

## THE IMPORTANCE OF TIMBER AS A BUILDING MATERIAL IN CONSTRUCTION INDUSTRY IN EDO STATE.

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### ABSTRACT

Tress and their derivative products have been used by societies around the world for thousands of years. Contemporary construction of tall buildings from timber in whole or in part, suggests a growing interest in the potential for building with wood at a scale not previously attainable. The important of Timber as a building material cannot be over emphasized. In this study, this importance was assessed using questionnaire from the construction professionals in Edo State. It is established that a building material like wood must be environmentally friendly affordable, flexible in usage and long lasting. Timber possesses these characteristic, flexibility easy to transport and durable when treated. It is comparable with other building material and for structural works; time is taken for the part used which has to do with the method of conversion. Additionally plants, the primary source of timber absorb carbon dioxide and release oxygen into the atmosphere during photosynthesis. In conclusion since timber is readily available in Edo State it is a highly important building material in the State. The problems associated with the usage of wood are attacks by insect, fungi, fire etc. and can be amended using preservative treatment, afforestation and fire retardant.

### INTRODUCTION

Timber is a fibrous rigid material of plant origin. The word timber, which is wood that is prepared for use in building construction, is sometimes used interchangeably with wood in our construction parlance. It is

broadly classified as hardwood and softwood. Hardwood is derived from angiosperm or broad-leaved trees such as Iroko, Mahogany and Danta . Softwood is obtained from coniferous trees, which have needle-like leaves. Examples of softwood trees

include Scots Pine, Norway spruce and Douglas fir. Timber has been used as a primary source of building material for ages in construction of building. The Raw Materials Research and Development Council of Nigeria, RMRDC, (1998) opined that the roof structure and ceiling noggins of most buildings are constructed with timber because of its workability and durability. Opepe (*Nauclea diderrichii*), a yellowish, very hard timber is used for door and window frames because of its natural resistance to insect attack. The importance of timber in the construction industry in Edo state is to shield against precipitation and direct heat radiation from outside sources, while still allowing air to circulate freely around them Stephenson (2007). It forms part of a standard weather station. Holds instruments that may include: (ordinary, maximum/minimum), a hygrometer, a psychomotor, a dew cell, a barometer and a thermograph.

Timber in respect to this study serves as part of an essential building material in the construction industry as it cuts across all aspect of construction. For example, at the foundation stage after excavation, timber is used for earth work support which holds the walls of the

foundation trench. Timber is also used as form work, ceiling, roofing and furniture etc. In the production of timbers various processes are employed using portable tools and others. The importance of timber products is related to building design & construction. Timber being a natural building material offers superior performance & environmental advantage. Its ability to also conduct thermal activities and its load bearing ability makes timber a choice for most construction design.

#### **DEFINITION OF TIMBER**

According to Frank Hilton (1970) Timbers is a type of wood which has been processed into beams and planks. Basically timber is a wood or firewood of growing trees. Timbers are used for the structural purpose. Those woods which are adapted for building purpose are timbers. In other word timbers are suitable for structural uses, in the building industry.

#### **SOURCES AND IMPORTANCE OF TIMBER**

The timber obtained from a matured tree is of a great importance that timber users should have good knowledge and understanding as regards to the various circumstances during timber construction process. This

is in accordance with the timber wood work stated in BS565.

### **CLASSIFICATION OF TREES**

The word timber is derived from an old English word "timbrain" which means to build. Timber or wood as a building material possesses several valuable properties such as low heat conductivity, low bulk density, amenability to mechanical working and relatively high strength. Trees can be classified into two categories depending on the mode of growth which are as follows:

1. Exogenous
2. Endogenous

#### **1. Exogenous**

This type of tree increases in bulk and grows outwards by the addition of one concentric ring formed in the horizontal section of such trees. Every number of annual ring represents the number of years the tree has lived. Such trees grow bigger in diameter as well. This type of wood is used for building and engineering purposes.

#### **2. Endogenous**

This type of trees grows inwards and fibrous mass is seen on their longitudinal section. Such trees show little branches and the timber from them has very limited engineering applications.

