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QUALITY CONTROL IN ABUJA MASS HOUSING

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Houses constructed under the Abuja Mass Housing Scheme are faced with challenges of non adherence to quality which result in the defects of houses built under the programme. The study evaluated the common defects in 108 housing units by the administration of structured questionnaires and semi structured interviews. The questionnaires and interviews set up were based on the categorisations of defects adopted from Project Management Tool Kits 2008 for measurement of defects in buildings. The data obtained from the semi-structured interviews were transcribed and content analysis was used to determine the themes and constructs leading to the identification of various types of defects. Furthermore, the data obtained from the structured questionnaires were analysed using mean ranking analysis of factors associated with the causes of the various defects in the estates. The results and data generated were transcribed. The analysis and key findings indicated that the common defects in the housing included cracks and plaster failures occurring in all the houses studied. Further defects were observed were electrical fittings malfunctions; irregular water supply and leakages of connecting pipes in over 50% of the facilities. The study also indicated that there were no quality control supervisions on the project. The contractors who were engaged for the projects lacked experiences in construction works. The study thus, concluded that the defective works of the mass housing projects were as a result of lack Quality Management (QM) on the project. It is recommended that quality control operational techniques should be adopted for use in control and measurement of the quality of materials and workmanship for quality mass housing production.

Key words: Abuja mass housing, common defects , quality control

INTRODUCTION

Sanusi (2003) asserted that housing is mankind most important basic need; and also one of the indices for measuring standards of living of people across societies. Ismail et al. (2012) affirmed that housing is not only basic need, but it is also a human right issue; and that the provisions of new houses are to be free from any defects. Dadu (2011) however reported that the provision of affordable housing

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has continued to pose a challenge to the Sub-Saharan Africa with Nigeria inclusive. In addition, Andrew (2007) stated that the country is bugged with a housing insufficiency of about 18 million units in which about N60 trillion is needed to remedy the deficit. Thus, the Federal Government of Nigeria (FGN) since independence of the country in 1960 has adopted various strategies in its efforts to provide affordable housing to the citizenry. Anthony et al. (2017) provided an overview of Housing delivery efforts' in Nigeria, and re-counted that from 1962 to 1968, the government focused principally on the provisions of housing in Lagos (the the Federal Capital of Nigeria);it had proposed the construction of 61,000 housing units, but sadly only 500 units were actually built. Government again in 1979 launched the National Housing Scheme (NHS) with the aim of building 400,000 housing units across the country; and again in 1983, government initiated the National Prototype Housing Scheme (NPHS) with the intention of building a variety of houses in selected states of the Federation. But Anthony et al. (2017) lamented that not much was achieved with all these schemes and programmes on the housing delivery efforts of the country. In 1980 for instance, government proposed the construction of 202,000 houses in Lagos and the State Capitals of the federation, again regrettably only about 28,000 units were constructed. But commencing from 1992, the FGN focus its housing programme on Abuja when it became the Administrative Capital of Nigeria in December 1991.The city at that time had an estimated population of 387,671people; but it had grown to 2,245,000 in 2012 with a growth rate of approximately 9.3% (Abdullahi and Wan, 2010; Elaigwu, 2009).

Muhammad et al., (2015) reported that as a result of Abuja population growth, the city is faced with acute housing shortage compelled by the spontaneous relocation of federal capital to Abuja in 1991 without adequate provisions on the anticipated influx of people to the new administrative capital city. Thus, in order to address the housing challenges, government rolled out three new Housing Policies for affordable housing for the FCT (Ogunsanya, 2011; Muhammad et al., 2015); by pegging of interest rates on Housing Loans to a maximum of 6%; introduction of Estate Development Loans (EDL); and the rolling out of guide lines for Build, Operate and Transfer (BOT) initiatives, under the operations of Public Private Partnership (PPP) scheme. These policies created the enabling environment for active private sector participations in housing delivery in the FCT. Under these initiatives, Government provide the primary infrastructure and allocate land to private developers; and the private developers, in turn, provide secondary and tertiary infrastructure as well as developed and sell completed houses to members of the general public (Umoh, 2012; Muhammad et al.,2015). Thus, Ogunsanya (2011) reported that, the Estate Developers turn out en-mass to participate in the Mass Housing scheme.

