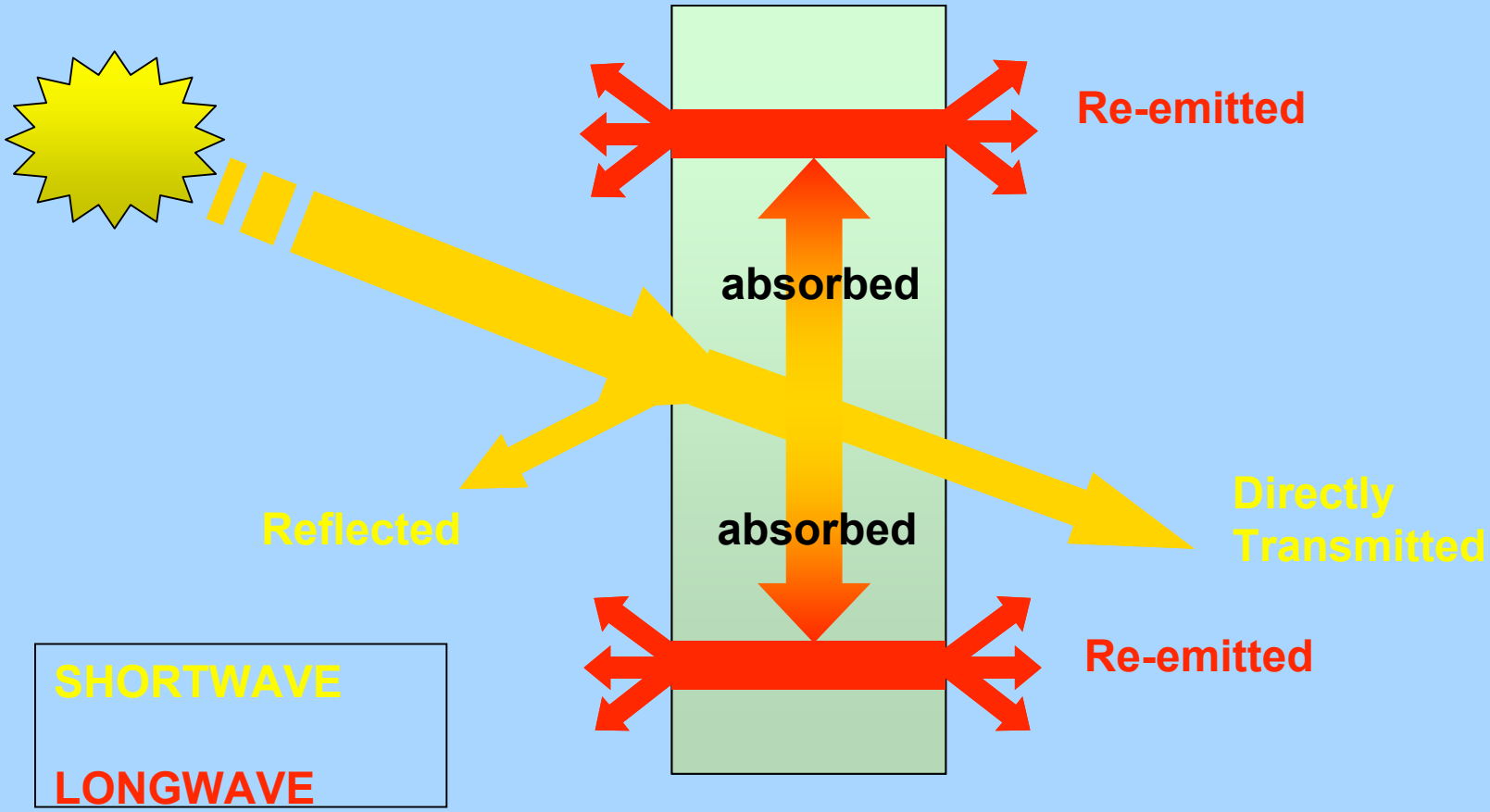
potential energy savingswithdimming photoelectri



Overall Energy



The Solar Process



Total Solar Gain

=

directly transmitted (shortwave)

+

re-emitted (longwave)

