

THE USE OF DRY CONSTRUCTION AND ITS APPLICATION ON SUSTAINABLE HOUSING IN NIGERIA

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Abstract

This research was aimed at implementing sustainability principles in the building construction industry the objectives of this research is to examine the material used for dry construction in Nigeria, to identify the benefits that can be gotten from the application of dry construction into building construction in Nigeria. To attain this aim questionnaires were given out to different construction personnel in delta state, sixty questionnaires were successfully retrieved out of one hundred that were given out. The results from the questionnaire were analyzed and used to attain the above objectives.

Keywords: Dry, Application, Sustainability, Construction

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Introduction

Housing is known to be among the best makers of people's way of life and of his/her place amongst the viewer's eyes. Housing and building are a necessity for a man's life but most Nigerians don't have access to good housing due to poor construction and unreliability of building materials of building constructions in Nigeria. This has brought to light the issue of providing sustainable and affordable housing without compromising the cost of construction. Dry construction practices have recently been implemented in a bid to find a balance between quality and cost efficiency. Housing and buildings conditions likewise mirror the expectations for everyday comfort of the public (Venkatarama, 2004). According Oxford dictionary of English, Housing is a protective cover designed to support and contain a person or group of people or a mechanical component, it's also a structure collectively in which people are housed.

Dry construction is a type of construction in which the interior wall is applied in a dry condition without the use of mortar. It contrasts with the use of plaster, which dries after application. The materials used in drywall construction are gypsum board, plywood, and fibre-and-pulp and boards asbestos-cement board.

The dry construction system as a forefront building system which has the inclination to make the reading of the building procedure into a modern procedure, according to Le (2014), the system is a faster construction scheme that allows up to 70 % construction efficient saving time unlike the normal wet construction applying blocks and cement. He also stated that whatever design outcome or idea the architect can ideate the dry construction/dry wall construction system can accomplish it. Dry construction as the name states it's a construction that is dry, this system of construction is unlike the traditional use of sandcrete block and brick, which requires most use of water for construction. This method requires very little use of water while erecting the

structure. It also involves the use of other materials like frames, panels and boards to construct the building.

Dry construction/dry wall construction is a common way of construction in countries like US. While in Russia, UK and Europe are using both dry and wet construction system. Dry construction adverts to building construction managed without mortal, most of the structures in Nigeria are constructed from sandcrete blocks and bricks. With the utilization of dry wall construction in building construction, constructing a four-bed room flat can be done within 2-3 months instead of a year or more using the normal/traditional construction system which is the use of sandcrete blocks. With this research the problem of unsustainable housing in Nigeria can be solved.

Dry Construction can be depicted as technique for construction where dominant part of the segments of the structure are pre-created off site and brought to site for gathering. Effectively manufactured to structure determinations housing tasks can be conveyed quicker, less expensive and to I the procedure of industrialization is applied. Dry construction process which is a result of Industrialization applied to building process is moderately unbendable as it utilized to building process is generally resolute as high volume of units are fundamental for monetary creation for example large scale manufacturing. Change in structure or in part includes changes in plant which could cause genuine postponement, loss of time and an expansion in generally costs. Dry Construction is most practical when applied to construction of mass housing with extensive reiteration of a similar kind of segments. Industrial facility design and creation or segments requires an enormous capital speculation for plant and premises and requires consistent progression of interest in items in other to keep up plant and gear.

The hidden explanation behind the new technique was to lessen the measure of site laborers associated with building activities, to decrease cost and to expand the business efficiency. This offered ascend to association and creation techniques which are normal for other exceptionally motorized industry in which efficiency is high and items are moderately modest. Idea on dry construction rose up out of the procedure of the assembling business. The idea is formed towards meeting the consistent progression of interest and guaranteeing congruity of creation, normalization, synchronization of the various phases of creation forms, a serious extent of association of work, automation to an enormous degree to supplant however much as could reasonably be expected physical work.

