DAIKIN

Heat Load Calculation

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Part 2 – Daikin Heat Load Software

1) Demonstration on Daikin Heat Load Calculation Software (DACCS-HKG)

Understanding Of Heat Load

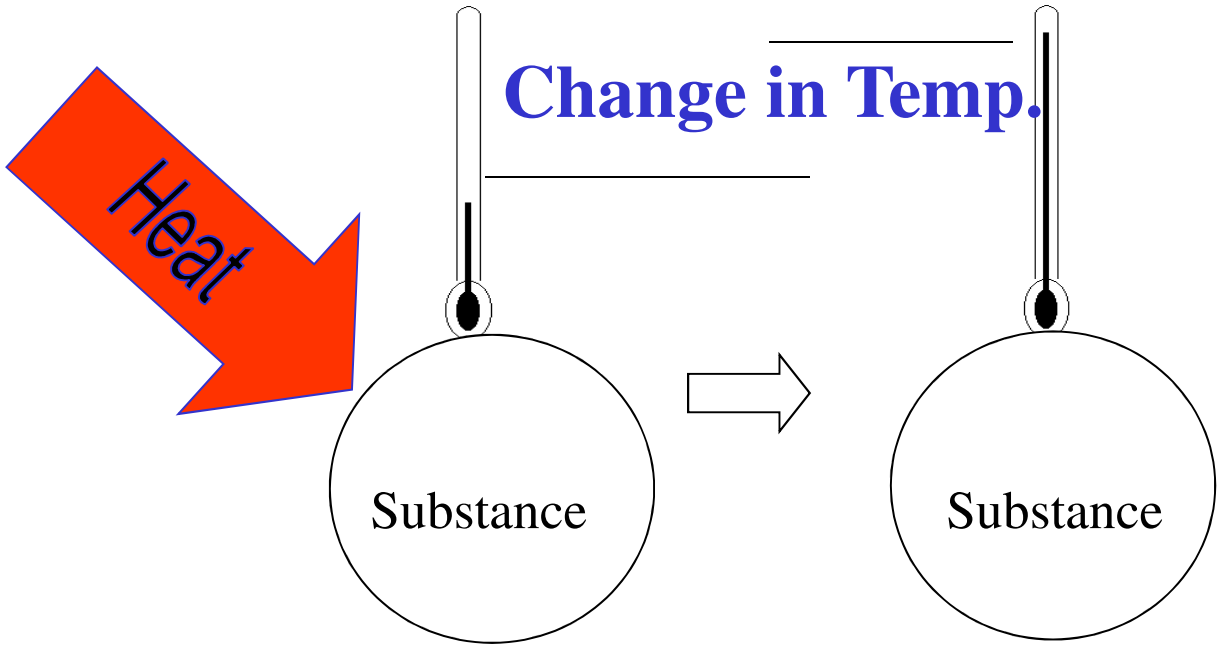
(Human Comfort)

1) Heat Load

- Classified into 2 main types :

1. **Sensible Heat**
2. **Latent Heat**

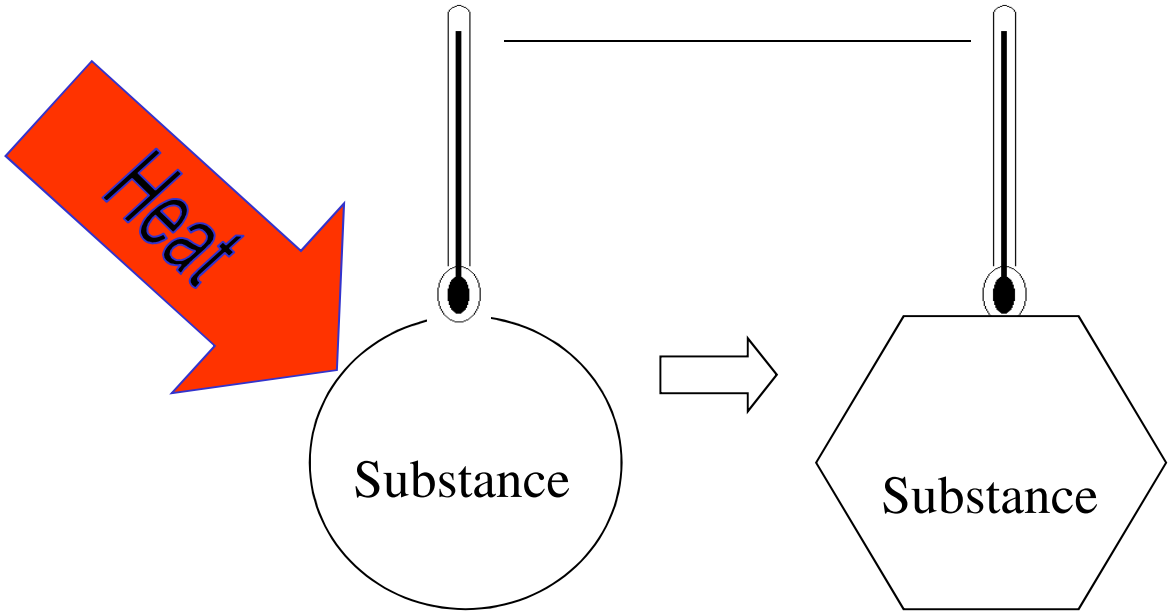
Sensible Heat



(No change in physical state)