Shading Coefficient

SC = SWSC + LWSC

Solar Gain through actual glazing

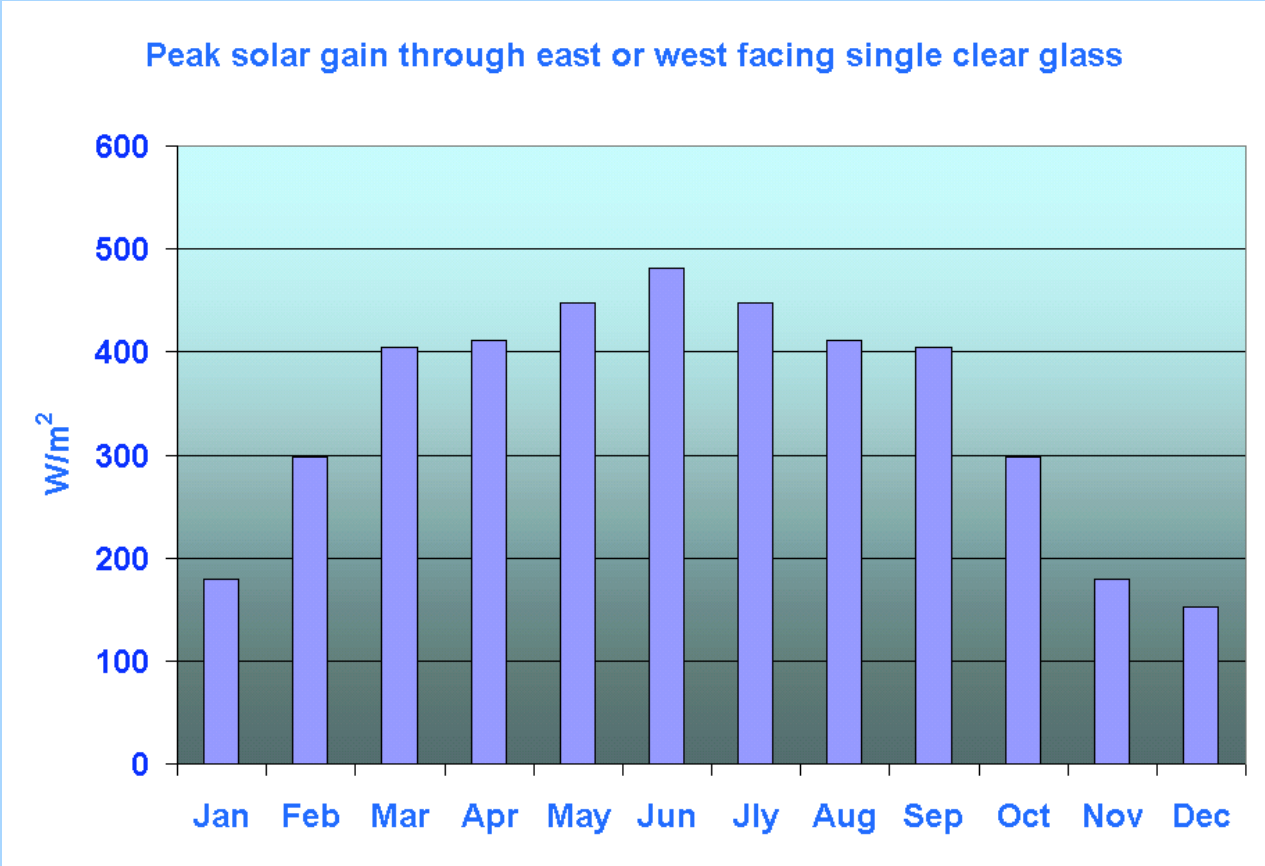