Examples are bamboo, cane, palm etc

### **STRUCTURE OF TIMBER**

These consist of the structure of soft wood and hard wood. The soft wood is made up of many long thin cells with their long axis along the length of the trunk of tracheids which give the wood strength and texture.

#### **True Wood or Duramen**

This is some time referred to as the heartwood it is called true wood as it is the wood which has reached maturity most of the timber used for building purpose are taken from this part of the tree.

#### **Sap Wood or Alburnum**

These surround the tree wood and are actually softer and lighter in color as the tree grows, the sap wood will harden and mature in true wood owing to the sweet food stored in some of the cells of the sap wood, the tree is often attacked by an insects, pest, and decay. This part is not generally used for the structural work in the building.

#### **Growth or Annual Rings**

These rings of woody fibred arranged in concentric circle around the pith because of such rings indicates the age of a tree, each rings often is seen as

a two distinct known as early wood or (spring wood) later wood is denser than the early wood and can be recognized, it's darker appearance.

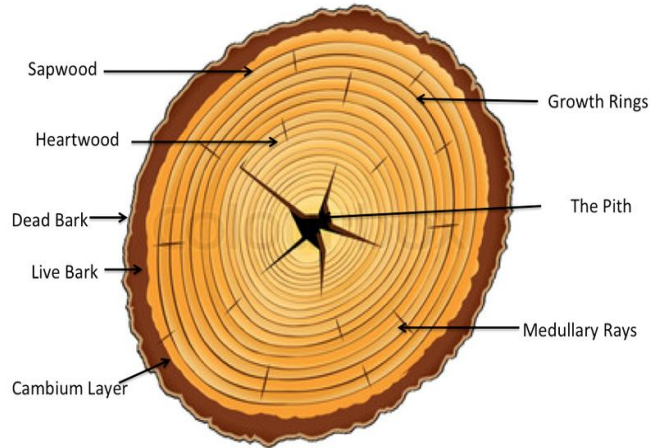


Fig 1. Tree cross-section

Source; Emary A.B (1974) Journal volume 2

There is another type of wood called engineered wood. These are wood products that has undergone seasoning, and cut into preferred shape for the construction purpose. Engineered wood are products used in a bigger part of the construction industry. They may be used in both residential and commercial buildings as structural and aesthetic materials. An example of engineered woods includes veneer and plywood. In buildings made of other materials, timber will still be found as a supporting material, especially in roof construction in interior doors and their frames and also in exterior claddings. Below is a table working stress for some durable timber.

## QUALITIES OF TIMBER AS A BUILDING MATERIAL

The qualities of timber as a building material include availability, physical and aesthetic qualities, workability and versatility, environmental sustainability, flexibility of space arrangement, dry construction, industrial production and comparative cost effectiveness (Gregory, 1984; Nolan, 1994 and Whitelaw, 1990).

### I. Availability and Acceptability

Timber is locally available in Nigeria. It can be purchased from local suppliers and transported to site using even small vehicles. Timber is accepted as an attractive building material in most cultures.

## ii. Physical and Aesthetic Qualities

Timber has a high strength to weight ratio making it an attractive framing material. Some species are highly resistant to rot. Timber withstands humidity with less structural change than other building materials. It is very durable and there are numerous finishes available to protect and enhance the natural beauty of the material. These sealants and protective finishes promote its durability. If well protected and well installed, timber can last for centuries with minimum maintenance (Sturges, 1991). Heavy timber construction is less prone to damage by short-term high temperatures allowing for a longer period for evacuation in case of fire.

## iii. Workability and Versatility

Timber can easily be shaped by simple hand tools. It can be cut, planed and chiseled. There are many ways to connect timber to timber or to other materials since timber can easily be secured or fastened with nail, screws, bolts and other connectors. There are many design options possible with wood that are not practical with inorganic materials such as concrete or steel. The design performance required by a particular building application can be more flexibly matched by

selecting timber of the appropriate density, compressive and tensile strength, color, texture and fire resistance (Anderson, 1970).

