NBRRI Newsletter

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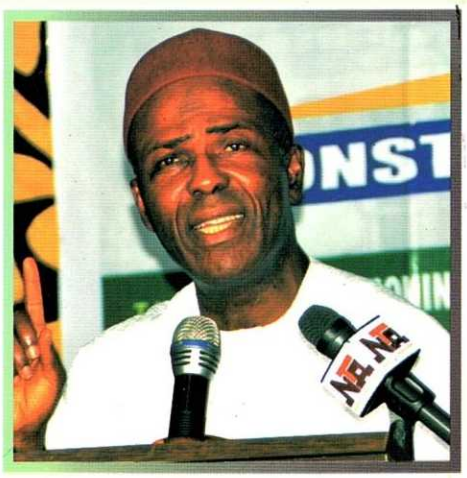
Special Edition

The Quarterly Newsletter of the Nigerian Building and Road Research Institute

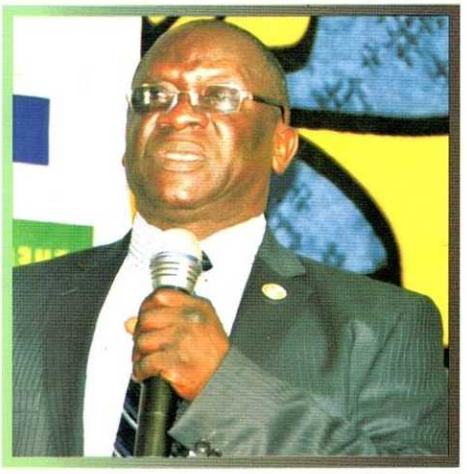
NBRRI ORGANIZES INTERNATIONAL CONSTRUCTION SUMMIT



FG WILL REJUVENATE LATENT CREATIVE ENERGIES AND DEVELOP INDIGENOUS CAPACITY

-Page 10

.... Dr. Ogbonnaya Onu,
Hon. Minister of Science and Technology



FOR HIGHER PRODUCTIVITY IN THE CONSTRUCTION INDUSTRY, THERE SHOULD BE HIGH LEVEL OF EFFICIENCY"

-Page 5

.... Professor Danladi Matawal
DG/CEO, NBRRI

Minister of S&T, Dr. Ogbonnaya Onu with other dignitaries pose for a photo after the opening ceremony of the Confab. -Page 2

CONSTRUCTION SUMMIT 2016

....NBRRI HOLDS 2016 INTERNATIONAL CONFERENCE

In keeping with its annual tradition of beaming searchlight and encouraging discuss on critical issues in the building and road sector, as well as achieving its mandate of building capacity and setting the pace in indigenous construction technology development, the Nigerian Building and Road Research Institute, organized its annual International Conference tagged Construction Summit 2016.

The 3-day Conference which was held in collaboration with relevant stakeholders in the construction industry has its Theme on Re-Positioning the Nigerian Construction Industry – Realities and Possibilities. The Conference which took place between 24th and 26th May 2016 at the Nigeria Air Force (NAF) Center, Jahi, Abuja, witnessed robust discussions, case study reviews and brainstorming amongst stakeholders in the Construction Industry.

The primary objective of the Conference was to address critical issues and challenges in the Industry, and proffer solutions that will enhance performance, relevance, innovativeness, and drive a robust environment to fast track socio-economic development. This arose from a general 3-prong consensus amongst practitioners in the Nigerian construction as follows:

- That the Nigerian Construction Industry has the potential to keep up with the pace of change witnessed globally, which is vital in maintaining relevance and competitive edge in line with national and global best practices.

- That despite its impressive performance, the Nigerian construction industry faces a significant number of challenges including the shortage of skilled manpower, difficulties in the procurement of plants and equipment, unethical practices, inadequate capital for execution of projects, lack of training and development instruments that can help sharpen the skills and ability of construction workers, etc.

- That for appropriate relevance and advancement, the Nigerian construction industry needs to be injected with peculiar processes, user-friendly techniques and unique materials and equipment resulting from indigenous R&D innovations and dictates of the country's different climate, environment, challenges and cultures.

The Conference, which was well attended by all shades of Stakeholders, dignitaries, doyen and captains of the Nigerian Construction industry; was declared open by the Honourable Minister of Science and Technology, Dr Ogbonnaya Onu. The Special Guest of Honour was the Honourable Minister of Power, Works and Housing who was ably represented by Salamatu Yusuf Mohammed, a Director in the Ministry.

Other notable personalities that graced the opening ceremony were the former Chairman, NBRRI Governing Board, Chief Dele Okeya; the representative of the Chief of Army Staff, Brig-Gen. F.O Akanji; the Representative of the Permanent Secretary, Federal Ministry of Science &Technology, Engr. Abbas Gummi; the President of the Council for the Regulation of Engineering in Nigeria (COREN), Engr. Kashim Ali; the President of the Nigerian Society of Engineers (NSE), Engr. Otis Oliver Anyaeji; Prof. Kunle Wahab of Obafemi Awolowo University, Ife; the President of the Nigeria Academy of Engineering (NAE), , Prof. R.I Salawu; the Chairman, House Committee on Science & Technology, Hon. Beni Lar ably represented by Hon. Chris Azubogu; the Registrar of the Council of Registered Builders of Nigeria, Dr. Peter Kuroshi; the Director-General/ CEO of national Space Research and Development Agency (NASRDA), Prof. Seidu Mohammed; the Director-General/CEO of the Energy Commission of Nigeria, Prof. Jidere Uba; the President of the Federation of Construction Industries (FOCI), Bldr. Solomon Ogunbusola; etc.

The Keynote Address titled Performance Evaluation of the Construction Industry within the Structure of the Nigerian Economy was delivered by Professor Kunle Wahab. This was followed by presentation of the Lead Paper titled Repositioning the Nigerian Construction Industry- Realities and Possibilities by Professor Danladi Slim Matawal, the DG/CEO of the Nigerian Building and Road Research Institute. A guided Tour of the Exhibition stands was thereafter conducted for the Hon Minister of Science and Technology and all dignitaries.

After the opening ceremony, the Conference went into impactful plenary session during which four incisive Papers were delivered followed by a robust compelling panel discussions from top consultants, leaders of construction companies, contractors, researchers,

academics, professionals, policy makers, etc, in the industry to bring to the forefront, challenging issues and new insights into the business, performance, economic challenges and opportunities in today's construction industry. The Papers were:

a) Strengthening Quality Assurance, Standardization and Codes of Practice In the Nigerian Construction Industry—By Engr. Kashim Ali President, COREN
b) Local Content in Nigerian Construction Industry: Strategies for Construction Equipment Development, Materials Processing, Construction Methodologies and Delivery—By Bldr. Solomon Ogunbusola, President, FOCI
c) Evolving Risk Management and Conflict Resolution For Effective Delivery In Nigerian Construction Industry—By Engr. Victor Oyenuga, Past President of Nigerian Institute of Structural Engineers
d) Health and Safety in the Construction Industry – By Dr. Nnamdi Ilodiuba, National President ISPON

The Proceedings for the remaining two days saw the delegates breaking into three Parallel sessions, with each made up of three Thematic sub-Themes as presented below:

PARALLEL SESSION A: INDUSTRY GROWTH AND PERFORMANCE
- ✓ Session A1: Workforce/Organizational Framework
- ✓ Session A2: Financing for Real Estate & Infrastructure Development/Urban Renewal
- ✓ Session A3: Quality Control/Structural Integrity of Old Structures

PARALLEL SESSION B: INNOVATIVE & SUSTAINABLE MATERIALS FOR CONSTRUCTION
- ✓ Session B1: Sustainable Materials for Construction: Aggregates
- ✓ Session B2: Sustainable Materials for Construction: Pozzolana/Admixtures
- ✓ Session B3: Sustainable Materials for Construction: Pozzolana

PARALLEL SESSION C: EMERGING CONSTRUCTION DESIGNS & TECHNOLOGIES
- ✓ Session C1: Sustainable Design and Architecture
- ✓ Session C2: Emerging Construction Techniques
- ✓ Session C3: Alternative Construction

In all 44 peer-reviewed Papers were presented which included the Keynote Address and the Lead paper.

At the end of the paper presentations, three parallel Syndicate Sessions were held to deliberate on all the key issues and salient points raised during the Conference. This constituted the input for the Communiqué session. All the resolutions that evolved were scrutinized and extensively deliberated by all participants. At the end of the deliberations, the Communiqué was unanimously accepted by the participants.

The participants at the Workshop commended the effort of NBRRI and its collaborators in organizing a successful conference and recommended that such Conferences should be more frequently organized. It urged that the recommendations should be brought to the attention of policy makers for implementation.

A cross section of participants at the conference

Editorial

In line with its character which has now become an annual tradition, the Nigerian Building and Road Research Institute (NBRRI) hosted the 2016 edition of its annual International Conference.