Dry construction technique is viewed as the best elective construction strategy by specialists. It uses composite boards or sheets introduced on metal or wood structures to outside dividers, inside dividers, roofs and numerous different applications (Adegbave, 2016). Nigerite's Group Marketing Director Mr Toyin Gbede in a meeting with Okwy Iroegbu-Chikezie on "Dry construction can connect housing hole" expressed that the regular wet construction process is exceptionally work escalated and delayed in housing conveyance. It exhausts the earth through broad use sand, rock and wood. Clearly, there is, in this way, a need to take a gander at the manner in which we work by utilizing elective procedures and innovations that will generously improve the manner in which we get things done.

For example, it takes around one year to fabricate a three-room house yet the new innovation takes pretty much two months or less. The innovation is tied in with amassing the different segments of a structure and carrying it to site to assemble it into a house. It makes considerable

addition in construction time, making new aptitudes and retooling talented work for improved productivity. The thought is to support Nigerians into tolerating a non-ordinary structure process that will help in fathoming the topic of effective and global best practice in current structure construction(Chukwuemeka, Clinton 2022, Ogundipe, Ogunbayo, Olofinnade, Amusan, Aigbavboa 2021).

Regarding cost suggestions, he noticed that it's less of value differentials, which is in any case, clear yet what is advantageous, reasonable and ready to withstand the notions of nature particularly in nowadays of environmental change issues. With ordinary wet construction process for instance, on the off chance that you go to the bank to acquire cash to assemble three-room house, it will take a normal of a half year to one-and-half years to manufacture and involve however the bank starts to charge enthusiasm on head from the day the credit is affirmed. You are additionally helpless before various laborers who don't feel the weight from the bank in this way, for the length of the construction time frame, you are not picking up yet at the same time paying bank enthusiasm for option to lease on the off chance that you are as yet an occupant. Interestingly with dry construction strategy a similar 3-room takes a normal of a couple of months to raise while the financial specialist quits paying rent with sufficient opportunity to reimburse the bank credit.

There are no place individuals consider better approaches for getting things done and permit introductory interruptions to settling an endemic issue. Eventually, as a matter of fact in other driving economies where this technique is by and large broadly utilized the cost descends by 30 percent. Different benefits related with dry construction are decrease of construction time, because of the way that basic work nearby is kept to developing the establishments and raising the pre-created parts, amount of materials required is diminished as formwork and platform are to a great extent killed, less labor is required since the vast majority of the pre-manufactured segments are made in a plant or at any rate under processing plant conditions, better nature of items is acquired and construction can continue freely of climate conditions (palanichamy, Muthuramu and Jeyakumar 2002). A drawback to dry construction is its weight. A standard 4-by-8 sheet of 1/2-inch drywall gauges in excess of 50 lbs. This implies it is possible that you need an accomplice to assist you with moving and introduce it or you have to pay to have it conveyed and utilize a machine called a drywall jack to introduce roof boards on the off chance that you are taking a shot at a roof. Another drawback to drywall is that it isn't as adaptable as mortar, so dry-construction bended surfaces is testing and may not accomplish the ideal outcomes.

Construction authorities have added voice to the require the appropriation of another cutting edge building framework known as Kalsi Dry Construction strategy, which tends to make an understanding of the structure procedure into an advanced procedure in the nation's housing territory. The stem is a more versatile and quicker construction technique, allowing up on strategy, allowing up to 70 percent construction efficient conceivable when contrasted and the standard wet construction that incorporates using of blocks and blocks. In contrast to the standard block and block strategy, the framework, requires least use of water and it produces least construction waste, jam room temperature and gives vitality productivity. It said that experts talked at the dispatch of model house known as Kalsi Experience Center by Nigeria Limited in the Lagos premises of the association. Within includes a duplex, which typifies the dynamism and accuracy of the Kalsi sheets and offers to investigate the striking and boundless possible

results of the dry construction framework. Commenting within, Chairman Nigerian Institute of Architect, Ladipo Lewis, communicated that the Kalsi building board was an acknowledged turn of events and offers a new additional opportunity for the structure and construction industry in Nigeria. He noticed that the time has come for Nigerians got a handle on change because of the various favorable circumstances in that (**Chukwuemeka, Clinton** 2022, Ogundipe, Ogunbayo, Olofinnade, Amusan, Aigbavboa 2021).