## ADVANTAGE OF TIMBER AS A BUILDING MATERIAL

### 1. It is readily available:

Timber is a natural material used in many forms for building and construction. It is readily available and can be easily sourced from many building material.

### 2. It is Safe:

Since it comes from a natural source, timber is non - toxic. It is safe to handle and even as it ages it will not cause damage to the environment. It is safe to reuse or recycle credits. Most timbers these days are endorsed on sustainably harvested to return a great life cycle.

### 3. It is easy to work with:

Due to its highness, density and grain structure are the fact we have been using timber in buildings from ant, drill and prepare timber to the required size and shape. Even hardwood timbers are relatively easy to work with compared to other

building material such as steel.

**4. It is cost effective:**

Timber is the cost effective alternative to many other materials, if you consider the life cycle of timber it has less steps to process than many other building materials, therefore less to produce.

**DISADVANTAGES OF TIMBER AS A BUILDING MATERIAL**

There are some disadvantages of wood but they are easy to disregard, and eliminate as long as the cause is known.

1. Shrinkage and swelling of wood: wood is a hygroscopic material. This means that it will adsorb surrounding condensable vapors and loses moisture to air below the fiber saturation point.
2. Deterioration of wood: the agents causing the deterioration and destruction of wood fall into two categories: biotic (biological) and a biotic (non-biological).
  - i. Biotic agents include decay and mold fungi, bacteria and insects.
  - ii. Biotic agent includes sun, wild,

water, certain chemicals and fire.

- a. Biotic Deterioration of wood: woods are organic goods like any organic good; wood is a nutritional product for some plants and animals. Humans cannot digest cellulose and the other fiber ingredients of wood, but some fungi and insects can digest it, and use it as a nutritional product. Insects drill holes and drives lines into wood. Even more dangerously, fungi cause the wood to decay partially and even completely.
  - b. Biological deterioration of wood: due to attack by decay fungi wood boring insects and marine borers during its processing and in service has technical and economical importance.
3. Insects:

Insects are only second to decay fungi in the economic loss they cause to lumber and wood in service. Insects can be separated into four categories: termites, powder post beetles, carpenter ants and marine borers.

- i. Termites: There are two types of termite's subterranean termites damage wood contact

with standing water, soil, and other sources of moisture.

- ii. Dry wood termites attack and inhabit wood that has been dried to moisture contents as low as 5 to 10%. The damage by dry termites is less than subterranean termites.
- iii. Powder post beetles attack hard wood and softwood. At risk are well seasoned wood as well as freshly harvest and undried wood.

### **CHALLENGES OF TIMBER AS A BUILDING MATERIAL**

No building material exists without its challenges; however, the limitations posed by these materials exist only in relation to subsisting level of knowledge, creativity and technology. Materials must be studied and scientifically explored. With the advancement in technology, new applications and potentials of materials are emerging. This is corroborated by Andreas (2005) that "There is no law, no principle, based on past practice, which may not be overthrown in a moment, by the arising of a new condition.

#### **i. Fire**

The greatest challenge of wood as a structural material has been

fire. Studies have shown that wood as a building material is the only material that insulates itself after the initial charring. Studies have shown that when timber burns, it gets momentarily protected by its own charring, which creates an insulating charcoal layer that reduces the speed of spread of fire.

#### **ii. Weathering and Decay**

Another factor that affects timber is weathering and decay. Timber decay arises from fungal attack in combination with excessive moisture, while weathering occurs as a result of chemical and light reactions (William, 1983). These effects of weathering can be prevented through the application of coatings on the surface of the timber. However, the protective benefits of all coatings also depend on proper maintenance of the coating.

#### **iii. Termite Infestation**

Termite control is of very high importance; however, the likelihood of termite encroaching into a dwelling is not dependent upon the type of frame used in construction. All that needs to be done is a simple adherence to some basic principles of maintenance. Some of the processes involved in controlling termite infestation are Site Management, Soil Barriers and choice of foundation.

### **a. Site Management**

Site management is another avenue where termite infestation can be controlled. This can be achieved through the proper disposal of construction debris, pegs and concrete form works rather than burying them.