Solar Gain through clear single glazing

Solar Heat Gain Factor

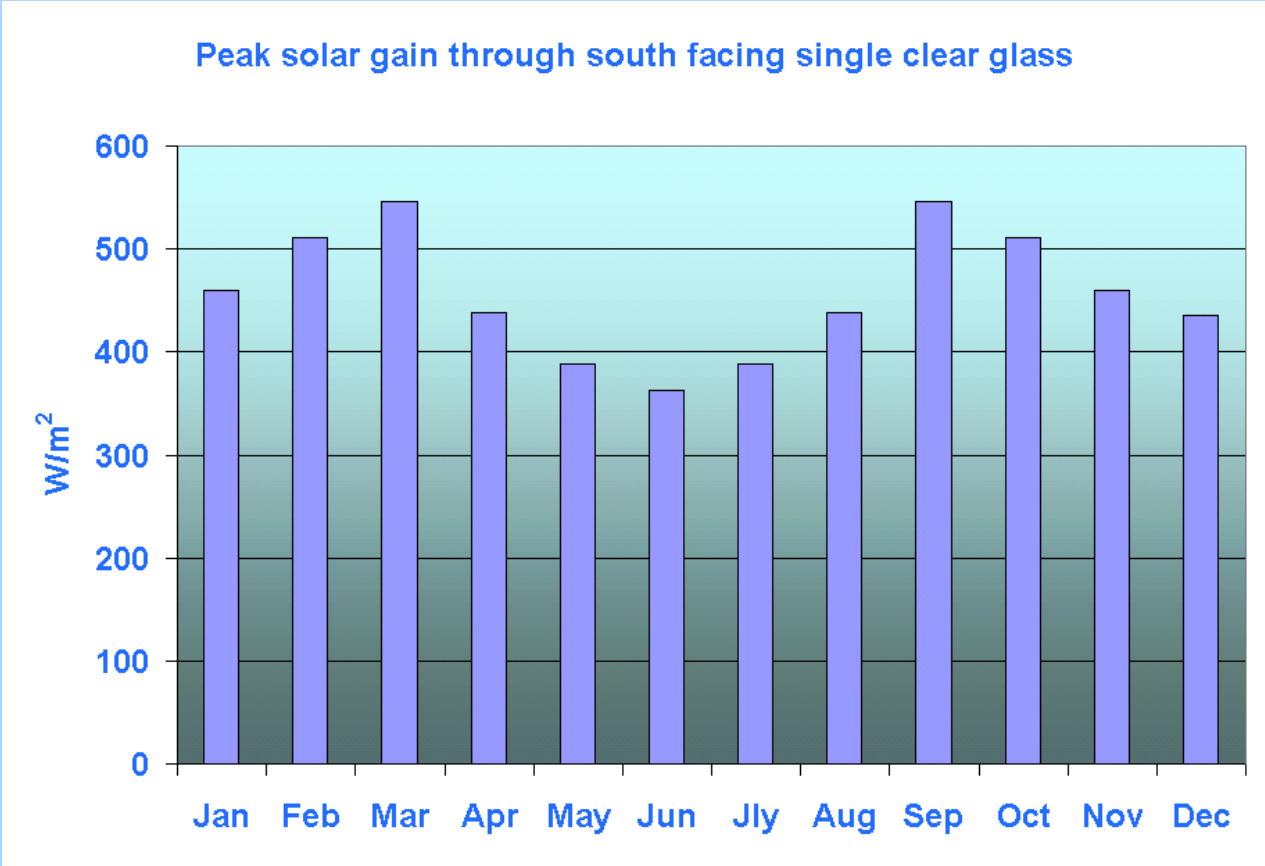
“g-value”

