PERENCANAAN TEKNOLOGI & SISTEM BANGUNAN (PTSB) *03*

What drives

climate system

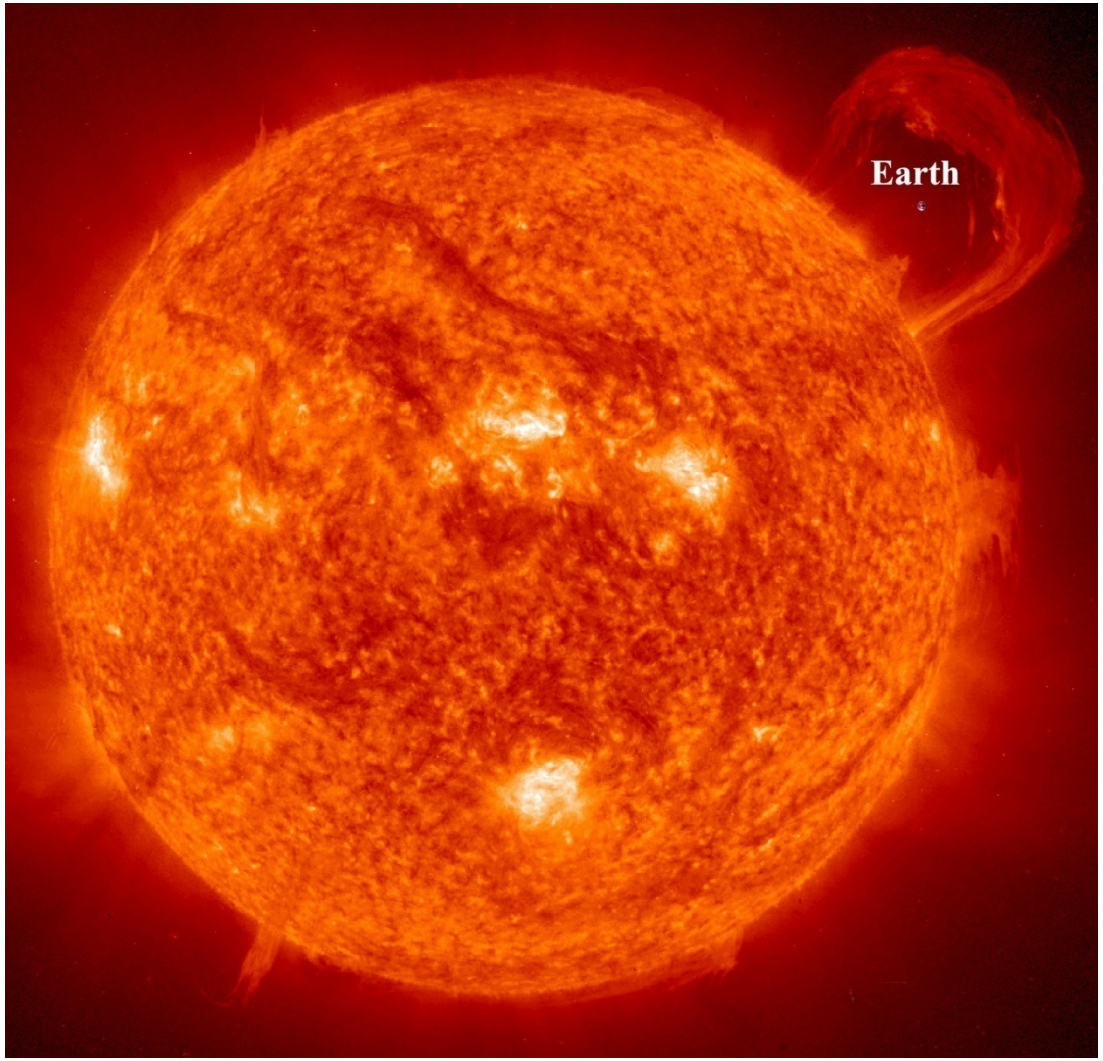
on our earth?

OUTLINE

FUNDAMENTAL
Sun
Atmosphere
Tropics

CLIMATIC
RESPONSIVE
BUILDING
Analysis
Principle

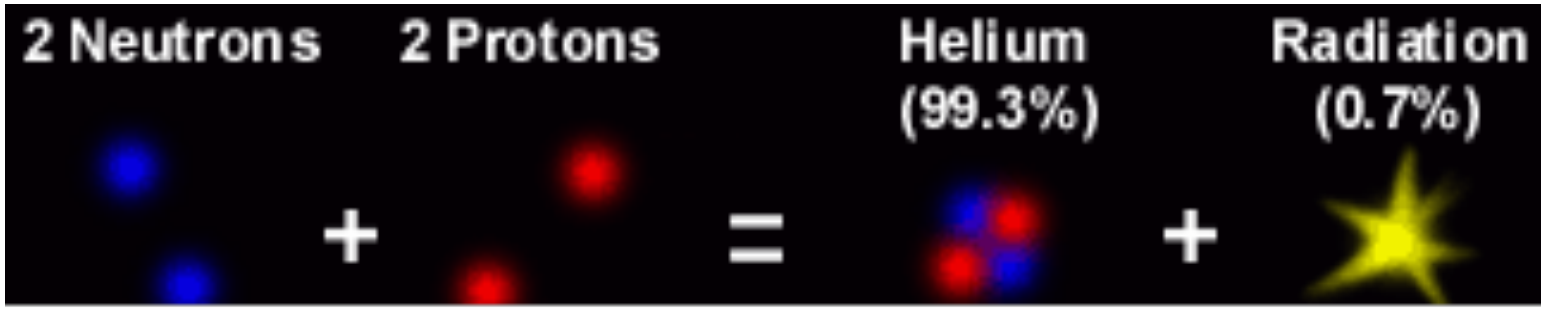
Fact 1: Solar radiation drives the earth's climate system



The sun is a giant ball of hot gases

70% hydrogen, 28% helium, 0.5% carbon, 0.5% nitrogen, 0.5% oxygen, and 0.5% other elements.

Fact 1: Solar radiation drives the earth's climate system



The creation of each helium nucleus requires four hydrogen nuclei.
The Sun converts 600 million tons of hydrogen into 596 million tons of helium every second.

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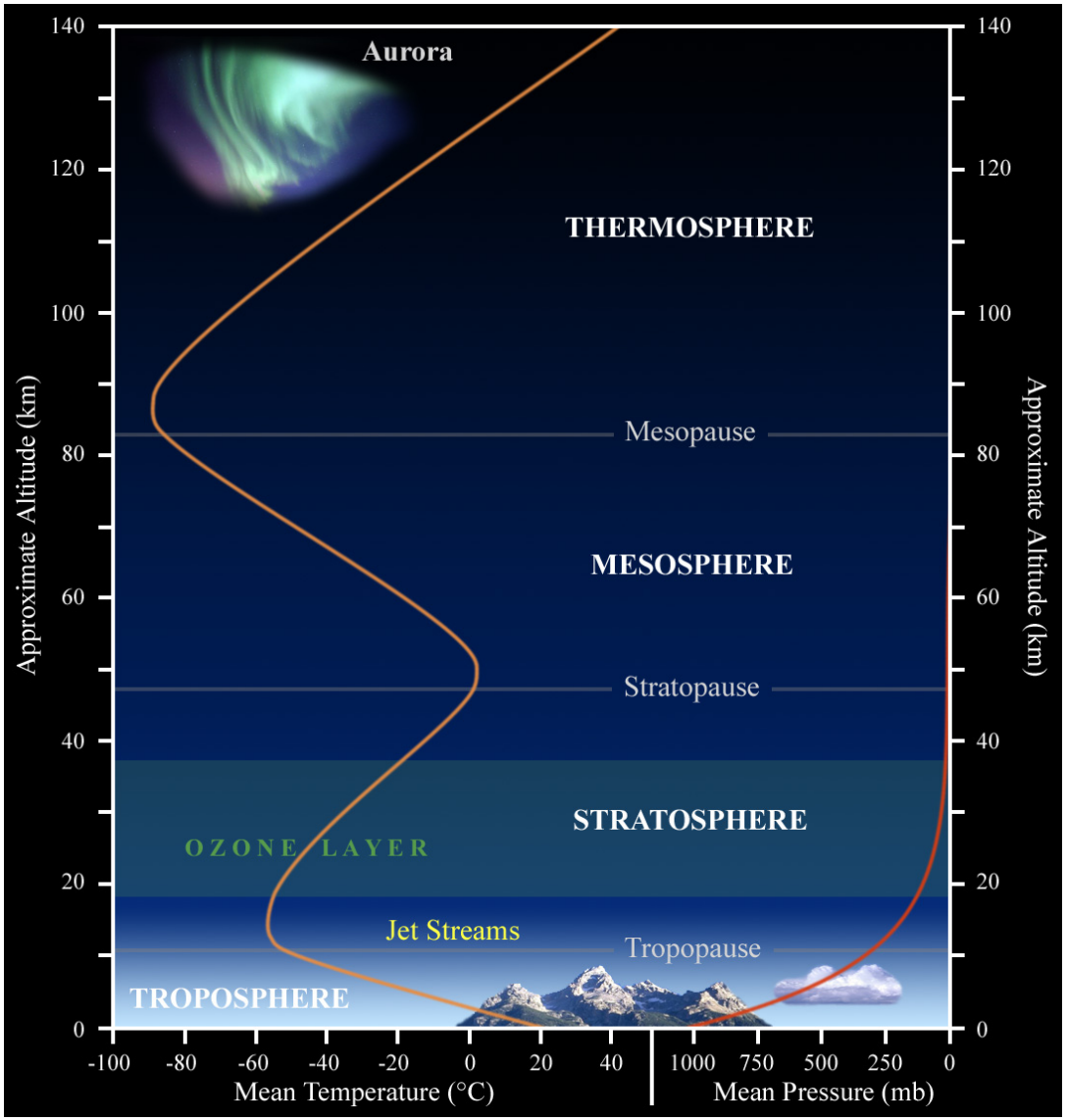

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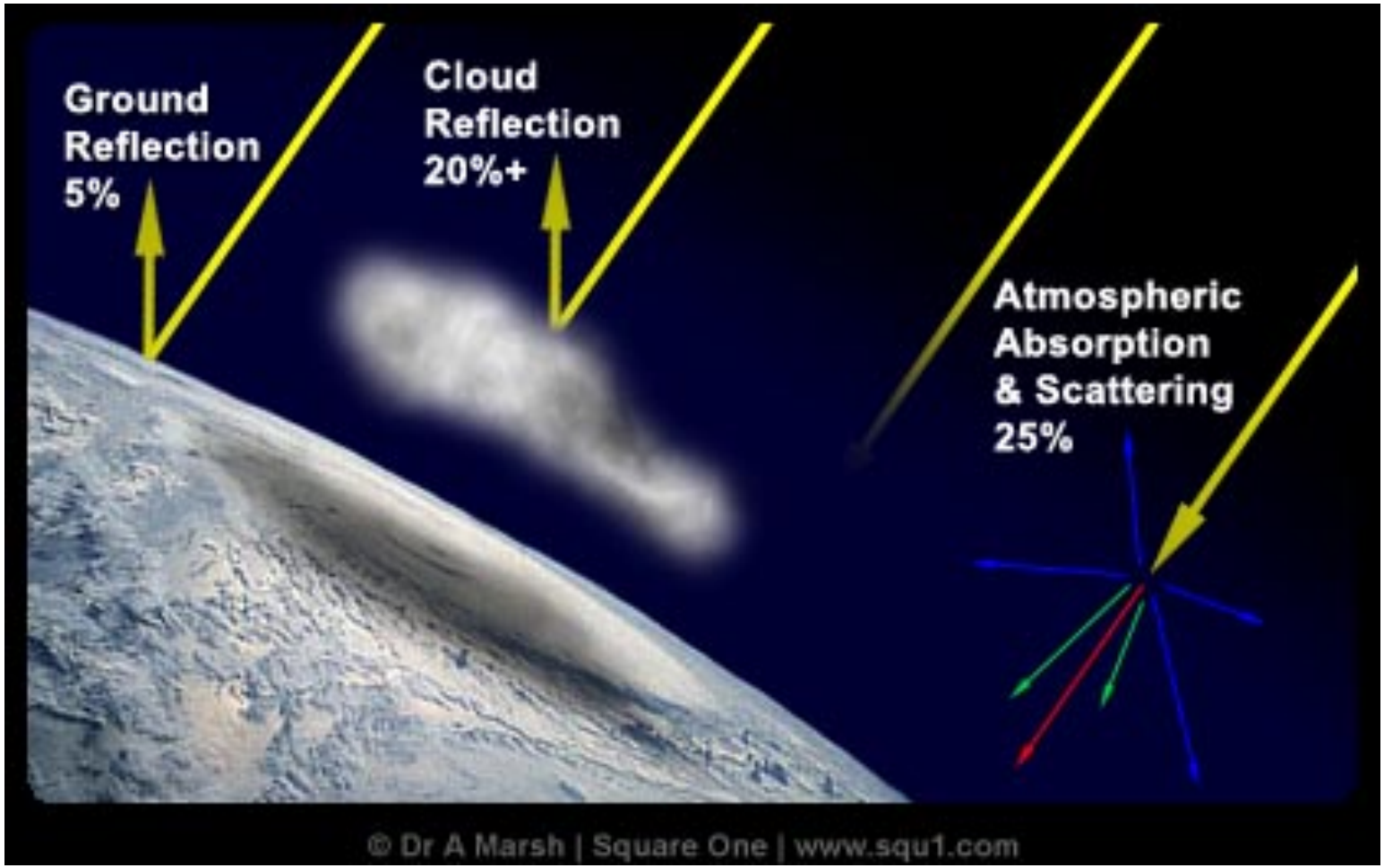