Latent Heat

No change in temperature



(Physical state is changed)

1.2) Classification of Cooling Loads

1) Skin Loads

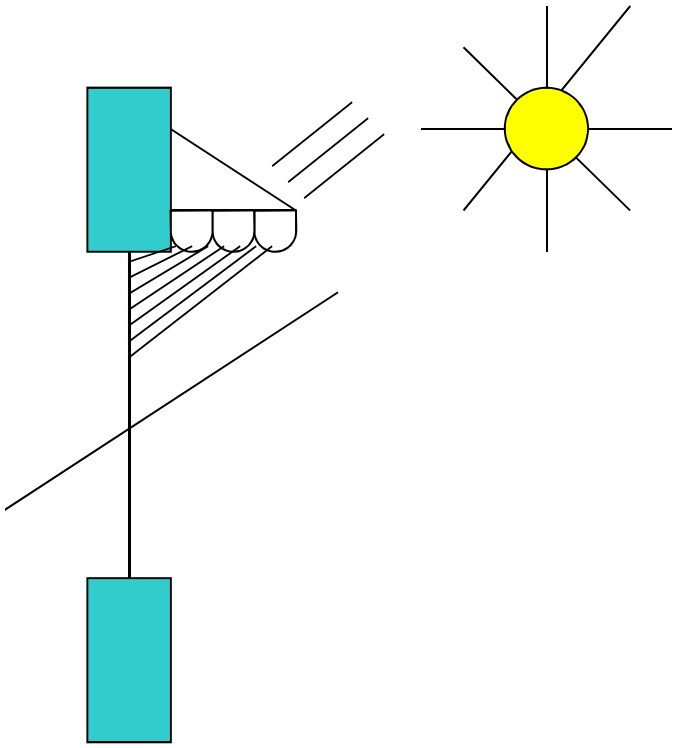
2) Internal Loads

3) Other Loads

1) Skin Loads

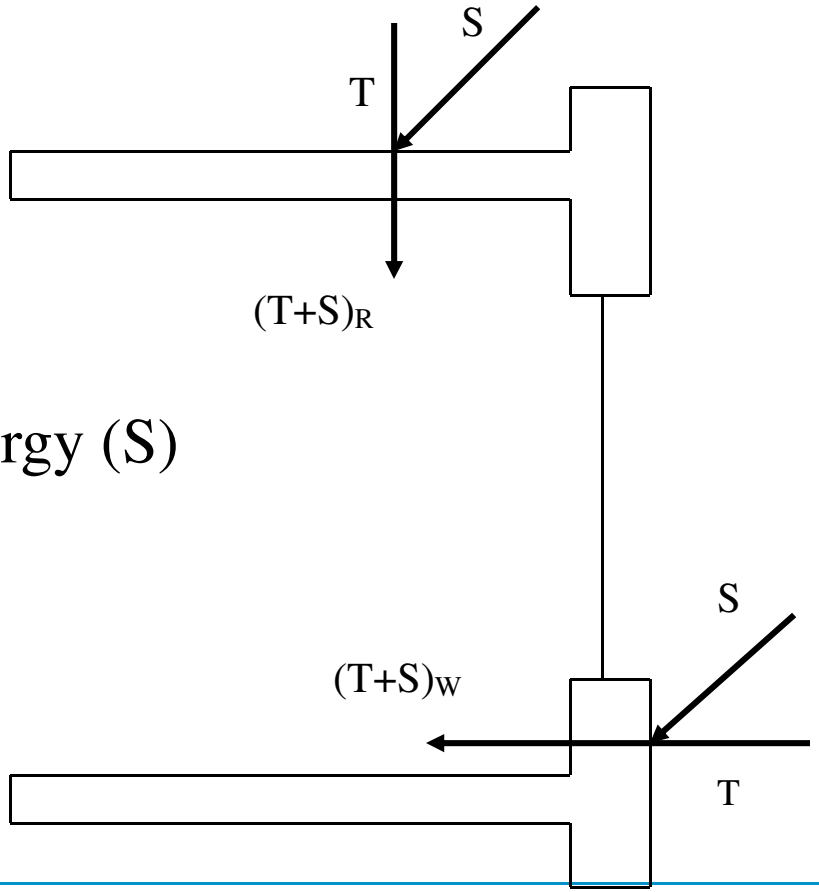
Skin loads originate from the heat sources outside or external to the conditioned space

a) Solar Gain Through glass (SG).