In any case, dry construction has been a notable wonder the world over for quite a while, yet it is still by and large phenomenal in Nigeria, that is the explanation Nigeria Limited, knowing the characteristic favorable position of this technique has ventured up with respect to pass on the structure board answer for Nigeria", said Nigeria regulating Director, including that Kalsi sheets are not planned to uproot the wet strategies, but instead that it was expected to enhance and make a possibility for manufacturers. The association anyway engaged that the benefits of the loads up over the standard techniques are never-ending, equipped for setting aside to 70 percent of construction time. "It is moreover reasonable, harder, more grounded. Lighter, more flexible and considers more conspicuous flexibility in construction structure". Different preferences of the dry procedure are that it reduces wastages, takes into account simple establishment of funnels and different administrations, it is greater condition benevolent and vitality proficient. Concerning cash sparing favorable position. The certified estimation of the dry construction relies upon key components like speed of foundation, minimal degree of help, straightforward fix, inconsequential abuse of material and improvement in material contrasted with blocks and concrete." In most various pieces of the world dry construction has been an "in-thing". Noticed that developers in like manner recognized the structure load up arrangement and that it is time Nigeria concurred affirmation of the item. This development is sufficient and it will fly. I understand that with time people will recognize it.

The issues of giving sustainable housing in developing countries, for example, Nigeria are huge and multifaceted. One measurement manages the procedure for fast conveyance of housing to the majority, while different arrangements with the development of items (housing) inside the conveying limit of supporting biological systems. For the most part, the structure segment is evidently a champion among the most asset concentrated ventures. Contrasted and different ventures, the structure business rapidly creating world vitality use and the usage of restricted oil subordinate resources has authoritatively raised concerns over flexibly challenges, fatigue of vitality assets and significant biological impacts ozone layer exhaustion, carbon dioxide emanations, an Earth-wide temperature boost, environmental change. Building material creation expends vitality, the construction stage devours vitality, and working a finished structure expends vitality for warming, lighting, force and ventilation (**Chukwuemeka, Clinton** 2022, Ogundipe, Ogunbayo, Olofinnade, Amusan, Aigbavboa 2021).

Despite vitality usage, the structure business is considered as a critical supporter to ecological contamination, a significant utilization of crude materials for worldwide utilize that creates a tremendous proportion of waste. It also helps (dry construction) to reduce the enormous material waste during building construction in Nigeria. Nigeria's uncompetitive construction sector leaves an entree open to imported materials which is costly in Nigeria Through this research it is important to find solutions to these problems, by the application of dry wall construction on providing sustainable housing in Nigeria (**Chukwuemeka, Clinton** 2022, Ogundipe, Ogunbayo, Olofinnade, Amusan, Aigbavboa 2021).

