

# A Study on the Building Materials and Construction Technology of Traditional Hausa Architecture in Nigeria

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**Abstract.** In this paper, the traditional Hausa Architecture (Tubali) a Vernacular Architecture common to Northern—Nigeria is taken as the research object. By visiting remaining buildings, conducting research and talking to local historians, we aim to outline the form, functions, construction materials, the unique Construction technology and more used in Hausa architecture. We hope that more people will understand this indigenous architecture and realize that it is disappearing, and based on this, suggestions are made for the improvement and contemporary development of the traditional architecture of Hausa.

## 1. Research background

The Hausa are one of the largest ethnic groups in Africa. Hausa is one of Africa's largest ethnic groups. The Hausa people are mainly distributed in the Sahelian and Sudan Daura area of northern Nigeria and southeastern Niger.

Before the introduction of modern European architecture and imported building materials, The traditional Hausa people in Nigeria already have their own home-built forms and skills to meet their social, cultural and religious needs. In the North, the strongest influence came from Islam whilst in the South influence came from the return of ex—slaves (mainly from Brazil) and colonization. And the climate, human physiology and geography led to the development of Curvilinear conical and mud roofed structure in the North and Rectilinear thatch roof mud houses in the South. However, both styles of Traditional Architecture used local materials such as earth, wood, stone and thatch.

Now most of traditional buildings have virtually disappeared from the landscape due to urbanization, weathering and general lack of interest in preserving them. It is very difficult to obtain historical information about the architecture of Nigeria before the 20th century, especially its pre-colonial period. This paper focuses on the study of the traditional architectural forms, materials, and construction techniques, and to raise awareness to the disappearance of Hausa architecture in Nigeria.

## 2. Characteristics of Hausa architecture

Rainy season in the northern part of Nigeria last for only three to four months (June—September). The rest of the year is hot and dry with temperatures climbing as high as 40°C. Therefore, most earth roofing of traditional Hausa buildings in Northern Nigeria are flat.

Hausa people are culturally conservative as a result, Hausa homes are designed to be very private. They are usually enclosed with walls and contain a courtyard in the middle connected to the entrance

hall. Hausa people have a high sense of community amongst the Hausa long before the influence of Islam. Hausa people usually settle in larger groups in areas of common interest. Its residence is also large, having 4-10 rooms because like stated earlier Hausa people live in extended families.

### 2.1. Architectural elements

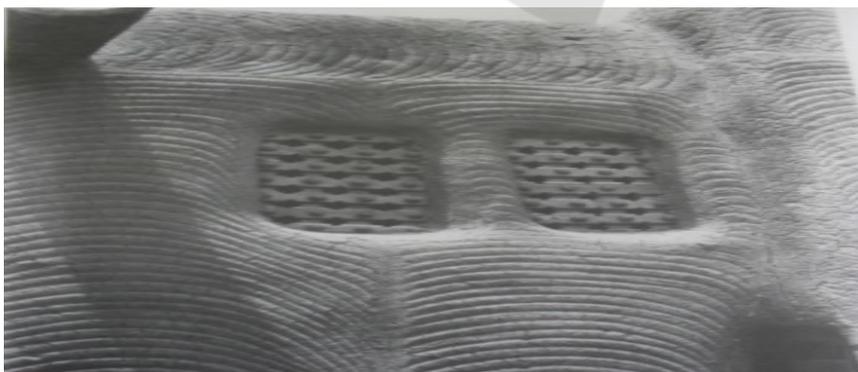
2.1.1. *Roof eaves.* The sprouts called ‘Indororo’ extend out from the palm—wood structure inside the roof. Long and projected roof eaves and spouts to drain rain preventing the water from soaking or weighing down the roof as shown in Figure 1. Then the drained rain water is collected in containers and used for cleaning, washing etc.



**Figure 1.** Hausa style homes with extended roof sprouts.

2.1.2. *Doorways and windows.* Doorways in Hausa building were usually of two types; outer doorways with wooden or iron doors on a pivot and inner doorways which were door less and usually covered with braided grass curtains. The use of lintels, beams, brackets and corbels were common in the design of the doorway.

These were simple openings usually on the uppermost part of the wall on the lee side of the building less affected by the driving rain. Despite their small sizes, they admitted quite enough light and air for lighting and ventilation. These windows sometimes had lattice work made of thin boards as shown in Figure 2.



**Figure 2.** Arabesque window screen.

2.1.3. *Decoration.* The decoration of houses is mainly to the women. They decorate their buildings exterior with painted designs or with relief patterns worked into a soft clay surface. Hausa women of northern Nigeria decorate and paint their houses mud walls with various geometric patterns used on

the shapes of windows, step and other building features and everyday objects, which communicate information about the social status of a building's owner.