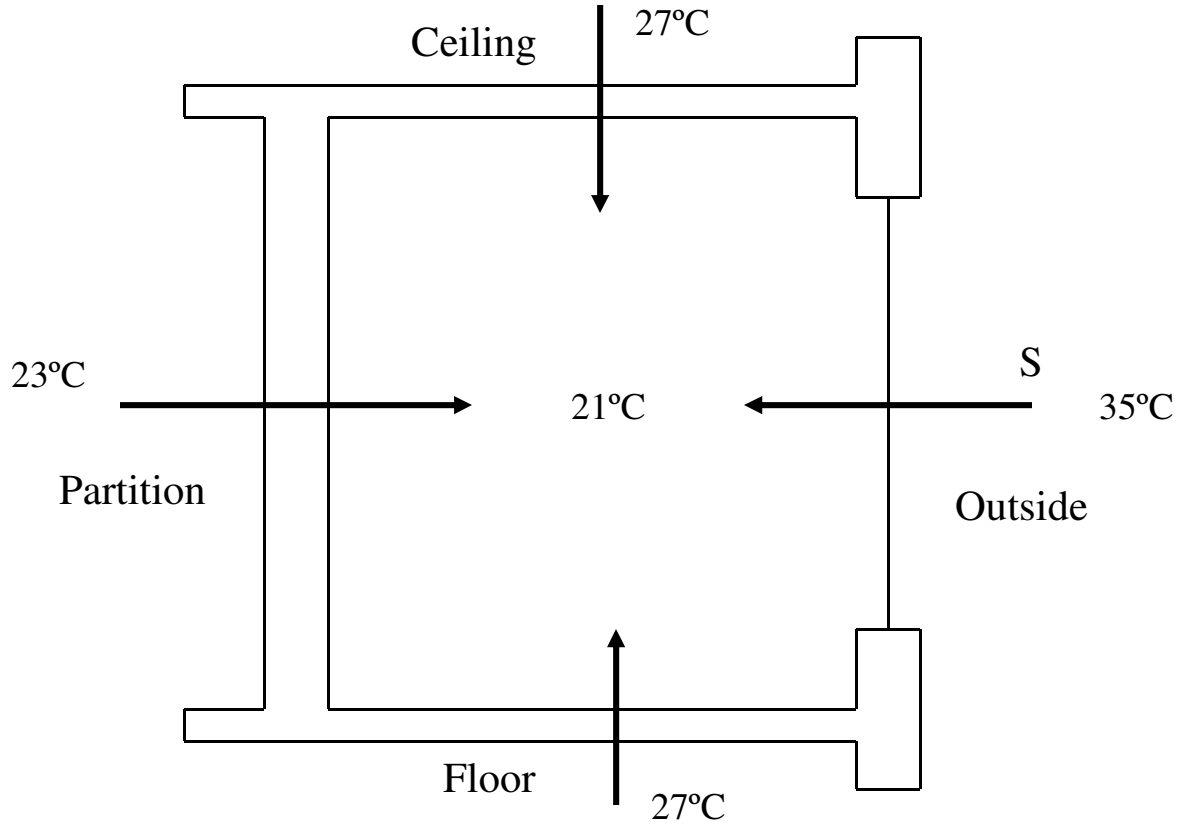
Solar heat gain is reduced by the use of internal or external shading devices such as overhang.

b) Solar & Transmission Gain Thru Walls and Roofs.