For several reasons, the Conference was quite unique and enigmatic. First, the planning faced a lot of challenges due to dearth of funds arising from non-release of budgetary allocation. It took quite a lot of ingenuity and sagacity of the DG/CEO of NBRRI, Prof Danladi Slim Matawal to evolve strategies that ensured that the Conference took place as scheduled between the 24th and 26th of June 2016 at the Nigerian Air Force (NAF) Centre, Kado. Abuja.

Secondly, the Conference Theme which was titled "Repositioning the Nigerian Construction Industry: Realities and Possibilities" was considered by Stakeholders to be apt, relevant and appropriate as it was coming at the early years of the Buhari Administration. This was because of the belief that the "Change Mantra" of the administration will come to bear on the Nigerian construction which was considered overdue for complete overhaul from its apparent comatose position.

Thirdly, the technical papers received were quite overwhelming and surpassed previous experiences with NBRRI Conferences. One hundred and fifty Abstracts were received out of which 70 were accepted. After peer reviewing, a total of unprecedented 44 papers (inclusive of 6 commissioned papers) were accepted for presentation at the 3-day International Conference. The highlights of these papers are presented in this Special Edition of NBRRI Newsletter for your utmost consumption. Again on further peer-review, 30 of these papers have been processed for publication in the Conference Proceedings.

Fourthly, the Conference which saw innovations in the effective presentations of technical papers, was well attended by Stakeholders in the Nigerian Construction industry including the Honorable Ministers of Power, Works and Housing who was the Special Guest of Honor and the Honorable Minister of Science and Technology, Dr. Ogbonnaya Onu, FAEng.

This special edition of NBRRI Newsletter is dedicated to the 2016 International Conference. It has been packaged in a simplistic manner to wet your appetite; and is succinctly presented for your easy reading and enjoyment. Please read on.....

Omange, George N.
Editor-in Chief

NBRRI (VISION, MISSION & CORE VALUES)

BUILDING CAPACITY & SETTING THE PACE IN INDIGENOUS CONSTRUCTION TECHNOLOGY DEVELOPMENT

VISION

To evolve and use a comprehensive and integrated approach in appropriate technology development and transfer, sustainable capacity building and investment promotion.

So as to foster the application of environment-friendly and energy-efficient innovation construction materials, manufacturing technologies and cost-effective building and road construction practices.

Which will enhance job-creation, wealth generation and poverty reduction as well as nurture the emergence of vibrant, knowledge-based and highly competitive indigenous construction companies capable meeting global standards

MISSION

Integrated R&D, capacity building and robust extension services in which technology innovation and knowledge-based practices in the fields of building, road, and engineering materials will be used to provide adequate and affordable housing and road infrastructure as well as increased economic empowerment.

CORE VALUES

* Professionalism
* Commitment and integrity
* Resourcefulness
* Innovativeness

Published by Nigerian Building and Road Research Institute (NBRRI)

FG WILL REJUVENATE LATENT CREATIVE ENERGIES AND DEVELOP INDIGENOUS CAPACITY

.... Dr. Ogbonnaya Onu, Hon. Minister of Science and Technology

While delivering his address at the Opening Ceremony of NBRRI International Conference on Repositioning the Nigerian Construction Industry, the Hon. Minister of Science and Technology, Dr. Ogbonnaya Onu expressed delight that the Construction Summit 2016 was held at an important time in the history the country; and congratulated the Nigerian Building and Road Research Institute (NBRRI) for its vision and foresight.

Dr. Onu lamented that since independence, the country has not been able to sufficiently build a robust indigenous capacity to rehabilitate existing infrastructure but rather relied heavily on foreigners; adding this lack of capacity had weakened the potentials to strengthen the drive for technological self-reliance that was needed to put the country in global affairs. He noted that this has created inadequate access of Nigerians to job opportunities and further reduced the capacity of competent indigenous entrepreneurs from competing with their counterparts from other parts of the world.

The Minister assured the participants that the Federal Government under the leadership of President Muhammadu Buhari, GCFR, would do the needful to rejuvenate the latent creative energies of Nigerians in order to develop indigenous capacity that would enable professionals in the country give their best in the important task of nation building.

Dr. Onu believed that the Nigerian Building and Road Research Institute (NBRRI) would play the important role of ensuring the deployment of appropriate research efforts to strengthen the building and maintenance of infrastructure that would meet the peculiar demands of the nation. He further noted that the Institute is well equipped to apply science and technology for the efficient utilization of locally available raw materials in the construction industry, in an effort to diversity the country's economy and further create jobs, build indigenous capacity and reduce poverty.

The Honourable Minister expressed his happiness that NBRRI was working to develop a suitable Curriculum for the purpose of producing artisanal and craftsmanship/technical skills in the built industry. Apart from this, he noted that NBRRI has also carried out investigations on the Collapse of Buildings either during or after construction in many parts of the country. This was in addition to NBRRI being at the forefront of working to ensure that Nigerian roads are built in line with the country's unique characteristics. He urged NBRRI to, as a matter of urgency, commence research on the use of cement for the construction of roads. Dr. Onu expressed confidence that the outcome of the Conference would go a long way to further strengthen the role Science and Technology can play in the development of the nation's economy, and urged the participants to be dedicated to national goals.

"Dr. Onu expressed confidence that the outcome of the Conference would go a long way to further strengthen the role Science and Technology can play in the development of the nation's economy"

"THE CONFERENCE IS RELEVANT TO THE FOCUS OF THE BUHARI ADMINISTRATION"

..... Hon. Minister of Power, Works & Housing

Representative of the Hon. Minister of Power, Works and Housing,
Mrs. Salamatu Y. Mohammed

"The Conference Is Relevant To The Focus Of The Buhari Administration".

This assertion was made by the Special Guest of Honor and the Hon. Minister of Power, Works and Housing, Babatunde Raji Fashola, SAN. The Minister who was ably represented by Mrs. Salamatu Yusuf Mohammed further remarked that the theme of the Conference was timely and relevant in line with the focus of repositioning the nation under the leadership of President, Muhammadu Buhari, GCFR.

Fashola emphasized that the 2016 fiscal budget underpinned the importance which infrastructure play in the growth of any nation's economy in terms of employment, wealth generation and the living standard of the citizenry.

He stated that he has noted that Communiqués of past annual Conferences organized by NBRRI since 2011 made recommendations to address the critical issues in the built industry, especially curbing the incidence of building collapse, road pavement failures, affordable housing and provision of safe, efficient and sustainable road transport system. The Honourable Minister believed that in order to reposition the construction sector to achieve sustainable development, there was the need to identify critical areas and develop sustainable solutions to tackle them. He averred that as part of the Government desire to address some of the daunting challenges in the construction industry; vocational education has been identified as a fundamental area requiring attention. This would involve schemes to empower and equip artisans and middle-level technical manpower with requisite skills, and reduce the existing dearth of artisanal manpower in the country.

The Honourable Minister noted that Government was committed to improving Nigeria's road network and decrease over-dependence on public finance for the execution of road projects by facilitating active participation of the private sector, multi-lateral and bi-lateral agencies on road development projects.

The Minister commended the Director-General/Chief Executive Officer of NBRRI, Professor D. S. Matawal and the entire management team for the successful hosting of professionals and stakeholders in the built industry and enjoined the participants to come up with strategies that could reposition the Nigerian construction industry, particularly the reduction of sourcing artisans and other skilled workers from abroad, and thereby bridging the infrastructural gaps that existed between the country and other developed countries of the world.

THERE IS NEED TO REPOSITION THE NIGERIAN CONSTRUCTION INDUSTRY

....DR. HABIBA LAWAL, Perm Sec, FMST

The Permanent Secretary (PS) of the Federal Ministry of Science & Technology, Dr. Habiba Lawal, in her address at the Conference, welcomed everyone to the epoch making event. The PS, who was represented by Engr. Abbas Gummi, pointed out that the Nigerian Construction Industry has been identified as one of the fastest growing around the world and hence the need for its repositioning it to ensure that favourable competitions with its contemporaries globally.

She pointed out that as a key agency under the Ministry, NBRRI is saddled with the responsibility of propagating and regulating scientific, technological and innovative advancements in the building and road sector of the nation. She reminded the gathering that since 2011, the Institute had engaged in annual national and international conferences which had deliberated on and addressed topical issues in the building and road sector.

Going down the memory lane, the Permanent Secretary noted that NBRRI, under Prof. D.S. Matawal, had organized a series of Conferences since 2011. These included a "Stakeholders Forum" in 2011, the National Technical Workshop on Building Collapse in 2012 and the Road Pavement Failure in 2013. In 2014, the Housing Summit was organized with a view to evolving

Mrs. Habiba Lawal,
Perm Sec, FMST

strategies to achieve affordable housing; while the 2015 edition addressed the need for Safe, Efficient and Sustainable Road Transportation in Nigeria.

Dr. Habiba noted that the 2016 edition of the Conference which had its them on Repositioning the Nigerian Construction industry has the full support of the FMST because of its relevance to the socio-economic development of the nation. She finally assured the commitment of the Ministry to implementing the outcome of the Conference.