'Dagin Arewa' it is one of the recurring elements you'll see in Hausa buildings. The symbol shows three interlocked (or merely superimposed) loops, forming a 2-axis symmetrical design as shown in Figure 3.



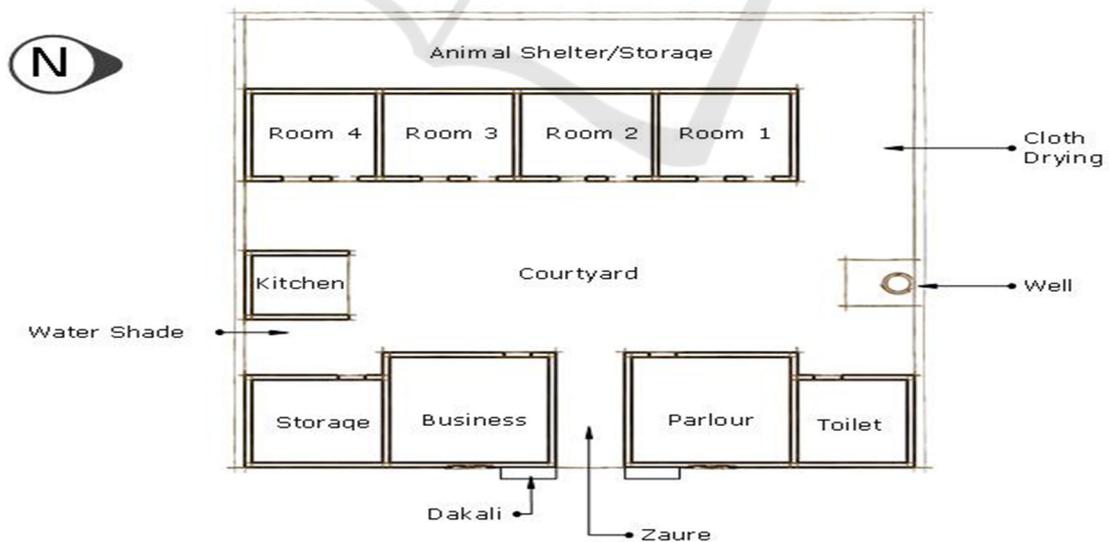
**Figure 3.** "Dagin arewa" decoration.

The Dagin Arewa is an emotive symbol of Northern Nigeria, it represents 'Unity in Diversity', which was encapsulated in the 'One North'.

*2.1.4. Typical hausa home layout.* The Hausa-man has always a preference for the main entrance of his house to face east. This gives a shaded 'Dakali' for evening relaxation. The entrance hall is usually the only way in and out of a Hausa home, the reason being security.

The parlor is used for receiving guests. The size and beauty of the parlor reflects the status of the home owner. Another room of similar description to the parlor is used for business, usually selling local food, spices, art & craft or selling services.

The toilets and kitchen are located usually far off the house as shown in Figure 4.



**Figure 4.** Typical Hausa home layout.

## 2.2. Structure characteristics

2.2.1. *Tubali walls.* Hausa architecture is called ‘Tubali’, the word was derived from the little cone—shaped mud bricks used in the buildings.

The walls of most Hausa buildings were built on stone foundations, which were either of tubali or stone. The depth and thickness of this foundation varied in proportion to the dimensions of the walls to be placed on them. The walls were laid with the tubali laid close together and an inverted tubali used to fill any gaps especially at the corners. All voids were filled with plaster, it was applied on the internal tubali of the wall first by using a horizontal force to push it inside; When done and dried, the outer layers were then covered with another layer of plaster. Thus creating an extremely thorough end result as shown in Figure 5.

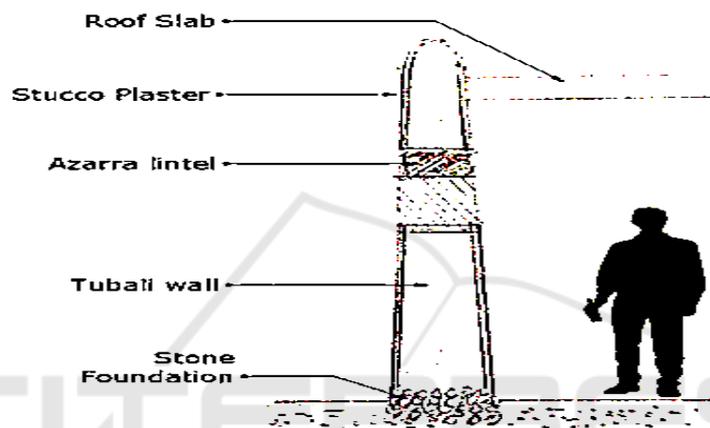


Figure 5. Tubali wall section.