Lamentably, the housing units being produced and marketed by the private developers are flawed with defects and are of poor quality. Dorcas et al,.(2019) asserted that this poor quality project delivery is a major problems that Nigeria construction industry is faced with ; and that the factors that cause defects in newly constructed housing, chiefly among them are construction mistakes, use of inexperienced labours, poor management commitment and leadership styles. (Zane, 2005) averred that developers of mass housing are in habit of producing defective works as a result of their QC operational deficiencies. As a result,

Ogunsanya (2011) asserted that that this make defects in Abuja mass housing very common. Some of these defects include failures in finishes; mechanical and electrical malfunctions; and that in some instances defects in new houses could cost the new owners' considerable financial resources in repairs after purchases (Mastin,2008).The consequences of these defects are that they affect the quality of the finish buildings and the environment. Defects are a foremost a challenge in the Nigeria building Industry particularly with the mass housing projects in Abuja. But amazingly, Ojo and Ijatuyi (2014) reported that defective housing construction is global and not limited to Nigeria or developing economies alone; and there are proofs of the existence of the problem of defective construction claims on defective construction in the California Housing Market Project in the United State of America.

But defects are faults that could affect the quality, durability, functionality of newly completed housing; and would harm the societies' especially in the present efforts of environmental sustainability and development (Zane, fects in the 108 housing units of Integrity Court, Lake View and Savannah Estates and proffer permanent solution to defects menace and quality control issues in estates development in Abuja.

LITERATURE REVIEW

Quality control in housing construction

Adeoye (2016) stated that quality is a mental or moral attribute of things which can be used when describing the nature, condition or property of that particular thing; and further assertion is that though quality is a product of subjective judgment housing must be of good quality in compliance with tolerable standard and must among other special effects be free from serious despair and energy efficiency. The function of the construction firms QM hence is to produce quality housing. Tang et al. (2005) stated that QM includes continuous methodical and independent assessments for the establishment of, whether quality activities results conform to plan objectives of management. In housing production, QM is the process of identifying and administering all activities needed to achieve the quality objectives of the organization. Though, Mass Housing production does have the challenges of Quality Control (QC) from the substandard works of both Contractors and Sub Contractors, it is the responsibility of the QC managers to insure that housing productions are carried out by professionals according to the satisfaction of prospective home owners (Zane, 2005; Mastin,2008).

Defining defects in housing construction

Defects in newly completed buildings have continued, in spite of the available of technical information globally on quality house production practice. Diverse researchers thus, have made divergence definitions of what constitute defects in buildings. Buys & le Roux (2013) stated that the word 'Defects' itself referrers to construction faults that exceed ordinary imperfections, which could affect the basic structural element of the building; and could reduce the value and functional characteristics of the building, installation, or the structure. Even as Atkinson (1999) appraised defective construction works as works which fell short of complying with the specific requirements of the contract on quality, workmanship, aesthetics and performance of the facilities. Sulieman et al (2014) in contrast,

defined building defects as building or house flaws, or design mistakes that reduce the functionality of the house to the occupants. Other researchers asserted that defects are: failing or shortcomings in the functions of the building; any breach of contract affecting the quality of work (structural or decorative); felling short of meeting the terms of the specific descriptions or requirements of the contract with any implied terms as to durability, quality, workmanship, permanence and artistic views of the project (Chamber, 1994; Atkinson, 1999; David, 1999).