### **b. Chemical and Soil Barriers**

Termite infestation can be controlled by the application of environmental friendly chemicals. Sharp sand laid along the foundation footing has been found to be a very strong barrier because they are too heavy for the termites to move and the spacing between them is too small for the termites to squeeze through.

### **c. Slab and Foundation Details**

Foundation walls and slabs can be designed to inhibit their entering into the building. The detailing of the foundation with concrete cap will force termites to the surface where they can easily be detected.

## **TIMBER AS A SUSTAINABLE BUILDING MATERIAL**

One of the most important questions in environmental sciences is how we can continue improving human welfare within the limits of the earth's natural resources. A possible solution to this dilemma is sustainable development, a term popularized

by " Our Common Future", the 1987 report of the World Commission on Environment, chaired by Norwegian Prime Minister Gro Harlem Brundtland (and consequently called the Brundtland Commission). In the words of this report, sustainable development means "meeting the needs of the present without compromising the ability of the future generations to meet their own needs.

- i. Easily available and affordable, preferably locally;
- ii. Meets with the requirements as specified in National Standards; in terms of durability and maintainability;
- iii. Should be environmental friendly and should not constitute any health hazard.

The sustainability of timber can also be determined by comparing its impact on the environment with three other common building materials as presented by Ferguson et al., (1996) and John (2003). From Table 1, rough sawn timber uses 750 MJ/m<sup>3</sup>, steel uses 266000 MJ/m<sup>3</sup>, concrete uses 4800 MJ/ m<sup>3</sup> and aluminum uses 1,100,000 MJ/m<sup>3</sup> of fossil fuel. Reveals that rough sawn timber releases 30 Kg/t of Carbon dioxide, while steel,



concrete and Aluminum release 700Kg/t, 50 Kg/t and 8700 Kg/t respectively. It also shows that rough sawn timber stores 250 Kg/m<sup>3</sup> of Carbon dioxide while steel, concrete and aluminum do not store any. It obvious that timber releases the least and stores the highest amount of carbon dioxide during its manufacture, hence it releases less greenhouse gases into the atmosphere.

This table shows thermal conductivity of some building materials. Fired clay has 1.0 J/m<sup>2</sup>K<sup>-1</sup>, cement board 0.6 J/m<sup>2</sup>k<sup>-1</sup>, limestone gravel 0.6 J/m<sup>2</sup>k<sup>-1</sup>, concrete 1.4-2.9 J/m<sup>2</sup>K<sup>-1</sup>, stone 1.5-3.0 J/m<sup>2</sup>K<sup>-1</sup>, wood 0.05-0.15 J/m<sup>2</sup>k<sup>-1</sup> and steel 19.0-21.0J/m<sup>2</sup>k<sup>-1</sup>.

From this, it is apparent that timber buildings require much less insulation to retain their warmth. The greatest challenge of tropical regions is the excessive heat gains in buildings especially those built of concrete and steel. Thus, it will be of great advantage to explore this potential in timber in order to have energy savings in cooling houses. It also shows that timber is better than stone in terms of resistance to heat flow and the same with concrete. When compared with steel, it is also resistant to heat flow. The resistance of heat flow found in timber can therefore be of great advantage as less energy will be required to cool the interior spaces of the dwellings.

Table 1: Thermal properties of building material used in construction

MATERIAL	THERMAL KCB/W/HR/°F	CODUCTIVITY
Wood	0.80	
Clay	4.80	
Limestone	6.50	
Sandstone	12.00	
Concrete	12.60	
Steel	32.60	
Aluminum	1,416.00	

### SEASONING OF TIMBER

Timber is hydroscopic, meaning that it absorbs water. Some preservatives can increase timber is ability to attract and absorb moisture. When timber absorbs moisture, the piece of timber will

increase in dimension by up to 5% across the grain and 0.1% along the length. When moisture is poorly managed, these combined properties if core wood can cause bow, crook, cut and twist in a piece of timber,

none of which are desirable on a building project. Keeping timber dry at every stage of the project is critical.

