

GBI Pro-Series

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Chapter 4

Architecture and Passive Design Strategy

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Clause 4 Architecture & Passive Design Strategy

Retained

- 1) DF equation and table
- 2) Sun path diagram
- 3) Air movement air speed impact on occupants

Amendments and Omissions

- 1) Amended : descriptions of Natural Ventilation, Cross Ventilation and Stack Ventilation;
- 2) Amended : “bulk” insulation becomes “mass” insulation;
- 3) Omitted fr 2017 : emissivity levels (low ≤ 0.1 , and high ≥ 0.9)

Clause 4 Architecture & Passive Design Strategy

Additions

- 1) Added : new diagrams showing different types of Cross Ventilation and Stack Ventilation.
- 2) Added : design considerations for Cross Ventilation and Stack Ventilation.
- 3) Added : descriptions for Mass Insulation technology (bulk or resistive); and for Reflective Insulation technology.
- 4) Added : a combination of both technologies is recommended
- 5) Added : strategic landscaping : planting strategy
- 6) Added : expansion on the descriptions and design strategies for RE

Clause 4.4.1 : Daylight Factor

$$DF = \frac{E_{\text{internal}}}{E_{\text{external}}} \times 100\%$$

- DF is expressed in percentage and counting only diffused light.
- DF can thus only be measured during overcast conditions.
- Direct solar radiation is not suitable for daylighting of workspaces due to its intense, glare and fluctuating nature, which is why daylighting design customarily only encompasses diffuse daylight from the sky.

Clause 4.4.1 : Table 1

| DF (%) | Lighting | Glare | Thermal comfort | Appearance and energy implication |
|-----------|-------------|---------------|-----------------|--|
| > 6.0 | Intolerable | Intolerable | Uncomfortable | Room appears strongly day lit. At daytime artificial lighting is rarely needed, but potential for thermal problems due to solar heat gain and glare problem. |
| 3.5 - 6.0 | Tolerable | Uncomfortable | Tolerable | |
| 1.0 - 3.5 | Acceptable | Acceptable | Acceptable | Room appears moderately day lit. Good balance between lighting and thermal aspects. Supplementary artificial lighting is needed at dark areas due to effect of layout or furniture arrangement |
| < 1.0 | Perceptible | Imperceptible | Acceptable | Room look gloomy, artificial lighting is needed most of the time. |

NOTE: In Malaysia, DF between 1.0 and 3.5 is recommended.

Clause 4.6 : Natural Ventilation

ADDED

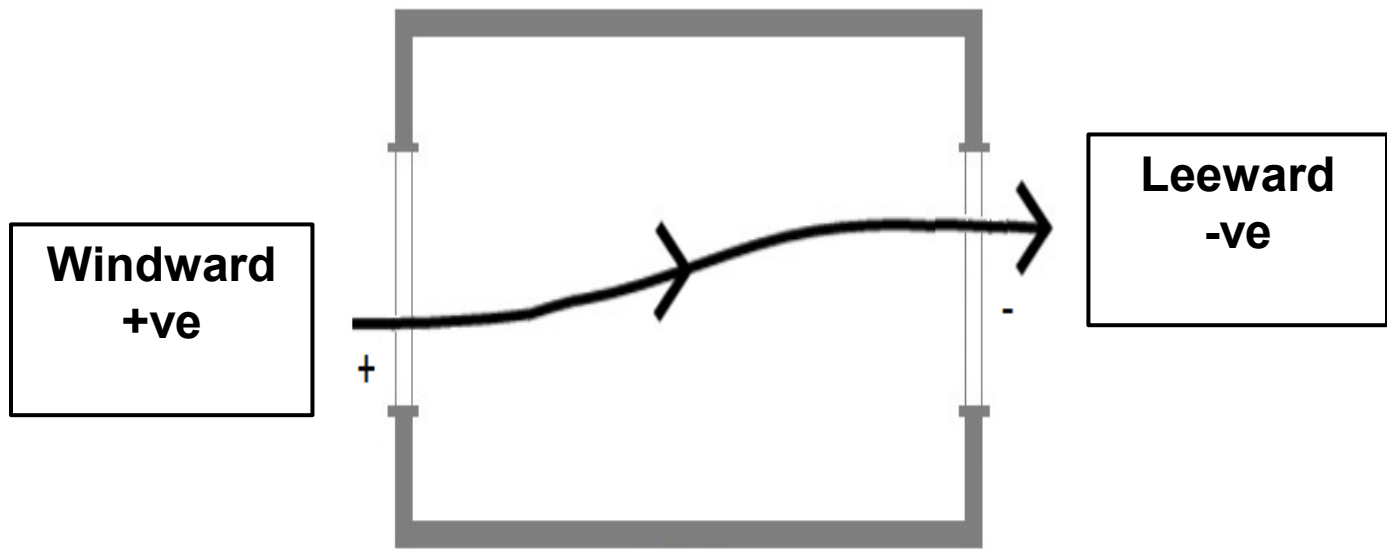
The purpose of ventilation is to provide:

- a) thermal comfort; and**
- b) health.**

Ventilation is the movement of air. Ventilation has three useful functions in the building sector. It is used to:

- a) maintain thermal comfort of occupants by increasing the rate of evaporative and sensible heat loss from the body;**
- b) satisfy the fresh air needs of the occupants; and**
- c) cool the building mass and interior space by an exchange of warm indoor air by cooler outdoor air, when appropriate.**

Clause 4.6.1 : Cross Ventilation



Clause 4.6.1
Orientate the building to maximise opportunities for cross ventilation

Clause 4.6.1 : Cross Ventilation

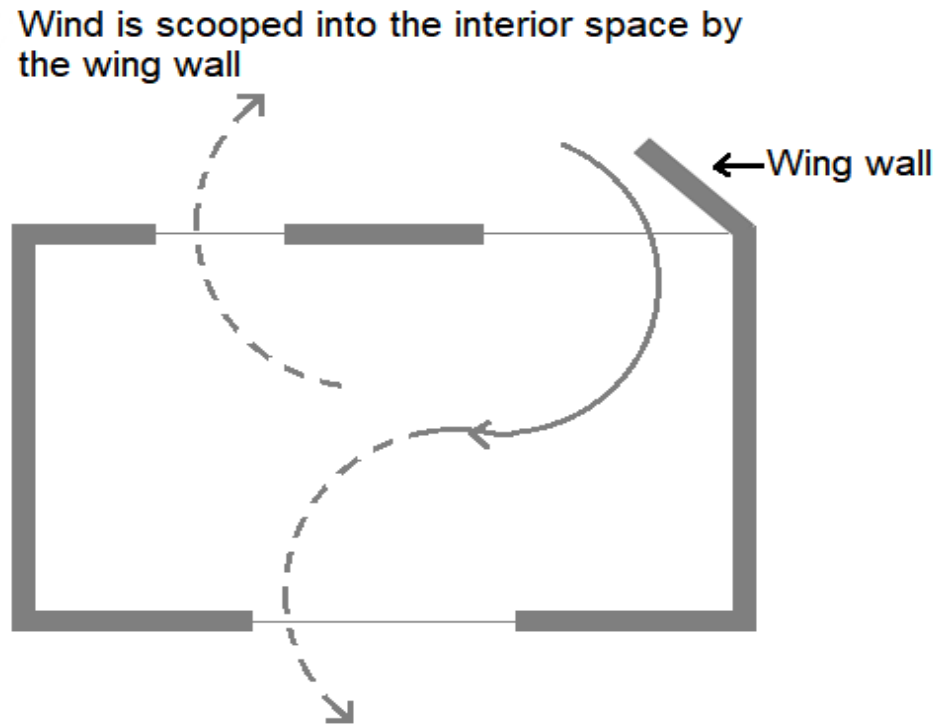


Figure 7

Use architectural features eg wing walls to create positive and negative pressure zones to induce cross ventilation

Clause 4.6.1 : Cross Ventilation

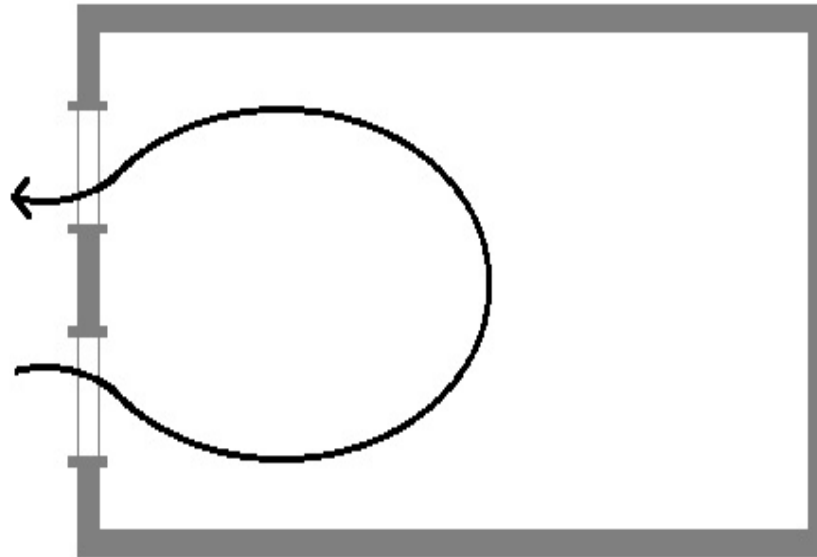


Figure 12

**Two ventilation openings provide better
cross ventilation.**

Applicable to plan or section.