Defects in housing

There are a variety of causes leading to defects in housing construction. Dorcas et al, (2019) asserted that severe factors affecting project quality in Nigeria construction industry are: construction mistakes, use of inexperienced labours; and poor, inspection, and management commitments and leadership styles. Buys & le Roux (2013) stated that other factors leading to defects in newly completed housing include inadequate artisan skills, projects management failures and defects dominated by over design related origins. Richardson (2001) added that negligence on the part of workmen, use of substandard building materials; absence of professionals in the project building team; and use of unqualified contractors are some of causes of common defects in recently built houses. Other researchers asserted further that major causes of defects in fresh buildings include non-compliance with Building Code and Building Regulations Standards; deficiencies in designs, planning and supervision of construction of new buildings (Bakri and Mydin,2013;San-Jose et al (2011).The consequences of these causes of common defects associated with mass housing construction and newly completed housing, Richardson (2001) asserted that these defects include cracks; water seepages; electrical malfunctions; faulty drainages; plumbing defects; peeling and fading of paints. Bakri and Mydin (2013) added that other common type's defects include faulty ventilation, cooling or heating systems and insufficient insulation or sound proofing.

THE STUDY AREA

Abuja FCT: The city is located in the central part of Nigeria, north of the confluence of the Niger and Benue Rivers (Muhammad et al, 2015).and lies at latitude 9.072264, and the longitude 7.491302. Global Position System (GPS) coordinates of 9° 4' 20.1504'' N and 7° 29' 28.6872'' E (newworldencyclopedia.org).According to Jibril and Garba (2012), Abuja Capital City is made of 22 Administrative Districts; its area covers7,315km square (newworldencyclopedia.org).Each of the districts is further divided into neighborhoods for planning and development purposes. A population of 3.2 million was envisaged for the FCT at the inauguration of the capital city in 1991 as an ultimate population (Ukoje and Kanu, 2014).

MATERIALS AND METHODS.

A Developer built 108 Housing Units in tree Estates in the hearth of the city namely:

(i).Integrity Court Estate: - this is made up of 30 units of 4-Bedroom Executive Terrace

Table1: Common defects of Integrity Court, Lake View and Savannah Estates in Abuja

SN	Types of Defects	Locality and Nature of Defects
I	Cracks	Cracks in Foundation
		Walls – interior and exterior
		Scooping Floors
		Plaster –interior and exterior
		POP/ceilings
		Broken Tiles
II	Leakages / Dampness	Ground water seepage
		Seepage from doors
		Floor dampness
		Broken pipes
		Defective taps/sanitary wares
		AC Seepage
III	Roof defects	Roof sagging
		Ceiling
		Roof leakages
		Defects in roof covering
		Eaves defects
IV	Electrical	Low power supply
		Some shocking components
		Loss of power phase
		Fittings malfunctions
V	Wood and carpentry	Door twisting
		Gab at floor(shrinking)
		Fungi attack(interior doors)
		Non alignment of doors
		Wardrobe sagging
VI	Mechanical/Water Supply	No water supply
		Low water pressure
		Irregular water supply
		Connecting pipe leakages
		Defective Hot water Supply
VII	Painting and Decorations	Paints peeling
		Paint fading
		Poor colouring
		Paints
VIII	Plaster Defects	Peeling of walls plaster
		Failed Plastering
		Failed Rendering
IX	Drains Defects	Blocked Drains
		Failed Plaster

Project management tool kit (Melton, 2007)

Houses, built on a 13,200 square meters of land. (ii). Lake View Estate:-this Estate is made up of 30 units of 4-Bedroom- Semi-detached Duplexes and constructed on 14,000 square meters of land and (iii). Savannah Estate:-this Estate is serviced with 48 units of 4-Bedroom Semi- detached Duplexes with a unit of 1-Room Boys' Quarters, built on about 19,540 square meters of Land. This research involved the evaluation of the defects in the 108 units of the newly completed houses and to establish the causes of the defects in the housing units. The study was carried out carried out by the use of structured questioners and semi structured interviews with relevant participants in the development of the Estates. The selections of common defects and the categorisations of the defects were adopted from Project Management Tool Kits for measurement of defects in buildings (Melton, 2007). The Project Management Toolkit was used to conduct preliminary studies and investigations which revealed the various defects as presented in Table 1.