The idea around dry construction is notable for a long time and comprises of utilizing building loads up introduced over a wood or light steel frame sub-development. After the erection of every one of these components, a straightforward completion method permits to have outside dividers (cladding), inside dividers (segments), roofs, floors and some different applications in a productive and down to earth way, perfect for new structures or redesign ventures. The cost productivity, quality, sturdiness, structure adaptability, versatility, are only a portion of the numerous focal points of dry construction over square, bricklaying or wood. With regards to money saving advantage, the genuine estimation of dry construction depends on key elements like the speed of establishment, the most reduced degree of support and simple fix, the insignificant misuse of materials and enhancement in materials contrasted with blocks and concrete, which are equivalent words of wet, wasteful and messy works. Dry construction incorporates the usage of materials, for example, gypsum board, compressed wood, or wallboard in construction, without the utilization of mortar or mortar. It is less expensive in this manner making home proprietorship moderate to a bigger level of the populace (Adebayo, 2013). At the point when we have dry construction, we mean structure construction without the utilization of mortar or mortar. The utilization of dry materials speeds the construction procedure and permits prior inhabitation. Dry construction process lessens wastages, takes into account simple establishment of funnels and different administrations, it is greater condition amicable and vitality effective." With accentuation to money saving advantage, the genuine estimation of the dry construction relies upon key factors like speed of establishment, the most decreased degree of upkeep, straightforward fix, irrelevant abuse of material and advancement in material contrasted with blocks and cement." (Adam, 2010).

The focus of this research is to determine the use and influence of dry construction in building construction and its application on sustainable housing in Nigeria. The objectives of this research are to: determine what dry constructions are, and its function in building construction; examine the material used for dry construction in Nigeria; and identify the benefits that can be gotten from the application of dry construction into building construction in Nigeria. The outcome of this research will edify all construction personnel i.e. builders and other personnel involved in building construction, the positive effectiveness and requirements to utilize the application of dry construction in sustainable housing in Nigeria. This research will identify the advantages of dry construction in the Nigeria's construction industry. This research will also identify the processes involved in dry construction to ensure sustainable housing in Nigeria. Dry wall construction utilizes less construction materials unlike the sandcrete block normally used in construction of buildings. The use of dry wall construction will reduce the amount of wasted building materials on site and also, avoid the delays made during the supply of building materials like sandcrete blocks etc. this research we greatly help in providing adequate knowledge and information on dry wall construction (Chukwuemeka, Clinton 2022, Ogundipe, Ogunbayo, Olofinnade, Amusan, Aigbavboa 2021).

Research Methodology

In this research two (2) methods were used which are the primary and secondary method to attain a complete analysis and viewpoints of the plaintiffs. This consists of the distribution of well-prepared questionnaires to some of the construction personnel in delta state, i.e. builders, architects, Q.S and civil engineer. This consists of a published or unpublished work that is studied and then reestablished by either describing, evaluating, summarizing or collected based on the

primary source resources.

Data was derived from previous publications in journals, textbook and internet bases on this research. This research is limited to Delta state. Delta state is an oil and it's also an agricultural producing state in Nigeria. It is located in the south-south region with a population of 4,112,445, male; 2,069,309, females; 2,043,136. (Wikipedia, 2018). The method used in this research was the survey research method. This research is put together to research dry construction on ensuring sustainable housing in Nigeria. Data's seen in this research are from matters on dry construction and collected questionnaires. The survey method will be used to inspect numerous variables (Emetere, Bello, Afolalu, Amusan, Iroham, Odun-Ayo 2021),

The population of this research entails of construction industries and its personnel that practices dry construction in Nigeria. The goal population consist of personnel's mainly from construction segment. These personnel are chosen due to their capability to postulate dry construction for the use in building company. The data composed from the survey were examined using the (SPSS) i.e. *statistical package for social sciences*. These results were exemplified using MS packages. The data were shown using tables, frequencies, percentages, bar chart, etc. in the research.

Results and Discussion

An overall number of 110 questionnaires were dispersed while only 60 were retrieved. The analysis of the data from the questionnaire obtained were interpreted using SPSS. These data analysis was given according to the objectives in the questionnaire. In attaining this aim the insight of the following professionals (builders, architects, civil engineers, structural engineers, Q.S, technicians) and others from the construction industry were analyzed. Table 1 presents the breakdown of the professional fields of respondents. Built on the analysis of the questionnaire they were 60 respondents.