Clause 4.6 : Natural Ventilation

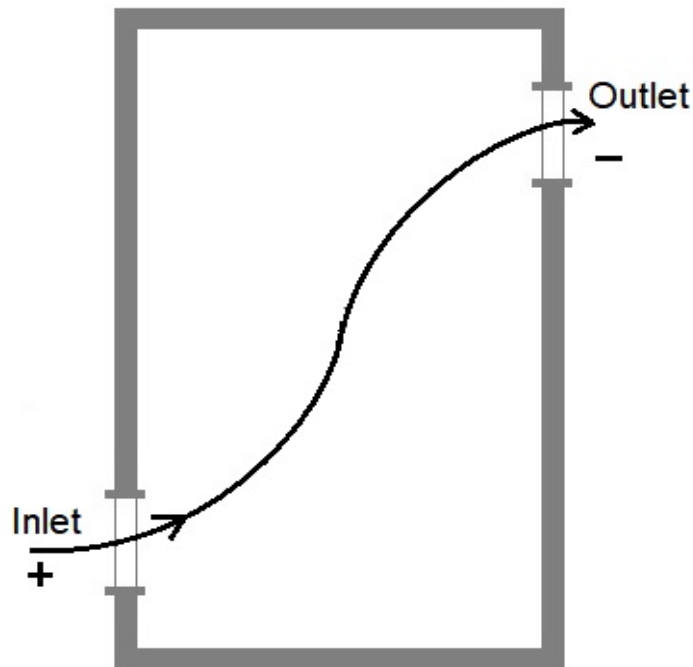


Figure 13 Stack Ventilation

where the vertical distance between inlet and outlet openings is maximized

Clause 4.7 : Thermal Insulation

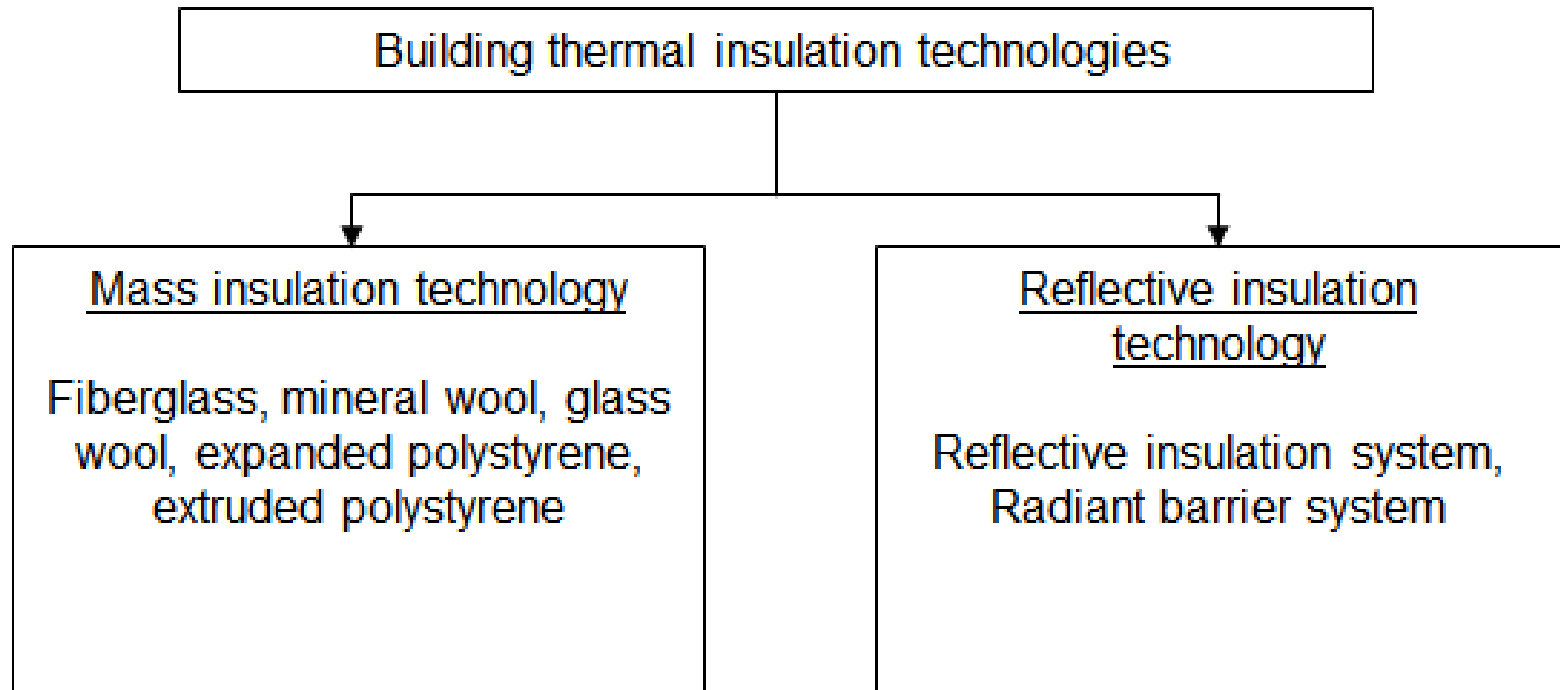


Figure 14

A combination of both technologies is recommended

Clause 4.7 : Thermal Insulation

Summary

- 1) use of both mass and reflective technologies is encouraged;
- 2) simple explanation on the relationships between thermal conductivity (k), thermal transmittance (U-value) and thermal resistance (R-value);
- 3) description of the differences between Mass Insulation technology and Reflective Insulation technology;
- 4) air space required for Reflective Insulation as part of its overall system or assembly R-value which relies on the low thermal conductivity of air;