The developer engaged a total of 26 Contractors in the constructions of the 108 units. The condition of the housing were evaluated by structured questionnaires and semi-structured interviews as adopted from the Project Management Tool Kits. Accordingly the management of the developer and contractors were asked similar questions in relation to past jobs executed; plants owned or hired by the companies for the work, organization structure and staffing.

A total of 140 questionnaires were administered: The Management of the Developers – 1no; 31no to the contractors and sub-contractors; and 108 no to the occupants/ new owner of the housing units. The management of the Developer returned its questionnaire fully completed. The occupants/new owners returned 101 questionnaires fully completed. While the contractors returned only 4 questionnaires. The data obtained from the semi-structured interviews were transcribed and content analysis was used to determine the themes and constructs leading to the identification of various types of defects and there occurrences presented in Fig. 1 to Fig. 8 and Table 3 and Table 4.

RESULT AND DISCUSSION

Result

The data obtained from the structured questionnaires and the semi structure interview questionnaires were analysed using mean ranking analysis of factors associated with the causes of the various defects in the estates. Also the data obtained from the semi-structured interviews were also transcribed and content analysis was used to determine the themes and constructs leading to the identification of various types of defects from categorisations based on the categorisations of defects adopted from Project Management Tool Kits for measurement of defects in buildings (Melton, 2007) of the defects in Table 1. The results of the analysis are presented in Fig 1 – 8; and Table 3 and 4

Fig. 1 – 8 are the percentage of occurrences of the categories of the defects in each of the three estates from the data from the questionnaires and interviews with the occupants/owners' of the housing units. The measurements of occurrences of the categories are as follows:

Category 1 defects: cracks

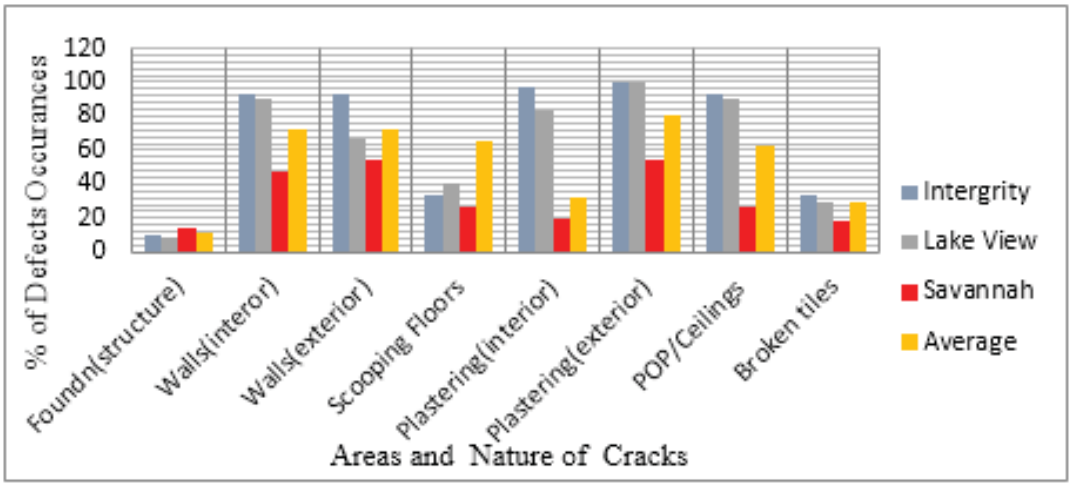

Figure 1: Cracks Defect

Defects resulting from cracks were mainly in the interior and Plaster failures 100% of all the houses studied. Cracks in foundations were also detected in 10, 9, and 15% of Integrity Court, Lake View and Savannah Estates respectively. While Plaster of Paris Ceiling finishes failures dominated Integrity Court Estate (93% of the Units affected).