Atmospheric Effects

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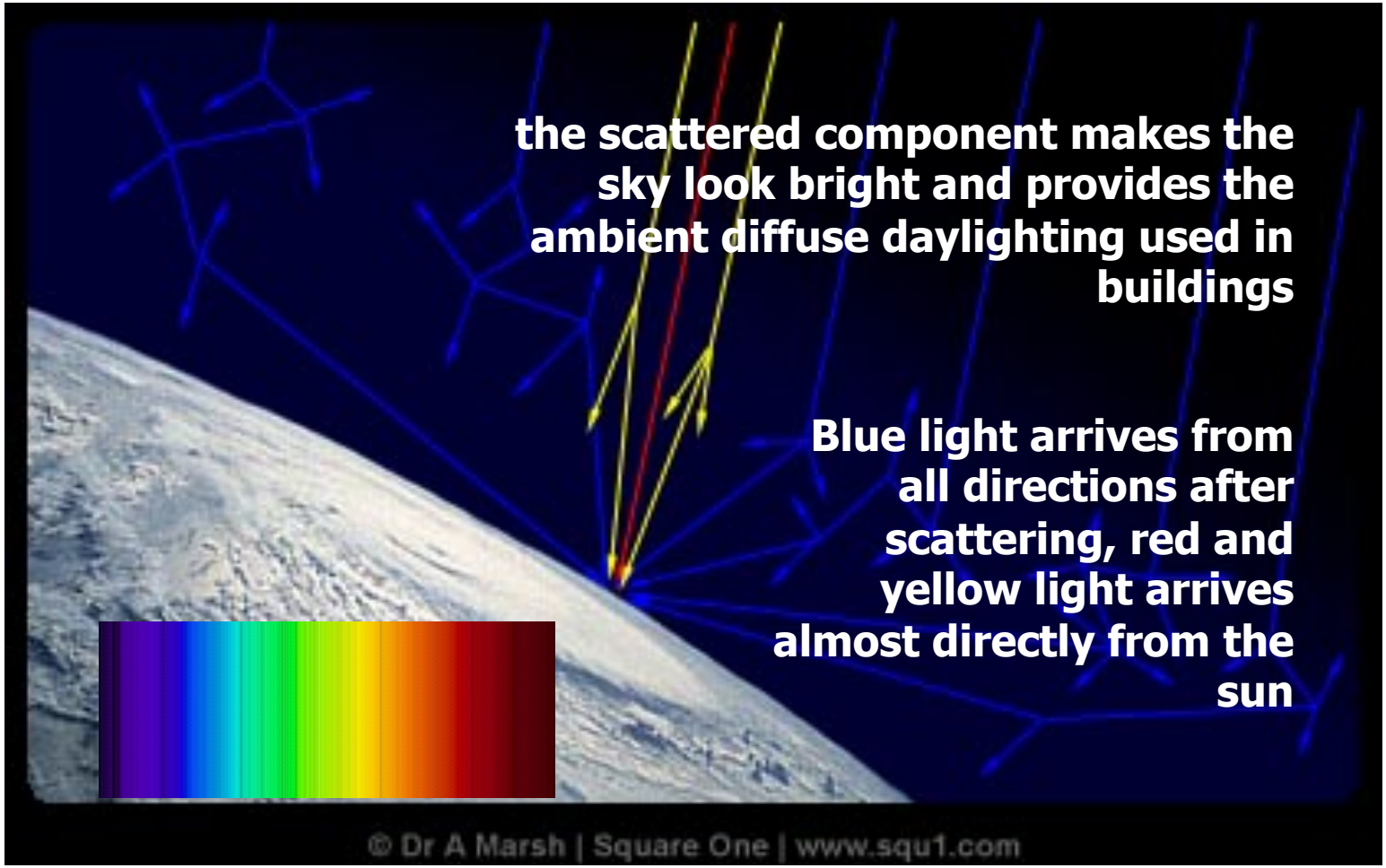

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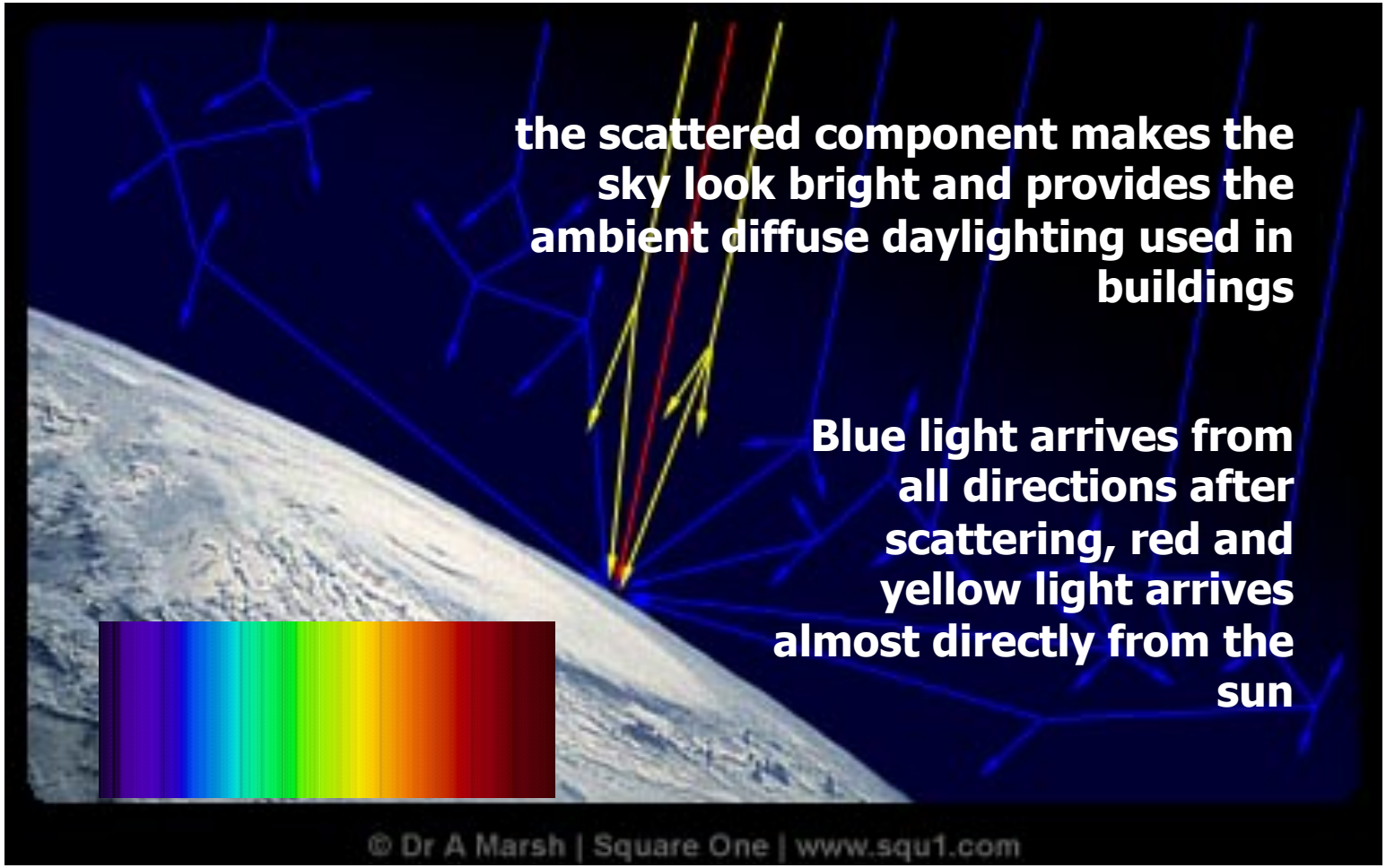

Atmospheric Effects

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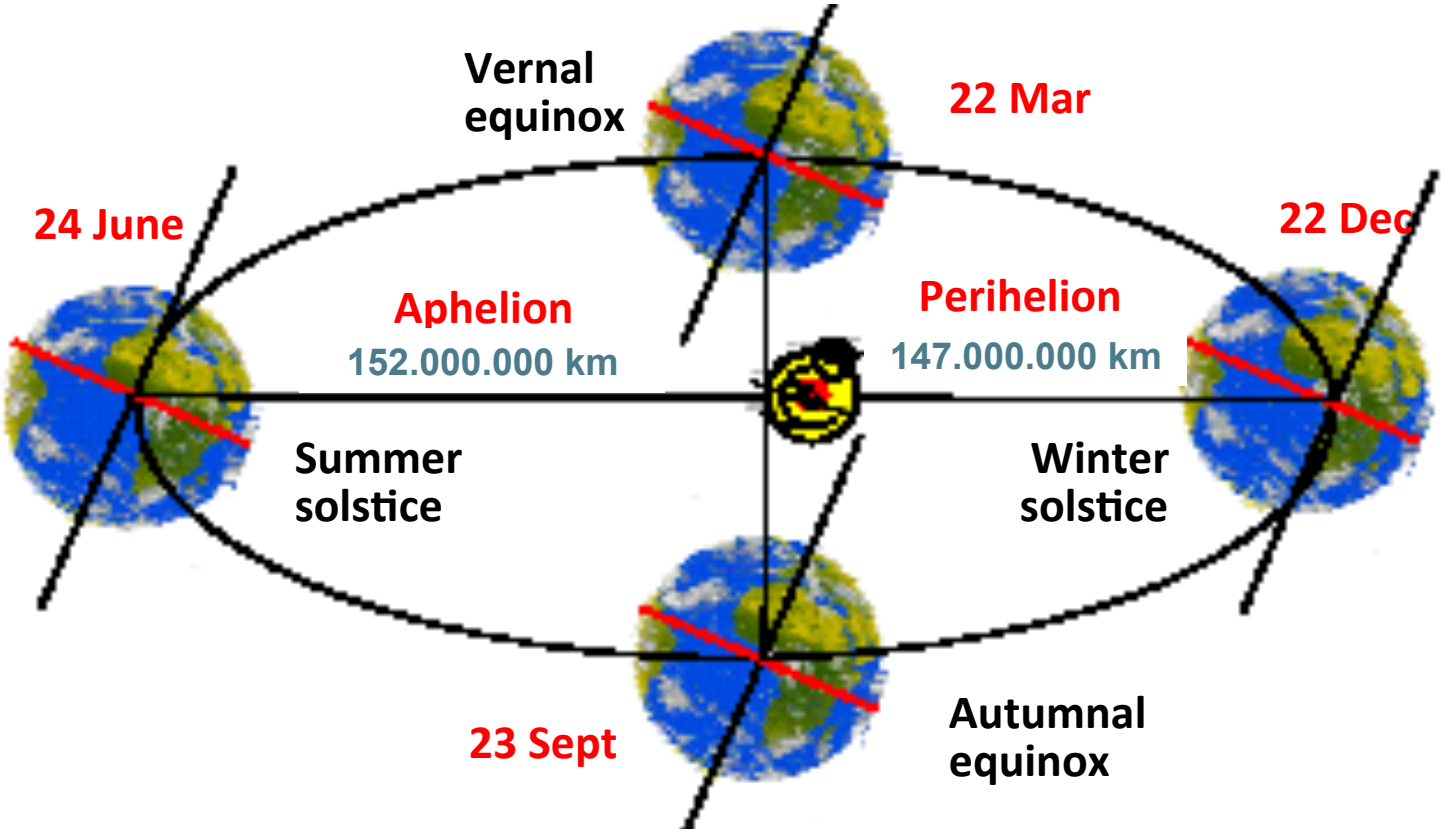
Fact 2: The earth is turning while running on its orbit



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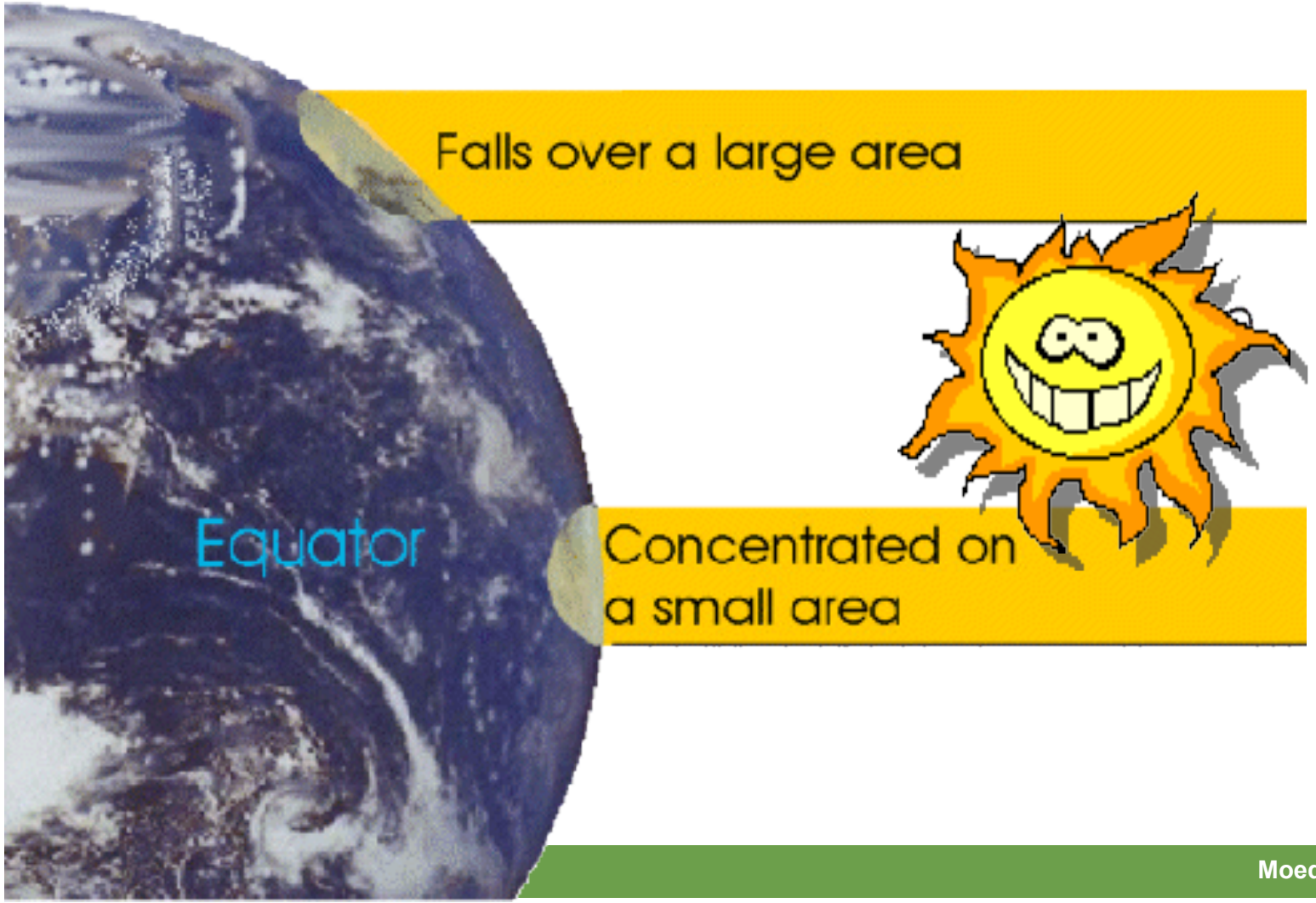