$$\frac{\text{Total Solar Gain}}{\text{Incident Solar Intensity}}$$

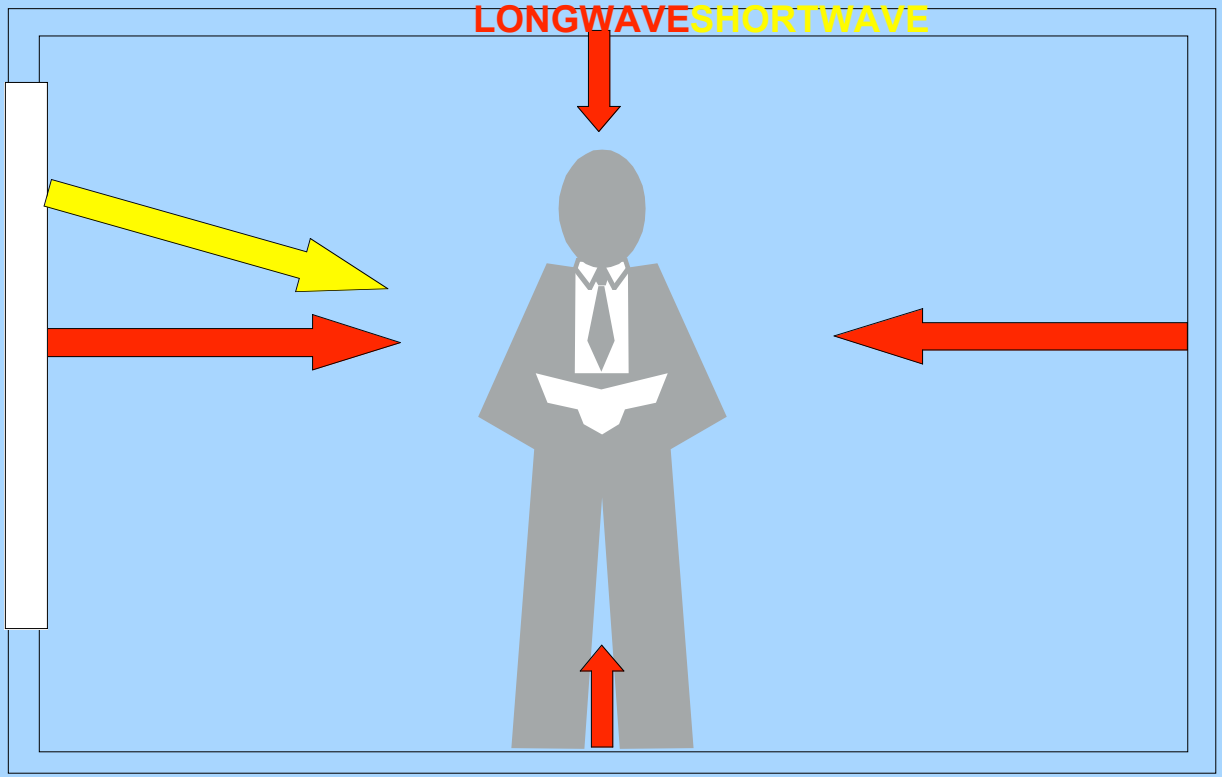
Peak Solar Gains - UK



Peak Solar Gains - UK



Thermal Comfort- Radiant Temperature



SHORTWAVE

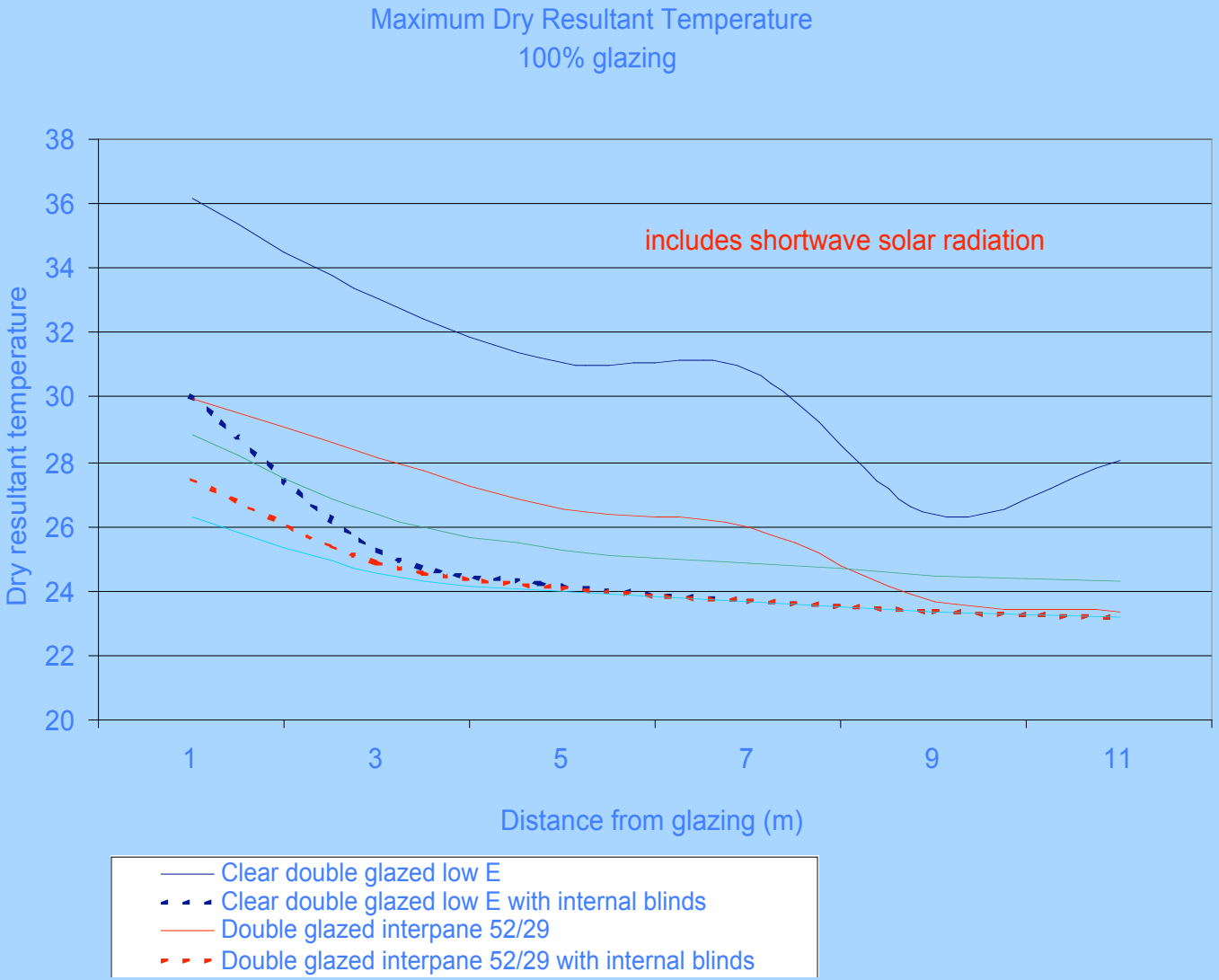