Category 2 defects: roof defects

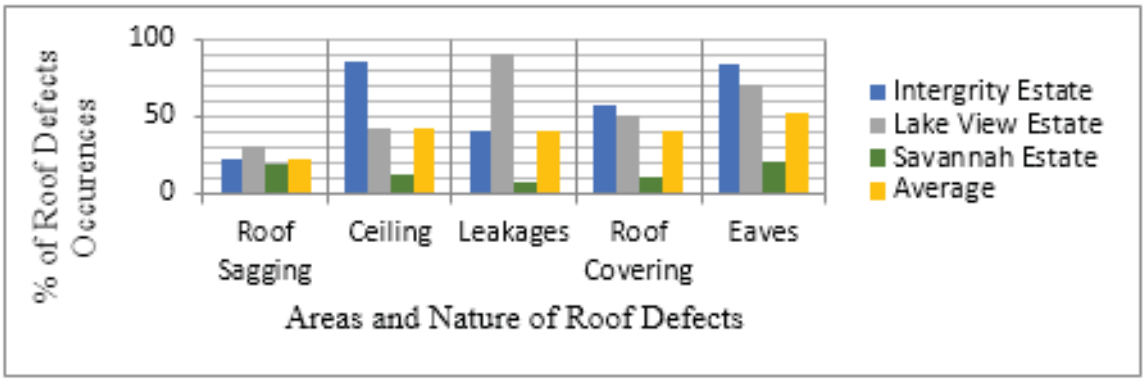

Figure 2: Roof Defects

There were defects in roof covering of 57% Integrity Court Estate and 50% of Lake View Estate. It was observed that 55mm aluminum gauge use as against the specifications of 70mm gauge for the project. Failures of ceiling works were detected in Integrity (87%) and roof leakages were identified in Lake View (90%).

Category 3 defects: leakages and dampness

Leakages (83%) and Dampness (70%) Defects in Integrity Court were seepages of water from doors and broken pipes. While Air Conditions (AC) seepages were detected in 53% Houses in Lake View Estate.

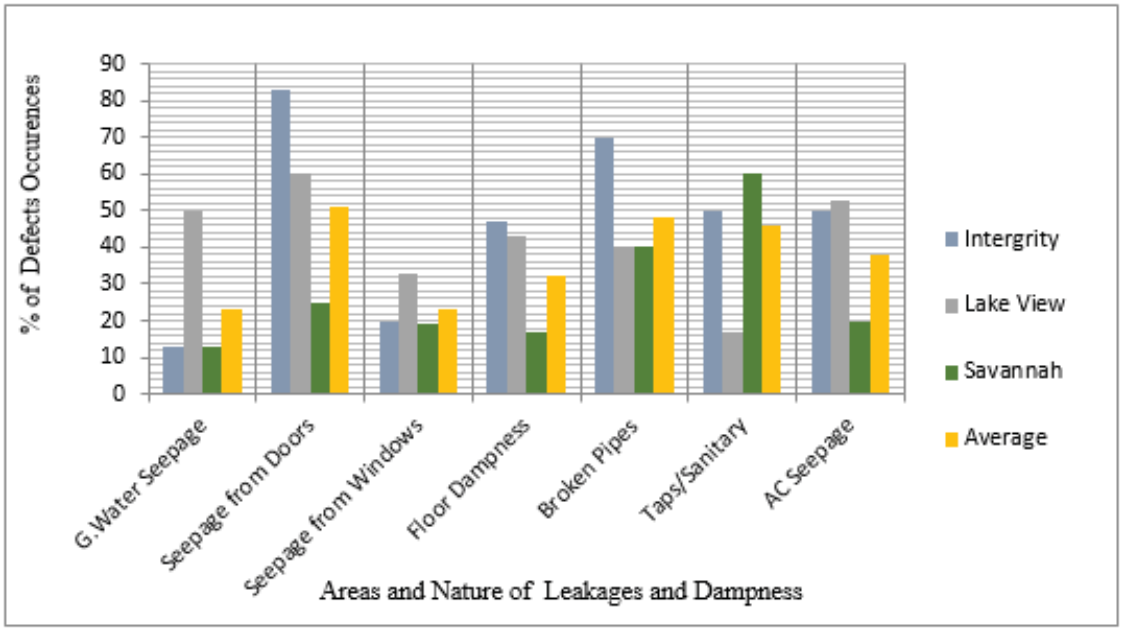

Figure 3: Leakages and Dampness Defects

Category 4 defects: electrical malfunctions.