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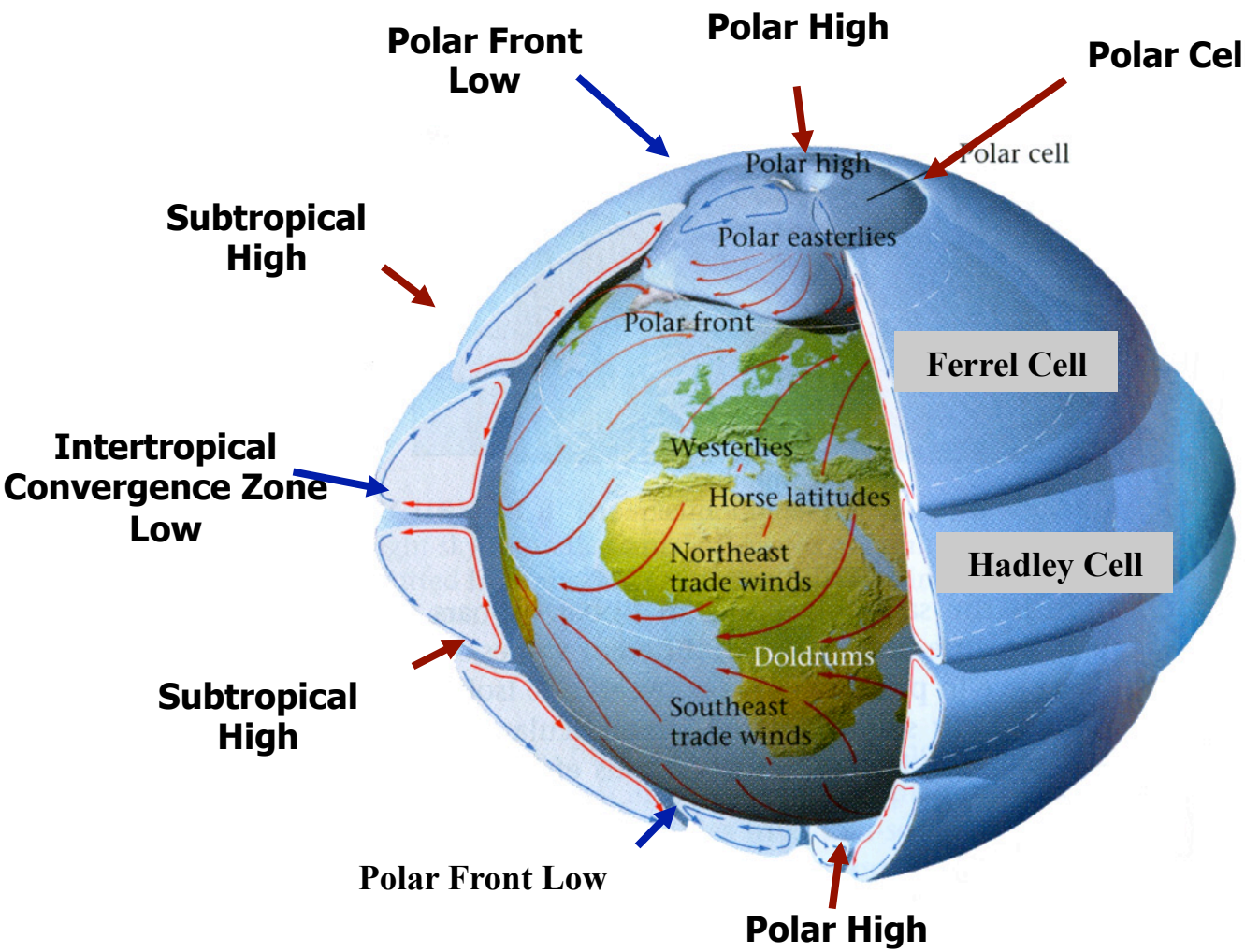
Fact 3: Coriolis effect develop atmospheric circulation cells



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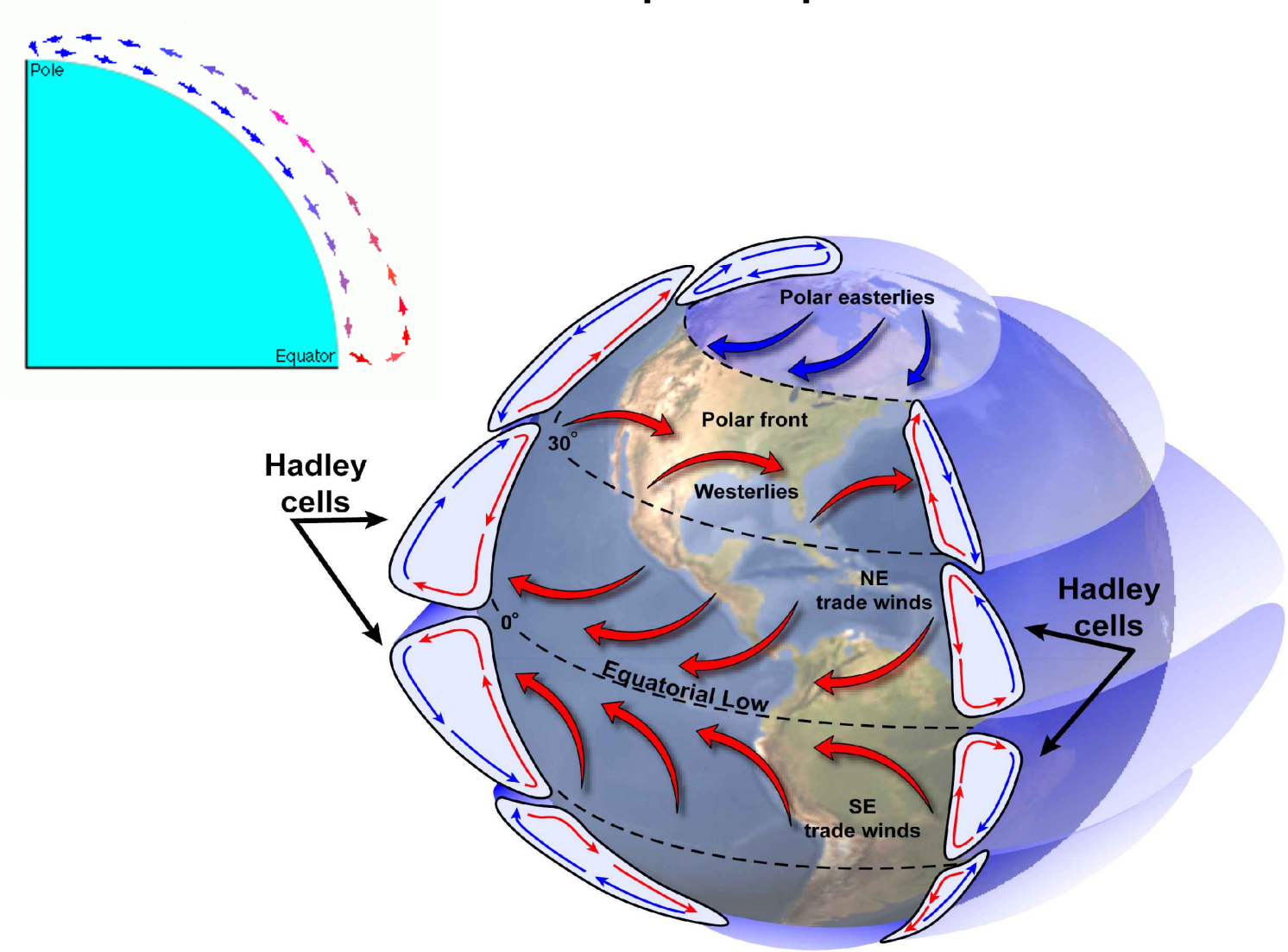

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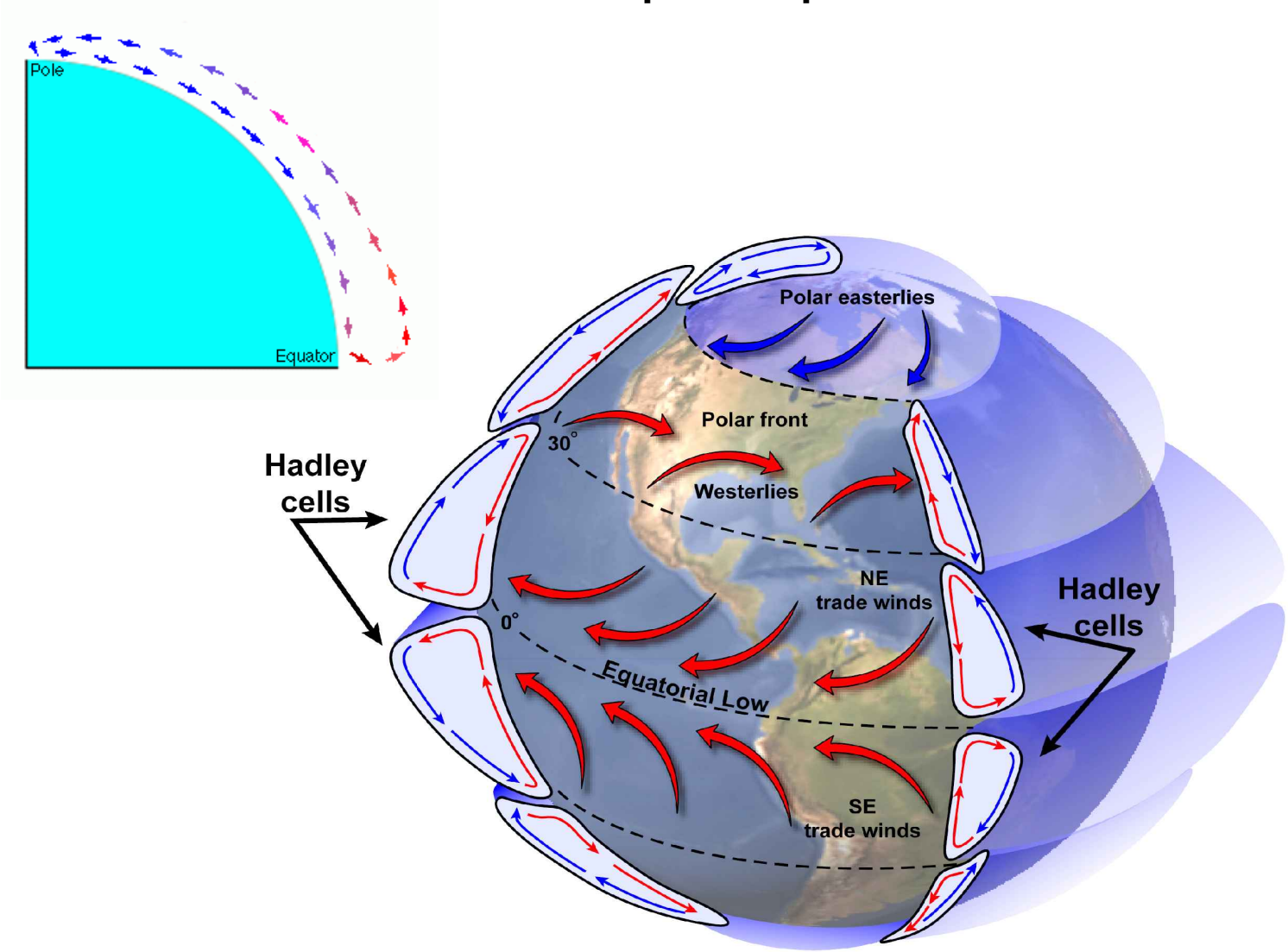

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What kind climate characterize our region?

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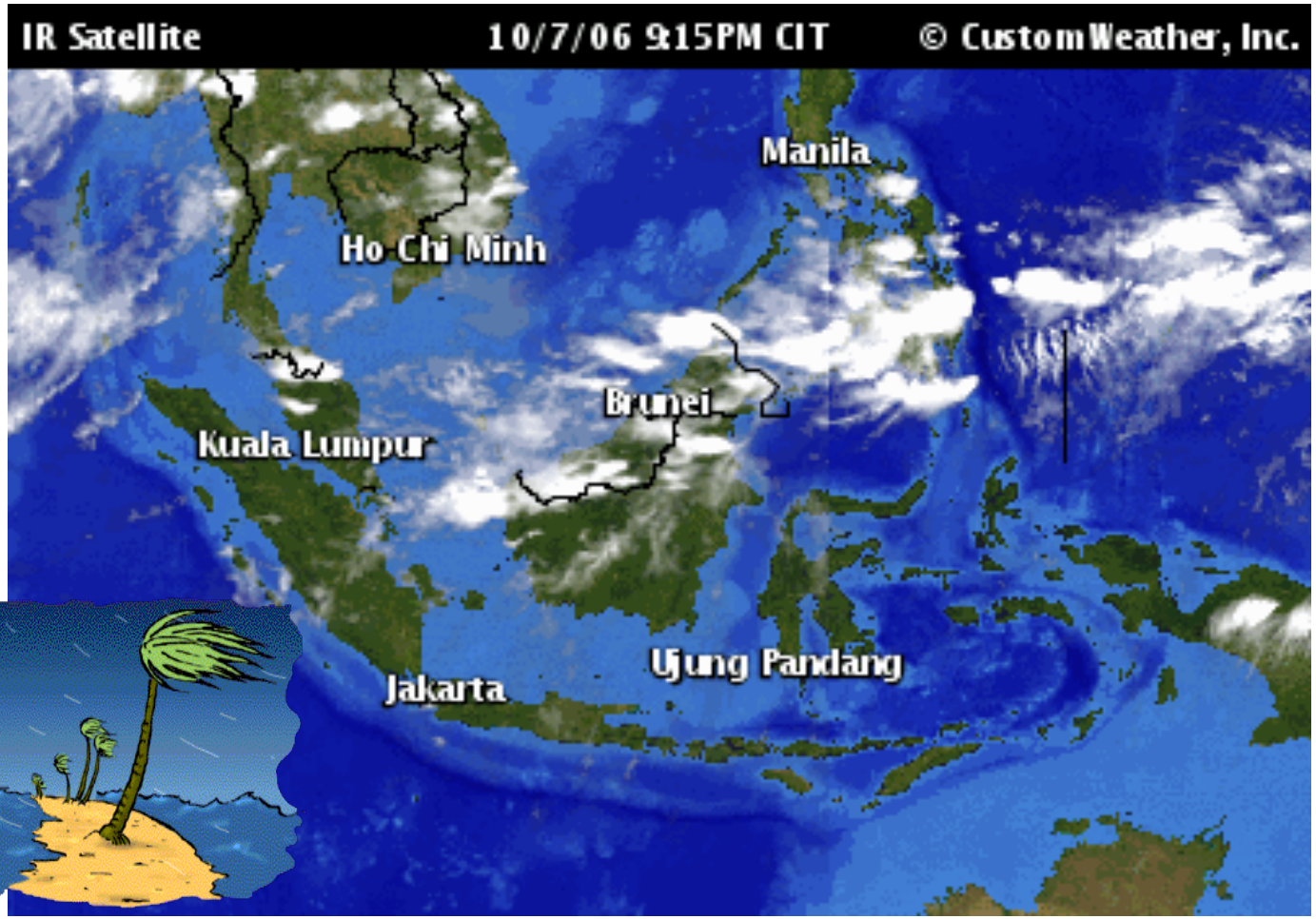