## **USES OF TIMBER IN THE CONSTRUCTION INDUSTRY**

The use of timber in construction cannot be over emphasized to me I will say timber is gift of nature to humanity.

In construction, timber is used for a lot of things:

1. **Timber is used for formwork:** Formwork is necessary part of all civil works especially for the construction of structural elements like beams, column, slabs etc. in fact, aside from pneumatic formworks timber is very essential. Timber is usually forms the shape of these structural element.
2. **Furniture:** Furniture is also part of construction; in fact the best furniture today cannot be made without incorporation timber into the system.
3. **Foundation works:** In the preliminary stage of building construction, timber is used for foundation footings, usually plants and board, but that's timber too right.

## **THE IMPORTANCE OF TIMBER PRODUCTS TO BUILDING DESIGN IN CONSTRUCTION**

Timber is a natural building material that offers superior performance and environmental advantages. It is a versatile, sustainable, attractive and cost effective building material that combines beauty, performance and environmental advantage. Properly treated recycled wood materials offer a multitude of building and design solution, creating living spaces alive with beauty, warmth and comfort.

### **The Construction Method**

The procedures involve in this case are;

- Cross cutting; the wood was marked out to the required size i.e. length, width and dept of the electronic shelf the marked portion we cut out with the acid of a cross cutting machine alternatively a hand cross cutting saw was used.
- Joint cutting; the already marked joint position were drilled out with the aid of brace, filted with drilling bit some cutting's were also done with the use of saw
- Joint testing; the already cut out joint were tested i.e the vertical and horizontal members were

temporarily fixed together to see if there were any tenor joint

### **TIMBER IN FLOORS**

It is worthy to note that all types of timber are suitable for flooring. People always use timber, as roof member like purlins, rafters, tie beams, and struts. In this part of the country, there is no record of where timber has not been use as a roofing material is place on asbestos sheets or aluminum sheets. However order continent like America, there are record to show that wood use in a frame construction as roof materials. According to Bertie (1975) it is a type of construction in which walls partitions, floor and roofs are wholly or partly of wood.

The structural form is timber, most of which has an animal thickness of 2" (50mm) the roof, framing is covered with a deck of sheathing or roofing is similar to that of paneling (tongue and groove).

### **METHOD ADOPTED**

This study is a descriptive research design which will involved the assessment of public and private construction professional opinions, using questionnaire in Edo State. The research could be in detailed description of existing

phenomena with the use of data to detail current conditions and practices or to make plan for improving construction (Ohaja 2003) and (Ezeji 2004). The primary data is sourced from the view and perceptions of members of a particular selected group.

### **Study Area**

This research will be carried out at Edo State is one of the 36 states in Nigeria which have the total population of 3,218,332.

### **Research Population & Sample Size**

Research population can be defined as the totality of a well defined collection of individuals or object that have a common, binding characteristics or traits (Polit et al, 2006). Burns et al. 1993 added that a population is defined as all elements (individuals, objects and event) that meet the sample criteria for inclusion in a study. The research will cover a population of respondents which are construction professionals who are categorized as consultants or contractors in the study area. The population size was the number of registered professional in the industry obtained from the directory of regulatory bodies in Nigeria. These regulatory bodies together maintain registers of

most active members as registration with these regulatory bodies add prestige to the construction professionals.

**Sampling Technique**

Sampling is a process of selecting a portion of the population to represent the total population and the findings from the sample represents the rest of the group. (Burns et. al, 2001). The advantages of selecting a sample is that it is less costly and time saving than collecting information form a large group of respondents. The selected sample should therefore, have similar characteristic to the

population under study to allow the results to represent the population (Burn et al 2001, Polit et al, 2006).

**Data Collection**

Data collection is vital in research because it add to apprehension of an academic background (Bernard 2002).The research instrument that will be used to obtain and collect the study data is the questionnaire. A questionnaire is a printed self report from designed to elicit information that can be obtained through responses of the subjects.

