

Review of Ventilation Principles in Traditional Igbo Architecture

Aneke, C. G.

*Department of Architecture,
Imo State Polytechnic Omuma*

Article DOI:

10.48028/iiprds/ijdshtmss.v15.i1.30

Keywords:

Ventilation, Thermal
comfort, Energy
Efficiency,
Traditional
architecture and
Design concept

Abstract

Architects and stakeholders in the building environment have severally been urged and challenged by the public to come up with architecture that is tropically responsive. This call is based on the fact that tropical climate is challenging and ideal for energy economy, and at advantage when compared to America and European situations, where architectural documentation existed. Tropical architecture in Nigerian before the import of colonialism was traditional and originated from the people. Traditional architecture was not designed to be mechanically supported rather it observed local climatic conditions, and was considered successful. The success recorded moved one to conclude that the unknown architect was able to express a deep understanding and mastery of his climate. The indept knowledge exercised doubt that the users were masters of their profession. This paper discusses the characteristics of traditional Igbo architecture in view of meeting the climate requirements, especially in ventilation and proper control of indoor thermal conditions. The paper recommends adoption of that thermal potential into modern designs, for energy of Efficient buildings.

Corresponding Author:

Aneke, C. G.

Background to the Study

Traditional architecture in Igbo ethnic area is basically on in earth, Earth however has been the most essential of building material since dawn of man, with nature setting the example. Termites built towers above ground and developed air circulation which predefined modern ventilation processes. (Eaton, 1981), the potter wasp and the cousin the “mud mixed” wasp used their mandible to knead and model vaults that were perfectly rounded as if designed by architects (Eaton, 1981). Kamarul (2005) expresses shelter as a basic need for man, and man's effort to shelter himself against the extremes of weather and climate is the ultimate aim of all human beings. This quest for shelter from the extremes of weather and climate is responsible for the peculiar house types and architecture dominant in Igbo region. The tropical Igbo architecture walls are either wattle and daub or adobe. The wattle and daub are an architecture whose walls are formed with light timbre, mainly from raffia, and timber from shrubs, cut from the forest. The stems are erected in a matrix format, on which mud paste is placed (Dmochowski, 1990). Traditional architecture of Igbo people in trabeated; that is pillar and beam. The pillars are of timber stems, which are forked at one end, to support the beams which crosses horizontally. The roofs are thatched.

Thatches have good thermal qualities which reduce solar radiation. The roofs are usually gabled with high pitches (Dmochowski, 1990). The walls and floors in Igbo traditional architecture are often rendered in earth; with the floor sometimes polished in grounded charcoal. This black charcoal gives the floor an aesthetic and cooling finish, another thermal quality. Ventilation, is very important in Igbo traditional architecture, since the area is characterized by sickly body feeling; sickly body feeling results from high humidity of not less than 80%, a feature of warm humid climate (Ogunsote 1990). Ventilation and vistas are often possible through placement of adequate windows, and proper orientation.

The building materials in Igbo traditional architecture are local, and greatly influenced the architecture (Dmochowsk, 1990). The building material qualities provide for indoor thermal comfort, due to its climatic insulating qualities. According to Dmochowski (1990), culture and climatic interference present pleasantry and calm in the architecture of the Igbos, an architecture born by the people, for the people in response to where nature has located and provided for them.

Overview of Igbo Traditional Architecture

The Igbo traditional architecture consists basically of rich wattle and daub wall, and timbered rafters and purling roofs covered in thick thatch, made from raffia palms. The Igbo architecture is either wattle and daub or absolute mud wall and shaped gradually when the paste which desired highlight reach. In wattle and daub, the timber wall matrix is bound by raffia palm, before mud paste in placed on it. This is usually faster than the total mud wall, to which sometimes take more than a year to make. In wattle and daub a builder can complete the building despite its size in 30 days, because most times labour in free, from the community and material locally sourced, and free of cost also, 2) The

ventilation attribute in this kind of compound settlement is that, usually vary large site are mapped out for development and while paternal families establish their buildings from one another is large, especially in settlement where land is not limited. In addition to the setbacks, in the use of economic trees within and around the compound for landscaping. These trees improve on the ventilation.

Among these qualities is also the natural earth landscape. Earth does not retail along its sides. The traditional Igbo architecture is one of pillars and columns, and reflected the aesthetic and creative ability of the ingenious builder, while meeting its socio-economic, cultural and environmental needs. The Igbo traditional architecture is one of flexibility as it could easily be extended along its sides. The buildings have remarkable heights with gabled roofs and high king post; an important good feature for architecture in tropical mid climate. The roof is often thatched, a light weight material from local raffia palm; whose heat absorption and retention are minimal.