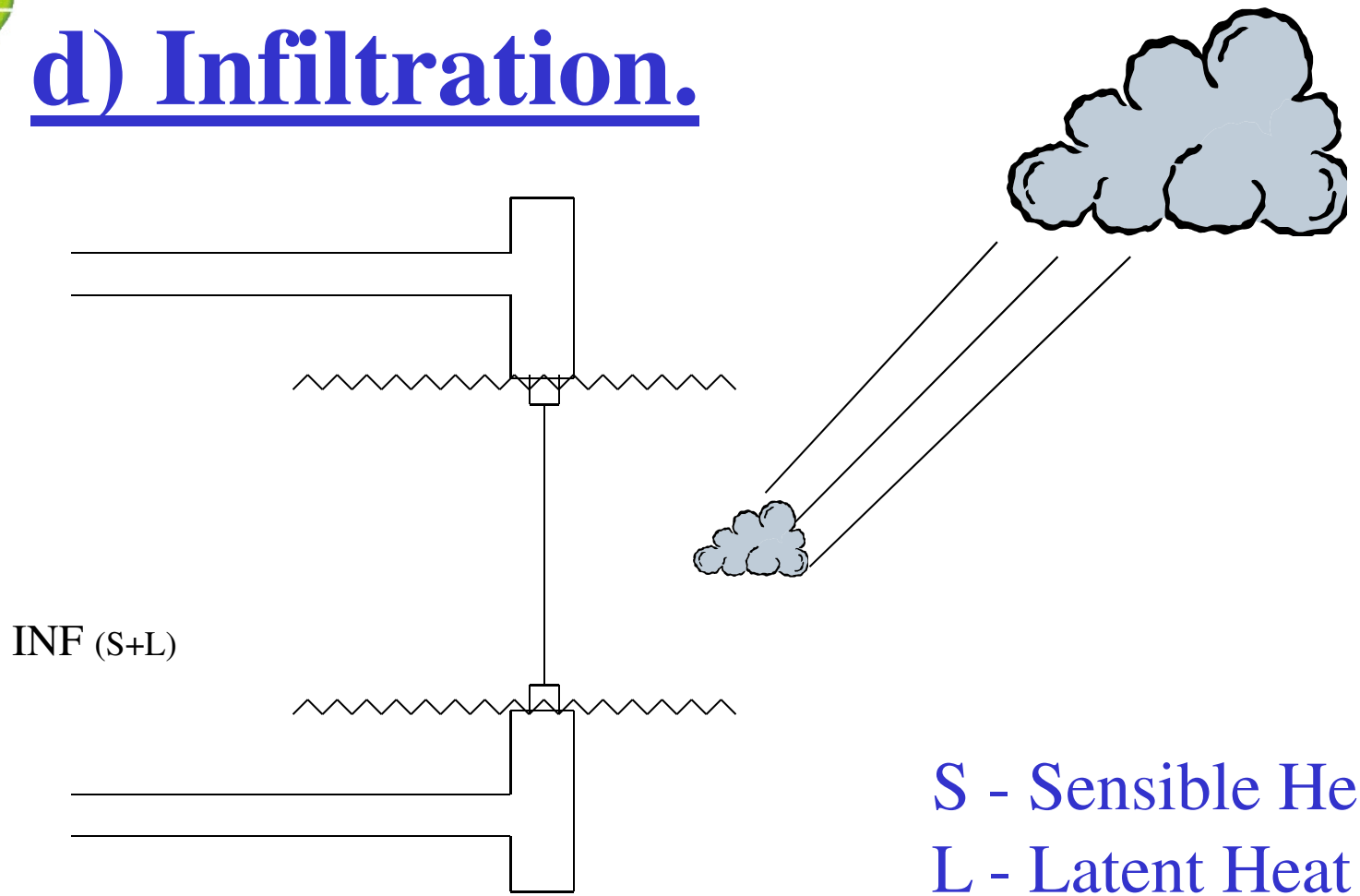


Absorbed Solar Energy (S)
Transmission (T)

c) Transmission Thru Glass, Ceiling, Partitions or Floors.



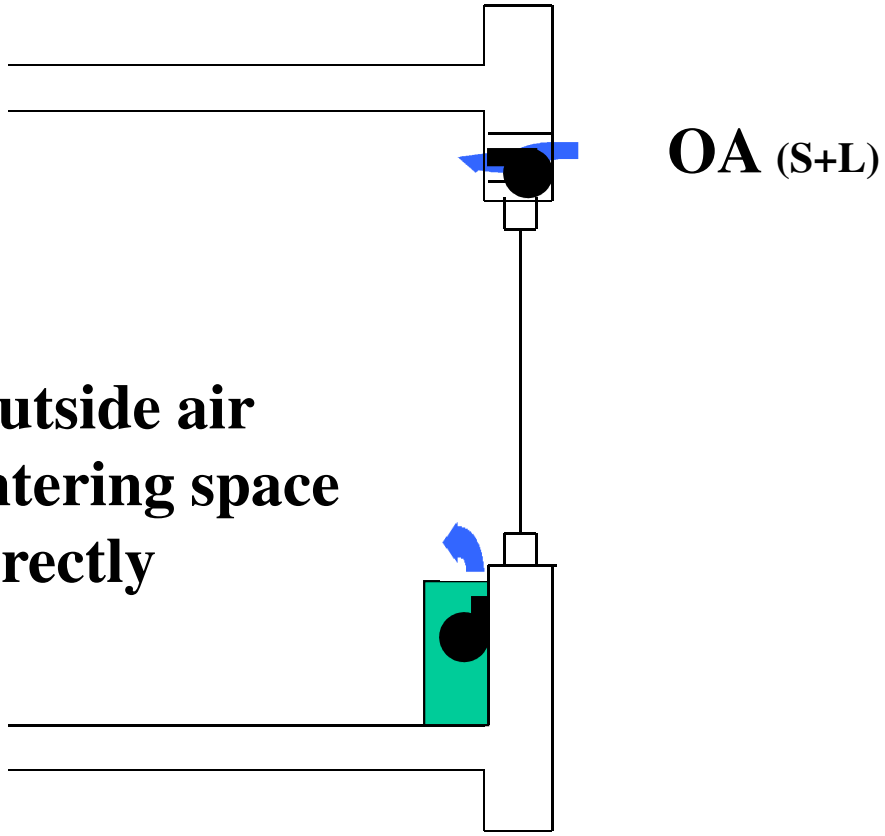
d) Infiltration.