Table 1: Professional structure of respondent

S/N	RESPONDENTS' DETAILS			
	FREQUEN CY	PERCENTAGE	VALID PERCENTA GE	CUMULATI VE PERCENTA GE
BUILDERS	13	21.7	21.7	21.7
ARCHITECT	11	18.3	18.3	40.0
CIVIL ENG	10	16.7	16.7	56.7
STRUCTUR AL ENG	2	3.3	3.3	60.0
Q.S	6	10.0	10.0	70.0
TECHNICIAN	4	6.7	6.7	76.7
OTHERS	14	23.3	23.3	100.0
TOT AL	60	100.0	100.0	

Table 2 presents the breakdown of the academic qualification. Built on the analysis of the questionnaire.

Table 2: Academic structure of respondent

ACADEMIC QUALIFICATIONS					
S/N		FREQUENCY	PERCENTAGE	VALID PERCENTAGE	CUMULATIVE PERCENTAGE
	BSC/B.TECH	25	41.7	41.7	41.7
	MSC/MBA	13	21.7	21.7	63.4
	PH.D	6	10.0	10.0	73.4
	OND/HND	9	15.0	15.0	88.4
	OTHERS	7	11.6	11.6	100.0
TOTAL		60	100.0	100.0	

Table 3 presents the breakdown of the years of experience of the respondents. Built on the analysis of the questionnaire distributed.

Table 3: Job experience of respondent

YEARS OF EXPERIENCE					
S/N		FREQUENCY	PERCENTAGE	VALID PERCENTAGE	CUMULATIVE PERCENTAGE
	1-5 YEARS	23	38.3	38.3	38.3
	5-10 YEARS	20	33.3	33.3	71.6
	10 YEARS AND ABOVE	17	28.4	28.4	100.0
TOTAL		60	100.0	100.0	

Table 4 presents the breakdown of how well the respondent known about dry construction. With the table shown below the level of awareness is moderate.

Table 4: Respondents' knowledge of dry construction

S/N	LEVEL OF AWARENES		VALID PERCENTAGE	CUMULATIVE PERCENTAGE
	FREQUENCY	PERCENTAGE		
	VERY HIGH	4	6.7	6.7
	HIGH	20	33.3	40.0
	MODERATE	26	43.3	83.3
	LOW	6	10.0	93.3
	VERY LOW	4	6.7	100.0
TOTAL		60	100.0	

The materials used for dry construction in Nigeria are presented in Table 5.

Table 5: Materials used for dry construction in Nigeria

S/N		MEAN	INDEX	RANK
	WOOD (TIMBER)	3.38	0.676	2
	GLASSWOOL	3.10	0.62	3
	POLYSTYRENE	3.04	0.60833	4
	METAL	3.84	0.768	1
	PVC	2.61	0.52083	5
	FABRIC	2.32	0.46531	6

The Table 5 shown above shows the following responses from the respondents when asked if wood shows sustainable properties in Nigeria construction. For Builders; (0 disagreed, 2 not sure, 9 agreed, 2 strongly agreed), For Architects; (0 disagreed, 1 not sure, 5 agreed, 5 strongly agreed), Civil Engineers; (0 disagreed, 1 not sure, 7 agreed, 2 strongly agreed), Structural Engineers; (0 disagreed, 1 not sure, 0 agreed, 1 strongly agreed), Q.S; (1 disagreed, 3 not sure, 1 agreed, 1 strongly agreed), Technicians; (0 disagreed, 2 not sure, 2 agreed, 0 strongly agreed), others; (0 disagreed, 1 not sure, 10 agreed, 3 strongly agreed), this shows that most of the respondent agreed that wood shows sustainable properties in Nigeria construction. Table 6 presents the respondents' view of wood for dry construction

Table 6: Respondents' view of wood for dry construction

WOOD
(TIMBER)

S/N	FREQUENCY	DISAGREED	NOT SURE	AGREED	STRONGLY AGREED
BUILDERS	13	0	2	9	2
ARCHITECT	11	0	1	5	5
CIVIL ENGINEER	10	0	1	7	2
STRUCTURAL ENGINEER	2	0	1	0	1
Q.S	6	1	3	1	1
TECHNICIAN	4	0	2	2	0
OTHERS	14	0	1	10	3