**IMPORTANCE OF TIMBER IN THE CONSTRUCTION INDUSTRY**

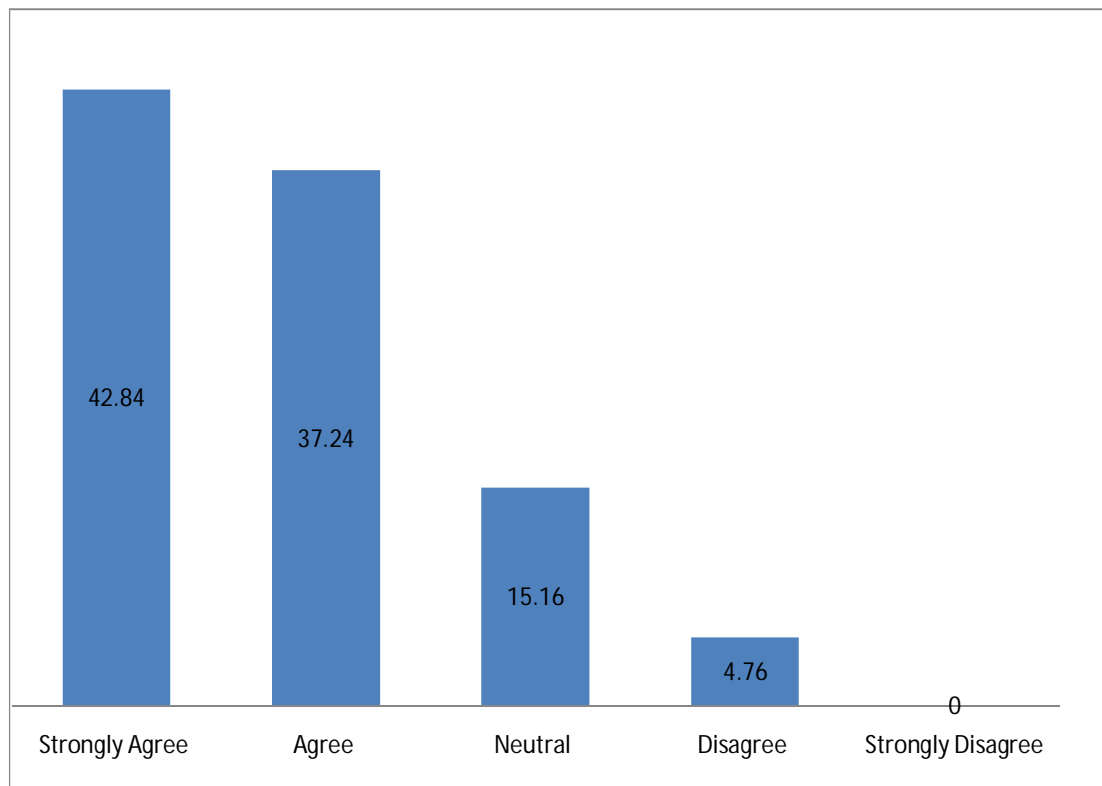
**Table 2.1 Importance of Timber in the Construction Industry**

S/n	Importance of Timber in The Construction Industry	Strongly Agree 5	Agree 4	Neutral 3	Disagree 2	Strongly Disagree 1
1	Timber is Important For heavy construction works like columns, trusses, piles.	15	20	10	0	0
2	Timber is important For light construction works like doors, windows, flooring and roofing.	33	12	0	0	0
3	Timber is important For other permanent works like railway sleepers, fencing poles, electric poles and gates.	10	18	17	0	0
4	Timber is important For temporary works in construction like scaffolding, centering, shoring and strutting, packing of materials.	18	11	16	0	0

**Source: Authors field survey, 2019**

S/N	Important of Timber in the Construction industry	Total	Mean Rank	Rank
1.	Timber is Important for decorative works like showcases and furniture's.	70	2.86	1
2.	Timber is important for light construction work like door, windows, flooring and roofing	70	2.84	2
3.	Timber is important for industrial uses like pulps (use in making paper), card boards, wall papers	70	2.51	3
4.	Timber is important for heavy construction works like columns, trusses and piles.	70	2.47	4

**Source: Authors field survey, 2019**



**The variables tested=100%**

**Figure. (1) Importance of Timber in the Construction Industry**

From Figure (1) the questionnaire finding 42.84% strongly agree on the importance of Timber in The Construction Industry. And 37.24% agree on it, 15.16% was neutral and 4.76% disagree on it.