depends on

- transmittance of glass
- external shading
- internal shading
- sun position

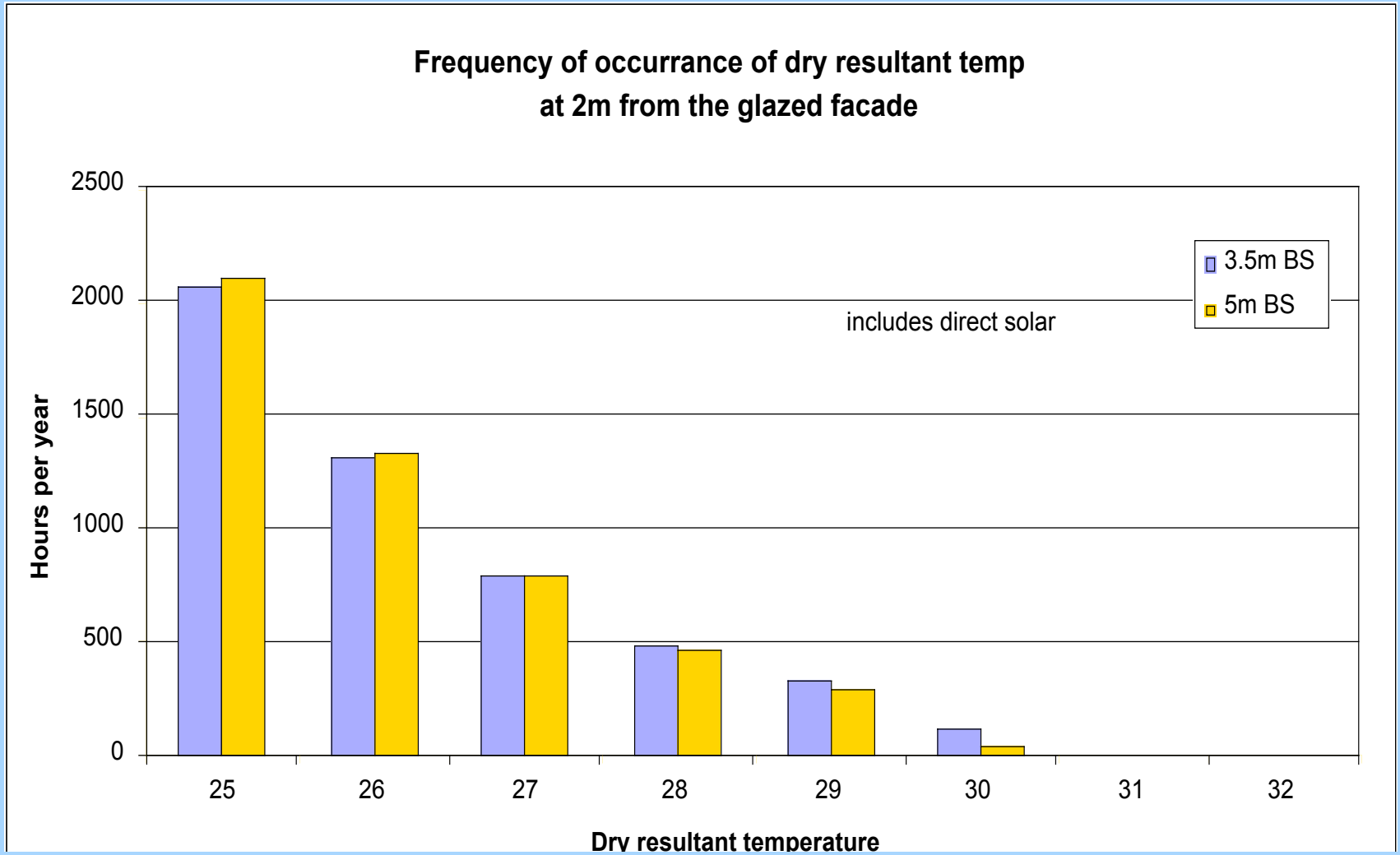
Longwave

- Depends on
  - glass/blind surface temp
  - glazing absorptance
  - window area
  - distance from glazing