GOODWILL MESSAGES

HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

In her goodwill message, the Chairman of the House Committee on Science and Technology, Hon. Beni Lar who was ably represented by Hon. Isiaka Ibrahim promised to ensure that the House Committee give their optimum support in promoting knowledge-based developmental strides that require policy backing at the Nigerian Building and Road Research Institute (NBRRI) and the Federal Ministry of Science and Technology. She noted the general culture of near non-adherence for safety and quality control in the Nigerian construction industry; and reiterated that FMST should encourage safety observance and quality control as these would impart well in curtailing or eliminating most of the challenges of the construction and other related industries.

Hon. Beni Lar, Chairman, House
Committee on Science and Technology

NIGERIAN ARMY

The Representative of the Chief of Army Staff, Brig. Gen. F.O. Akanji commended NBRRI, the Conveners of the Conference for the sustained efforts at sensitising Stakeholders on the challenges of the construction industry and presenting a suitable forum for proffering solutions. He reiterated that the construction industry encompasses a wide spectrum of professionals and the Nigerian Army is not left out because the Corp of Army Engineers is saddled with meeting the engineering responsibilities of the army. He wished all participants a successful session and deliberations.

Brig. Gen. F.O. Akanji
Nigerian Army Representative,

GOODWILL MESSAGES

COUNCIL FOR THE REGULATION OF ENGINEERING IN NIGERIA (COREN)

In his goodwill message, the President of the Council for the Regulation of Engineering in Nigeria (COREN), Engr. Kashim Ali congratulated the DG and Management of NBRRI on its consistency in the organization of the annual Conferences. He expressed concern however, on whether resolutions from past Annual Conferences had been absorbed or adopted by the Government and transformed into policies. Nevertheless, he expressed his belief on the outcome of this year's Conference would be different as a result of the presence of the Honourable Minister of Science and Technology. He ended his goodwill message by charging the Honourable Minister to play a key role in ensuring Nigeria becomes a knowledge-based economy.

Engr. Kashim Ali.
President (COREN)

The Nigerian Society of Engineers (NSE)

The President of the Nigerian Society of Engineers, Engr. Otis Anyaeji FNSE expressed his pleasure at being a participant at the epoch-making event. He believed that the Conference will offer all stakeholders the chance to deliberate on topical construction industry challenges and proffer tangible solutions. He expressed his belief that the present Buhari's Government resolve to change our national fortunes will go a long way in ensuring a paradigm shift in the construction industry; once the challenges and solutions are articulated into deliverable communiqués for implementation.

Engr. Otis Anyaeji,
President (NSE)

LEAD PAPER

"FOR HIGHER PRODUCTIVITY IN THE CONSTRUCTION INDUSTRY, THERE SHOULD BE HIGH LEVEL OF EFFICIENCY"

...Professor Danladi S. Matawal
Director General/CEO, NBRRI

The Director-General/Chief Executive Officer, Professor Danladi S. Matawal presented the Lead Paper for the Conference titled: "REPOSITIONING THE NIGERIAN CONSTRUCTION INDUSTRY – REALITIES AND POSSIBILITIES"

Matawal said the construction industry globally had often been perceived to be the life wire of every country's socio-economy development, contributing immensely to the Gross Domestic Product (GDP). He however averred that the contribution of the Nigerian construction industry had not been able to measure up to those of many countries due, in part, to its developing nature and other internal concerns peculiar to the Nigerian environment. While the construction industry of some developed countries were responsible for as high as 22 percent of their respective GDPs, the erudite Professor of Civil Engineering noted that the case in Nigeria was different as it contributed as low as 6 percent to the economy. He further noted that this has been dominated by few large expatriate firms who carry out about 90 percent of the work while many small Nigerian contracting firms accounted for the rest of the work.

Prof. Matawal said that in order to achieve higher productivity, it was essential to develop and maintain a culture of high level of efficiency in how projects are planned and executed. He noted that construction could be improved through enhanced performance that ensured projects are completed faster at lower project costs. Consequently, the country needed more competitive bidding platform and should work hard for more profits by being more efficient.

He noted that in the past, Nigerian engineers, architects, planners and surveyors made headway in designs and supervision of projects and wondered why these good developments had got enmeshed in the poor attitude that misconstrued technology to a transfer of profits. He further mentioned issues of construction safety, stating that when reinforced with effective proven best practices, training, planning and accountability, many companies could significantly reduce accidents on projects sites and in transportation of construction materials.

He emphasized that Construction may be considered a 'marketplace without boundaries' and there is the need to understand how to create new value in new ways through digital transformation, develop diverse and dynamic partnerships, find different ways of thinking and working. Construction industry leaders will have to show vision and flexibility in thinking, and superb powers of listening and learning to make clear, informed decisions.

Prof. Matawal stressed that many construction companies tend to be active in New and Adjacent Industries and that Digital technologies are especially valuable in improving company operational efficiency, as well as enhancing data analysis and external and internal collaboration. Consequently Prof Matawal advocated that engineering and construction companies should invest in digital technologies to create value in new ways. The DG/CEO however noted that 67 percent of engineering and construction businesses had more opportunities for growth than there were in 2010 - 2012. There were also risks that the construction industry needed to be aware of such as high taxes, bribery and corruption; and advocated for the evolution of strategic and effective regulations.

KEYNOTE ADDRESS

THERE SHOULD BE SYNERGY FOR IMPROVED, GOAL ORIENTED DEVELOPMENT IN THE CONSTRUCTION INDUSTRY

..... Professor Kunle Wahab

In his keynote Address at the Conference, Professor Kunle Wahab reiterated the timeliness of the Conference in the wake of current national economic realities; and stated that with the economy at its lowest ebb, all hands should be on deck to bring about a restructuring of the construction industry. These according to Prof. Wahab can jumpstart a revolution to revamp the entire national economy.

Furthermore, the erudite Professor stated that due to its complex processes, activities and prospective output, the construction industry exhibits an all embracing outlook that touches the lives of several members of the populace, groups and other industries etc. He equally opined that investments in infrastructure particularly roads, energy, water supply and housing by both the public and private sectors are key to Nigeria's national development. He equally reiterated the high contribution of the Construction industry to GDP; its capacity to employ large number of stratified people such as professionals, technological and senior personnel, technicians, craftsmen as well as numerous unskilled and semi-skilled workers. Professor Wahab further noted that the Construction industry also produces a large number of the nations' assets (buildings and various infrastructures) with Governments being the major clients of the sector that is responsible for production of physical and economic goods and services.

Prof Wahab went further to discuss the theme and sub-themes of the Conference vis-a-vis the impact and implications of each of the groupings to national economy. He tasked NBRRI and all Stakeholders to ensure a follow-up on the content and recommendations of the Conference along the following lines:

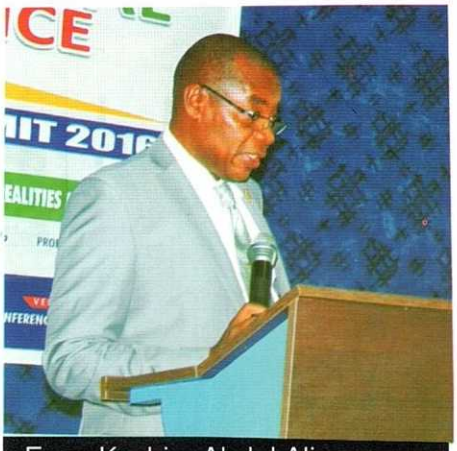
- Identify quick wins;
- Develop strategies to achieve needed policies;
- Implement the policies towards acceptable outcome;
- Introduce appropriate incentives to speed up the realization of identified policies;
- Avoid unnecessary delays in policy implementation;
- Establish criteria for achieving required realistic performance;
- Reward those who achieve required performance;
- Introduce sanctions for defaulters or failures;
- Match expenditures on projects with deliverables;
- Institute remedial actions for undesirable outcomes.

Prof Wahabi posits further on the challenges inhibiting progress in the sector and enumerated the short, medium and long term efforts of successive governments towards mitigating the challenges and providing enabling environment for public and private participation in Nigeria's construction industry. He also suggested partnerships and synergies between NBRRI and other relevant establishments for improved, goal-oriented development in the area of its mandates and actualization of sustainable development.

PLENARY SESSION

QUALITY ASSURANCE, STANDARDISATION AND CODES OF PRACTICE IN THE NIGERIAN CONSTRUCTION INDUSTRY

The paper discussed building collapse phenomenon and the need to escalate discussions on the issue with a view to identifying all possible causes and determining appropriate remedies that will include quality assurance and standardization in the construction sector. It went further to discuss the frameworks of quality assurance to include: Determination of adequate technical requirement of inputs and outputs, Certification and rating of suppliers, Testing of procured material for its conformance to established quality, among others. Also, the negligence and non-standardization of quality assurance in Nigeria were discussed. Engr. Ali reiterated the efforts being made by COREN towards ensuring quality assurance standardization and compliance with codes of practice in Engineering projects which included enforcing the accreditation of engineering programmes, among others.