Ventilation in Igbo traditional Architecture

Heat in the day, and cooling effect during the night. The gables are often eaves to stop driving rain, while windows, are carefully placed on the walls to provide view and ventilation. Most corner rooms are provided with windows of both sides which provides cross ventilation. This is another effective design attribute in achieving sustainable indoor comfort in warm humid climates (Dmochowski 1990). Typical traditional Igbo architecture floor plan seldomly exceeded four bedrooms and a living room. Verandahs were matter of choice, since the central building (Obi) served the same purpose (Barbour 1982).

The site layout allowed for the head of the family to have his house (Obi) occupying a central position, which is accessible through (ovu) a building with moderate open space, used for family meetings and entertaining visitors. The house of the family head (obi) is usually the biggest, with his yam store, (barn) behind or by the corner. Other buildings, belonging to the wives, may flank both sides of the house, according to hierarchy. A larger family may comprise of children from the same paternity, who now from a nucleated compound, with the father, as the head of the family, but in the absence of the father. This creates for spatiality in settlement.

Warm-Humid Climate

This is referred to as the equatorial climate and lies between 5⁰ and 15⁰ North of the equator. The most common feature of warm humid climate is its great uniformity of temperature throughout the year. Mean annual temperature is always around (30⁰C) with little variations, cloudiness and precipitation help to moderate daily temperature so that even at the equator, the climate is not unbearable. Regular land and sea breezes help in maintaining a truly equable climate. Illoje (1981) opines that relative humidity in humid climate is always high, over 80% making one feel sticky and uncomfortable. There are sporadic periods of relative rainfall.

Thermal Comfort

The essential factors resulting to thermal stress in the warm humid climates are temperature, solar radiation, humidity glare. Thermal comfort in contemporary buildings in warm humid locations can only come from controlling these factors (Ogunsote 1991.28). To reach thermal comfort, heat gained by the body from the environment though solar radiation to warm air must be minimized to constant body temperature of about 26°C, (Heerwagens, 2004). While heat lost though conduction, radiation and convection may be negligible because air temperature are continually near the body temperature. The major means of giving heat to the body include solar radiation, hot air, conduction and radiation from building fabrics, therefore to obtain some level of thermal comfort, the saturated envelop around the body must be removed.

Most often heat is absorbed within the building fabric which results to discomforts, and this is as a result of materials with high thermal capacity such as sandcrete blocks and concrete. Inferences therefore reveals that for thermal comfort to be reached in warm-humid climate such as in parts of Eastern Nigeria, Solar heat gain by buildings and human body must be minimized, while maximizing heat dissipated from the body through ventilation and evaporative cooling. The thermal comfort exhibited by traditional architecture in a warm-humid climate may be understood better by analyzing the typical traditional Igbo architecture in warm humid environment, found in Abia State in South Eastern Nigeria.

Environmental, Control Components

The traditional Igbo building is equipped against the Hazards of climate, while accommodating its benefits. The Igbo traditional architecture exerts a control on sun, rain and wind. Igbo buildings create proper ventilation for cooling of the indoor environment through:

Control of direct solar radiation

Cultivation of natural vegetation which provides cooling effect in the environment.

Use of building materials with low thermal capacity, so that limited heat transfer into the house takes place.

Protection against rainfall and Glare control.

The Igbo traditional architecture achieves its ventilation from two significant approaches namely from the top and through cross ventilation (Dmochowski, 1990).

Layout planning and Building Types

Site Planning

In traditional architecture, site plan is an issue of importance. The traditional Igbo family has a polygamous tendency; hence large layouts are not uncommon. Two important considerations in Igbo traditional planning of compounds include linear and random arrangement of buildings to ensure that wind velocity in the houses is not reduced. In the

random arrangement, this situation is often due to land scarcity. The linear arrangement ensures that all buildings benefit from the same wind velocity.

Orientation

Igbo traditional architecture is oriented such that bedrooms align the east and where bedrooms are unavailable located in the west, thick surrounding vegetations, acts as sun breakers, thereby reducing solar radiation, and improving ventilation. The traditional Igbo orientation have always taken advantage of the South-East and South-West winds to create maximum indoor comfort.