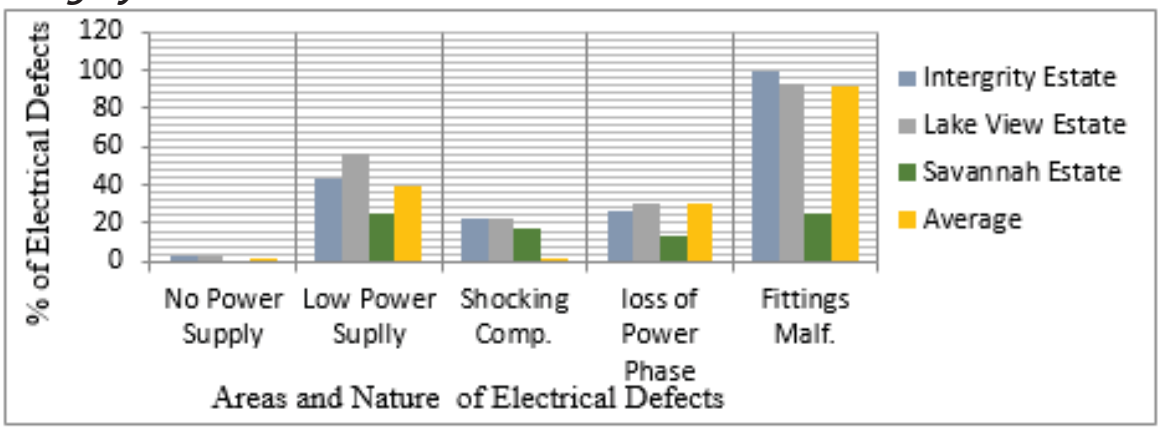

Figure 4: Electrical Defects

Malfunction of electrical fittings were ascertained in 92 % of the 108 housing followed by low power supply (39%) while 12% of houses had no power supply at all at the time the new owners took possession.

Category 5 defects: wood and carpentry.

The common defects in this section were door shrinking (gab between the doors and the floors) affecting 48% of the houses in Integrity Estate and the door twisting in Lake View Estate were 38%. In addition defects resulting from Non-Align doors were evaluated in 26% of the houses

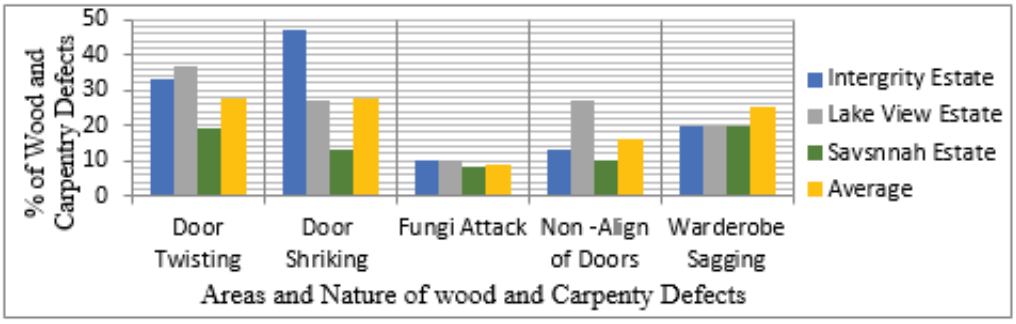

Figure 5: Wood and Carpentry Defects

Category 6 Defects: Paints and Decorations.

