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IMPACTS OF WOOD AND OTHER ACCESSORIES IN CONSTRUCTION

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Abstract

The main purpose of this study is to find out the impact and the contemporary uses of wood and other accessories in the construction industry. Howbeit, wood is a natural material produced by the growth of plants, mainly trees and shrubs. Conversely, some people may refer to some places in the world as 'wood'... For instance, South Dakota (town), county, Texas, County, West Virginia, Wisconsin, a town and county Wisconsin: wood could also refer to music; for instance wood wind instrument or wood, wood (Moxy Fryvous album); wood (widespread Panic album); also it could refer to wood Television (TV). One could see all disambiguation of wood from the standpoint.

Introduction

Wood and other accessories impact in construction industry is so important that uses cannot be under estimated. Wood is a natural material produced by the growth of plants; mainly trees and shrubs. These had been used for thousands of years for both fuel and as a construction material. It is an organic material, a natural composite of cellulose fibres.

It is built in a matrix of lignin which resists compression. Wood could be described as the secondary xylem in the stems of tree, Hickey Mand King C. (2001). It is defined more broadly to include the same type of tissue elsewhere such as in the roots of trees or shrubs. However, in a living tree; it performs a support function, this enables woody plants to grow large or to stand up by themselves. It carries water and nutrients between the leaves, other growing tissues, and the roots. Wood may also refer to other plants materials with comparable properties and to material engineered from wood or wood chips or fibre. In 2011 discovery in the Canadian Province of New Brunswick uncovered the earliest known plants to have grown wood approximately 395 to 400 million years ago. In 2011 N.B Fossils show origins of wood. Wood can be dated by carbon dating and in some species by dendrochronology to make inferences about when a wooden object was created. Conversely, wood for millennia for many purposes, primarily as a fuel or as a construction material for making houses, tools, weapons, furniture, packaging, artworks, and paper. These make the year to year variation in tree ring widths and isotopic abundances give clues to the prevailing climate at that time, opined Briffa K; Shishov, V.V; Melvin, T.M; Vaganov, E.A; Grudd, H.; Hantemirov, R.M; Eronen, M; Naurzbaeu, M.M (2008).

In the course of growth or development of a tree; their are some problems or misgrowth that ensued. For instance, the knot is a particular type of imperfection in a piece of wood; it will affect the technical properties of the wood, usually reducing the local strength and increasing the tendency for splitting along the wood grain, but may be exploited for visual effect. Within a knot, the direction of the wood (grain direction) is up to 90 degrees different from the grain direction of the regular wood.

A knot in a tree is either the base of a side branch or a dormant bud. In the course of development of a tree, the lower limbs often die, but may remain attached for a time, sometimes years. Subsequent layers of growth of the attaching stem are no longer intimately joined with the dead limb, but are grown around it. Hence, dead branches produce knots which are not attached, and likely to drop out after the tree has been sawn into boards.

Subsequently, grading lumber and structural timber, knots are classified or divided according to their form, size, soundness, and the firmness, with which they are held in place. This firmness is affected by among other factors, the length of time for which the branch was dead while the attaching stem continued to grow, postulated by record, Samuel J (1914). However, some decorative applications, wood with knots may be desirable to add visual interest. In applications where wood is painted, such as skirting boards, fascia boards, door frames and furniture, resins present in the timber may continue to ‘bleed’ through to the surface of a knot for months or even years after manufacture and show as a yellow or brownish stain. A knot primer paint or solution correctly applied during preparation may do much to reduce this problem but it is difficult to control completely, especially when using mass produced Kiln – dried timber stocks.

No definite relation exists between the annual rings of growth and the amount of sapwood. Within the same species the cross sectional area of the sapwood is very roughly proportional to the size of the crown of the tree. If the rings are narrow, more of them are required than where they are wide. As the tree gets larger, the sapwood must necessarily become thinner, or increase materially in volume. Sapwood is thicker in the upper portion of the trunk of a tree than near the base, because the age and the diameter of the upper sections are less.