Hadley cell dominates the atmospheric circulation in tropical zone like the Southeast Asia which creates monsoons (derived from the Sanscrit *"mausim"* which means "a season")

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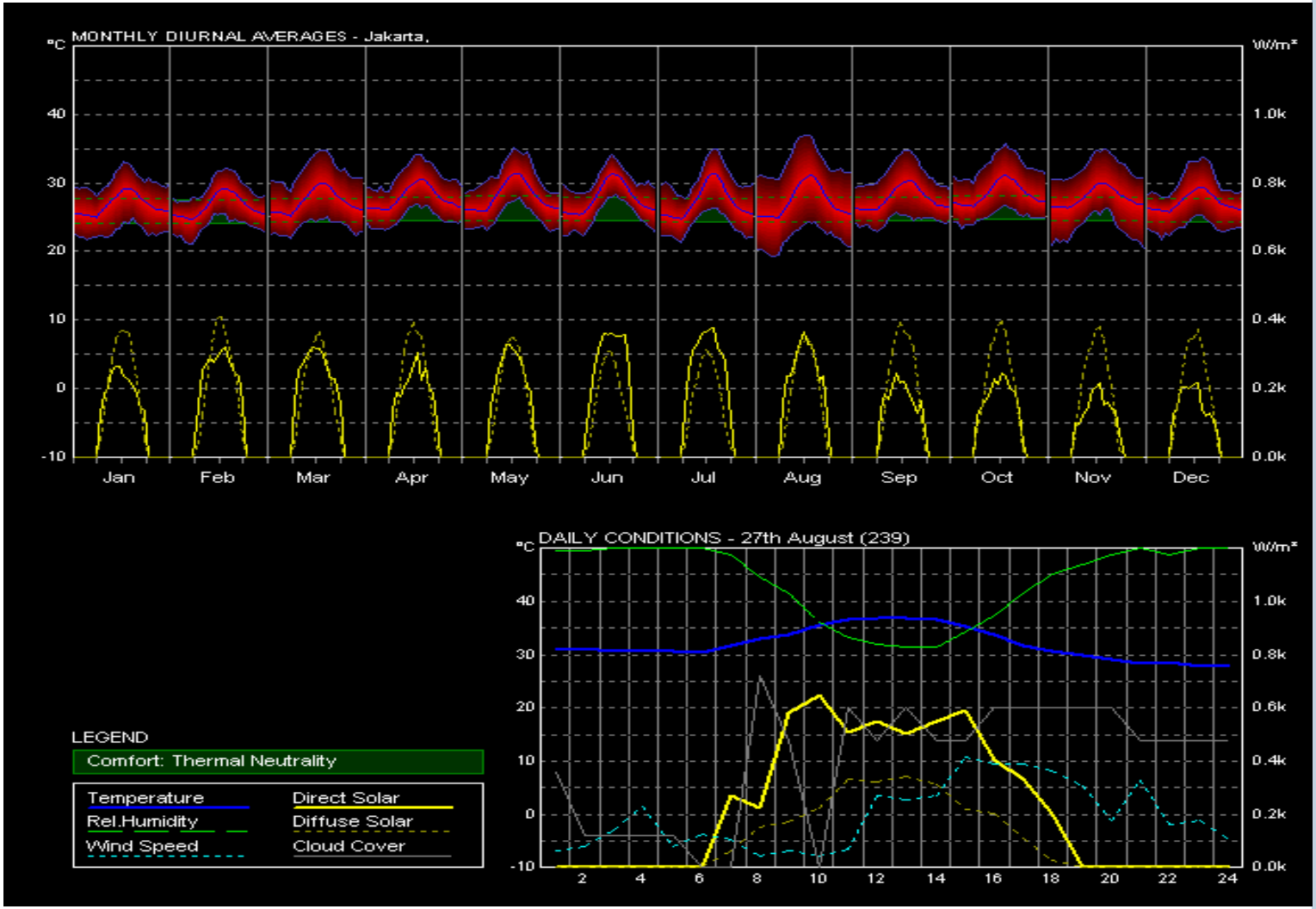

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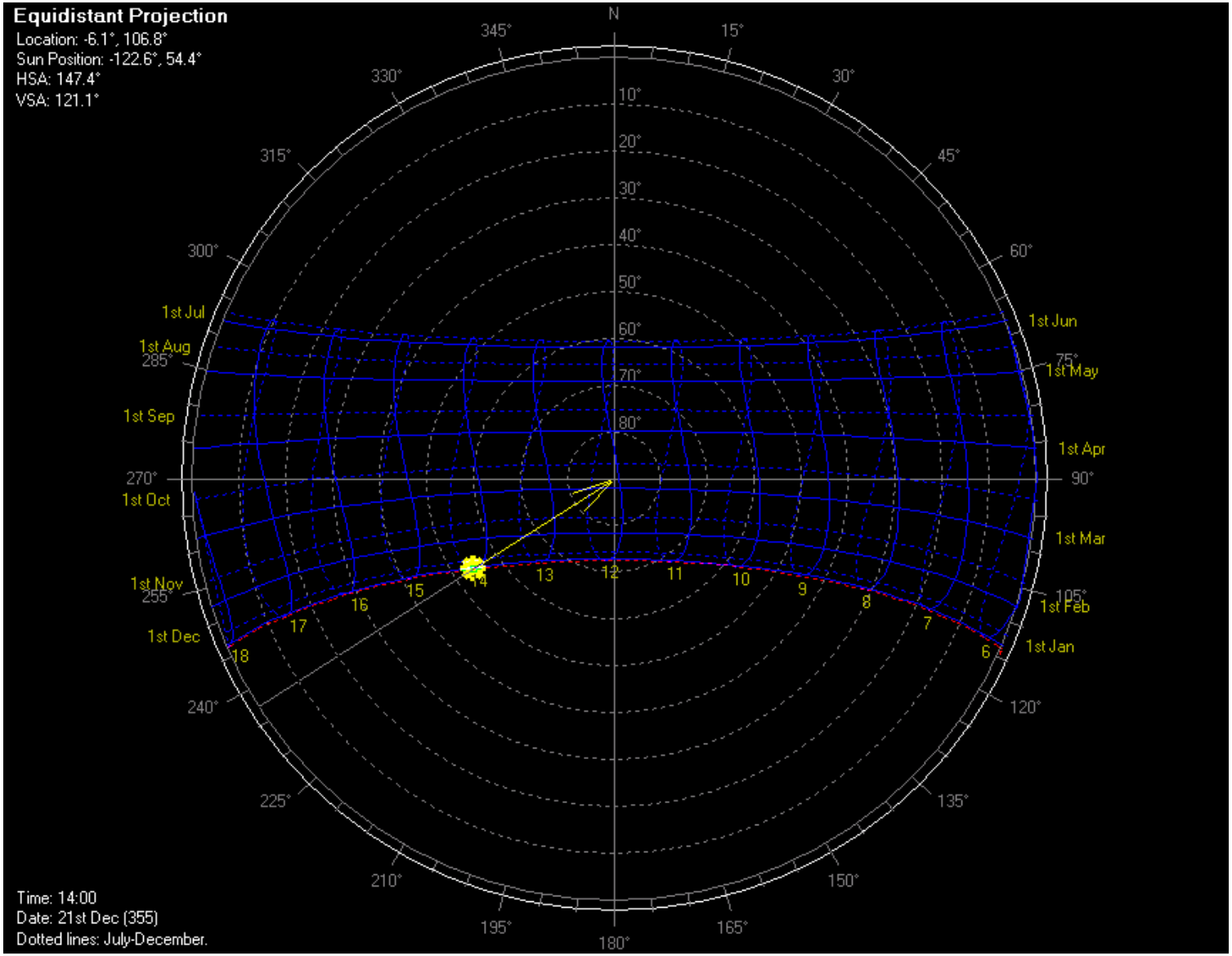

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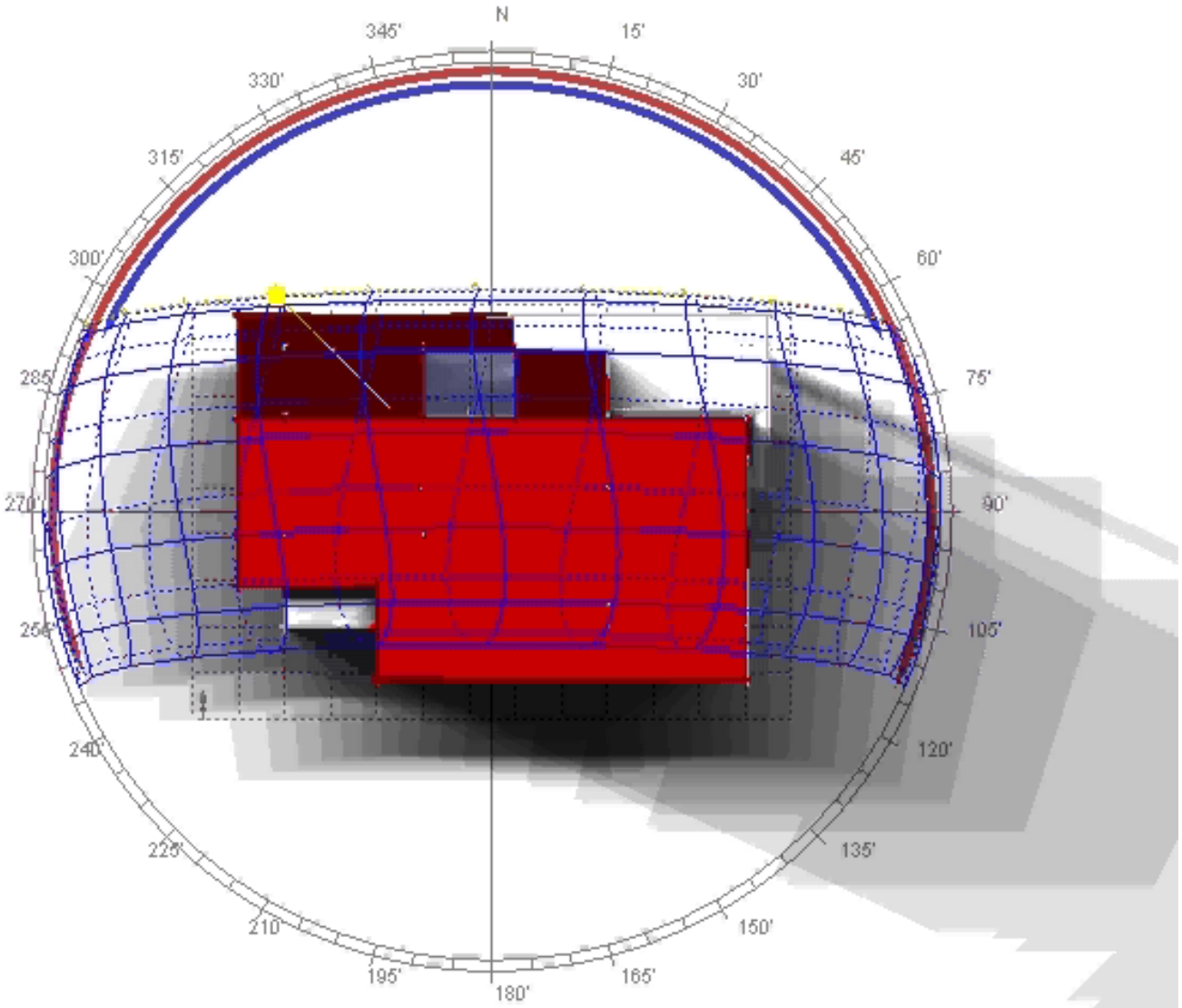

Semarang; Lat. -6°55´; Long. 110° 8´(+7.0)

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A typical house for hot-humid climates (Szokolay, 2004)