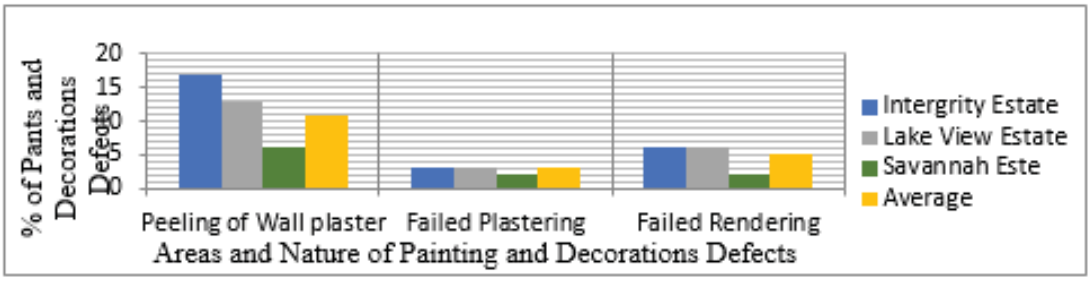

Figure 6: Plains and Decorations Defects

Pain staining defects affected 82% of the houses (particularly the ceiling portions) followed by pains flaking with 63%. Fading paints ranked high with a percentage of 100 and 97 % in Integrity Court Estate and Lake View Estates respectively.

Category 7 defects: mechanical and water supply defects.

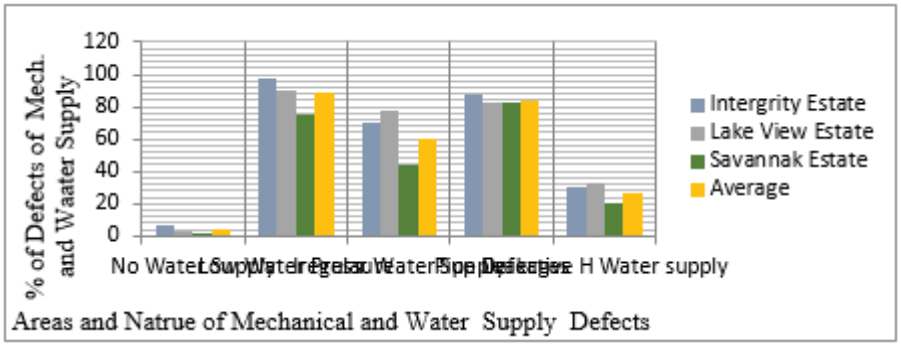

Figure 7: Defects in Mechanical and Water Supply

Low water pressure (89%), irregular water supply (60%) and leakages of connecting pipes (84%) are the most frequent Mechanical and Water supply defects in the 108 Units of the three Estates studied. There are extreme cases of no water supply in 4% of the housing units.

Category 8 defects: drains defects.

The drainage systems were characterised blockages (5%) and failed finishing (14) in the three Estates.

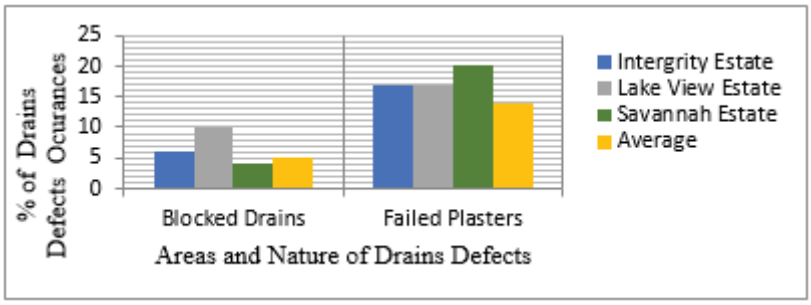

Figure 8: Drains Defects.

Developers' and contractors' capacity

The analysis of the data from the questionnaires and the interview administered to the contractors, managing tem of the developer of the housing and the professionals that took part in the housing projects are presented in table 3 and 4.