S - Sensible Heat

L - Latent Heat

e) Ventilation (O.A)



Skin Loads

a) Solar Gain Through glass (SG).

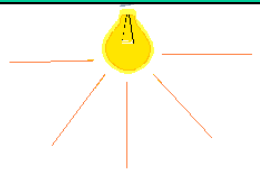
b) Solar and Transmission Gain Through Walls and Roofs.

c) Transmission Through Glass, Ceiling, Partitions or Floors.

d) Infiltration.

e) Ventilation (O.A)

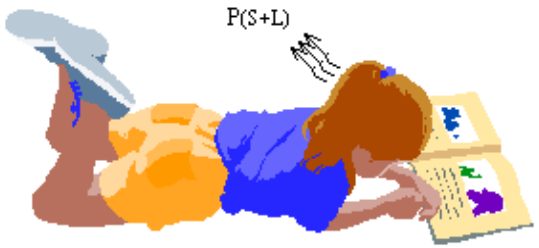
2) Internal Loads

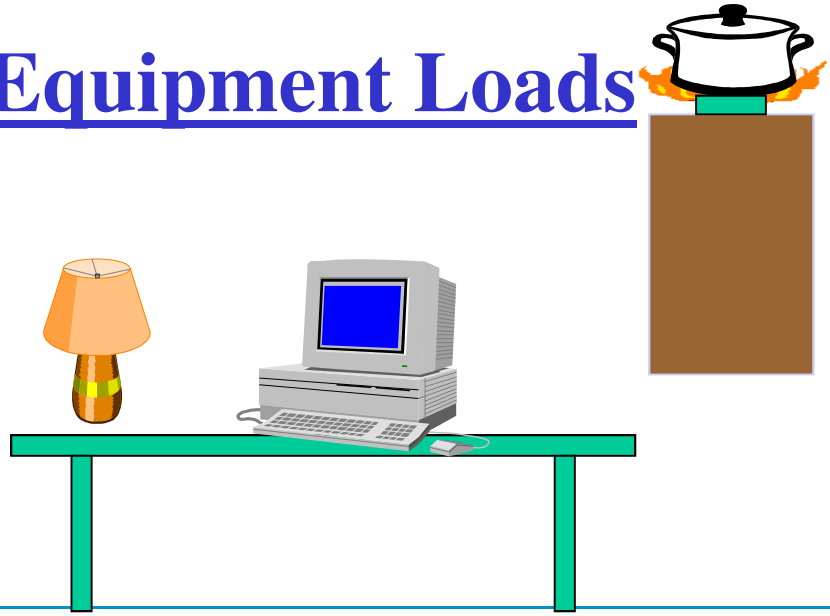


a)Lighting Loads

b)People Loads

c)Equipment Loads





Room Loads

- Add all sensible loads together results in sensible heat gain.
- Add all latent load together results in latent heat gain.

Sum of of the Room Sensible and the Room Latent heat is the Room Total Heat

3) Other Loads

a. Supply Air Side

b. Return Air Side

c. Outside or Ventilation Air

a) Supply Air Side

i) Supply Duct Heat Gain (SDHG)

(Sensible heat gain)

ii) Supply Duct Leakage Loss (SDLL)

(Sensible & Latent heat loss)