Building Layout

The traditional Igbo house, due to high humidity and temperature, a characteristic of the warm humid climate has been oriented to consider the body level as most vital area for ventilation for comfort. The adoption of open plan concept provides effective ventilation. The Igbo Traditional architecture design concept focuses on the need to achieves proper ventilation and could be summarized as follows:

The rectangular, and easily extendable open nature of the plans allow for easy flow of air, which creates the enabling facades to provide cross ventilation. Limited floor spaces, and roof vents provide good air flow inside the buildings. The compound size, it openness and thick vegetation indicate the importance attached to ventilation and indoor comfort in Igbo traditional architecture.

Openings in Igbo Traditional Architecture

Windows and doors are the main elements of ventilation at body level. Other than these, there are also decorative elements, especially designed to allow air passage into the interior part of the house. These elements help to achieve thermal comfort. The design characteristics of the openings are as follows:

Having many full length and openable windows and doors at body level, which allows cross ventilation. The position of windows in Igbo traditional house can be found at all panel of the house, especially in living and bedrooms areas.

Most door and window types allow air passages even when shut.

Roof

Roofs spaces in the traditional Igbo house are properly ventilated by the provision of ventilation ducts and panels;

- i. No ceiling panel is used, assuring no air blockage.
- ii. Ventilated roof space helps to cool the house interior.

Conclusion and Recommendation

The study revealed the thermal potentials of Igbo traditional Architecture, an architecture developed and perfected by traditional builders, without formal training but adapted from climatic experiences over the years. The potential inherent in traditional

architecture, include, planning, construction and orientation, building materials and construction if adopted in modern buildings, architects design and old ones they refurbish will in like manner provide the same better thermal comfort in buildings because the Architect would've added his experience and trainings as tools that will yield quality results.

This is so because most residents in Urban areas are denied the express right of sustainable green environment due to plot sizes because they are inadequate causes over designing and over development. Also concrete which has high thermal mass are commonly used for landscape, this increases the thermal discomfort. In conclusion, clear lessons could be adopted from thermal suitability of Igbo traditional architecture and injected into modern designs. The product of this adoption will be energy efficient buildings cut cost of providing mechanical and thermal comfort in buildings while healing the environment from pollution. It very well reduces the action of ozone layer which brings about global warming and climate change.

The characteristics as discussed earlier and found in many modern houses makes them very uncomfortable to live. Besides the use of unsuitable building materials in the environment, social and economic pressures have also contributed to the adverse urban climate situation. With high density living, more areas are paved and less left for trees and greenery. Higher building costs and profit motivation have also cut the necessary large roofs eaves short, and made open shady verandahs disappear, and lowered ceiling heights. The need for greater security and privacy in the urban areas has led to house designs which are more closed, thus reducing ventilations. Modern bulky furniture and finishes also make the house warmer as they store up heat and make the house stuffy and crowded. The way modern housing estates are developed makes the housing estate barren of vegetation. Residents have to suffer the intense heat absorbed and stored in the barren environment. The use of traditional Igbo house from as a source for identity in the modern contexts is both difficult and tricky and the present approaches used have largely failed for many reasons, due to lack of traditional Igbo house, the approaches towards the use of the traditional Igbo house from for the creation of Igbo identity have been superficial and uncreative. Many of these approaches have taken the traditional Igbo house into completely new socio-economic and cultural contexts. Many of them are set in the urban setting and applied to modern institutional, commercial and public buildings instead of the housing unit. As a solution, clear lessons can be drawn from the climate design of the traditional Igbo house for housing in the modern contexts. Wooden houses and lightweight constructions can be promoted in the suburban areas in the housing estates where densities are not so high to suit the environment.

References:

- Barbour, K. M, Oguntoyinbo J. S, Onyemelukwe, J. O. & Nwafor, J. C. (1982) *Nigeria in Maps* Hodder and Stoughton, London.
- Dmochowski, Z. R. (1990); *An Introduction to Nigerian traditional architecture Vol. 3: Souths Eastern Nigeria, The Igbo Speaking Areas*. Ethnographical in Association with the National Commission for Museum and Monuments, Lagos.
- Heerwagen, D. (2004). *Passive and active environmental control*, McGraw Hill Higher Education Publisher Boston.
- Illoje, N. P. (1981). *A New geography of Nigeria Ikeja* Longman.
- Ogunsote, O. O. (1991). *Introduction to building Climatology. A Basic Course for Architecture Students*. Ahmadu Bello University, Zaria.
- Kamarul, S. K. & Lilwati, A.W. (2005). Climatic design feature in traditional malay house for Ventilation Purpose. *International Seminar Malay Architecture as a Lingua Franca (2003)*. 41-48.