

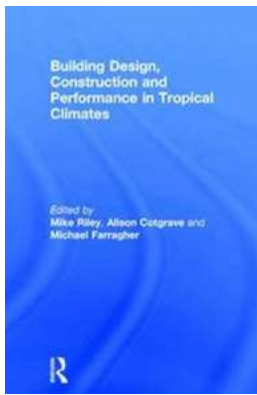
# Building Design Construction And Performance In Tropical Climates



Tropical climates pose unique challenges when it comes to building design, construction, and performance. From oppressive heat and high humidity to heavy rainfall and strong winds, architects and engineers must consider various factors to ensure that buildings in tropical regions are not only aesthetically pleasing but also functional, sustainable, and resilient.

## Design Considerations

One of the primary design considerations in tropical climates is passive cooling. Buildings need to be designed in such a way that they maximize natural ventilation and minimize the need for mechanical cooling systems. This can be achieved by incorporating features like high ceilings, large windows, and strategically placed openings to promote cross-ventilation.



## Building Design, Construction and Performance in Tropical Climates by DACO (1st Edition, Kindle Edition)

★★★★★ 5 out of 5

Language : English  
File size : 107589 KB  
Text-to-Speech : Enabled  
Enhanced typesetting : Enabled  
Screen Reader : Supported  
Print length : 283 pages



Another aspect to consider is the use of appropriate materials. Construction materials that have high thermal mass, such as concrete or clay, can absorb heat during the day and release it at night, helping to regulate indoor temperatures. Additionally, materials with high reflectivity properties can prevent the absorption of solar radiation and reduce the heat gain inside buildings.

### The Tropical Climate

The tropics lie along the equator, between 23° and -23° latitude and can be distinguished by hot humid conditions. Mean annual temperatures reach a maximum of 30°C during the day and 24°C at night, however, diurnal ranges tend to be low, ranging approx. 8°C. Humidity levels vary between 60% - 100% and a tropical climate is accompanied with a high levels of rainfall, during 'rainy periods' where annual mean rainfall can exceed 1000mm. Monsoons, hurricanes and earthquakes are also typical in a tropical environment. (Adapted from Lauber W. and Koch-Nielsen H)

The main stresses of this climate are high humidity levels, temperatures and solar radiation. Humidity reduces cooling via evaporation as the air is already saturated, so by ventilating a space, the saturated air is removed, increasing the rate of evaporation and convection that dissipates heat from the body, building structure and fabric. Solar shading is also an efficient means of keeping cool however, due to the limited nature of this assignment, ventilation is the focus of this study.

### Characteristics of Tropical Vernacular Architecture

Untutored builders of the vernacular had an admirable talent for suiting buildings to their environment. An extensive knowledge of the climate and ability to modify their buildings meant various ventilation techniques for cooling and reducing solar gains were incorporated into building designs.

### Climatic Design of the Malay House

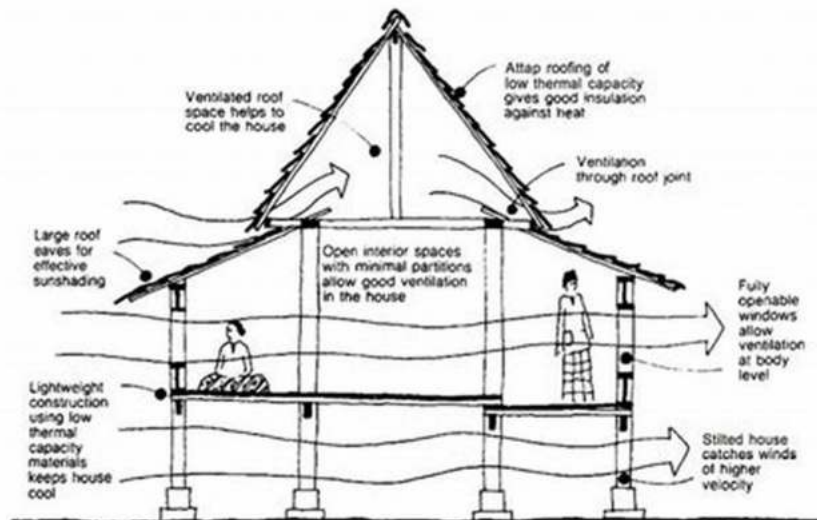


Fig. 1 "...the near perfect house form which is appropriate to local climate" (Yuan L. J.)