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CLIMATIC RESPONSIVE BUILDING
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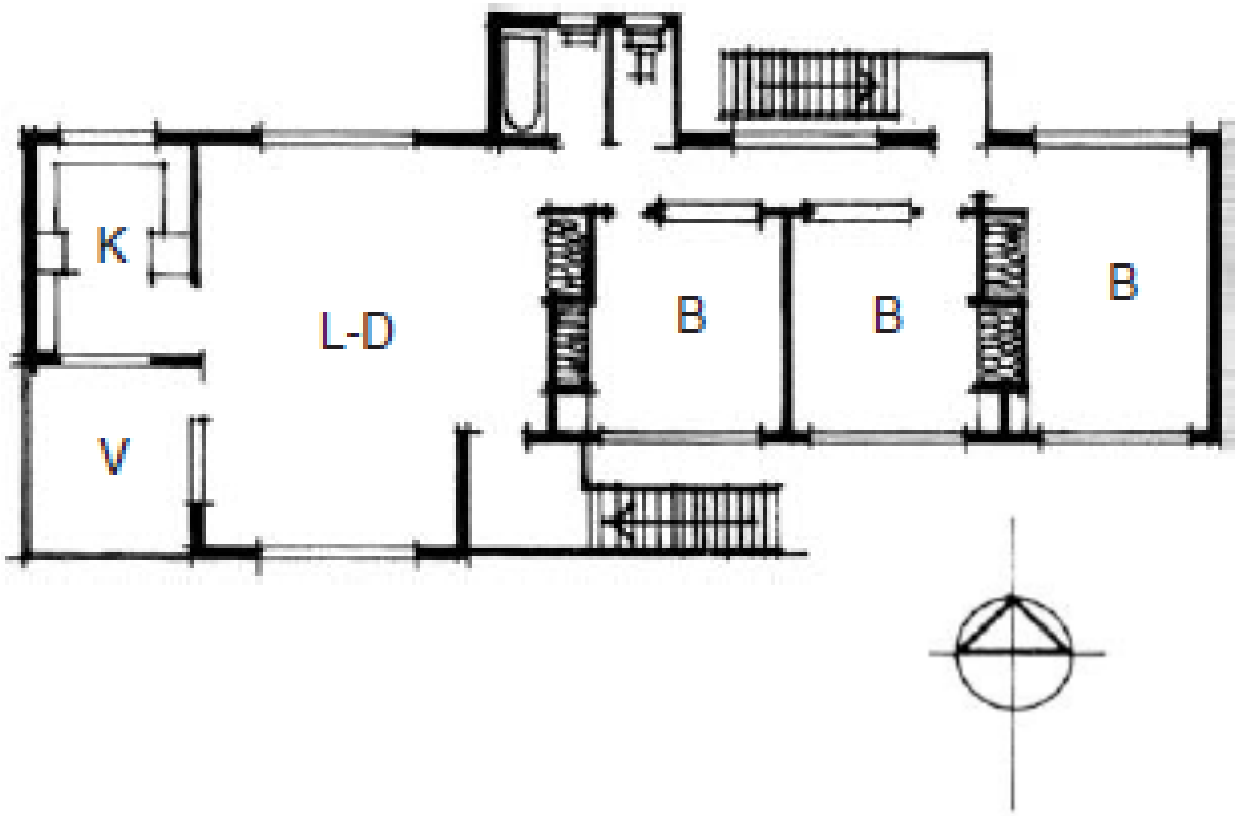

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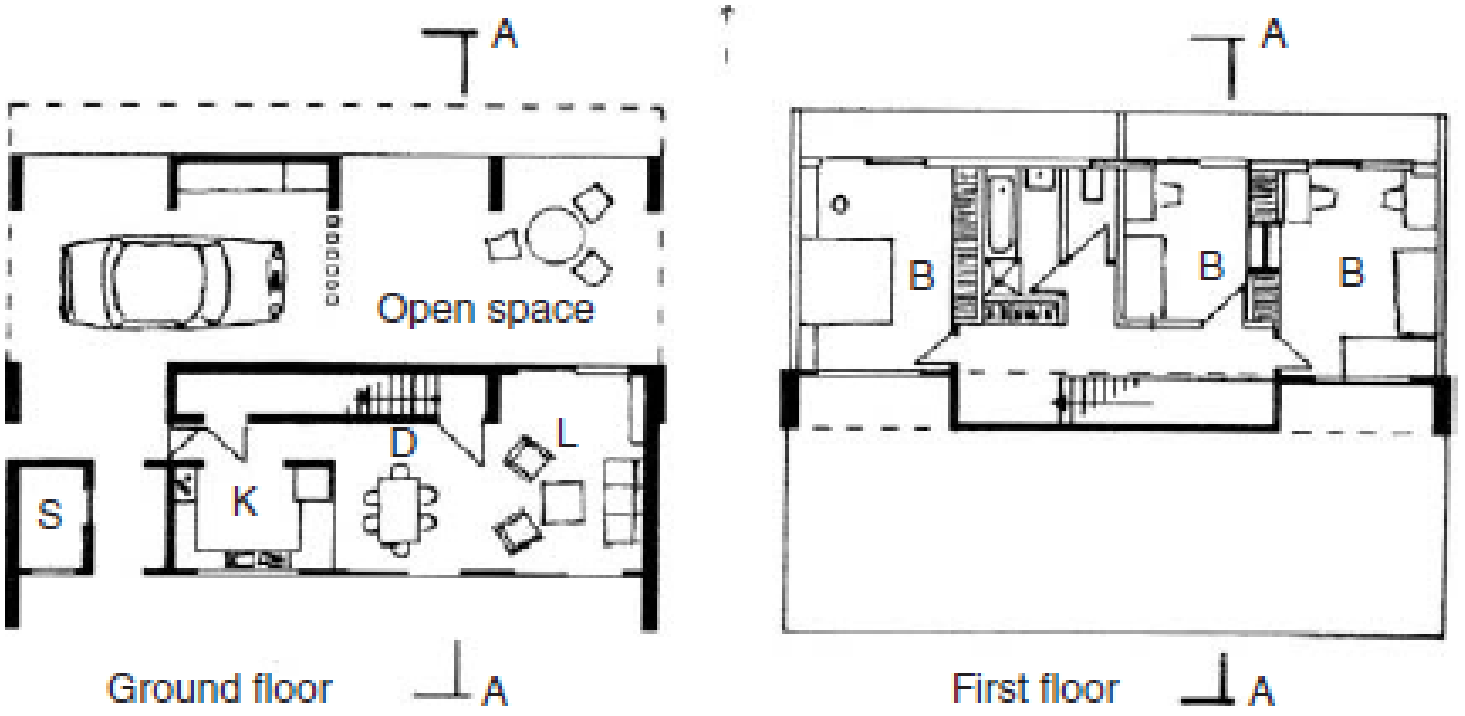

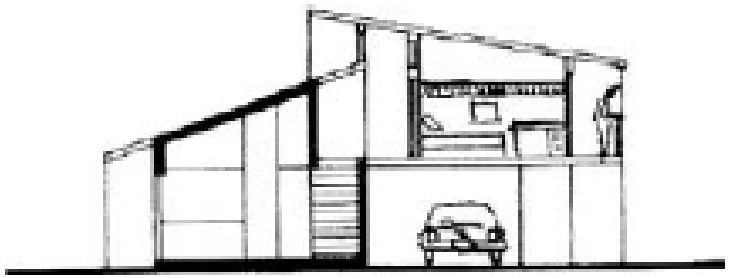

A typical house for hot-humid climates (Szokolay, 2004)

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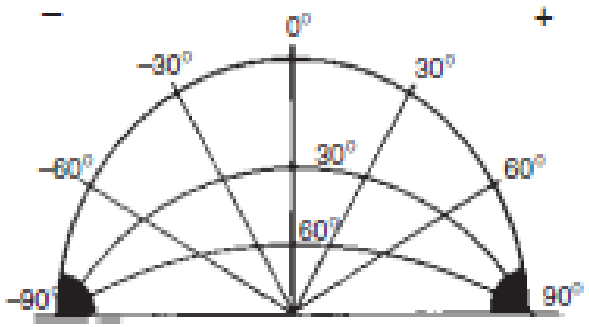
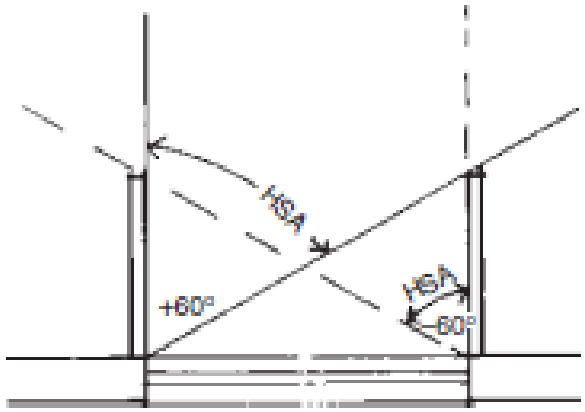
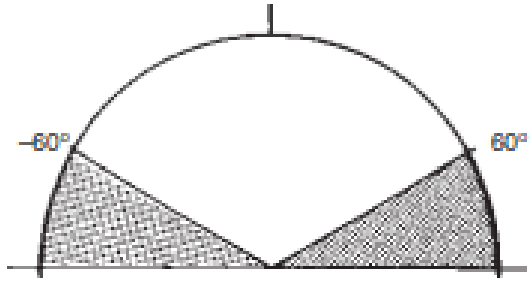




horizontal shadow angles (HSA)



vertical shadow angle (VSA

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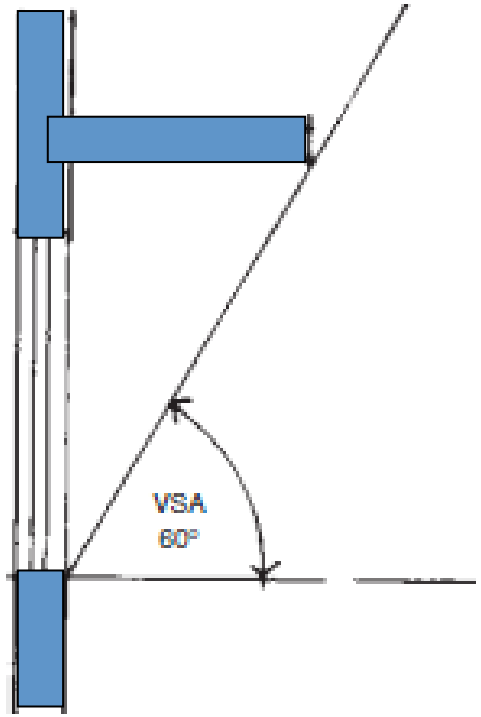
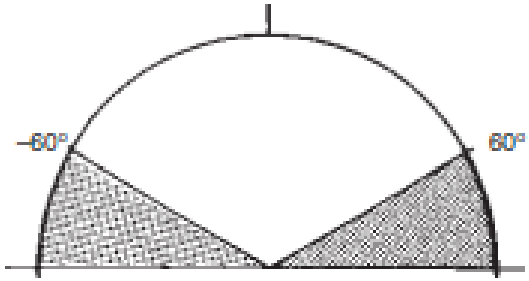


vertical shadow angle (VSA)



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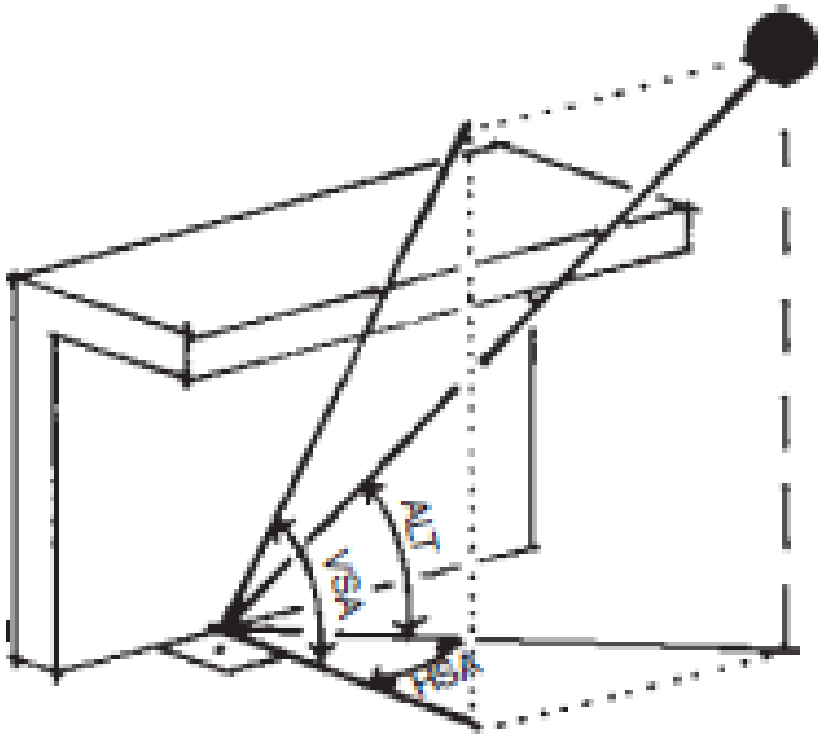

OUTLINE

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CLIMATIC RESPONSIVE BUILDING
Analysis
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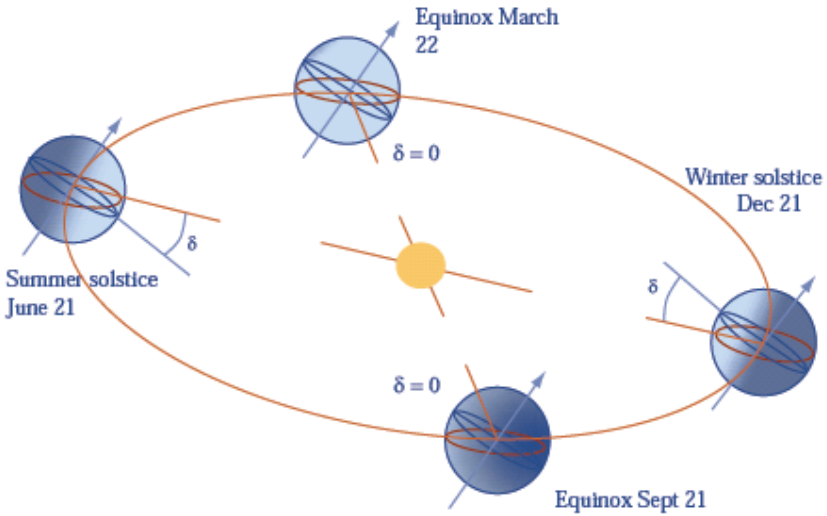
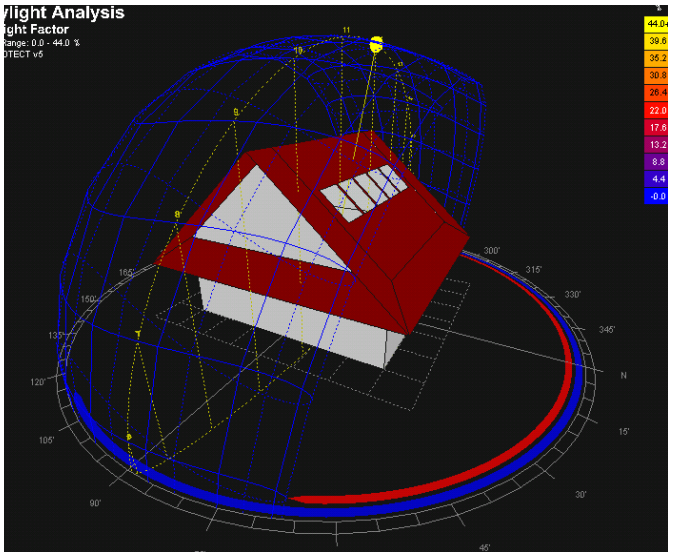
Main parameters in daylight availability