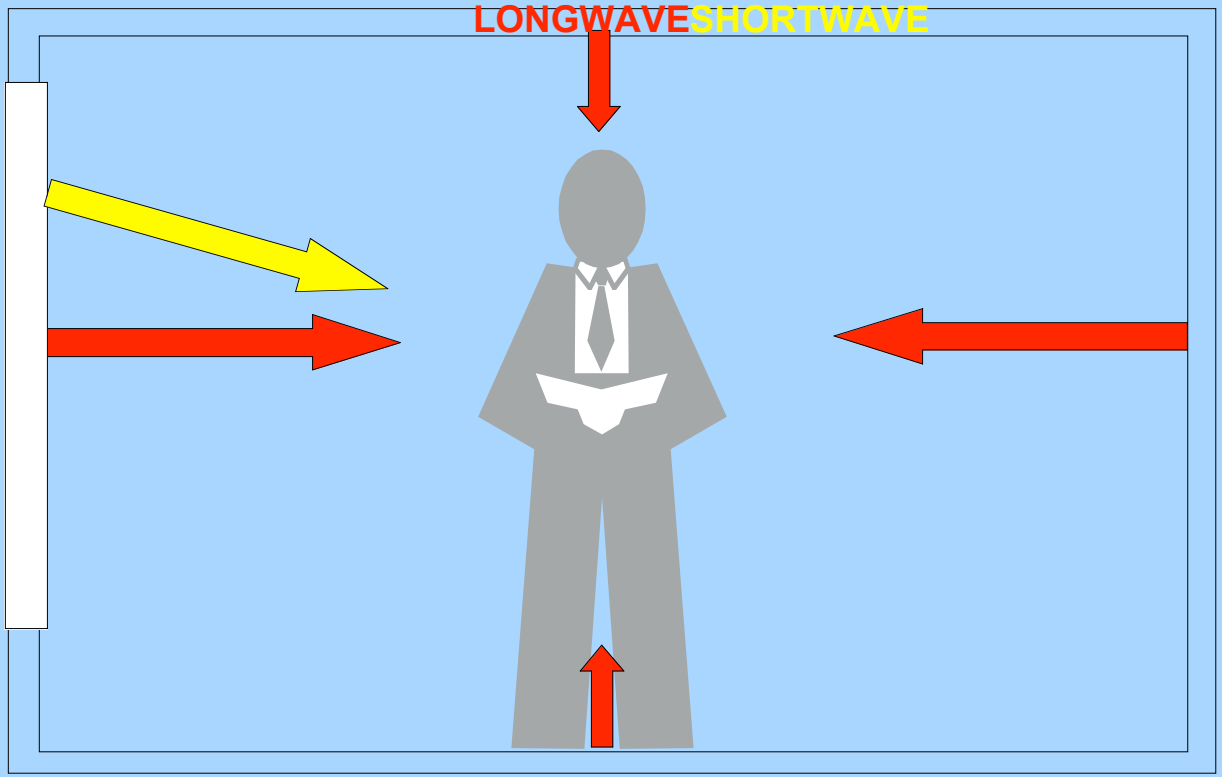
GLAZING


Maximum Dry Resultant Temperature
100% glazing
includes shortwave solar radiation
Dry resultant temperature
38
36
34
32
30
28
26
24
22
20
1
3
5
7
9
11
Distance from glazing (m)
Clear double glazed low E
Clear double glazed low E with internal blinds
Double glazed interpane 52/29
Double glazed interpane 52/29 with internal blinds

GLAZING

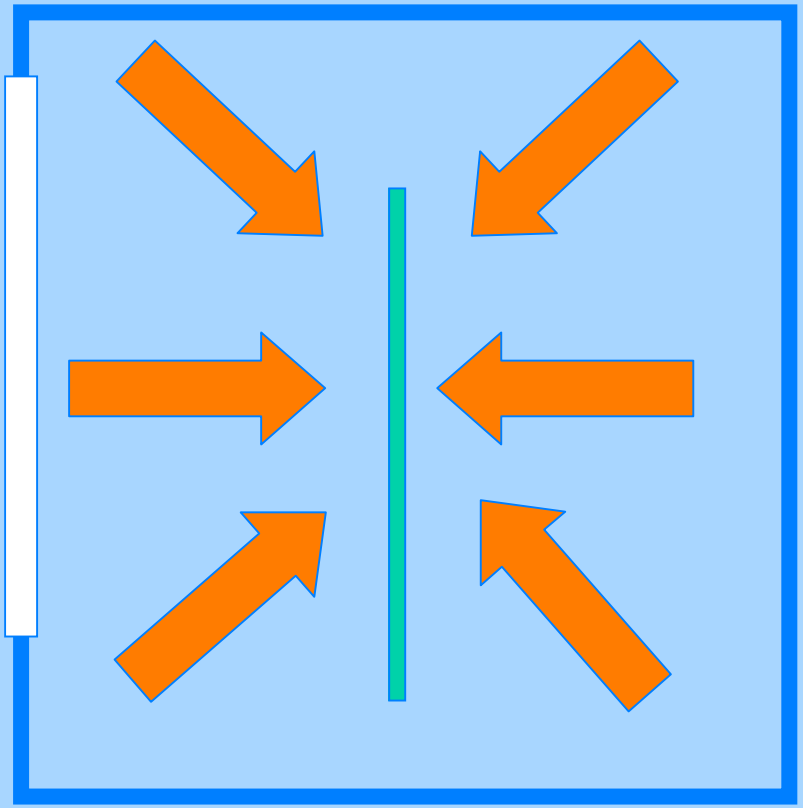

Frequency of occurrance of dry resultant temp
at 2m from the glazed facade
Hours per year
2500
2000
1500
1000
500
0
includes direct solar
3.5m BS
5m BS
25
26
27
28
29
30
31
32
Dry resultant temperature

