

**BIOCLIMATIC DESIGN STRATEGIES FOR ENERGY EFFICIENCY IN  
THE DESIGN OF AN ARMED FORCES ORTHOPAEDIC HOSPITAL IN  
ABUJA.**

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**JULY, 2023**

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**BY**

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**A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE  
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COLLEGE OF SCIENCE AND TECHNOLOGY, COVENANT  
UNIVERSITY, OTA, OGUN STATE**

**JULY, 2023**

## **DECLARATION**

**I, IBRAHIM, ABDUSALAM MOHAMMED, (21PCA02240)** declare that this research project was carried out entirely by me under the supervision of Dr Eghosa N. Ekhaese, of the Department of Architecture, Covenant University, Ota, Ogun State. This research has not been presented, in part or whole, for any degree elsewhere. All scholarly information sources used in this research work were duly acknowledged and appropriately cited.

**IBRAHIM, ABDUSALAM MOHAMMED**

**Signature and Date**

## **ACCEPTANCE**

This is to attest that this dissertation is accepted in partial fulfilment of the requirements for the award of the Master of Science (MSc) Degree in the Department of Architecture, College of Science and Technology, Covenant University.

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(Secretary, School of Postgraduate Studies)

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**Prof. Akan B. Williams**  
(Dean, School of Postgraduate Studies)

**Signature and Date**

## **DEDICATION**

This project is dedicated to God; My Father, Saviour and the Lover of my Soul and My Parents; Mr and Mrs Ibrahim Mohammed for their unrelenting love and support. I am eternally grateful.

## **CERTIFICATION**

We hereby certify that this dissertation titled “**BIOCLIMATIC STRATEGIES FOR ENERGY EFFICIENCY IN THE DESIGN OF AN ARMED FORCES ORTHOPEDIC HOSPITAL IN ABUJA.**” is an original research work carried out by **IBRAHIM, ABDUSALAM MOHAMMED (21PCA02240)** In the Department of Architecture; College of Science and Technology, Covenant University, Ota, Ogun State, under the supervision of Dr Eghosa N. Ekhaese. We have examined and found this work up to the standard to be presented as part requirement for acceptable as part of the requirements for the award of Master of Science in Architecture.

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## ABSTRACT

Traditional Architecture comprises a very strong relationship between the forms of architecture and the local climate. The form of shelter decides the bulk of its energy consumption. The climate becomes the dominant force in finding the solution when available resources are scarce. This study investigates the bioclimatic design to suggest ways of improving energy efficiency in the design of an Armed Forces orthopaedic hospital in Abuja the following objectives of this study are threefold, to identify the bioclimatic design strategies adopted in the design of hospitals in Nigeria, to evaluate the extent to which design features of selected orthopaedic hospital buildings comply with bioclimatic design principles, and to analyze the bioclimatic design strategies that enhance energy efficiency in an orthopaedic hospital. To achieve these research objectives, a mixed research method was used, including both qualitative and quantitative methods. The qualitative method involved a comprehensive review of relevant literature on bioclimatic design strategies and energy efficiency in hospital buildings. A case study analysis was carried out on the three existing National orthopaedic hospitals in Nigeria to evaluate the extent to which design features of selected orthopaedic hospital buildings comply with bioclimatic design principles while the quantitative method involved the distribution of questionnaires in selected orthopaedic hospital buildings in Nigeria to analyze the bioclimatic design strategies that enhance energy efficiency in the hospitals. The research findings show that all of the selected case studies adopted some of the Bioclimatic design strategies in their design which in turn reduced energy consumption. These buildings also depended so much on energy gotten from non-renewable sources to power electrical appliances within the buildings e.g., Diagnostic equipment, lifts, H.V.A.C, lighting and other electronics within the building, which were not efficient enough and increased the cost of running the buildings significantly. The study also identified several bioclimatic design strategies that can be adopted in the design of orthopaedic hospitals in Nigeria, including passive solar heating and cooling, natural ventilation, daylighting, and green roofs. This study contributes to the field of sustainable building design by providing useful information for future hospital designs and highlighting the importance of bioclimatic design strategies in enhancing energy efficiency. The research findings can be used as a guide for architects, engineers, and building designers in the development of energy-efficient hospital buildings that are sustainable, comfortable, and healthy for occupants.

**Keywords:** *Energy, Energy efficiency, Orthopaedic, Hospital, Bioclimatic design, Bioclimatic design strategies.*