## QUALITY OF TIMBER, ITS USES AND ITS CONDITIONING

**Table 2.2 Quality of timber, its uses and its conditioning**

s/n	Quality of timber, its uses and its conditioning	Strongly Agree 5	Agree 4	Neutral 3	Disagree 2	Strongly Disagree 1
1	Timber is Durable and easy to maintain	12	22	11	0	0
2	It has Quick build time	7	28	10	0	0
3	It has No limits on design and size	17	14	14	0	0
4	It is Easy to work with	14	18	13	0	0
5	Energy efficient timber houses	17	15	13	0	0

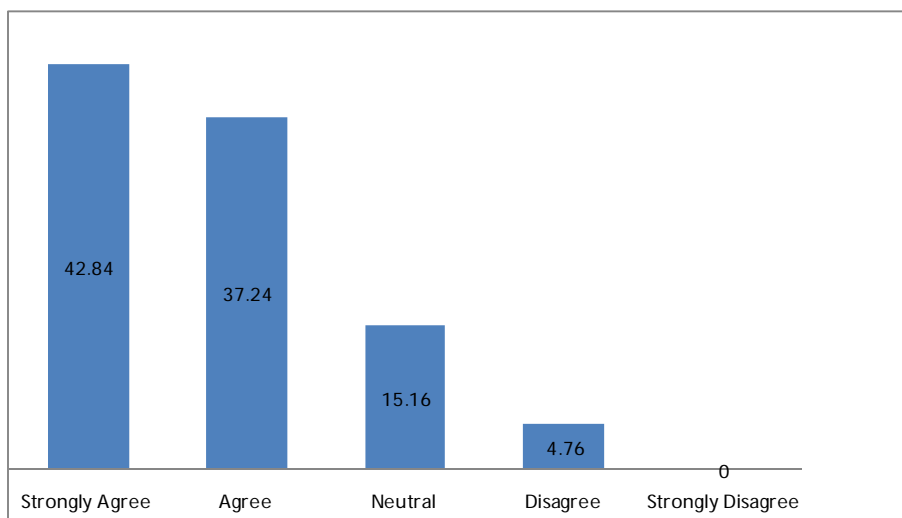
**Source: Authors field survey, 2019**

### NATURAL MATERIAL

This section of the study discusses the natural material. To do this, the respondents were presented with 10 questions to rank from list (1) to highest (5). The result of the rank t – test represent in table 4.5

S/N	Natural Material	Total	Mean rank	Rank
1.	If new trees are planted to replace those harvested, timber will continue to be available.	70	2.79	1
2.	Timber is one the few natural building materials, which have a lot of advantages.	70	2.61	2
3.	Generally timber is non – toxic, does not leak chemical vapor into the building and is safe to handle and touch.	70	2.52	3
4.	It also means that as timber ages, it does so naturally	70	2.49	4

**Source: Authors field survey, 2019**



## CONCLUSION

From the write up we can see that the importance of timber construction in building industry is prominent. It is environmental friendly, durable, readily available, easy to maintain and versatile in usage. As a building material timber possesses all these aforementioned qualities and performs better compared to most other building materials in the Nigerian construction industry.

## RECOMMENDATION

From the result obtained from the questionnaire distributed to stakeholders in the building industry, this paper therefore recommends that a good technical knowledge of timber is necessary for its application in for a specific construction work. Due to the quality of timber which includes physical and aesthetic qualities, workability, dry construction, cost effectiveness, environmental sustainability it is an important material in the construction industry. To avoid dilapidation of timber members, collapse of possible failure of timber structure, it is important that timber be subjected to some prophylactic treatments like thorough seasoning and application of chemical preservatives to lessen cases of distortion of timber structural member and dimensional instability.

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