TABLE 4.6

The Table 6 shown above shows the following responses from the respondents when asked if steel is the best sustainable material (structural/frame) used for dry construction. Most of the respondents agreed to the fact that metal (steel) is the best sustainable material (structural/frame) used for dry construction. The benefits gotten from the application of dry construction in Nigeria is illustrated in Tables 7 & 8. The Table 7 below shows the respective benefits associated with dry construction in Nigeria. Speed in construction time was shown to the most significant benefit which was followed by the design flexibility.

Table 7: Benefits gotten from the application of dry construction

	MEAN	INDEX	RANK
CONSTRUCTION TIME SPEED	4.28	0.856	1
LABOUR SAVING	4.04	0.808	4
BETTER CONSTRUCTION QUALITY	3.60	0.72	6
BUILDABILITY	3.94	0.788	5
ENVIRONMENTAL FRIENDLY	4.10	0.82	3
DESIGN FLEXIBILITY	4.14	0.828	2

Figure 1 shows the data gathered from the respondents when asked if dry construction takes lesser construction time. This result shows that most of the respondent agreed to the fact that dry construction takes lesser construction time

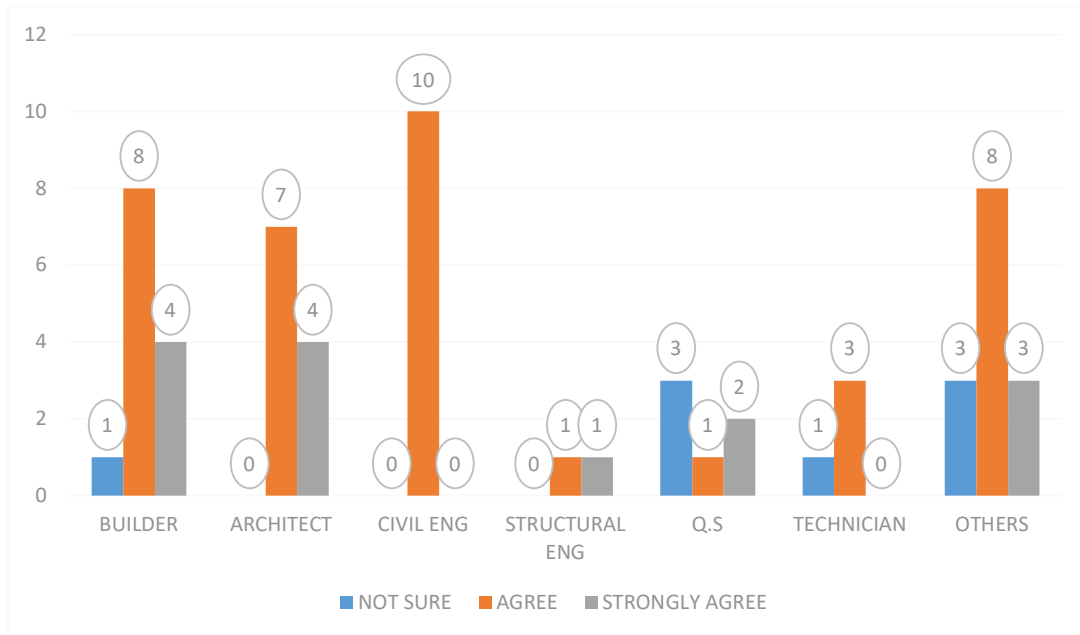


Figure 1: View of professionals on dry construction

Figure 2 shows the responses from the professional respondents when asked if dry construction has design flexibility. This result shows that most of the respondent agreed to the fact that dry construction has design flexibility.