Asymmetric radiation

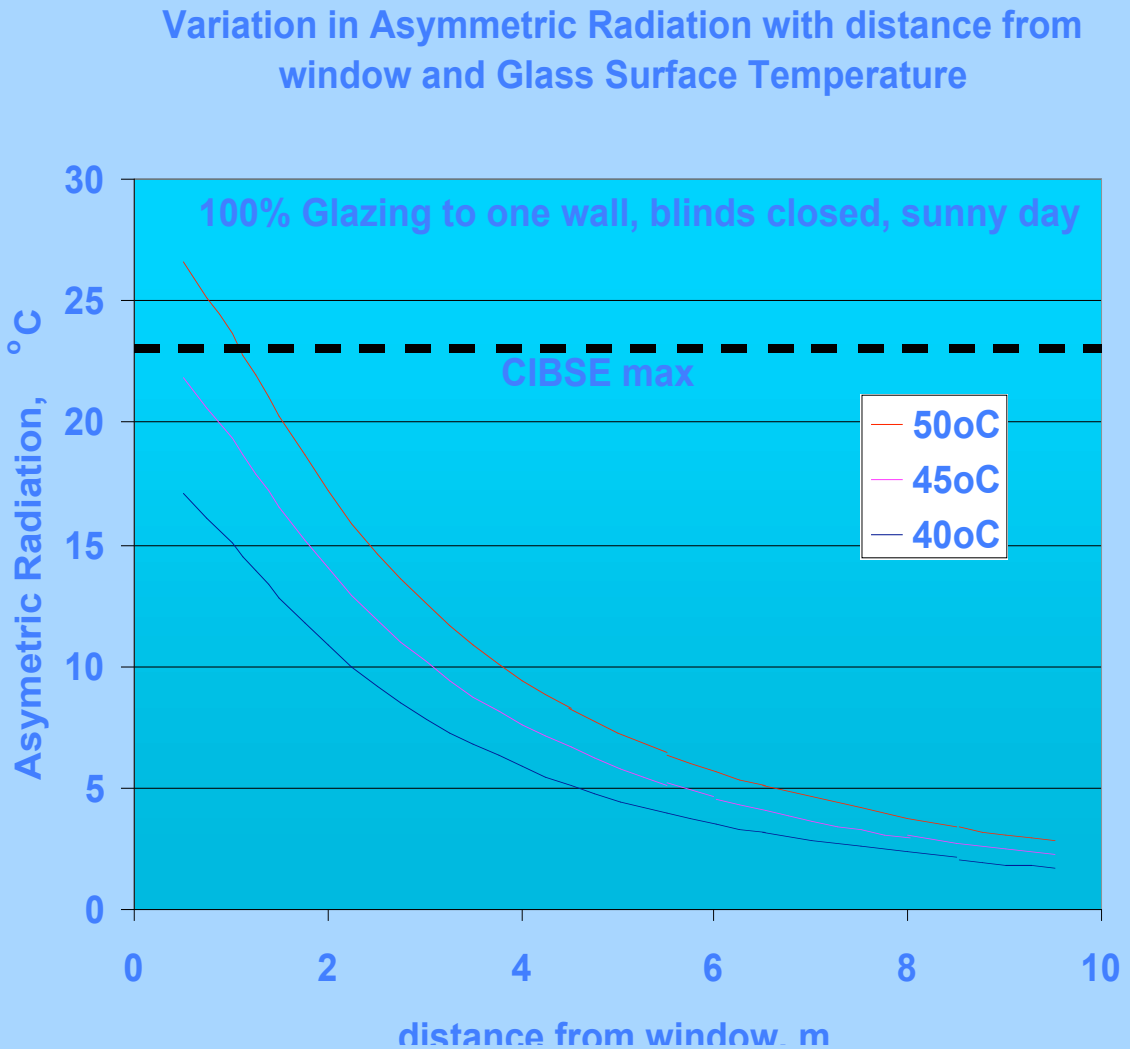


GLAZING

ISO 7726



GLAZING


Variation in Asymmetric Radiation with distance from window and Glass Surface Temperature
100% Glazing to one wall, blinds closed, sunny day
CIBSE max
50oC
45oC
40oC
Asymetric Radiation, °C
30
25
20
15
10
5
0
0
2
4
6
8
10
distance from window, m

GLAZING

flexibility!