In large building where cost was not a major consideration, horizontal bracings made from azara grids were set in the walls for extra strength. The walls decreased in thickness upwards making them well tapered and thus increasing their structural stability.

2.2.2. *Arches structure.* One characteristic feature of Hausa architecture is the domed room formed by a number of intersecting arches projecting from the walls of the building. The arches are made of lengths of palm wood set into the wall and projecting at increasing angles until they are horizontal at the apex of the arch where they are joined to a similar construction projecting from the opposite wall as shown in Figure 6. The palm-wood frame is then covered with mud to produce smooth free-standing arches which support a ceiling made of palm-wood panels and covered with rush mats and then with a water-resistant layer of plaster, like material made out of the residue of indigo dye pits.

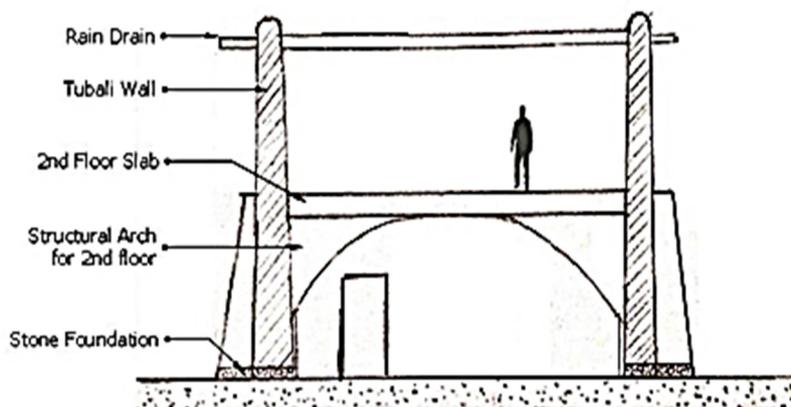


Figure 6. Section of a 2 floor building with structural arches.

### 3. Main traditional material and construction technology

These naturally occurring materials of Hausa architecture include: mud, timber, bamboo, thatches, clay, palm frond, raffia palm, bark of trees, bush palm—fiber, animal waste, stone etc.

The uses of these materials were based on the following factors: availability, crude technological know—how, financial constraint, crude tool and equipment, transportation system, the ruling class choice and the climatic effect on such materials. However, much has been achieved in the use of these materials. Building materials in Hausa architecture are divided into four groups earth, plants, iron and stone.

#### 3.1. Earth

Birji is earth used to make tubali and mortar. It is dug out from the kududdufi, the burrow pit carefully chosen by the builder since the birji varies considerably from town to town and even from pit to pit. The birji is first broken into small particles with shovel. From then on the processing is quite different depending on whether it is to be used for tubali, mortar or plaster.

The broken birji is wetted, spread flat and trampled by foot until it reaches the consistency of thick paste. It is left for a couple of days to dry and then wetted and trampled again before being formed into tubali.

Then the tubali maker begins by rolling the churi on the ground using fine sand to prevent sticking he then shapes his material first into a cylinder then into a double cone, thick in the center and pointed at both ends. This he lifts in both hands about half a meter from the ground and then throws it down with one hand in such a way that one of the pointed ends flattens against the earth. The particles of the birji adjust themselves during this short moment of impact and about two weeks later when the tubali are dry the particles will be immobilized in this position thus almost pre stressed as shown in Figure 7.



Figure 7. Tubali bricks left to dry in the sun.

Mortar is prepared from the same birji as the tubali only the process of breaking, wetting, tramping, and drying is repeated more than twice.

### 3.2. Plants

These timbers commonly called 'Azara'. Fibrous trees found mainly in the savannah region of Nigeria. Unlike timber, it is a termite resistance structural and don't easily decay unless subjected to long period of dampness. Their uses are wide-ranging. They serve as a wooden reinforcement, strengthening the structure of walls and pillars of loam; they make sophisticated frame constructions, beams, brackets and corbels; they create a framework within arch like structures; and they serve as elements carrying flat and domed roofs. They are also used as overlay for toilet pits.

For binding the rafters of grass-hoofed houses, the extremely tough stems of the fara geza were used. Ropes of great strength were produced from twisted bark of the roots of dakwora, were also produced from the inner layer of the bark of the kuka (baobab) tree.