- 5) description of the Reflective Insulation technology's principles of reflecting and re-emitting radiant heat due to the properties of high reflectivity and low emissivity.

Clause 4.8 : Strategic Landscaping

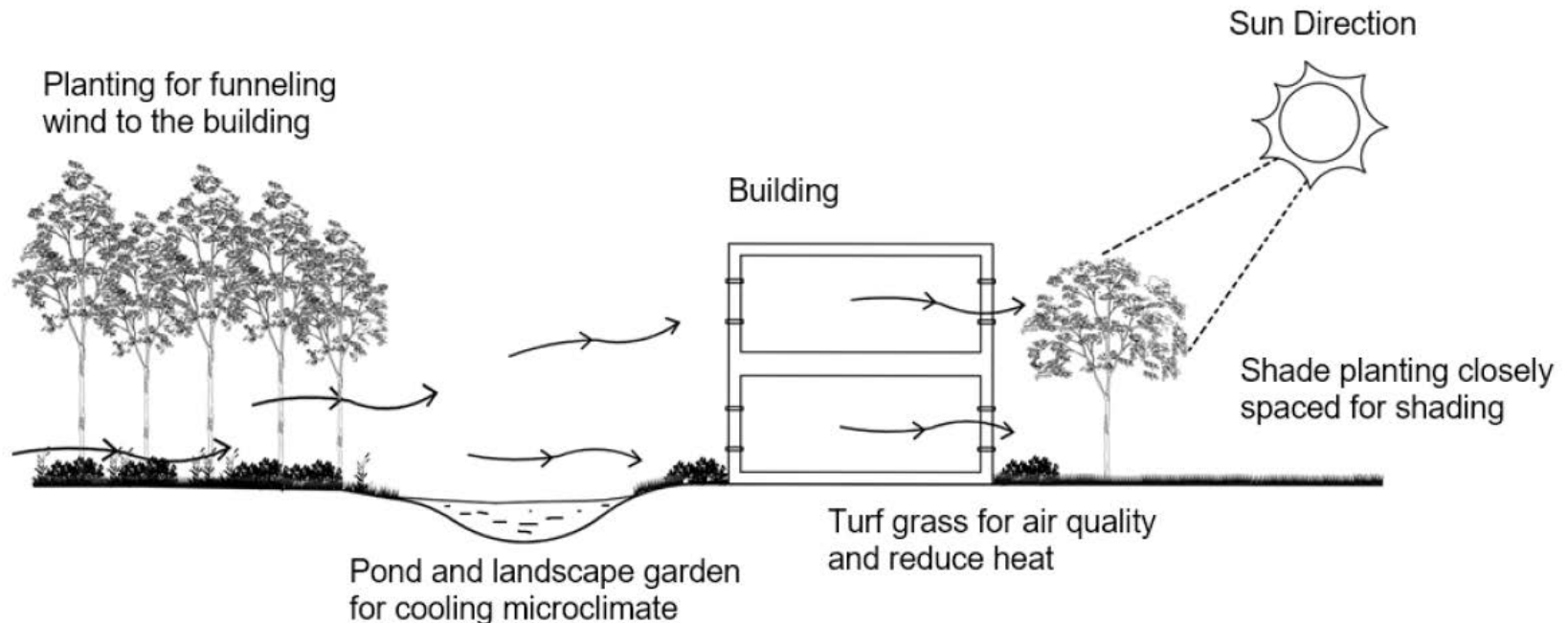


Figure 15 Sample of planting strategies.

SRI is mentioned

Clause 4.9 : Renewable Energy

RE applications to complement passive design

- 1) Use of RE is encouraged
- 2) Consider topography, accessibility and site selection
- 3) Availability and sustainability of the resources
- 4) Design considerations, integration into building
- 5) Consider the by-products and emissions
- 6) Safety requirements
- 7) Wider elaboration of the different types of RE
- 8) Referenced to other codes eg MS 1837