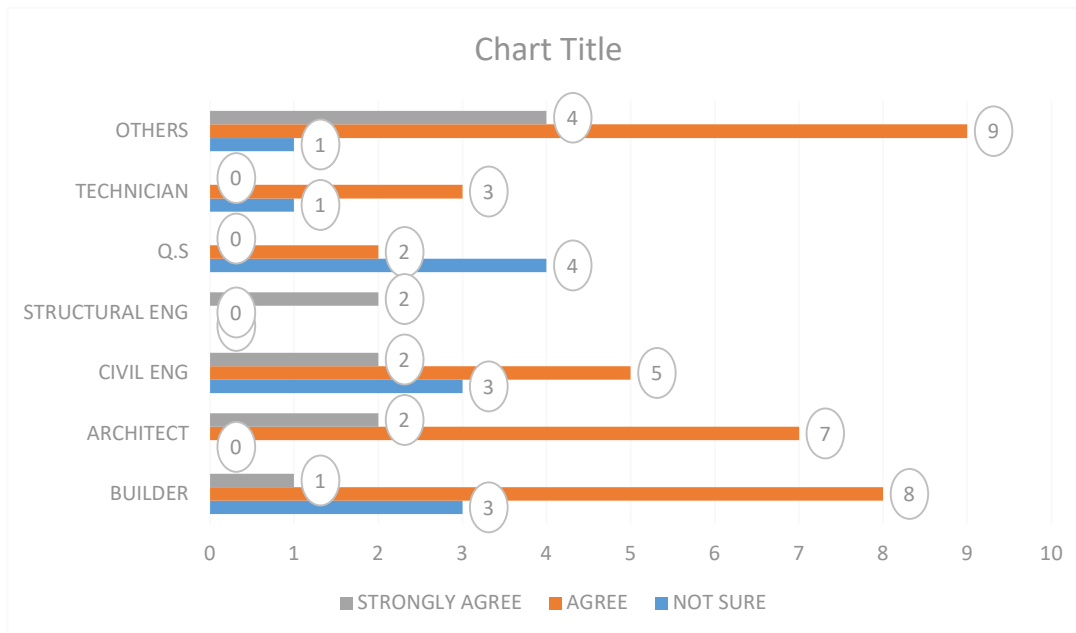


Figure 2: Professionals perception on the flexibility of dry construction

This report considered and investigated a portion of the essential construction expert's view on the procedures for executing sustainability in dry construction system in Nigeria. It also looked at a portion of the materials utilized for sustainable dry construction system in Nigeria and furthermore a portion of the advantages picked up from the use of dry construction in construction work. From the above outcomes, it was seen that some construction experts are as yet not mindful

of this technique for construction, this shows there is despite everything need to raise up consciousness of this strategy for construction both to construction organizations and key partners of the construction business. Ayedun and Oluwatobi (2011), Emetere, Afolalu, Amusan, Mamudu (2021).

In light of recycling potential and simplicity of demolition, human health and comfort, energy conversation and versatile reuse of a current building, the examination done shows that in this recognized regions the dry construction strategy for construction is executing these techniques as surveyed by the respondents , while dependent on least upkeep materials, utilization of locally accessible materials and water preservation, the utilization of dry construction strategy is evaluated to actualizing least sustainability as is required or essential.

Conclusions

From the research research, we were able to attain the following conclusions, It came to a conclusion from the insight of the respondent recycling potential and simplicity of demolition, human health and comfort, energy conversation and versatile reuse were recognized as major reasons for implementing dry construction for sustainability in Nigeria. It was discovered that steel is recognized to be best sustainable (structural/frame) material used for dry construction in Nigeria.

During the research it was discovered that the speed construction time of construction is the major benefit from the application of dry construction in Nigeria. It was discovered that level of awareness of dry construction amongst construction personnel's is moderate. The following recommendations below were obtained from the research outcome: The research of dry construction should be implemented in the educational forum to increase the level of awareness amongst the construction personnel in training. People should be educated on the benefits on use of dry construction over wet construction. More research should be carried out by construction personnel on dry construction.

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