Grasses found in Nigerian traditional architecture. The type of grasses available in a locality depends on the climatic region, vegetation and closeness to water source. The raffia palm leave that found in the most river banks were made into thatch roof cover called 'Bambu'. The barks of such tree were used as ridges to root while leaves and thatches were used as roof cover. Some leaves can also be used as wall paint, such as indigo.

The plaster used for covering walls and is made from birji and the fluid makuba which is made from the fruit pods of the locust bean tree. Also powdered locust bean pods were spread over the floor of beaten earth, and water was poured over it.

### 3.3. Iron ore

The most impressive Hausa iron products were the city gates, made of long strips of hammered metal joined together on sturdy frames and set on pivots instead of hinges as shown in Figure 8. Apart from that, iron was used for complementary items, mostly nails. Some nails were cast with decorated heads and were used in rails of outer doors of houses.

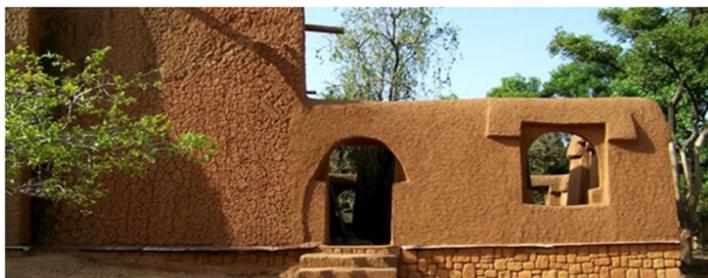


**Figure 8.** Hausa style irongate.

Iron ore was found two or three meters down and to get it, wells were dug to the ore levels and then extended sideways as the ore was excavated. Huge furnaces of clay about two meters high were built on site and charged with alternate layers of ore and wood charcoal.

### 3.4. Stone

Stone wasn't often used for building in Nigeria. But the Hausa used it in building town walls and bridges. Rough stones were also used for foundations of structures and sometimes as walling material for houses and fences as shown in Figure 9.



**Figure 9.** A building of traditional Nigerian architecture with a stone foundation.

#### **4. Contemporary development and problems**

For over a thousand years, it is said that traditional Hausa architecture has been part and parcel of the Hausa civilization itself. Richness in the architectural design often signifies royalty, power, wealth and scholarship. Also the traditional Nigerian architecture has the advantage of abundance of materials, low cost, sustainability, no skilled—Labour, longevity, urban fabric for shade, no irritant chemicals, environmental friendliness, soundproofing, fire resistance and so on. Although, some Niger republic cities and other ancient places, the architectural design that once adorned these towns have now been replaced with the modern architectural designs—often laced with the traditional Hausa architectural touch. But the traditional building designs are now getting increasingly absent. Even the royal palaces are now changing their look. Finding information on tubarius becomes more difficult.

Natural erosion and a general lack of interest by the people are the main factors in the disappearance of traditional Hausa architecture. The high influx of modern architectural designs is the greatest threat to those of old. Maintenance is another factor, people find it very difficult to maintain the traditional designs because the materials are difficult to find and the expertise is also fast-vanishing. The lack of research and transfer of technology to the younger generation are also one of the factors militating the development of the traditional designs. Even people believe that living in mud houses is a sign of backwardness, forgetting that there is a lot of science in mud houses.

How to protect the traditional Hausa architecture, inherit the traditional construction technology, and realize the adaptive development model under the concept of contemporary social development is the urgent solution we need to solve. Nowadays, in Nigeria, modern auxiliary composites such as adobe brick, cast earth, rammed earth, cob, and mud based ferrocement have been gradually recognized as eco—friendly connecting and reinforcing materials. And tries to apply it to the renewal of the technical protection and construction of the traditional Hausa buildings, which provides more adaptability and possibility for the contemporary development of the traditional buildings. Determined to promote Hausa traditional architecture, an NGO called ‘International Network for Traditional Building, Architecture & Urbanism (INTBAU)’, is also making efforts in the areas of seminars and workshops among others towards the promotion of the designs.

#### **5. Conclusions**

With the growing number of environmental problems, we see all around us, natural building materials are a powerful alternative to modern conceptions of building. In the protection of traditional architecture, we should to shift the focus unto the essence of traditional building. Hence the materiality (earth, wood, stone and thatch) and the principles (privacy, space, comfort) guarding the designs of Nigerian traditional architecture. Sure, we need to put emphasis on innovation and seek new ways to make buildings perform better.

With that being said, there’s still a place for history, there are many lessons we can learn from the past. And we will continue to promote the comfort and sustainability of traditional buildings and

meet the modern low-carbon lifestyles through new technical means and modern auxiliary materials in terms of physical environment, space use and structural adaptability.

### **Acknowledgments**

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