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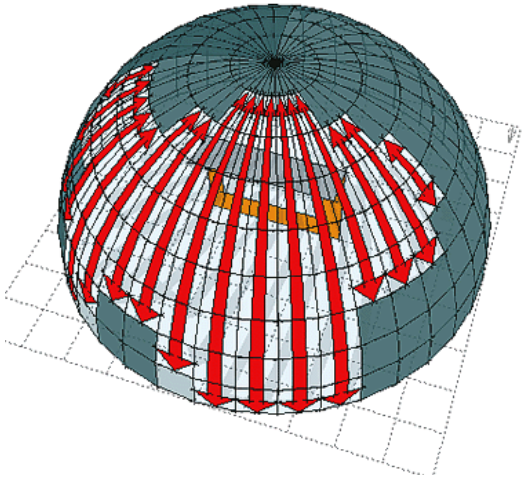
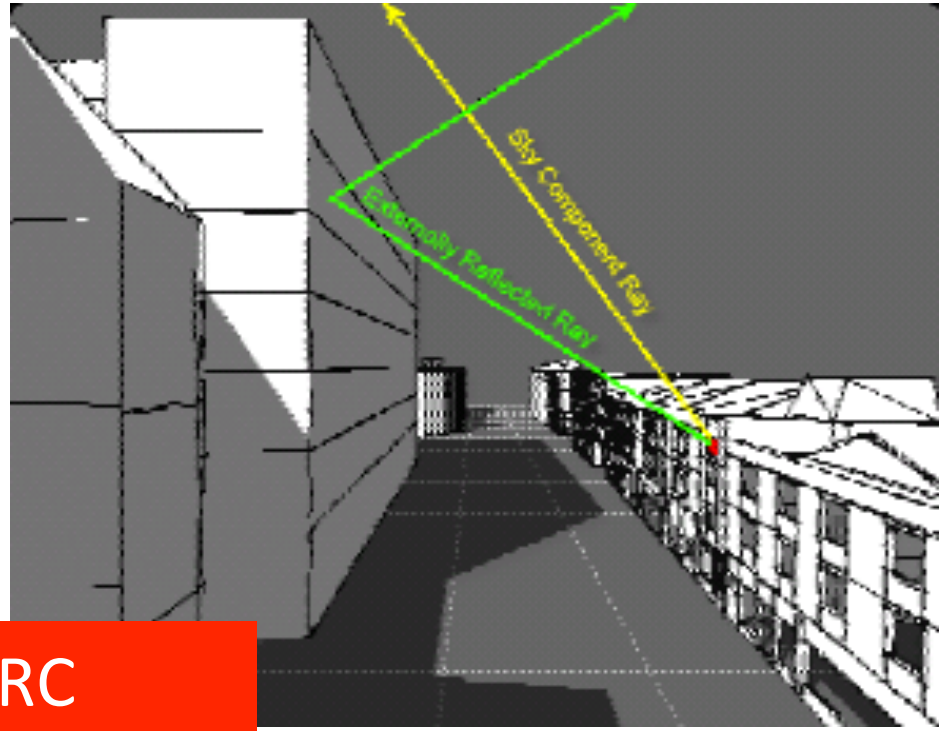


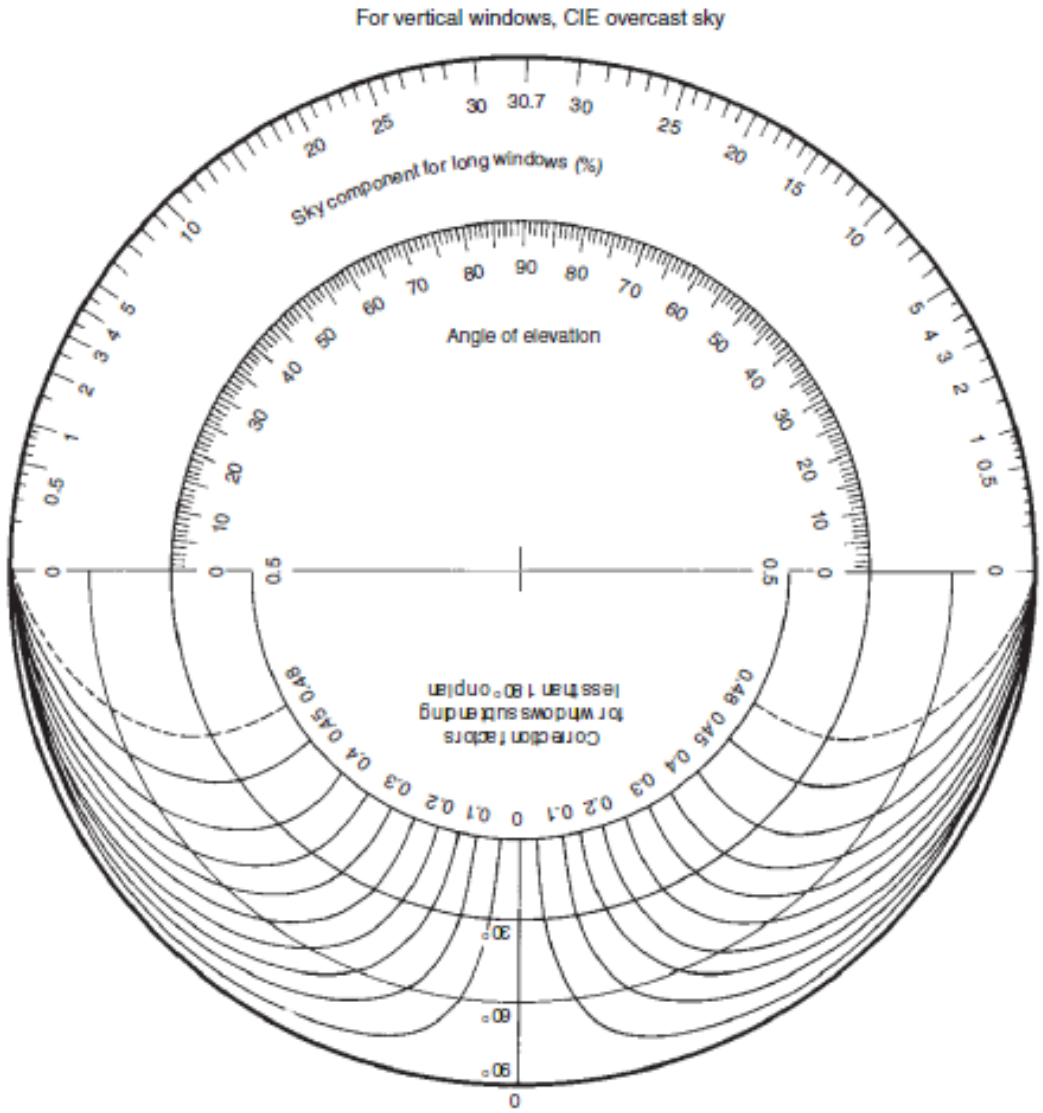


DF = SC + ERC + IRC

Sky Component (*SC*) - Directly from the sky, through an opening such as a window.

Externally Reflected Component (*ERC*) - Reflected off the ground, trees or other buildings.

Internally Reflected Component (*IRC*) - The inter-reflection of 1 and 2 off surfaces within the room.



BRS DAYLIGHT FACTOR PROTRACTOR NO. 2

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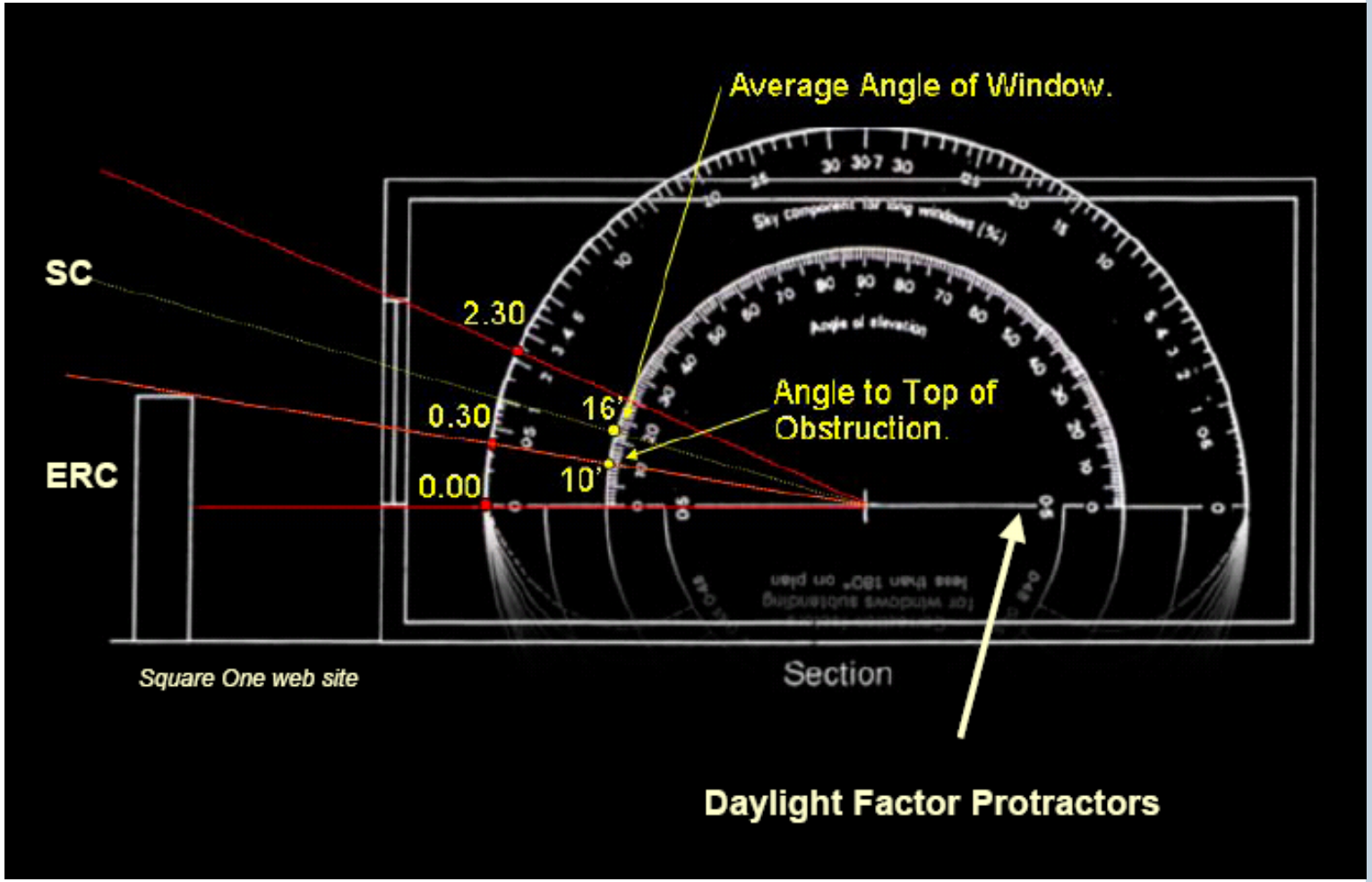
SKY COMPONENT



(1) ISC – skala luar **(2) Sudut rata2 –** skala dalam

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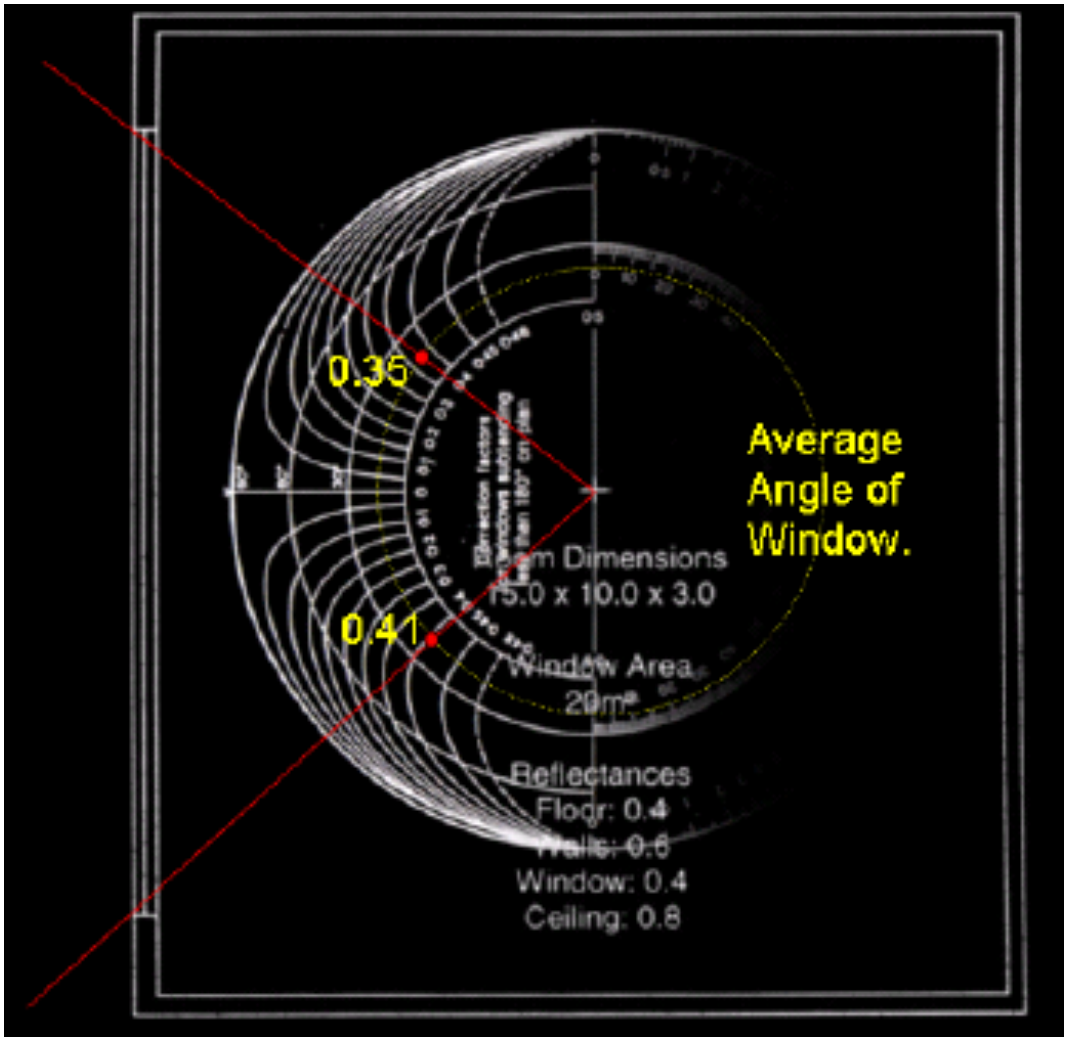
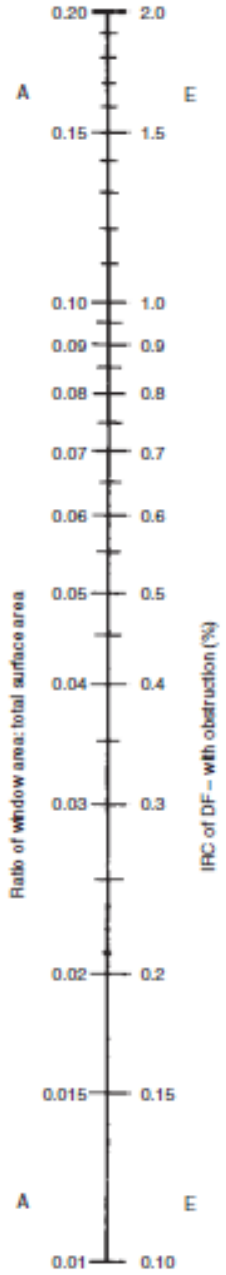