Different pieces of wood cut from a large tree may differ decidedly, particularly if the tree is big and mature. In some trees, the wood laid on late in the life of a tree is softer, lighter, weaker, and more even textured than that produced earlier, but in other trees, the reverse applies. This may or may not correspond to heart wood and sapwood. In a large log the sapwood, because of the time in the life of the tree when it was grown, may be inferior in hardness, strength, and toughness to equally sound heartwood from the same log.

Conversely, species which show a distant difference between heart wood and sapwood the natural colour of heart wood is usually darker than that of the sapwood, and very frequently the contrast is obvious. This is produced by deposits in the heartwood of chemical substances, so that a dramatic colour difference does not mean a dramatic difference in the mechanical properties of heart wood and sapwood, although there may be a dramatic chemical difference.

As such, water occurs in living wood in three conditions, namely;

1. In the cell walls;
2. In the protoplasmic contents of the cells and
3. As free water in the cell cavities and spaces.

The general effect of the water content upon the wood substance is to render it softer and more pliable. A similar effect of common observation is in the softening action of water in raw hide, paper, or cloth. Within certain limits, the greater the water content, the greater its softening effect. The greatest strength increase due to drying is in the ultimate crushing strength, and strength at elastic limit in endwise compression; these are followed by the modules of rupture; and stress at elastic limit in cross bonding while the modulus of elasticity is least affected, opined Record, Samuel J. (1914).

Furthermore, the single most revealed property of wood as an indicator of wood quality is specific gravity (Timell 1986), as both pulp yield and lumber strength are determined by it. Specific gravity is the ratio of the mass of a substance to the mass of an equal volume of water; density is the ratio of a mass of a quantity of a substance to the volume of that quantity and is expressed in mass per unit substance, for instance, grams per millimetre (g/cm^3 or g/ml). The terms are essentially equivalent as long as the metric system is used. Upon drying, wood shrinks and its density increases. Minimum values are associated with green (water saturated). Wood are referred to as basic specific gravity (Timell 1986) [15]

Wood density is determined by multiple growth and physiological factors compounded into one fairly easily measured wood characteristic (Elliot 1970). Age, diameter, height, radial growth, geographical location, site and growing condition, Silvicultural treatment, and seed source, all to some degree influence wood density. Variation is to be expected. Within an individual tree, the variation in wood density is often as great as or even greater than that

between different trees (Timell 1986). Variation of specific gravity within the bole of a tree can occur in either the horizontal or vertical direction.

The chemical composition of wood varies from species to species, but is approximately 50% carbon, 42% Oxygen, 6% hydrogen, 1% nitrogen and 1% other elements (these are calcium, potassium, sodium, magnesium, iron, and manganese). Wood contains sulphur, chlorine, silicon, phosphorous, and other elements in small quantity.

Besides, from the lignocellulose, wood consists of a variety of low molecular weight organic compounds, called extractives. The wood extractives are fatty acids, resin acids, waxes and terpene Miroms, Argneta; Michael J. Kuckurek; Jef A Pyiatte and Elizabeth E. Wright (1993). For example rosin is exuded by conifers as protection from insects. The extraction of these organic materials from wood provides tall oil, turpentine, and rosin, quipped Fiebach, Klemens, Grimm, Dieter (2000).

SOME ASSOCIATED IMPACTS OF WOOD AND OTHER ACCESSORIES IN CONSTRUCTION.

Wood has a long history of being used as fuel, which continues to this day; mostly in rural settings to date. Hardwood is preferred over softwood because it creates less smoke and burns longer.

Similarly, wood has been an important construction material since human being began building shelters, houses and boats. Wood that could be used for construction work is commonly called LUMBER in North America. Usually other places refer to it as felled trees, and the word for sawn planks ready for use is timber. Wood like poplar, small-knotted pine, Douglas, fir cedar, Ash, Birch, Cherry, Mahogany, maple, oak, walnut. New domestic housing in many parts of the world today is commonly made from timber framed construction called GREEN BUILDING. Engineered wood products are becoming a bigger part of the construction industry. These could be used for both residential and commercial buildings as structural and aesthetic materials. Buildings made of other materials like stone masonry (Random Rubble masonry and Ashlars' masonry), Brick masonry, Hollow concrete blocks masonry, Reinforced brick masonry, composite masonry and green masonry walls.