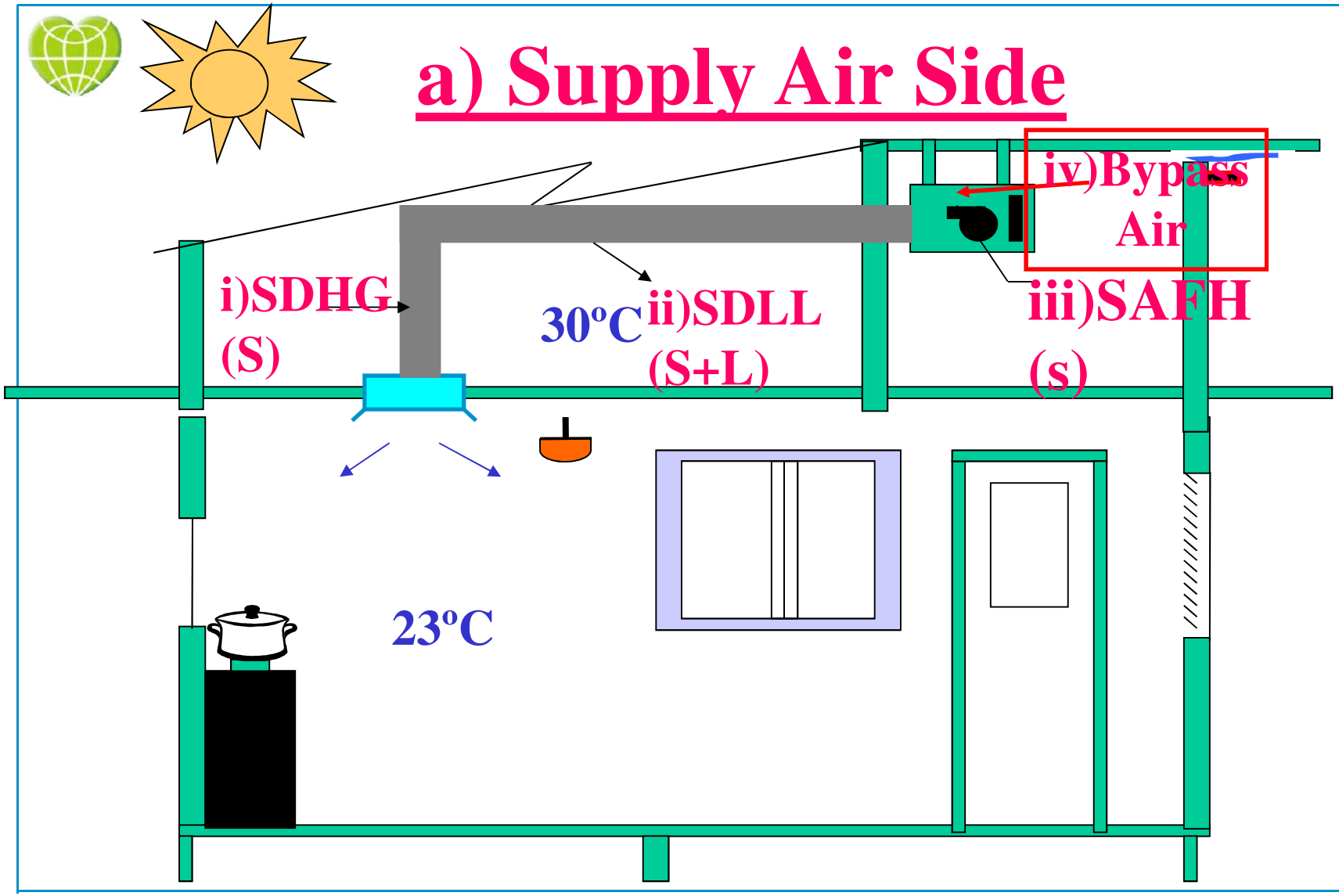
iii) Supply Air Fan Heat (SAFH)

Sensible heat gain from fan &motor(if motor located in the air stream).

iv) Bypassed Outdoor Air

- coil is not perfect cooling devices, a portion of the E.A passes thru coil unaltered in temp. (**Sensible & Latent loss)**

a) Supply Air Side



b) Return Air Side

i) Return Duct Heat Gain (RDHG)