(2) Sdt rata2 – lingkaran imajiner **(3) FC –** jml angka garis lengkung



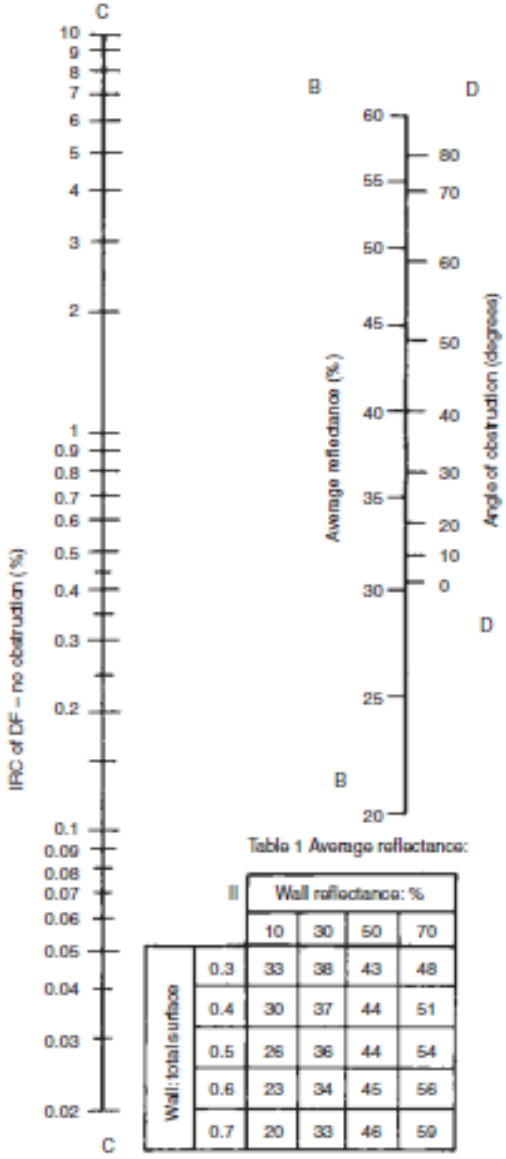


Table 1 Average reflectance:

Wall: total surface	Wall reflectance: %			
	10	30	50	70
0.3	33	38	43	48
0.4	30	37	44	51
0.5	26	36	44	54
0.6	23	34	45	56
0.7	20	33	46	59

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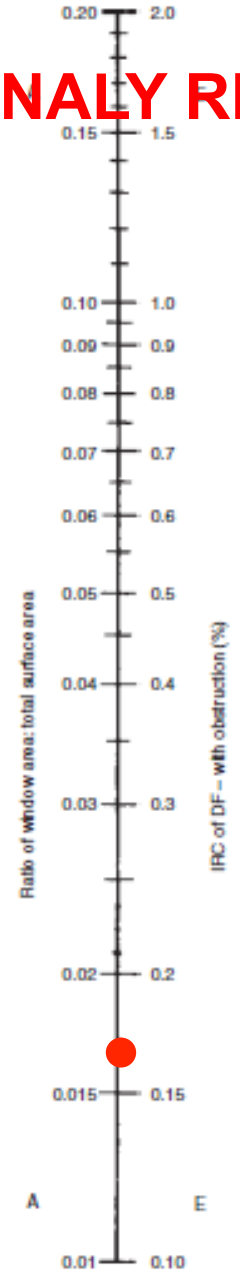
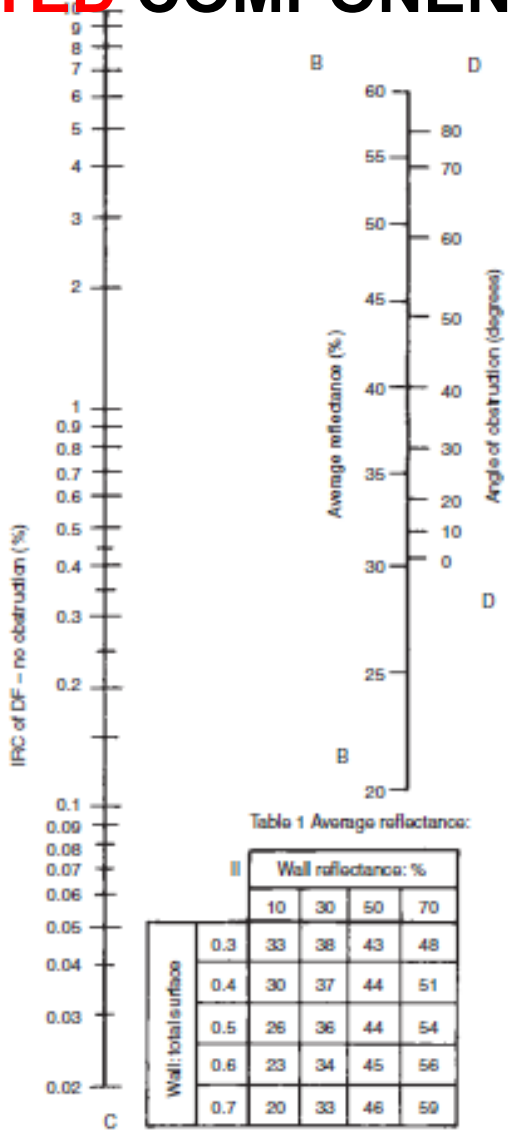
INTERNALY REFLECTED COMPONENT

(1) Hitung luas jendela, luas dinding, luas lantai, luas langit-langit

→ Luas total permukaan ruang
→ Perbandingan luas jendela dan luas total permukaan
→ Tandai di Nomogram A

INTERNALY REFLECTED COMPONENT





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(2) Hitung perbandingan luas diding dan luas total permukaan ruang

→ Tandai pada kolom kiri tabel

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INTERNALY REFLECTED COMPONENT

(3) Pantulan dinding (%)

→ Lakukan interpolasi

misal (56 – 54)/(0.6-0.5)*0,06

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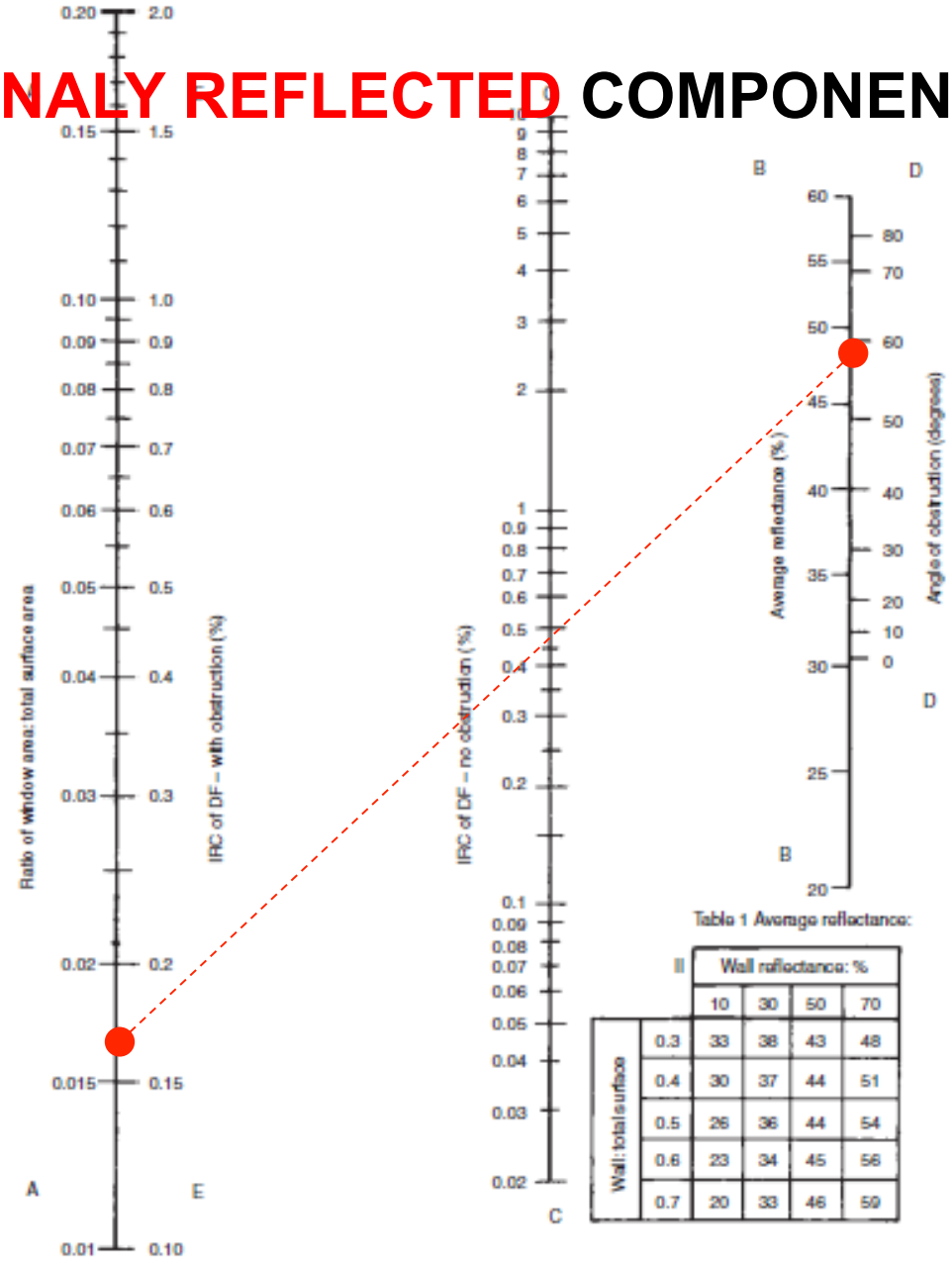
INTERNALY REFLECTED COMPONENT



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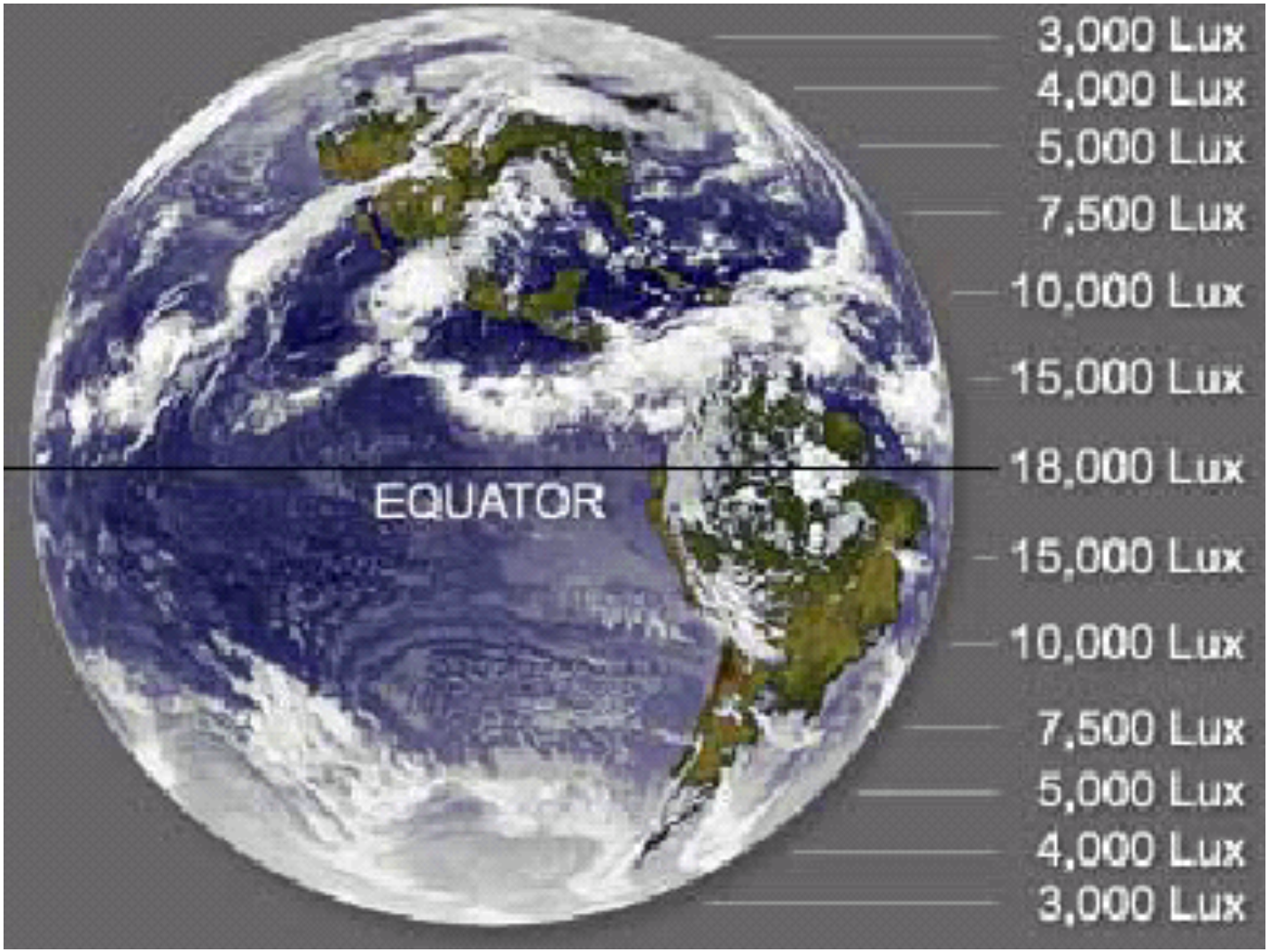
DAYLIGHT FACTOR