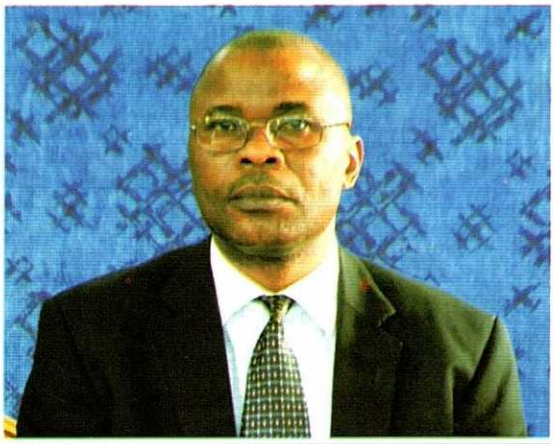
Engr. Kashim Abdul Ali, FNSE

It opined that standards in construction should be dynamic to ensure safety for buildings and lives as well as ensure adequate budgetary allocation for quality control. He further advocated that regulatory bodies and agencies should re-strategize to put in place and ensure maximum enforcement and high ethical standards for achieving global standards and best international practices in the construction sector.

ACHIEVING IMPROVED LOCAL CONTENT IN NIGERIAN CONSTRUCTION INDUSTRY: STRATEGIES FOR CONSTRUCTION EQUIPMENT DEVELOPMENT, MATERIALS PROCESSING, CONSTRUCTION METHODOLOGIES AND DELIVERY

Bldr Ogunbusola presented an overview of the construction industry in Nigeria, enumerating the successes recorded over the years vis-à-vis the challenges hindering sustainable growth and development of the sector. He posits that in spite of the industry being the highest employer of labor after the government, it relies heavily on imported equipment, tools, expertise and methodologies in executing projects. The Builder also asserts that the industry has since grown tremendously but the local content improvement in construction processes has only been observed with respect to labor provision while Local content improvement as it relates to construction equipments development, materials processing, construction methodologies and delivery is still a mirage. He therefore recommended the following as veritable tools to achieving improved local content in the Nigerian construction industry:

- Revamping of steel rolling mills;
- Government encouragement of local manufacture of industrial machines;
- Skills development and enhancement of institutions;
- Favorable Tax Policies; and
- Sustainable Construction methodologies.



Bldr Solomon Ogunbusola
President of Federation of Construction Industry (FOCI)

PLENARY SESSION

EVOLVING RISK MANAGEMENT AND CONFLICT RESOLUTION FOR EFFECTIVE DELIVERY IN NIGERIAN CONSTRUCTION INDUSTRY

In the light of the enormous risks associated with the construction industry and the consequent conflict that unarguably ensue, the authors gave a robust discussion on emerging risk management and conflict resolution in the Nigerian construction industry. The paper classified Risks peculiar to the Nigerian construction industry into six broad classes namely Technical, Logical, Management, Environmental, Financial and Socio-political risks. It was stated that several models of risk management have been developed and a number of sequential risk management strategies have also been formulated. The Paper noted that there is no "one method fits all" model when it comes to risk management. Essentially, the peculiarity of the anticipated risk informs the management procedure.

Engr. Dr. Victor O. Oyenuga
Past President, Nigerian Institute of Structural Engineering

The Paper avers that the consciousness and the effect of risks associated with the construction industry in Nigeria precipitated the following five categories of response to risk over the years, namely

- Accepting the Risk,
- Risk Qualification,
- Monitoring the Risk and Preparing Contingency Plans,
- Transferring the Risks, and
- Mitigating the Risk

It was however concluded that Risks and conflicts cannot be divorced from the construction industry. It is therefore wise to utilize the emerging risk management and conflict resolution strategies appropriately in order to facilitate effective project delivery in a timely, cost-effective way; best quality and reduce bottlenecks encountered to the minimum.

HEALTH AND SAFETY IN THE CONSTRUCTION INDUSTRY

The paper analyzed the factors that influence the implementation of occupational health and safety program and its benefit to contractors, employers and the construction industry. Statistics were presented to confirm the assertions made in the discourse as it relates to Health and Safety in the construction industry. In the course of the presentation, it was further ascertained that there were at least 60,000 fatal accidents on construction sites annually around the world. This rate is not only very high but the frequent occurrence of accidents on sites has led to loss of lives, properties, workers, money, materials and time. The presentation also highlighted a number of factors that have negative impact on health and safety management in developing countries. It concluded by offering sustainable strategies towards ensuring safety in the construction environment.

Nnamdi Ilodiuba FISPN, FNIIS
National President, Institute of Safety Professionals of Nigeria (ISPON)

PARALLEL SESSIONS

The Parallel sessions focused on critical topical issues that are relevant to repositioning the Nigerian Construction Industry. There were three Parallel sessions each of which contained three session areas as presented below:

PARALLEL SESSION A: INDUSTRY GROWTH AND PERFORMANCE

Session A1: Workforce/Organizational Framework (3 Papers)
Session A2: Financing for Real Estate & Infrastructure Development/Urban Renewal (6 Papers)
Session A3: Quality Control/Structural Integrity of Old Structures (4 Papers)

PARALLEL SESSION B: INNOVATIVE & SUSTAINABLE MATERIALS FOR CONSTRUCTION

Session B1: Sustainable Materials for Construction: Aggregates (4 Papers)
Session B2: Sustainable Materials for Construction: Pozzolana/Admixtures (6 Papers)
Session B3: Sustainable Materials for Construction: Pozzolana (3 Papers)

PARALLEL SESSION C: EMERGING CONSTRUCTION DESIGNS & TECHNOLOGIES

Session C1: Sustainable Design and Architecture (3 Papers)
Session C2: Emerging Construction Techniques (6 Papers)
Session C3: Alternative Construction Materials (3 Papers)

In all 38 papers were presented during the parallel sessions followed by robust discussions and Question and Answer Sessions

PARALLEL SESSIONS A1:

WORKFORCE/ORGANIZATIONAL FRAMEWORK

AN INVESTIGATION INTO THE SAFETY CULTURE OF NIGERIAN CONSTRUCTION WORKERS: A CASE STUDY OF BENIN-CITY

– **Agbonkhese O.** (Research officer, NBRRI)

The research assessed the level of compliance of safety culture by Artisans within the construction industry, using Benin-City as a case study. The reviewed the term safety culture and the associated challenges and beliefs as it relates to the construction industry. The Paper identified the causes of accidents at construction sites, discussed preventive strategies especially with respect to the most abused safety rules and regulations in the industry. The paper discussed the safety culture of Nigerian construction workers based on field survey data generated; and concluded as follows:

- There is a general poor safety culture in the Nigerian construction industry
- There is a significant relationship between poor safety culture and increased rate of unsafe acts

As part of the remedial measures, the Paper advocated as follows:

- ✓ It is the responsibility of every construction worker to identify unsafe conditions and behaviors at construction sites, and try to correct them.
- ✓ Regular site safety audits that will facilitate the identification/elimination of potential workplace hazards and enable management to sense the safety climate of the work site, should be conducted on a regular and periodic basis

PARALLEL SESSIONS A1:

WORKFORCE/ORGANIZATIONAL FRAMEWORK

INVESTIGATING PERFORMANCE ENHANCERS OF ARTISANS IN THE NIGERIAN CONSTRUCTION INDUSTRY: A CASE STUDY OF SELECTED AREAS OF THE F.C.T. ABUJA

– Maton J. D., Kigun P.A., Lawan S. A. and Nwanade, O

The Paper provided local, up-to-date and reliable information concerning artisans' level of job satisfaction within the construction industry in Abuja and its environs. This was achieved using a quantitative research approach that generated primary data through the administration of questionnaires. From the analysis of the data generated, it was concluded that Artisans' performance the construction industry is a problem plaguing the construction industry especially in the Federal Capital Territory. While reviewing how the construction industry contributes significantly to the Gross Domestic Product (GDP) of countries, the paper recommended as follows:

- Artisans should be encouraged to form Associations that will regulate and add value to their operations, and register same with the Corporate Affairs Commission.
- Regarding low motivation, double targets could be set on projects
- Regular interactions can be organized to recognize hardworking artisans to motivate others to work harder.

CAUSES OF CONFLICTS IN FEDERAL ROAD PROJECTS IN NIGERIA

– Adewumi J. R. & Ajayi, S.A

The paper discussed 'conflict', 'dispute' and 'disagreement' in the construction industry taking note of the fact that Construction activities involve stakeholders (clients, consultants for design and supervision, contractors and subcontractors) and their interactions and actions that can sometimes lead to conflicts. The research aims at identifying and proffering solution to the causes of dispute between consultants and contractors, and also to identify and determine the strength of the dispute factors. In order to achieve these, the research required a large amount of documented data on both completed and uncompleted projects where dispute occurred between consultants and contractors. Owing to non-availability/accessibility of such data due to our poor data management in Nigeria, they adopted a questionnaire survey approach. In conclusion, the research findings indicates that construction conflicts/ disputes if not resolved on time, can become very expensive, considering the finances, personnel, time lost, and the opportunity costs involve. Hence, there is urgent need to find solutions to this problem in the construction industry.