Solar gains vary with

- **Weather conditions**
- **Time of year**
- **Time of day**

GLAZING

flexibility

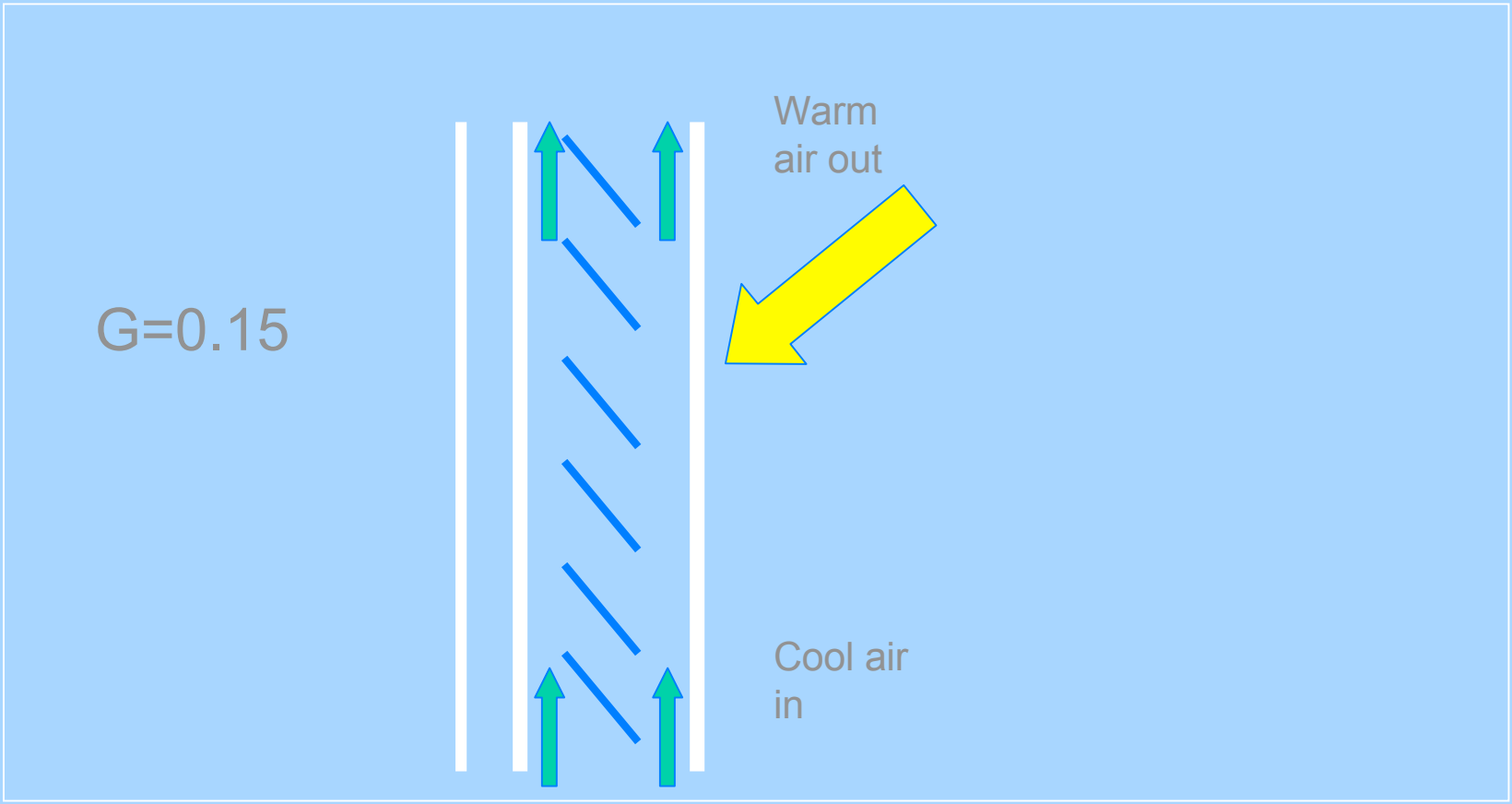
Want a glazing system that can cope with this:

***Variable* solar performance**

Possible solutions?

- Ventilated cavity
- Adjustable external shading
- photochromic

Ventilated cavity



summary

- Opportunity to reduce energy consumption
- Improve occupant well being
- Improve productivity
- Potential for discomfort on sunny days
- Standard calculations not sufficient
- Need an adaptable system of solar control