

---

---

# BUILDING DESIGN REPORT

## FOR CONSTRUCTION OF RESIDENTIAL BUILDINGS IN KERALA (INDIA) - EXECUTIVE SUMMARY

---

---

A GUIDE TO ASSIST ARCHITECTS AND BUILDING DESIGNERS IN THE EARLY STAGE  
DESIGN OF BUILDINGS THAT EXHIBIT HIGH THERMAL AND DAYLIGHT PERFORMANCE  
IN KERALA.

BY

RENJITH JAYAPALAN NAIR

*Loughborough University  
United Kingdom*

©RENJITH JAYAPALAN NAIR, 2019

ALL RIGHTS RESERVED. NO PART OF THIS DOCUMENT MAY BE PHOTOCOPIED,  
REPRODUCED, STORED IN A RETRIEVAL SYSTEM, OR TRANSMITTED, IN ANY FORM  
OR BY ANY MEANS WHETHER, ELECTRONIC, MECHANICAL, OR OTHERWISE WITHOUT  
THE PRIOR WRITTEN PERMISSION OF THE AUTHOR.



## Executive summary

*This report forms a part of the residential building design guide developed to assist architects and designers, during the early-stages, to design buildings that exhibit high thermal and daylight performance. The design guide is presented via an interactive web-based platform. This design report was produced from the website, based on the user's design considerations and priorities. The design consideration consists of details regarding the location, building type, building context and building orientation. These details are presented in the table below under location and building details tab. The design priority is for a building that exhibit high thermal and daylight performance. The building's thermal and daylight performance were assessed based on the annual total energy demand and Useful Daylight Illuminance (UDI) values respectively. The annual total energy demand for heating and cooling for the building design is 15 kWh/m<sup>2</sup>. This is below the lower threshold value (8 kWh/m<sup>2</sup>). Thus the design exhibits better thermal performance. The UDI-c value of the building design is 89%. This is higher than the upper threshold value (86%). Thus the design exhibits better daylight performance.*

**Building base form:  
Type 1**

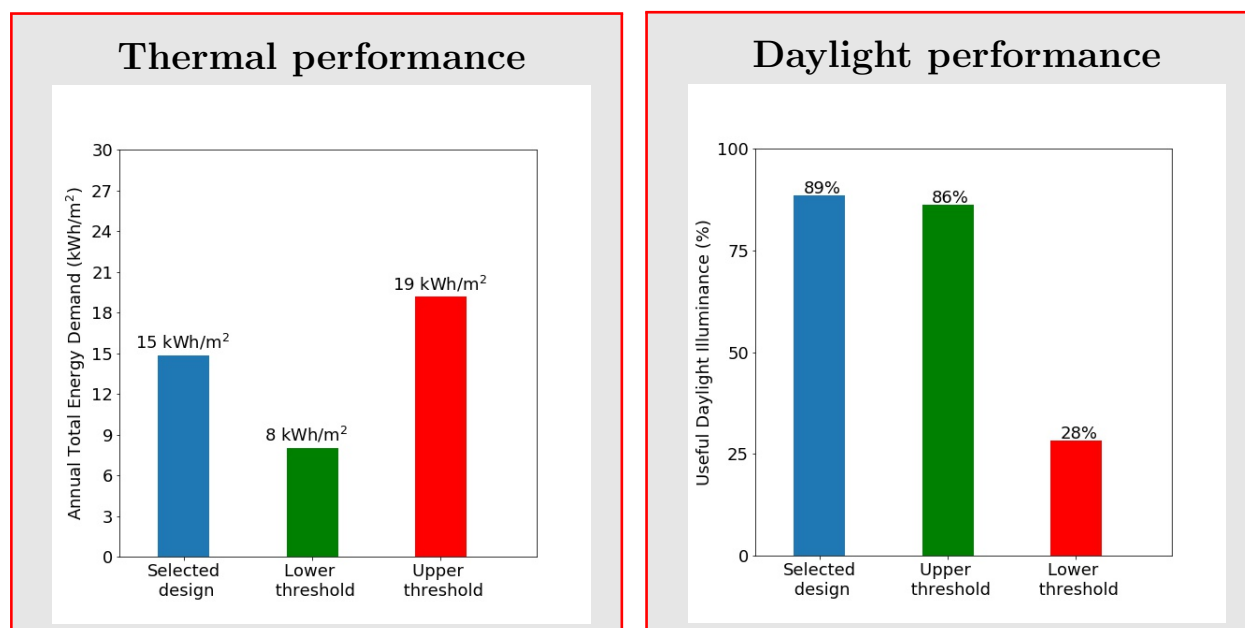


**Building plan:  
Type 1**



| Design context   |                     |
|------------------|---------------------|
| State            | Kerala              |
| District         | Thiruvananthapuram  |
| Location         | Thiruvananthapuram  |
| Climate zone     | Adaptively Hot Zone |
| Building type    | 1                   |
| Building context | Open low rise       |
| Orientation      | South               |
| Design number    | 22                  |
| Design ID        | 114                 |

| Building design parameters |                    |        |
|----------------------------|--------------------|--------|
| Parameters                 | Units              | Values |
| Wall A U-value             | W/m <sup>2</sup> K | 0.80   |
| Wall D U-value             | W/m <sup>2</sup> K | 3.25   |
| Floor U-value              | W/m <sup>2</sup> K | 0.61   |
| Roof U-value               | W/m <sup>2</sup> K | 2.70   |
| WWR Wall A                 | %                  | 26.00  |
| WWR Wall B                 | %                  | 17.00  |
| WWR Wall C                 | %                  | 54.00  |
| WWR Wall D                 | %                  | 15.00  |
| Ground reflectance         | -                  | 0.17   |
| Wall reflectance           | -                  | 0.51   |
| Window transmittance       | -                  | 0.58   |
| Ceiling reflectance        | -                  | 0.62   |



The bar charts above show the thermal and daylight performance of the selected design against the lower and upper threshold values. The threshold values are used to identify whether the design exhibits better, medium or worse thermal/daylight performance. The designs that have an annual total energy demand below the lower threshold is considered to exhibit better thermal performance. Those designs that have an annual total energy demand higher than the upper threshold is considered to exhibit worse thermal performance. All other designs that have an annual energy demand in between the lower and upper threshold are considered to exhibit medium performance. For assessing the daylight performance of designs, the case is vice-versa to thermal performance.