PARALLEL SESSIONS A2:

FINANCING FOR REAL ESTATE & INFRASTRUCTURE DEVELOPMENT /URBAN RENEWAL

SUSTAINABLE FINANCING AND MANAGEMENT OF HIGHWAY INFRASTRUCTURE IN NIGERIA - PUBLIC-PRIVATE PARTNERSHIP (PPP) OPTION

– Abiodun, I.

In providing a preamble, the Paper noted that the current state of highway network in Nigeria is deplorable and has largely been responsible for the frequent cases of fatal accidents as well as delayed travel time and environmental degradation. It further noted the failure of government over decades to provide sustainable road infrastructure due to underfunding, inefficient procurement and poor maintenance strategies. To address these and other related issues, the research-based Paper explored the potential of using the PPP Initiative as an alternative procurement method in place of the conventional procurement method for highway development and operations in Nigeria. The work focussed on investigating factors that fuel the need for Public Private Partnership (PPP) as a procurement option for highway infrastructure projects in Nigeria. The findings showed that PPP by way of its unique financial models, efficient procurement, operation and maintenance processes, technical and managerial capacities, as well as the bundling of design, construction and maintenance in a single contract package, may produce timely, cost-effective, good quality and sustainable highway network in Nigeria.

FINANCIAL PERFORMANCE OF SMALL AND MEDIUM CONSTRUCTION FIRMS (SMCFS) IN ABUJA, NIGERIA

– Olowe J. Mayowa & Okotie A. J.

The paper investigated the performance of small and medium construction firms (SMCFs) engaged in property development in Abuja, with a view to providing information that will enhance effectiveness. The Paper used the data generated from financial statements and records of 7 SMCFs, to establish the financial performance/sustainability of the firms in the study area. The Financial performance profile of the companies studied such as revenues, expenses and profits were discussed using parameters such as Liquidity Ratios, Profitability Ratios, Operating margin, Health of an organization; and the Multi Discriminant Analysis (MDA) model. From the analysis performed, it was concluded that though the firms were performing well financially, they had fair management of resources profile as shown in their current ratio (CR), return on equity (ROE), return on assets (ROA) and profit margin on sales. It recommended that financial bodies within the country should mandate SMCFs to have financial guidelines, engage the services of proper auditing firms and prepare their financial statement that will meet Generally Accepted Accounting Principles (GAAP).

PARALLEL SESSIONS A2:

FINANCING FOR REAL ESTATE & INFRASTRUCTURE DEVELOPMENT /URBAN RENEWAL

AN IMPACT ASSESSMENT OF THE RE-ENGINEERED 2012 NATIONAL HOUSING FINANCE POLICY

– Bidda G.B

In discussing the impact assessment of the 2012 National housing Finance Policy, the author reiterated the fact that shelter is one of the basic needs of human survival. It also noted that ineffective policies of government in the provision of housing in spite of its importance and higher priority rating, has been a major impediment. However the need for private sector participation in effective and sustainable housing finance and indeed in housing delivery, guided the Federal Government to establish the Federal Mortgage Bank of Nigeria (FMBN). The study assessed the impact and the efficacy of the re-engineered Housing Finance policy as enshrined in the new National Housing Policy (2012). This was done through the conduct of Questionaire administration based on critical impeding factors and challenges observed in housing finance over the past years.

In the findings, the overall assessment shows that 72% of respondents believed that the policy has performed only fairly considering what it ought to have achieved. The study also showed that the re-engineered housing finance policy has performed poorly with regards to its objectives since the policy has not yet effectively addressed the problem of affordability and profitability among home owners and private developers. Another key finding was that the National Housing Fund under the previous National Housing Finance policy cannot alone provide the huge financial outlay needed for mass housing delivery in Nigeria; it consequently advocated that the Federal Mortgage Bank of Nigeria (FMBN) should be re-capitalized to enable it provide sustainable and affordable mortgages to Nigerians.

ROADMAP FOR INNOVATIVE URBAN REGENERATION AND RURAL SETTLEMENT UPGRADE AS TOOLS FOR ACHIEVING COMPETITIVE CITIES IN NIGERIA

– Tpl T. Ayinde

The paper reviewed road map for innovative urban regeneration and rural settlement upgrade as tools for achieving competitive cities in Nigeria. The paper provided an overview of existing and emerging deteriorating urban and rural settlements and the challenges faced in upgrading them to become competitive cities. As a panacea, the paper discussed new ways and methods of making deteriorating settlements become vibrant, productive and rewarding again through innovative and improved construction methodology and strategy. In arriving at this, the Paper examined and provided a critical overview of urban and rural regeneration including the causes, the need for regeneration, the philosophy, the quantum of settlements, the dynamic design to make the settlements inclusive, the critical stakeholders, the processes involved, the infrastructure quality, speed of construction, affordability and the associated costs. The concept and roadmap was buttressed with practical examples in Lagos State. The paper concluded that regeneration is an opportunity to rethink the economy of declining areas of the city and positively influence man's life in its entirety.

PARALLEL SESSIONS A2:

FINANCING FOR REAL ESTATE & INFRASTRUCTURE DEVELOPMENT /URBAN RENEWAL

A CRITICAL EVALUATION OF FUNDING MECHANISMS FOR URBAN INFRASTRUCTURE DELIVERY IN NIGERIA

– Tpl Onibokun O.Abimbola FNITP

The paper focused attention on the importance of infrastructure and services in achieving efficient and effective functioning of cities and towns as well as promoting national economic development. With respect to the construction industry in particular and settlement development in general, the paper noted that urban infrastructure mirrors specific characteristics and by nature requires high capital input for its realization. Adequate infrastructure is a prerequisite for opening up access to investment flows, increasing the competitiveness of production and services as well as sustaining a nation's economic growth. It was revealed that Urban infrastructure financing in Nigeria has been undertaken through Annual Budgetary Provisions, Institutionalized Sources, Off-shore Borrowing, Specialized Finance Institutions, and Private sector Interests. The merits and demerits of the different funding mechanism for infrastructural development were succinctly discussed; with focus on the performance of the defunct Urban Development Bank and the Infrastructure Bank which replaced it. The Paper concluded by positing that, to overcome the constraints to funding infrastructure and housing projects, some urgent steps should be taken which the planned establishment of Metropolitan Transportation and Planning Authority (MTPAS) for orderly functioning of cities, amongst others as stated in the paper.

PARALLEL SESSIONS A3:

QUALITY CONTROL/STRUCTURAL INTEGRITY OF OLD STRUCTURES

ASSESSMENT OF BUILDING COLLAPSE PHENOMENON IN NIGERIA: CASE STUDY OF ABUJA AND ITS ENVIRONS

– Omange G.N. & Matawal D.S.

The paper investigated the recurrence of building collapse in Nigeria which necessitated the swift intervention of the Nigerian Building and Road Research Institute (NBRRI) to investigate and provide solutions towards zero tolerance for the building collapse phenomenon. The paper presented the outcome of field and laboratory investigations carried out on 4 building collapse incidences in Abuja and its environs. It also featured the analyses of the circumstances that led to the collapses corroborated by field evidences and drew up the critical causative factors which preceded recommendations to prevent future occurrences.

In the preamble, the Paper noted that the incessant collapse of buildings witnessed in Nigeria between 2010 and 2011 was becoming embarrassing and this necessitated a need for intervention to stem the tide and embarrassment to the stakeholders and Government. This required the mobilization of technical Building Collapse Team raised by NBRRI to visit Building collapse sites as soon as they occurred, noting the site conditions, taking measurements and eye witness accounts, conducting laboratory tests where feasible, etc. The results of the investigations of building collapse in Mararaba, Kubwa, Gwarimpa and Apo areas of the FCT were presented. The results showed that the causative factors in each of the cases were not all the same, the collapse in each case was not due to a single factor but a combination of more than one factor from 8 factors identified from the study. These are the Use of Poor Quality Construction Materials, Inadequate Design/Non-compliance to Design Specs, Inadequate/Wrong Foundation/Poor site conditions, Poor workmanship, Unconventional construction practice, Inadequate & Unprofessional Supervision Quacks in the Construction Industry, Improper Supervision & Use of non-professional at site. The Paper concluded with a 7-point recommendation relating to Regulation, Enforcement, Legal, Insurance, Education/Training, Monitoring and Sensitization, and Information Management.

PARALLEL SESSIONS A3:
QUALITY CONTROL/STRUCTURAL INTEGRITY OF OLD STRUCTURES

STRUCTURAL INTEGRITY ASSESSMENT OF THE ACADEMIC AND HOSTEL BUILDINGS AT UNIVERSITY OF ILORIN USING NON-DESTRUCTIVE METHODS

– Yusuf I.T. & Jimoh Y. A.