Wood will still be found as a supporting material especially in roof construction like (Mansard roof, Gambrel roof, Saltbox roof, Pyramid roof, Hip roof, Bonnet roof, Flat roof, Cross Gabled roof, Arched roof and Skillion roof), in interior decors like doors and their frames, ceiling (dry ell ceiling, suspended ceiling, coffered ceiling, and cathedral ceiling with their underlining materials for doing them like Plaster of Paris (POP), Asbestos, Plywood and Polyvinyl Chloride (PVC), and as exterior cladding. Wood is also commonly used as shuttering material to form the mould (Formwork) into which concrete is poured during reinforced cement concrete (R.CC slab) and in situ construction.

Other materials adjourning or alluded to wood in construction are Rocks. It is hard and compact, natural aggregate of mineral grains cemented by strong more or less permanent bonds. Rocks could be classified as: Igneous Rocks, Sedimentary Rocks and Metamorphic Rocks. Further, cement concrete is a mixture of cement, water, fine aggregate (sand) and coarse aggregate (crushed stone, crushed boulders, gravel) and any admixture approved by the engineer. The proportion of cement, sand or aggregates 1:2 or 3:4 or 6.

In addition, wood is used for floor finishes. This adds as aesthetic value to green buildings. Also, engineered wood products, glued building products 'engineered' for application specific performance requirements are often used in construction and industrial applications. Glued engineered wood products are manufactured by bonding together wood strands, veneers, lumber or other forms of wood fibre with glue to form a larger, more efficient composite structural unit.

Similarly, wood could be used for furniture and utensils. Wood has been used extensively for furniture, such as chairs and beds. It is also used for tool handles and cutlery, such as chop sticks, toothpicks, and other utensils, like the wooden spoon.

It is postulated that in the next generation; new linin glue application, recyclable food packaging, rubber tyre replacement applications, anti bacterial medical agents, and high strength fabrics or composites.

Moreso, wood has long been used as an artistic medium. It has been used to make sculptures and carvings for millennia. Examples include the totem poles carved by North American indigenous people from conifer trunks, often Western Red cedar (Thuja Plicata), and the millennium clock tower now housed in the National Museum of Scotland in Edinburgh. Certain types of musical instruments, such as those of the violin family, the guitar, the clarinet nad recorder, the xylophone, and the marimba are traditionally made mostly or entirely of wood. In the same vein, many types of sports equipment are made of wood, or were constructed of wood in the past. Example, cricket bats are typically made of white willow.

As earlier on enunciated about doors and windows (Timber and steel), the followings are typified windows and doors:-