Table 3: The Property Developers' Capacity and Competence

SN	Areas of Management Competence and Capacity	Attainment
1	Experience in Mass Housing Development.	None
2	Experience in Similar Projects	None
3	Organization Management Structure	Not defined
4	Engagement Professions: Builders, Engineers and Architects	< 5%
5	Management system of QM for the project	None
6	Quality Control Unit	None
7	QC and QA operational techniques in place	None

Table 3 reveals that the developer and its Management did not exhibit inexperience and also lack knowledge and understanding of QM in Mass Housing Production.

Contractors' capacities

Table 4: Contractors' capacities and experiences

SN	Areas of Capacity and Competence	Score
1	Experience in similar jobs.	15%
2	Contractors Technically Qualified	10%
2	Organization Structure	None
3	Quality Control Unit	None
4	Employments of Professionals: Builders, Engineers and Architects	< 5%
5	Engagement Professions: Builders, Engineers and Architects	19%
6	Staff on Regular Employments.	0%
7	Plants and Equipment	None

Table 4 indicated that only 4 (10%) of the contractors were technically qualified to be engaged by the Managements of the developer for the Mass Housing execution.

DISCUSSION

The evaluation of the occurrences of common defects in under the Abuja mass housing project was carried out in 108 housing units made up of: 30 units each of 4-Bedroom Executive Terrace and 4-Bedroom- Semi-detached; and 48 units of 4-Bedroom Semi - detached Duplexes with a unit of 1-Room Boys' Quarters. The results and findings are contained in Fig.2 to 10. These shows the percentage occurrences of common defects in the houses.

Defects resulting from cracks were mainly in the interior and plaster failures in occurred in all the houses studied. Cracks in foundations were also detected in three Estates. Ceiling finishes failures. Leakages and air conditions seepages; defects in roof coverings and leakages in ceiling works. Doors twisting and non-aligned were found in over 50% of the houses were dictated. Also malfunction of electrical fittings; Low water pressure; pain staining defects affected; leakages of connecting pipes were ascertained in over 80 % of the 108 housing units evaluated. These numerous defects confirmed the assertion of Bakri and Mydin (2013) and Richardson (2001) and other researchers, that these are the common defects associated mass housing productions.

The Property Developers' Capacity and Competence (Table 3) is exposed. The data and analysis showed that the Management of the Estates' Developer has no Quality control plan for the estates development; and did not exhibit inexperience, knowledge and understanding of Quality Management in Mass Housing Production. This lack of understanding in what QM was reflected in selection of unqualified contractors' for the execution of the housing projects. The outcome of the exercise is poor quality products and defective works such as cracks, water and plumbing; electrical and faulty drainages; plumbing fading of paints. This confirmed the assertion of (Zane, 2005) that developers of mass housing do produce defective works due to Quality Control operational deficiency. Additionally result confirmed the averments of other researchers that deficiencies in planning and supervision of construction of new buildings; absence of

professionals in a project building team; and use of unqualified contractors are major causes of common defects in newly built houses. (Bakri and Mydin, 2013; San-Jose et al, 2011; Richardson, 2001). It can be averred that Housing Developer's Management did not involve a system of QM that could have ensured standard quality of material and labour for effective QC operational activities and techniques in the construction of houses.

From Table 4 exposes the quality of contractors employed for the projects. This confirms. There are a variety of causes leading to defects in housing construction. Dorcas et al, (2019) assertion that severe factors affecting project quality in Nigeria construction industry include use of inexperienced labours; and poor, inspection, and management commitments and leadership styles. Buys & le Roux (2013) stayed that factors leading to defects in newly completed housing include inadequate artisan skills and projects management failures. All these defects are attributable to poor workmanship. (Rachardson, 2001; Ransom, 1987; Mastin, 2008; Hinks, 2001). It can re - stated that major factors leading to defects in houses include inadequate artisan skills, projects management failures (Buys & le Roux, 2013)

CONCLUSION AND RECOMMENDATION

The study thus, concluded that the defective works of the entire 108 apartments evaluated were as a result of lack Quality Management (QM) on the project. It is recommended that quality control operational techniques should be adopted for use in control and measurement of the quality of materials and workmanship for quality mass housing production.

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