The research explained the knowledge of concrete properties under anticipated loading conditions where the fatigue strength data of concrete and other materials that are used for development of load induced stresses are discussed for safe, effective and economical design. The paper noted that the Ultrasonic Pulse Velocity (UPV) through concrete provides a measure of the quality or integrity of concrete because it checks the uniformity of concrete, detects cracking and voids in concrete, etc. The Paper further presented results of a study which used non-destructive test methods namely the Ultrasonic Pulse Velocity (UPV) and Non Destructive Testing (NDT) methods, to determine the residual life of buildings and used Faculty of Engineering buildings at the University of Ilorin as the case study. The principle of the methodology involved observing the residual lifespan of concrete deduced after an informed monitoring of strength subjected to many repetitions of loads. The portable ultrasonic Non-Destructive digital tester (PUNDIT apparatus) was used to examine the influence of the frequency of loading on fatigue properties of the concrete buildings. The results generated and analyzed revealed that the concrete walls of Faculty of Engineering blocks and the whole blocks in the academic and hostels of University of Ilorin commissioned about 40 years ago, are still structurally sound.

CODES AND QUALITY CONTROL IN NIGERIAN CONSTRUCTION INDUSTRY

– Njoku, C.F & Dike B.U.

The paper reviewed and investigated the adherence and compliance by professionals and construction firms to codes and standards in the industry. In doing this, the Paper provided a classification of codes and standards as they relate to quality of control in the construction industry and building codes for actual construction work. It provided a general overview of the need for and benefits of adherence to codes of practice in order to achieve uniformity in the quality of work. From the wholistic overview made, the Paper concluded that the Nigerian construction industry still faces the challenges of quacks and corruption among the professionals, from the planning stage to the completion stage of any project. The authors further concluded that though Codes, Standards and Specifications exist locally and internationally, professionals in the construction industry do not readily comply. The Paper recommends that measures to address this challenge would include the following:

- Employment of Quality Assurance Engineers and Quality Managers to ensure quality control and quality assurance.
- Every construction company should have a Quality Assurance/Quality Control Department,
- The Organization of QMS trainings for staff of the company and subcontractors should be accorded high priority.

PARALLEL SESSIONS A3:

QUALITY CONTROL/STRUCTURAL INTEGRITY OF OLD STRUCTURES

STABILITY INTEGRITY OF TAMBURAWA BRIDGE, KANO STATE

Ejeh S.P., Nkposong A., Sule J., Akinmade O.D., Jibrin U.S., Inuwa I.A., Yisa G.L & Matawal, D. S.

The paper was a presentation of the investigation carried out to assess the structural integrity of a bridge in Tamburawa area of Kano State. The investigation became necessary because of the exposed piers and piles observed at the foundation of the two bridges, each of which had two lanes. The investigation involved a site visit during which the bridge inspection was done to ascertain existing structural defects, collect soil samples from trial pits for laboratory testing, note the on-going sand mining and farming activities, conduct geotechnical investigation, etc. The results of the investigation revealed several issues which included observed corrosion of the steel beams and cross-bracing at certain places, scouring of the river bed which resulted in the exposure of the steel raked piles, diagonal cracks observed at the abutments wing walls, etc. Further investigation revealed that the scouring of the river bed around the piles could have been accentuated by farming activities within the vicinity of the bridge embankment, the aforementioned sand mining activities, as well as the fact that the predominantly sandy soils in the River Challawa had little or no clay content. In spite of the observed shortcomings, the bridge was adjudged to be safe for vehicular movement, though suggested appropriate and proper maintenance works were recommended to be immediately carried out.

PARALLEL SESSIONS B1:

SUSTAINABLE MATERIALS FOR CONSTRUCTION: AGGREGATES

TIN ORE TAILING AS FINE AGGREGATE IN CONCRETE PRODUCTION FOR USE IN RIGID PAVEMENT WORK

– Manasseh Joel and Rondong Luka Chung

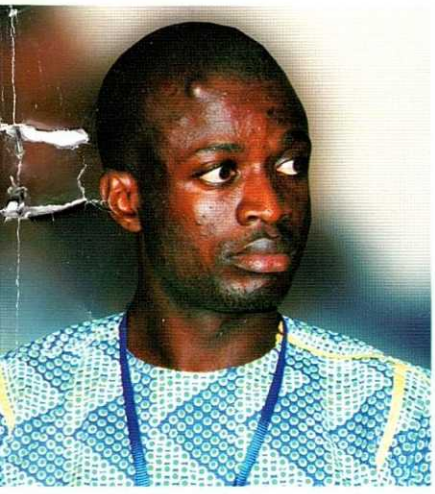
The Paper presented the report of research which investigated the suitability of Tin Ore Tailing (TOT) as replacement to river sand in the production of concrete for use in rigid pavement work. Compressive and flexural strength tests results were used as basis for the assessment. The investigation involved the replacement of river sand with TOT at intervals of 10 % by dry weight of sand from 0 % to 100% TOT. Sieve analysis and specific gravity tests were performed on TOT and fine aggregate. Similarly the oxide composition of the TOT was determined while the Slump test was performed on fresh concrete. Compressive and flexural strength tests were performed on concrete produced with fine aggregate replaced with different percentages of TOT. Mix ratio of 1:2:4 (cement: Fine aggregate: coarse aggregate) by volume and water/cement ratio of 0.55 were used to cast concrete cubes and beam specimens that were subjected to the aforementioned tests. The results generated when river sand used as fine aggregate was replaced with 50% TOT showed that the Optimum compressive and flexural strength values were 36.89 N/mm2 and 5.71 N/mm2 respectively. Based on the test results generated, it was concluded that TOT can be used to completely replace sand in concrete production; and its use in concrete production will provide an effective way of disposing TOT which is a waste material. Moreover, it will ensure economy in concrete production.

PARALLEL SESSIONS B1:

SUSTAINABLE MATERIALS FOR CONSTRUCTION: AGGREGATES

INVESTIGATION OF THE COMPRESSIVE STRENGTH OF LIME-CEMENT CONCRETE

– Awodiji C., Onwuka D.O., Awodiji O.O., & Dike B.U



This paper presents the experimental results of the investigation of the compressive strength of Lime-Cement (LC) concrete. The variations of the compressive strengths of concrete mixes with varying w/c ratios within 28 days after curing and casting, were experimentally investigated. In all, a total of 90 concrete cubes were cast (3 specimens for each mixture) and tested so as to determine their compressive strengths. It was observed that slump values obtained for LC concrete were higher than those from OPC concrete. The initial and final setting times for OPC paste were recorded at 60mins and 430mins respectively, while those for the HL paste were 2880mins and 4320mins respectively. The density of concrete cubes ranged from 2449Kg/m3 to 2616Kg/m2 indicating that the concrete is a normal weight concrete. Granite chippings used was poorly graded, having an average bulk density of 764.92kg/m3 while the sand used for the study was poorly graded with average bulk density of 1033.77kg/m3. It was concluded that LC concrete could be used for various civil engineering and building works, even at 28 days of curing.

EVALUATION OF THE COMPRESSIVE STRENGTH OF CONCRETE MADE WITH RECYCLED CONCRETE AGGREGATE USING METAKAOLIN-BASED GEOPOLYMER

– Adejo J.E., Okoli G.O. and Ka'as, E.T.

The Paper presents the results of research carried to evaluate the compressive strength of metakaolin based-geopolymer concrete made with recycled concrete aggregate (RCA) and ordinary Portland cement (OPC). While Metakaolin and alkaline solution (sodium hydroxide and sodium silicate) formed the binder used for the concrete production, the use of recycled aggregates and geopolymer binder provided cost-effectiveness and environmental benefit, and has potential to reduce use of OPC. The investigation involved testing the composite concrete cubes containing RCA at 0%, 20%, 30%, and 40%. The Metakaolin-based geopolymer concrete was produced and cured at 60oC in the oven for 24hrs after which they were left to air dry in the laboratory and the compressive strength determined after 28days curing. The PCC was similarly tested after curing in water for 28days. The highest average compressive strength obtained at 28 days curing for PCC were 24.23N/mm2; 21.09N/mm2, 19.81N/mm2 and 19.37N/mm2, while those for the geopolymer concrete (GPC) were 31.54N/mm2, 31.17N/mm2, 28.55/mm2 and 26.40N/mm2. It was concluded that the compressive strength of metakaolin-based geopolymer concrete containing RCA is higher when compared to that of PCC containing RCA.

PARALLEL SESSIONS B1:

SUSTAINABLE MATERIALS FOR CONSTRUCTION: AGGREGATES

MECHANICAL PROPERTIES OF WASTE TIRE-RUBBER-CHIPS CONCRETE MODIFIED WITH PALM FRUIT FIBER (PFF)

Garba A., Mukaddas A.M. Maleka A.M. and Siyanbola S.A.

This research work covered by the paper explored the potential utilization of waste tire rubber chips modified with palm fruit fiber (PFF) in various mix categories for the production of concrete. The properties of fresh and hardened concrete such as slump, density, compressive and flexural strengths were examined. The results of the study and the analyses revealed some significant findings and conclusions which included but were not limited to the following:

a) There was a decrease in slump value as the percentage of palm fruit fiber increased.
b) The slump recorded a maximum decrease of PFF replacement.
c) Increasing the tire rubber chips content leads to decrease in the density, compressive and flexural strengths of the concrete.
d) Incorporating palm fruit fiber as additive led to an increase in compressive strengths.
e) The Waste tire rubber chips concrete modified with palm fruit fiber recorded an increase in compressive and flexural strengths by 22% compared to RC mix specimens at 28 days curing.