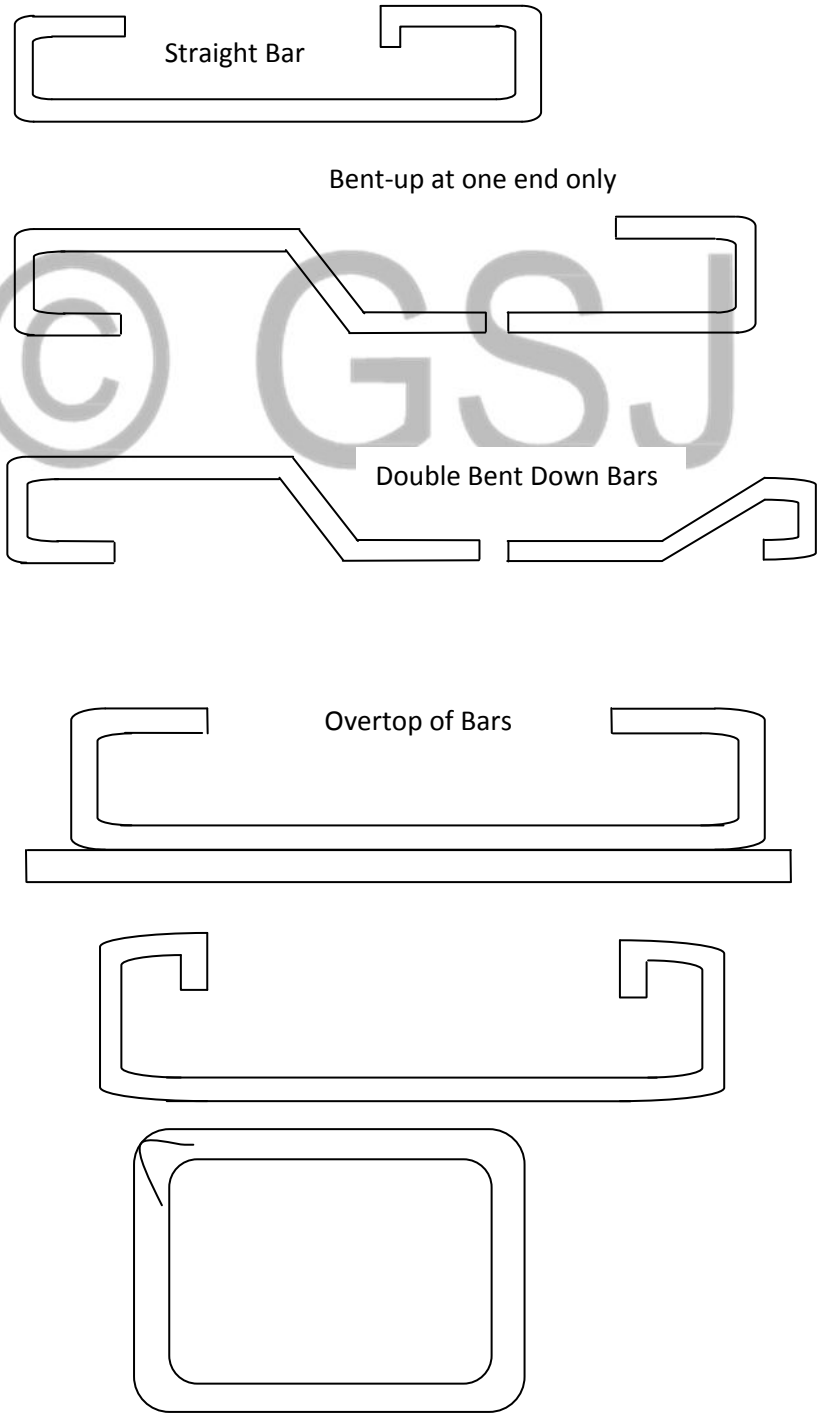
1. Ledged door
2. Ledged and braced door
3. Ledged and framed door
4. Ledged, framed and braced door
5. Flush door
6. Panelled door
7. Panelled and glazed door
8. Panelled venetian door
9. Wire gauged door

All the aforementioned types of doors must be well framed with stile firmly fixed; the bottom rail and top rail must be well fixed and arranged. Panelled doors depend on the types of panelled decided to have.

Furthermore, another aspect of wood and other accessories for construction is the Bar bending schedules for reinforced cement concrete (R.C.C Slab) calculations and diagrams as relate to cantilever beams, columns, slab, pillars to foundations. The process of Bending Reinforcing steel into shapes required for reinforced concrete construction. Bar Bending Schedule (or schedule of Bars is a list of reinforcement bars for a given R.C.C work item, and is presented in a tabular form for easy visual reference.