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DAYLIGHT FACTOR

below 1% → dark, only suitable for storage areas

1% to 2% → low illumination, suitable for circulation areas

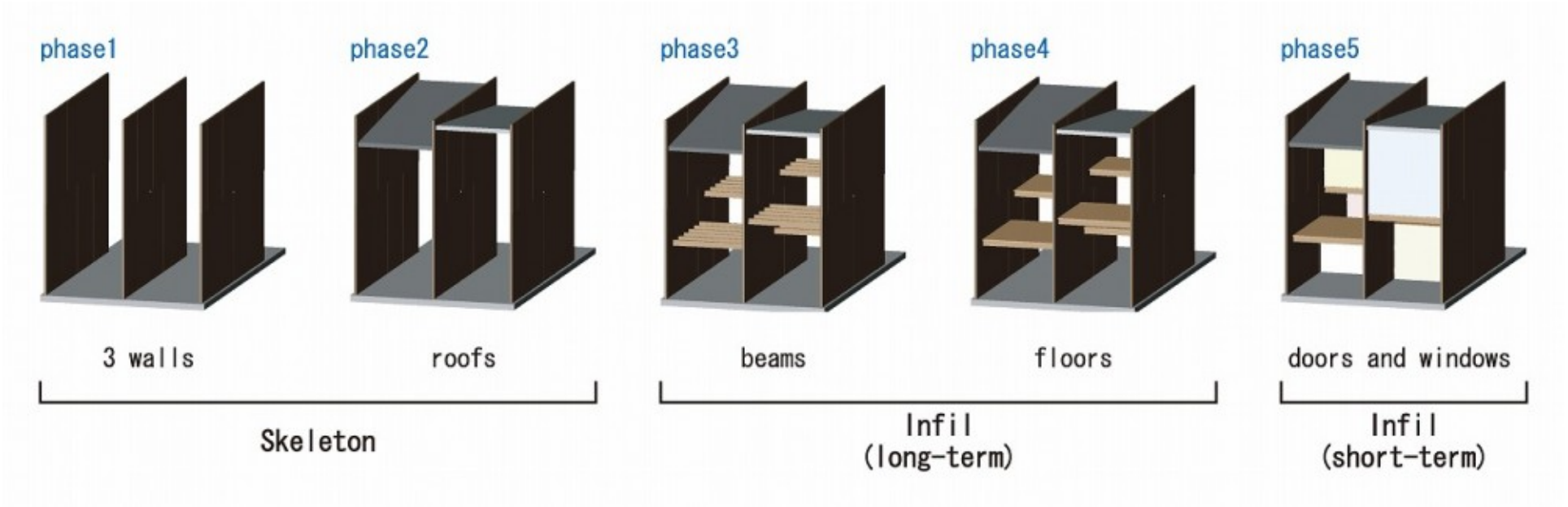
2% to 4% → moderate, for living spaces

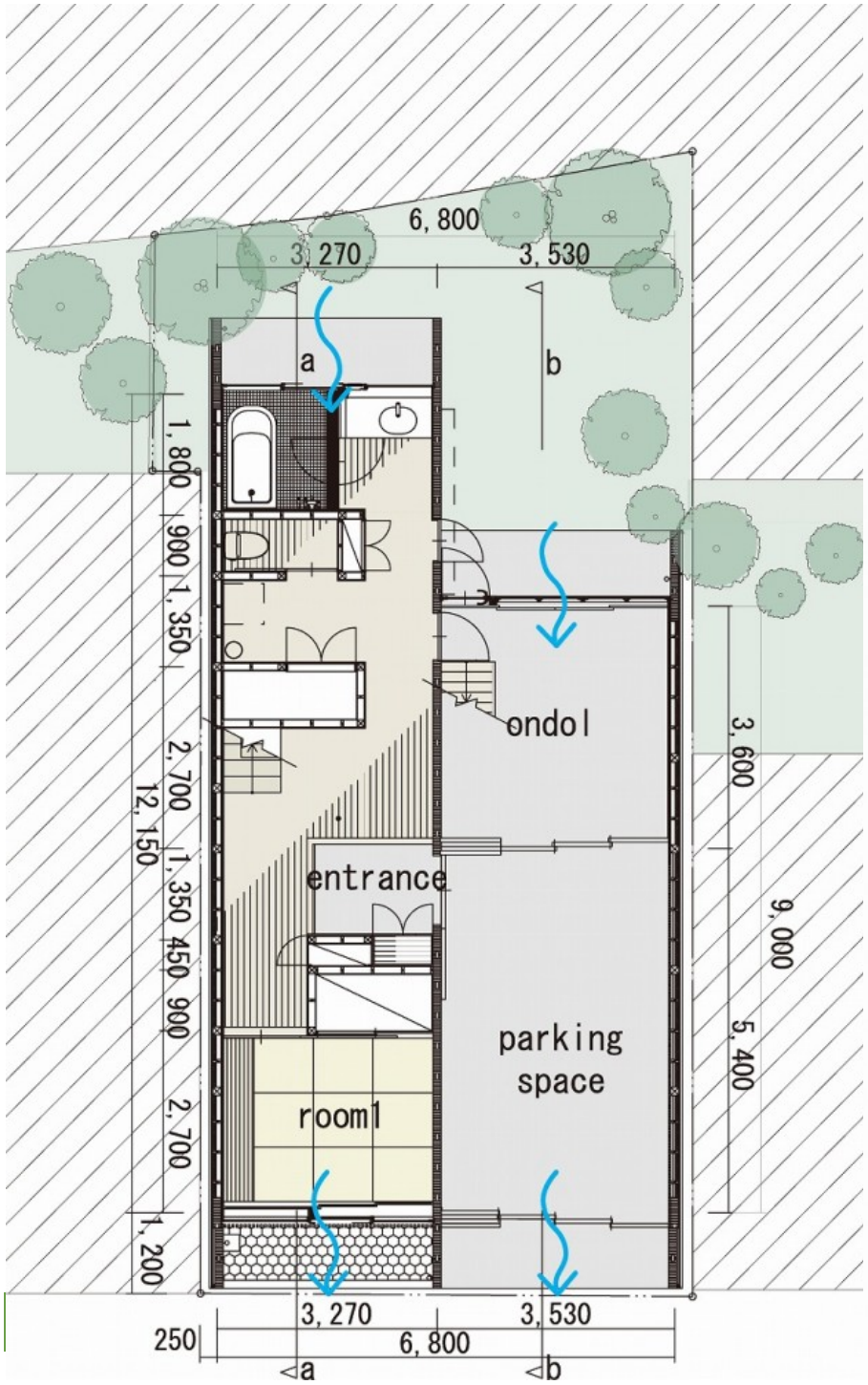
4% to 7% → medium, for office work

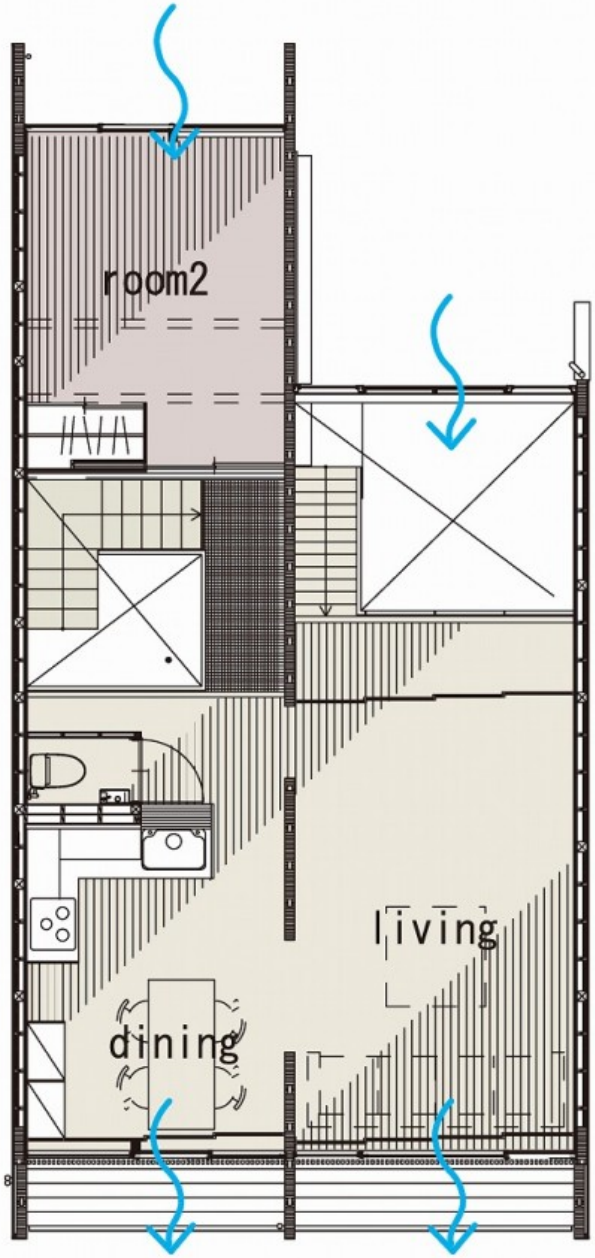
7% to 12% → high, for precision tasks

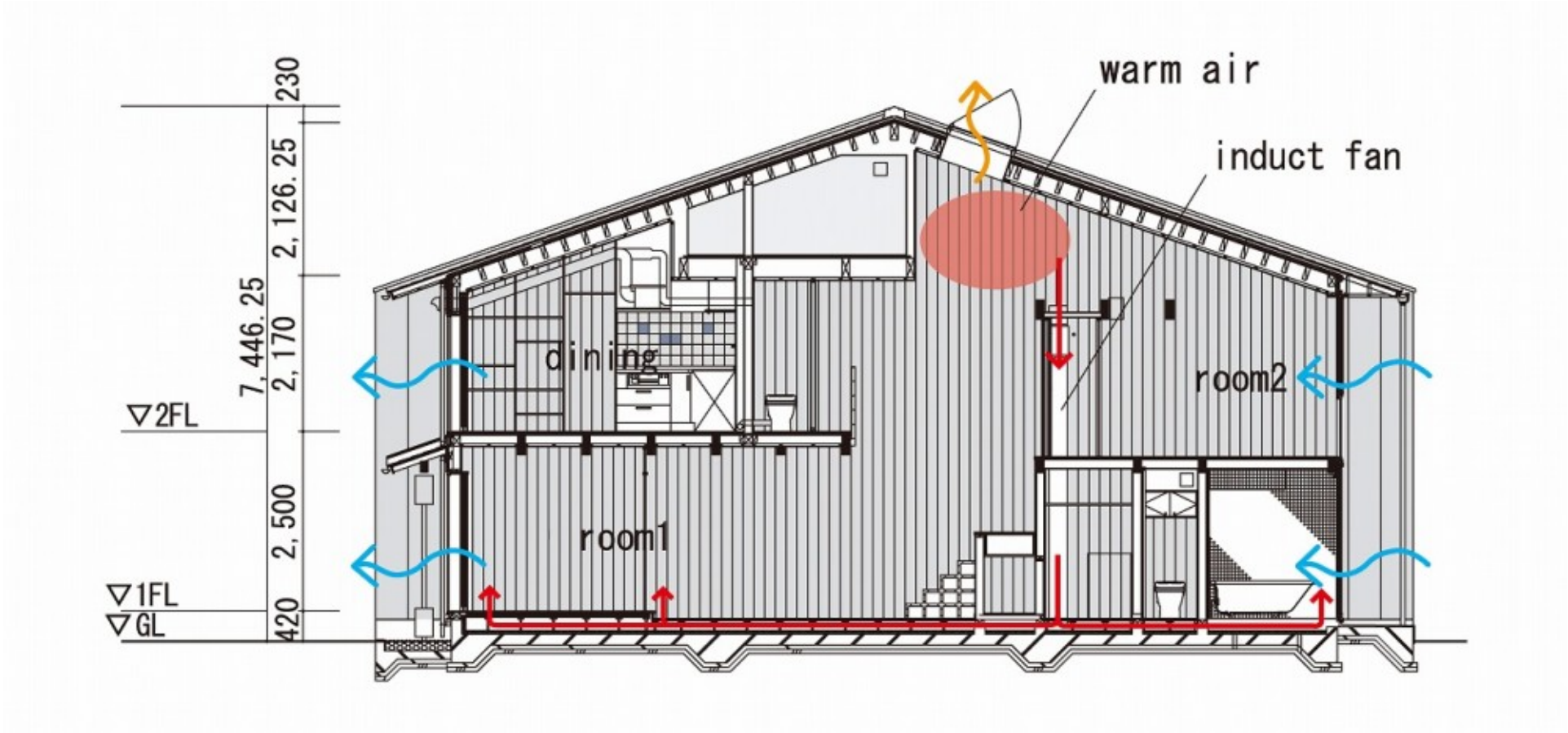
over 12% → very high, for exceptional light requirements

2010


phase1
phase2
phase3
phase4
phase5
3 walls
roofs
beams
floors
doors and windows
Skeleton
Infil
(long-term)
Infil
(short-term)


6,800
3,270
3,530
a
b
1,800
900
1,350
2,700
12,150
1,350
450
900
2,700
1,200
ondol
3,600
9,000
5,400
entrance
parking
space
room1
3,270
3,530
250
6,800
a
b


room2
living
dining


warm air
induct fan
dining
room2
room1
▽2FL
▽1FL
▽GL
230
2,126.25
7,446.25
2,170
2,500
420