This research work showed the significance of incorporating palm fruit fiber in concrete and recommended its usage in structural concreting.

PARALLEL SESSIONS B2:

SUSTAINABLE MATERIALS FOR CONSTRUCTION: POZZOLANA ADMIXTURES

EFFECT OF PALM OIL FUEL ASH ON CEMENT AND CEMENT POZZOLANA BINDER FOR RAMMED EARTH CONSTRUCTION

– Agbonkhese O. *Research officer, NBRRI*

The research work covered by the paper investigated the effectiveness of Palm Oil Fuel Ash (POFA) as a supplementary cementitious material in the stabilization of lateritic soil for rammed earth construction. Five different mixes were produced of laterite only (un-stabilized), laterite-cement (stabilized) and laterite-cement-POFA. Proctor test was conducted to establish the optimum moisture content (OMC) and maximum dry density (MDD) for all the mixes. Tests for compressive strength and water absorption were also carried out. The effects of curing on the evaluated properties were recorded at 7, 14, and 28days. A minimum load bearing compressive strength as specified by the International Building Code (2006) for rammed earth was adopted as success criteria. The results showed that the minimum strengths were achieved at all levels of stabilization. The study also showed that rammed earth products with POFA replacement of up to 20% presented the highest strengths; thus this percentage was considered as the optimum percentage replacement. It was concluded that the strength of the mixes increased generally with curing age. Also the stabilized mixes were found suitable in terms of water absorption capacity

PARALLEL SESSIONS

PARALLEL SESSIONS B2:

SUSTAINABLE MATERIALS FOR CONSTRUCTION: POZZOLANA ADMIXTURES

UTILIZATION OF PALM OIL FUEL ASH AS CEMENT REPLACEMENT MATERIAL IN CEMENT MORTAR

– Usman J., Abdulrahman M.S., Dahiru D. Mas'ud Mamman M. and Getso A.I

The Paper presented the results of the research carried out on the utilization of Palm Oil Fuel Ash (POFA) as pozzolan in cement-based materials and production of sustainable construction materials. POFA is an agro-waste from the Palm Oil Industry which is obtained from burning palm oil residues (palm fiber and shell) as biofuel for energy production in the palm oil industry. The effective use of POFA in the construction industry is considered as beneficial especially in ensuring proper waste management. The laboratory-based investigation involved the evaluation of the effects of POFA as cement-replacement material especially as mortars. In addition to presenting empirical data generated on fresh and hardened properties of the composite mortar, the paper also determined the physical, chemical and mineralogical characteristics of POFA. Additionally, the workability, compressive and flexural strengths of the cement mortar containing 10 to 30% POFA by weight substituting ordinary Portland cement (OPC) were determined. The results showed that POFA can be considered as Class F- pozzolan and up to 20% POFA can be used to improve the workability, compressive and flexural strengths of cement mortar. It was concluded that POFA can be used as cement-replacement material.

EFFECT OF PALM OIL FUEL ASH (POFA) FINENESS ON THE FLOW AND STABILITY OF ASPHALTIC CONCRETE

Maleka M.A., Mukaddas A.M., Saidu A. and Yero, S.A.

The use of Palm Oil Fuel Ash (POFA) as filler in asphaltic concrete was studied with varying degree of success. The Paper investigated the effect of the fineness of POFA on the mechanical properties of asphaltic concrete. Using 4 different categories of POFA fineness (based on 30min, 60min, 90min and 120min of grinding with LAAV machine), a number of trial mixes were prepared using the Marshal Mix design procedure with 5% POFA to arrive at asphalt concrete mixtures that fulfilled the Marshal criteria. The effects of each POFA fineness category on the stability flow and stiffness of asphaltic concrete mixtures at their respective optimum binder content were evaluated. The results showed that Marshall stability flow and stiffness generally improved when POFA was grinded than the control, but after some period of grinding (peak of the curve), the values diminished. The therefore concluded that grinding POFA to some extent improves the properties of asphaltic concrete. Specifically, it was further concluded that grinding POFA for up to 60 minutes gave the optimum improvement of the properties of asphaltic concrete mixes

PARALLEL SESSIONS B2:

SUSTAINABLE MATERIALS FOR CONSTRUCTION: POZZOLANA ADMIXTURES

LATERITIC SOIL STABILIZED WITH CEMENT-CORN COB ASH POZZOLAN AS NEW MATERIAL FOR CARBON CREDIT EARNING IN PAVEMENT WORKS

– Apampa O.A. and Jimoh Y.A

The paper examined the carbon savings that could result from the partial substitution of Ordinary Portland Cement with corn cob ash (CCA) as artificial pozzolan in the cement chemical stabilization of lateritic soil. It also considered the monetary value of the carbon in the international carbon credit market. The quantity of carbon dioxide emission reduction realizable from the partial substitution of ordinary Portland cement (OPC) with pozzolanic corn cob ash (CCA) in the chemical stabilization of a lateritic soil for road works as compared with OPC stabilization was evaluated in order to establish the potential of Nigeria benefiting from the international Emission Trading Scheme embodied in the Kyoto Protocol. The corn cob studied was obtained from Maya in South West Nigeria and incinerated to ash of Class C pozzolan.

PARTIAL REPLACEMENT OF CEMENT WITH SOYA BEAN HUSK ASH IN RIGID PAVEMENT CONCRETE PRODUCTION

– Manasseh J. Johnson J.M. and Tsafa J.D.

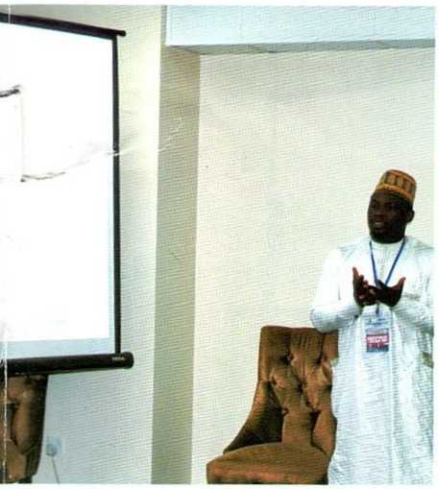
The research covered by this paper investigated the suitability of concrete produced with cement partially replaced with Soya Beans Husk Ash (SHA) for use in rigid pavement concrete work. The cement was partially replaced with SHA by dry weight of cement; the chemical oxide composition analysis of SHA powder and cement were determined, the setting times of cement-SHA paste tests were carried out while the compression and flexural strength tests were performed on concrete cubes and beam specimens for Grade concrete. In discussing the results, the Paper found out that the 28-day compressive strength of grade concrete produced with only cement decreased significantly when cement was partially replaced with SHA. Likewise the 28-day Flexural strength of the composite grade concrete decreased. Based on results, the paper recommended that cement partially replaced with SHA can be used in the production of concrete for some aspects of rigid pavement construction work; and that such usage will help solve waste management problems associated with SHA.

PARALLEL SESSIONS B2:

SUSTAINABLE MATERIALS FOR CONSTRUCTION: POZZOLANA ADMIXTURES

STRENGTH AND MICROSTRUCTURE OF CONCRETE MORTAR CONTAINING METAKAOLIN

– Kaura J.M., Amartey D.J., Shuaibu A.A. and Rabilu A.



The paper is a report of the research carried out to establish the influence of Metakaolin (MK) on the strength and microstructure of concrete mortar when used as partial replacement of ordinary Portland cement. Concrete mortar cubes made of Ordinary Portland Cement (OPC) replaced with varying replacement levels of Metakaolin were cast, cured and subjected to varying engineering tests. Additionally, the microstructures of the mortar cubes were investigated using Scan Electron microscope (SEM). From the analysis of the results generated, it was established that the partial replacement of OPC with Metakaolin in concrete mortar led to considerable increase in compressive strength at all ages in comparison with the strength of the control test cubes. The improvement in the compressive strength was however, not significant beyond 12% Metakaolin replacement of OPC. Consequently, 12% OPC replacement with Metakaolin was considered and recommended as the optimum. Also, the SEM analysis revealed that the addition of Metakaolin in concrete greatly reduced the void spaces, indicating a highly impervious concrete capable of performing well. It was concluded that Metakaolin is a sustainable material compared to ordinary Portland cement.

PARALLEL SESSIONS B3:

SUSTAINABLE MATERIALS FOR CONSTRUCTION- POZZOLANA

DEVELOPMENT OF PILOT PLANT FOR POZZOLANA CEMENT PRODUCTION IN NIGERIA

– Matawal, D.S., Lawal, R. B., Omange, G. N., Gidado, M. T and Ogwu, E. A.