HOW TO CONSTRUCT BAR BENDING SCHEDULE

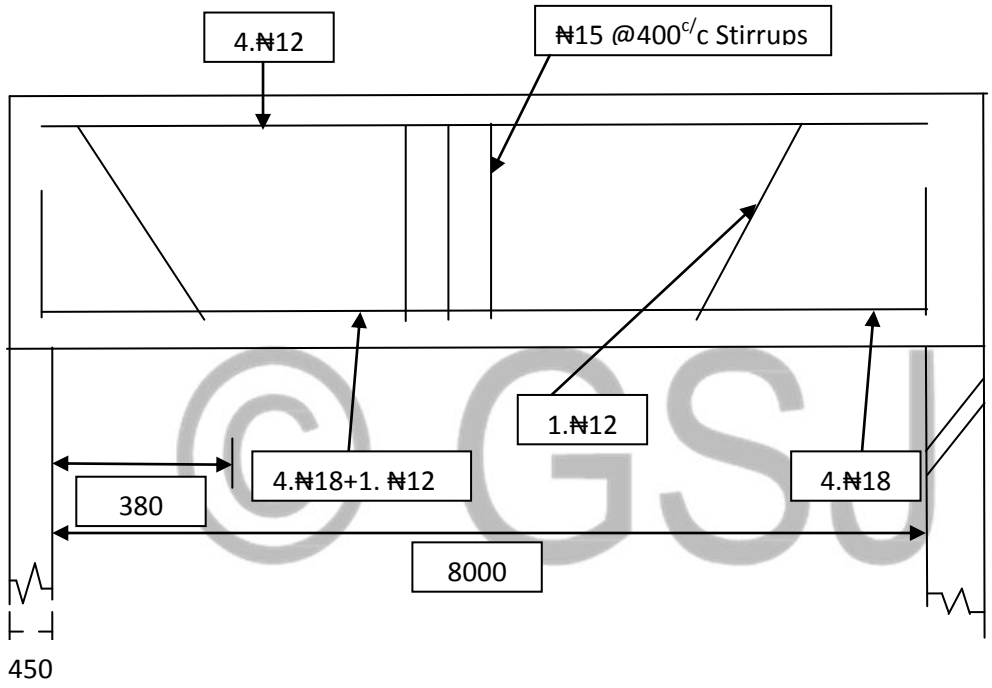
DETAILS OF BAR SHAPE



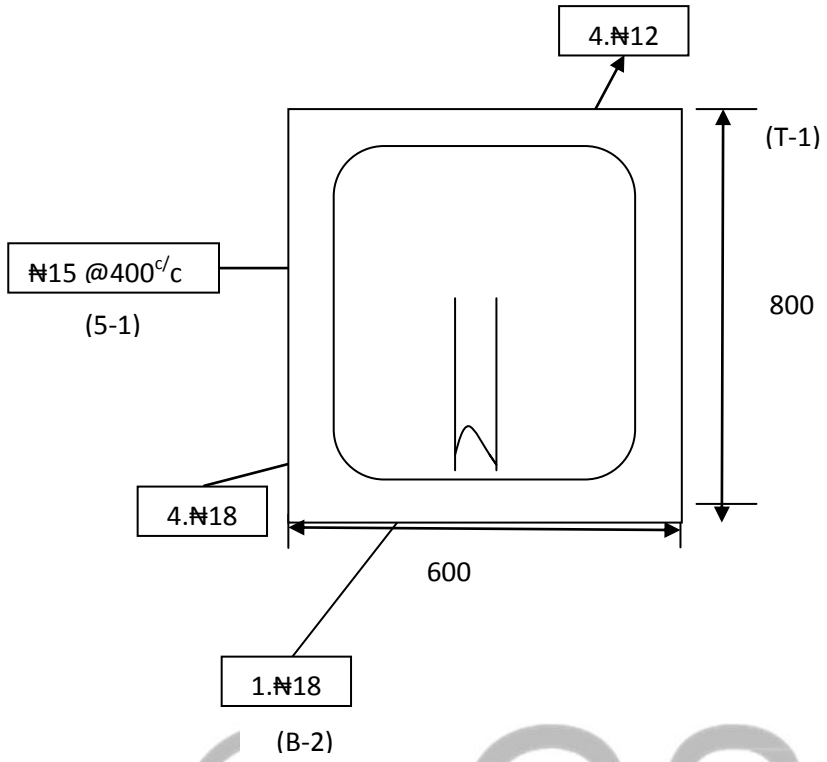
Bar Bending schedule provides the reinforcement calculation for reinforced concrete Beam. It provides details of reinforcement cutting length, type of bends and bend length. Here the researcher calculates samples for reinforcement quantity for a concrete Beam.

Use the below diagrams to answer the questions:

Consider a beam of clear length of 8m, 600mm wide by 800mm depth. It consists of 6 – 20 diameter bars at top, and 6 – 24 diameter and 4 – 16 diameter bars at the bottom. Diameter bars at the bottom. Diameter of stirrup is 20mm spaced at 400m centre to centre. Clear cover to reinforcement provided is 100mm.