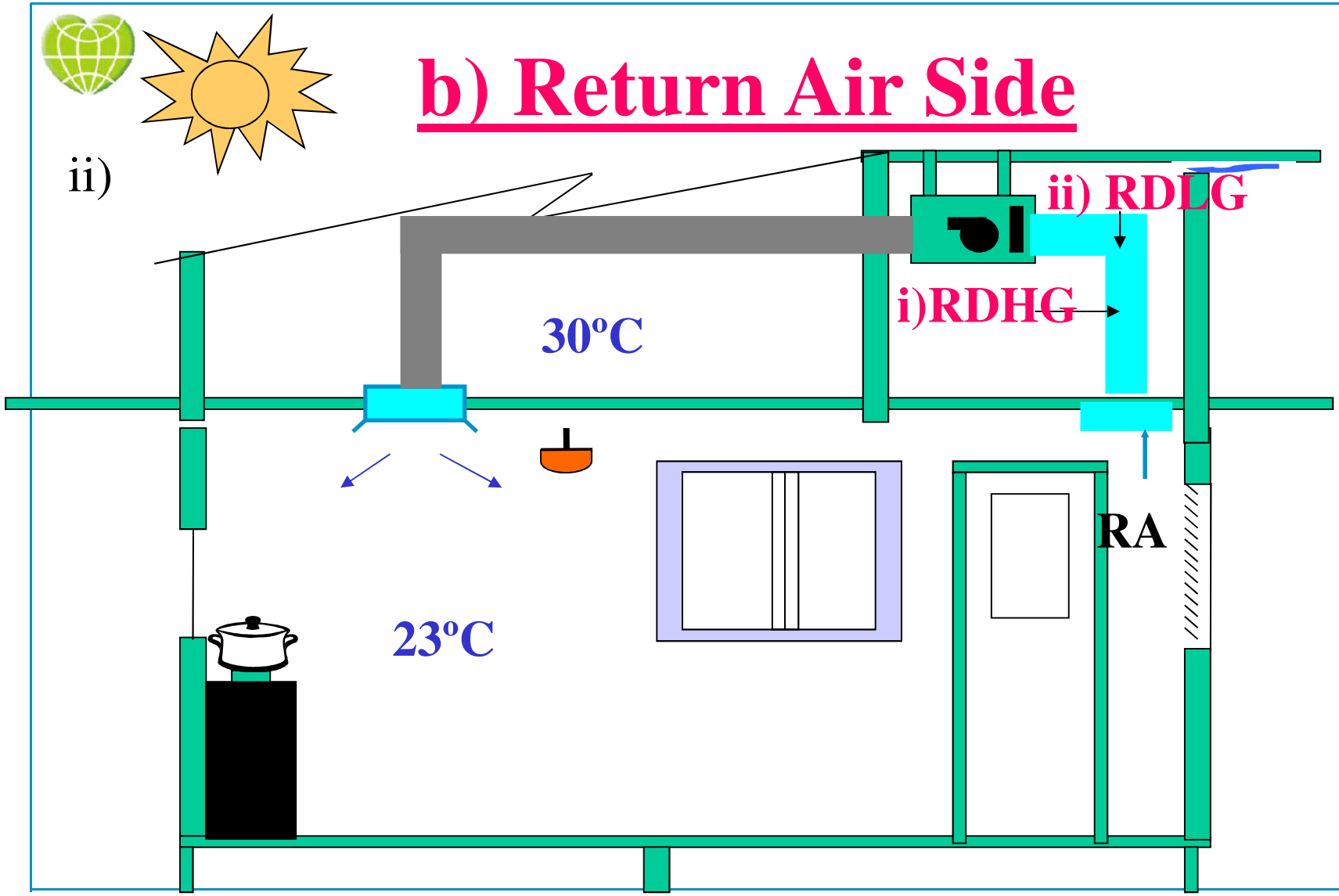
(**Sensible heat** gain)

ii) Return Duct Leakage Gain (RDLG)

(**Sensible + latent** gain)



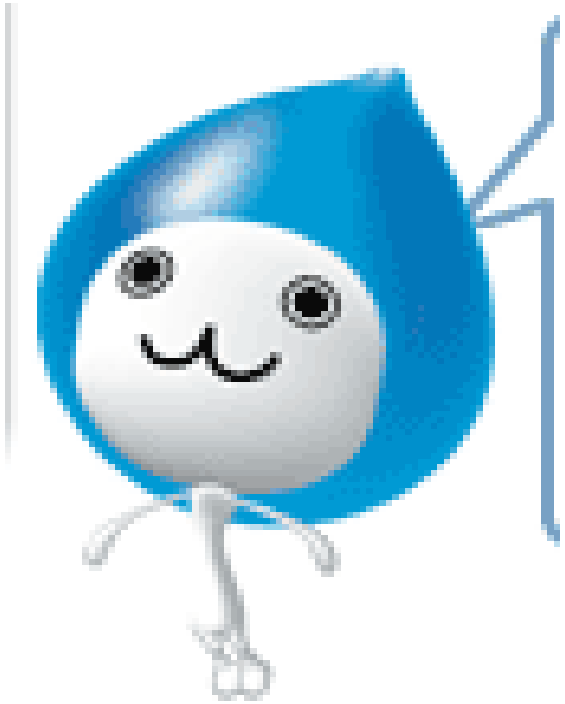
b) Return Air Side



3) Outside or Ventilation Air



When FA enter thru an AHU/FCU, the resultant sensible and latent loads show up as load on the coil.



WHY Heat Load Calculation?

Cooling Load Estimation

2.1) Purpose

Select SMALLEST AIR CON to meet cooling requirement



Indoor Condition (S'pore)

By law, the indoor conditions of an air con space shall maintained within the following limits :

Design Temp.	**:**	**23ºC +/- 1 ºC**
Max. RH	**:**	**65%**
Max. air movement	**:**	**1.25m/s**

Note : At occupant level of 1.5m above floor.