## Construction Techniques

In order to withstand tropical weather conditions, buildings must be constructed using techniques that ensure durability and resistance. Reinforced concrete structures are commonly used due to their strength and ability to withstand high winds and earthquakes. Additionally, proper waterproofing measures should be implemented to protect buildings from heavy rainfall and potential flooding.

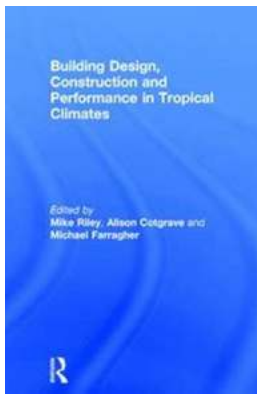
Incorporating shading devices, such as overhangs or fins, is essential to protect buildings from direct sunlight and reduce heat gain. These devices can also provide additional areas for outdoor living, connecting the indoor spaces with the surrounding tropical environment.

## **Sustainability and Resilience**

Building design and construction in tropical climates must prioritize sustainability and resilience. This includes incorporating energy-efficient features like solar panels, rainwater harvesting systems, and green roofs. These features not only reduce the environmental impact of buildings but also make them more self-sufficient and resilient during power outages or water shortages.

Another important aspect is the proper design and placement of windows. Incorporating glazing materials with high insulation properties and installing windows strategically can contribute to the reduction of solar heat gain, improve natural lighting, and enhance the overall comfort and energy efficiency of buildings in tropical climates.

Building design, construction, and performance in tropical climates require careful consideration of various factors. From passive cooling strategies and appropriate material selection to construction techniques that ensure durability and resistance against tropical weather, architects and engineers play a crucial role in creating sustainable, resilient, and comfortable living spaces in these challenging environments. By prioritizing sustainability and utilizing innovative design techniques, we can create buildings that seamlessly blend with their tropical surroundings while providing a comfortable and energy-efficient living experience for occupants.



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The design, construction and use of buildings in tropical climates pose specific challenges to built environment professionals. This text seeks to capture some of the key issues of technology and practice in the areas of building design, refurbishment, construction and facilities management in tropical regions.

Using a consistent chapter structure throughout, and incorporating the latest research findings, this book outlines:

- the functional requirements of buildings in tropical climates;
- the challenges associated with the sustainability of the built environment, building form and whole life performance in the context of a tropical setting;
- the impact of potentially hostile tropical conditions upon building pathology and the durability of components, structure and fabric;
- the tasks which face those responsible for appraising the design, condition, maintenance and conservation of built heritage in tropical regions;
- the facilities management issues faced in tropical climates; and



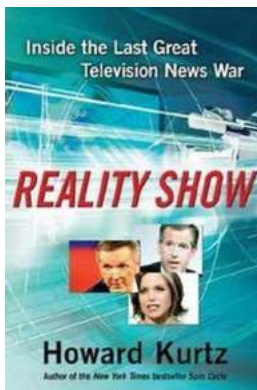
- the refurbishment, upgrade and renewal of the tropical built environment.

The book is ideal as a course text for students of Architecture, Construction, Surveying and FM as well as providing a sound reference for practitioners working in these regions.



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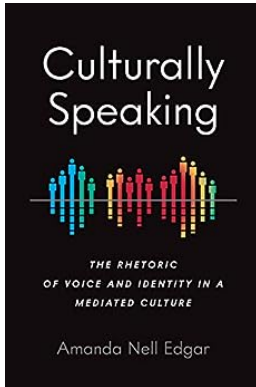
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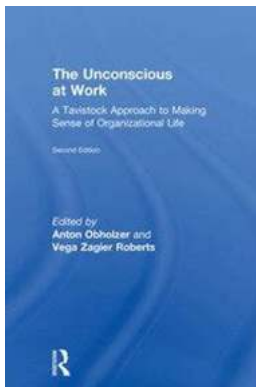
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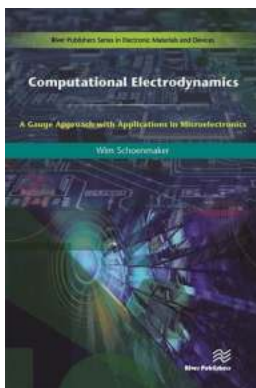
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