LONGITITUNAL SECTION STEEL BEAM BENDING

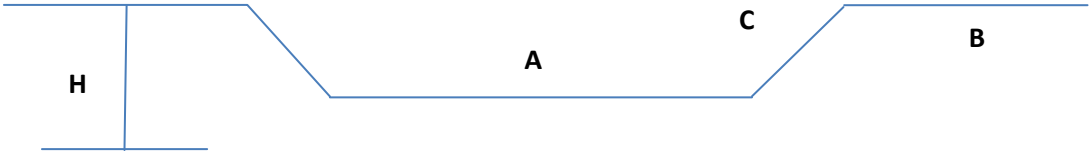


RCC BEAM CROSS-SECTION

SOLUTIONS

Bar Shape of B_1 is as shown below:-

Length of B_1 = clear distance between walls + 2x
Width of walls – 2x bar cover + 2x bend length
Bend Length = 12 x 16 = 192
Bend length is calculated as 12 x diameter of bar for reinforcement conforming to IS: 1786 – 1961
Length of B_1 = 8000 + 4 x 450 – 4 x 100 + 4 x 192
= 8000 + 1800 – 400 + 768
= 9800 – 1168
= 8632 mm
Length of Bar B_2 is calculated based on shape of this bar. This bar bends up near the support as shown below:-



Length of Bar B_2: A + B + C
=8000 + 4 x 450 – 4 x 100 + (1.414 x H – H)

H = 800 – 4 x 100 – 4 x 24 – 4 x $^{24}/6$
= 800 – 400 – 96 -16
= 400 – 80
= 320mm

B_2 = 8000 + 4 x 450 – 4 x 100 + (1.414 x 320 – 320)
= 8000 + 1800 – 400 + (452.48 – 320)
= 9800 – 852.48 – 320
= 9800 – 532.48
= 9,267.52mm
= 9,268mm

Length of Bar T_1 = 8000 + 4 x 450 – 4 x 100
= 8000 + 1800 – 400
= 9800 – 400
= 9400mm
Length of Stirrups S1:

Stirrups are spaced at 200mm centre to centre. Stirrups are provided between walls or support for a beam

No of Stirrups required for given beam

$= {}^{8000}/_{400} + 1.24$

$= 30 + 1.24$

$=21.24$ Stirrups

Length a $= 800 – 4 \times 100 – 20$
$= 800 – 400 – 20$
$= 400 - 20$
$= 380$mm

Length b $= 600 – 4 \times 100 – 20$
$= 600 – 400 – 20$
$= 200 - 20$
$= 180$mm

Therefore Length of 1 Stirrup S1

$= 2 (380 + 180)$mm
$= 2 (560)$mm
$= 1120$mm

Conclusion

Based on the discussion so far, the researcher would like to adduce that impacts of wood and other accessories in construction cannot be over emphasized. Hence, it is probable to use wood reasonable quantity and quality to effect good, formidable, economic, more stable structure, serviceability type of structures, more flexible, strength aesthetics, durability, safety of which they will all lead to stable structural analysis and structural design. Of recent wood structures are becoming more economical and provide aesthetics than most masonry walls structures, especially in some parts of the country; Nigeria.

Recommendations

The followings were the recommendations made as a result of the conclusion drawn:

1. Wood construction should be recommended for economy reasons and for more affordability.
2. Wood structures should be built as a result of modernisation.
3. It is recommended because of the local content, material and costs. These bring in cost benefit analysis and cost effectiveness analysis.
4. Wood construction is recommended as it will avoid collapses, failures, stress and instabilities.
5. The professional bodies in construction; Nigeria Institute of Architects (NIA); Architect Registration Council of Nigeria (ARCON), Nigerian Society of Engineers (NSE), Council of Registered Engineers of Nigeria (COREN), Nigerian Institute of Builders (NIOB),

Nigerian Institute of Quantity Surveying (NIQS), Nigeria Institute of Estate Management and Valuers (NIEMU), Nigerian Institute of Town Planners (NITP) and government should jointly work together to achieve common goals and achieving their vision and mission.

6. Green Building is an affordable structure; hence the recommendation.

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