3) Purpose of Zoning

In order to maintain the whole building/area in a constant temperature, we divide the whole building/area into different zones

3.1) Zoning Methods

a) Directional Zoning

b) Usage Zoning

a) Directional Zoning

Based on the building or area direction

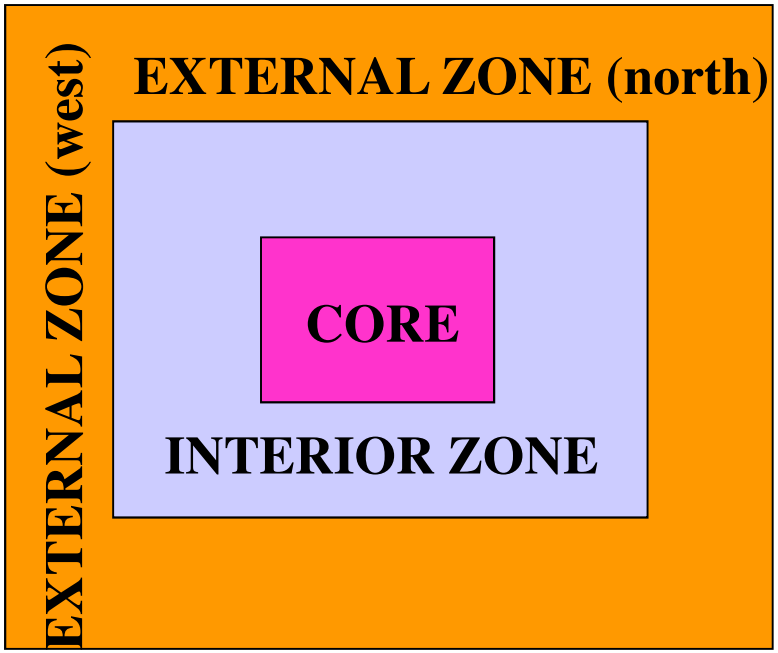
i) Exterior zone.

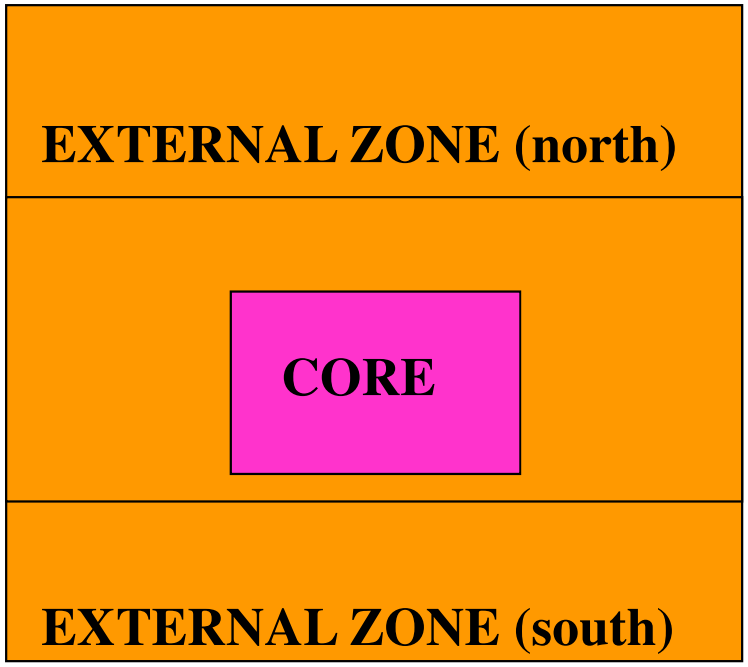
- **for those external wall with windows.**

ii) Interior zone .

- **Depth of building < 10m, no interior zone required.**
- **Small scale building < 200m^2 /floor, normally no zoning is required.**

Example of Directional zoning





1b) Usage Zoning

For special condition :

- diff. in temp. & RH. (e.g. Computer rm)

For special heat load :

- very high sensible heat factor.

(e.g. Meeting rm, Canteen)

Introduction

4) U-Value Calculation

- **Thermophysical Properties of Building Materials**

4.1.1) Thermal Conductivity (K-value)

(Appendix 2, Table 3)

Defined as the quantity of heat transmitted under steady state conditions through unit area of the material of unit time when the temperature difference exists between it opposite surfaces.

(W/m^oK)

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Appendix 2, Table 3

Sr No	Material	Density kg/m^3	K-value W/m°K
1	Asbestos cement sheet	1488	0.317
2	Asbestos insulating board	720	0.108
3	Asphalt, roofing	2240	1.226
4	Bitumen		1.298
5	Brick:		
	(a) dry (covered by plaster or tiles outside)	1760	0.807
	(b) common brickwall (brickwall directly exposed to weather outside)		1.154
6	Concrete	2400 64	1.442 0.144
7	Concrete, light weight	960 1120 1280	0.303 0.346 0.476
8	Cork board	144	0.042
9	Fibre board	264	0.052
10	Fibre glass (see Glass Wool and Mineral Wool)		
11	Glass, sheet	2512	1.053