This paper presented work done on the development of two pilot plants for the production of Pozzolana cement, from the conceptual and design to the construction/installation stages. For the Pilot Plant located in Ota Ogun State, the basic pozzolanic raw material was Clay while for the pilot plant in Bokkos in Plateau State, the pozzolanic raw materials were Clay and Volcanic ash. The Paper described the various technical activities, processes, challenges and breakthroughs that accompanied the construction of the 15 tonnes/day capacity Pozzolana Pilot Plant which was completed in Ota and undergoing test-running. The paper further described the similar activities for the same-capacity pilot plant which was nearing completion in Bokkos, Plateau State. As a result of the widespread occurrence of the Clay in Nigeria, the Paper recommended that the prototype plants developed can be replicated in different parts of the county as a primary and sustainable source of alternative cement to Ordinary Portland Cement, in order to facilitate mass housing delivery. The paper however noted that the pilot Plants can process any of the variable agro-industrial waste materials of high pozzolanic potential such as Rice Husk Ash (RSA), Saw Dust Ash (SDA), Fly Ash, Baggasse and others being revealed everyday through research.

PARALLEL SESSIONS B3:

SUSTAINABLE MATERIALS FOR CONSTRUCTION- POZZOLANA

EVOLVING GREEN AND ENVIRONMENTALLY-FRIENDLY ALTERNATIVE BINDER TO CEMENT TOWARDS A SUSTAINABLE CONSTRUCTION BINDING MATERIAL

– Opeyemi, J., Tolulope D., Ogunro, A.S., Matawal, D. S. and Lawal, R.B

The paper noted that concrete production contributes up to 5% of the annual global CO2 emissions of which the bulk is from the production of cement. This concern has led to the development of greener and cheaper alternative binders which had so far evolved to blended and pozzolanic cements. The study described in the paper is with respect to the development of a fully pozzolanic process involving the blending of NBRRI Clay pozzolana (derived from NBRRI Pilot Pozzolana) with calcium hydroxide (Ca(OH)2 sourced from Carbide Waste (CW). The carbide waste is the by-product of carbide after being used to generate acetylene employed industrial welding processes, etc. The study showed that the combination of the pozzolan (from clay or agro wastes) and carbide waste in the presence of water produced the C-S-H responsible for strength development as in cement hydration leading to production of an alternative binder material in place of cement mortar. It recommended further investigation to develop this sustainable innovation to a commercializable level in the construction industry.

ASSESSMENT OF OWODE-KETU CLAY DEPOSIT IN PARTS OF SOUTH-WEST NIGERIA FOR POZZOLANA PRODUCTION AND ITS APPLICATION IN THE CONSTRUCTION INDUSTRY

– Osadebe C.C, Sulymon N., Lawal R.B., Ogunro, A.S., Quadri H., Emmanuel S. and Nwannenna, O.

The paper assessed Owode-Ketu (South-West of Nigeria) Clay deposit for production of pozzolana and its application in the construction industry. in doing this, the paper noted that due to its pozzolanic activity, accessibility and its low price, calcined clay has better potential as an admixture for concrete when compared with other pozzolanic material. The assessment included the physico-chemical investigation on the possibility of using calcined clay as sustainable construction material; the determination of the pozzolanic properties of Owode-Ketu clay, the particle size distribution and the chemical composition by X-ray fluorescence of the clay, etc. The analysis classified the clay pozzolana used as class N-pozzolan with an average pozzolanic index of 85%. The values obtained were higher than the minimum requirement of 20 N/mm^2 at 28 days as specified for concrete and construction works. It was concluded that the Owode-Ketu clay deposit is a potential pozzolanic materials for use in Ordinary Portland cement blending.

PARALLEL SESSIONS C1:

EMERGING CONSTRUCTION DESIGNS AND TECHNOLOGIES SESSION C1: SUSTAINABLE DESIGN AND ARCHITECTURE

ACHIEVING ADAPTABLE HOUSING THROUGH OPEN BUILDING PRINCIPLES AS MEANS OF CATERING FOR COMMON CHANGES IN HOUSING NEEDS: A PILOT STUDY OF GRACELAND, ZARIA

– Suleiman I.I., Maina J.J, and Sagada M.L

This paper is a pilot study on achieving Adaptable Housing Open-Building design principles, as a solution to the inevitable changes that occur in housing situations and occupants' lifestyles. It opined that the need for these modifications is often the case in the study area (Zaria) where there is continuous change in house occupancy for different reasons. The paper argued that buildings and their neighborhoods are not static, but need adjustments to remain functional. Th3q\ the research methodology included the administration of questionnaire to households in Graceland, Zaria, to establish the common types of changes users require in their houses. Analysis was done to check the Relative Satisfaction Index (R.S.I) of the spaces, and results obtained indicated that users want more bedrooms in their apartments. The paper also found out that although the occupants were satisfied with the living rooms and kitchens, they would like them modified. However, the greatest hindrance to the modification was the partition walls. The research therefore recommended that architects should develop buildings that will make changing of house-interiors possible and easy.

EFFECT OF THERMAL MASS AND WALL INSULATION INTERIOR TEMPERATURE, THERMAL COMFORT AND COOLING ENERGY EFFICIENCY IN KATSINA

– Muhammad U.A, Abdul Karim M., & Kimeng H.T.

This paper presents a case study of the derivable benefits of Sustainable architecture in Katsina City, Katsina State. The study was aimed at establishing the effect of the two strategies on indoor temperatures, thermal comfort and cooling energy demand in hot dry climate. The paper indicated that the conventional walling system used in Nigeria is the hollow sandcrete blocks with a very low time lag. The implication is a resultant thermal discomfort during hot season. The methodology applied in this study included the simulation of a typical residential building, modifying its indoor temperatures, thermal comfort hours and energy reduction when a mechanical cooling system is used, vis-a-vis a comparison with Autodesk Ecotect Analysis. Findings from this study indicated that though thermal mass had the advantage of storing heat, it was not as sustainable as insulation. The paper therefore recommended a design phase cognizance of the micro-climate of Katsina especially with respect to building forms and configuration; and noted the importance of eliminating thermal transfer rate between the building envelop and surrounding to maintain the thermal balance.

PARALLEL SESSIONS C1:

EMERGING CONSTRUCTION DESIGNS AND TECHNOLOGIES SESSION C1: SUSTAINABLE DESIGN AND ARCHITECTURE

COMPARATIVE ANALYSIS OF COMPRESSED EARTH BRICKS AND SANDCRETE BLOCKS FOR SUSTAINABLE HOUSING DELIVERY IN NIGERIA

– Obaje, J.A., Doshu R.G. and Ndandok C.T.

This paper presented the component parts of sustainability in housing through the effective use of materials and technologies of building. It explored the challenges of urbanization and increasing deficits of affordable housing in Nigeria and zeroed in on the need to establish materials and technologies that will be sustainable to meet these demands. The paper assessed the importance, the concept, the variables and features of sustainable housing. It identified features of sustainability in compressed earth bricks and sandcrete blocks and then drew up a comparative analysis to establish which of the materials is more sustainable. While the findings indicated that compressed earth bricks had better and higher advantages, it however noted low acceptability and poor user perception were the main challenges. The paper therefore recommended the implementation of policies that would promote and encourage the use of compressed earth bricks for sustainable large scale housing. It also recommended further researches and efforts by governmental, non-governmental organizations as well as Regulatory bodies involved in the Built environment to develop standards and ensure their inclusion in the Building code; and evolve strategies for the massive use of compressed earth bricks in housing delivery.

PARALLEL SESSIONS C2:

EMERGING CONSTRUCTION TECHNIQUES

AN INVESTIGATION INTO CHALLENGES OF ADOPTING ERGONOMICS IN THE NIGERIAN BUILDING CONSTRUCTION INDUSTRY

– Abdul-Hafeez, I. and Mustapha T.

The paper presented the negative effects of Musculoskeletal disorder with respect to construction health, safety and productivity; and how it poses a challenge to Ergonomics. It argued that the practice of Ergonomics have been successfully implemented in developed countries towards improving health and safety on construction sites. The paper investigated the challenges of adopting ergonomics in the Nigerian building and construction industry as well as ways of enhancing its adoption. The research methodology adopted included the administration of questionnaire which, after data collation and analysis, revealed that that the level of awareness of ergonomics in the construction industry was low. The study thus recommended among others the following:

- Training on construction ergonomics at all levels in the construction industry;
- Introducing ergonomics in the syllabus of construction related courses in tertiary institutions;
- Continuous Professional Development in this field
- Apprenticeship training of craftsmen
- Ergonomics should be included in the Health and Safety plan of the national Building Code
- Ergonomics should be included in the Health and Safety plan as part of the contract document.

PARALLEL SESSIONS C2:
EMERGING CONSTRUCTION TECHNIQUES

PREDICTION OF BEARING CAPACITY AND SETTLEMENT OF FOUNDATIONS USING STANDARD PENETRATION DATA IN SOUTH-SOUTH GEO-POLITICAL ZONE OF NIGERIA

– Salahudeen A. B., Ijimdiya S.T., Eberemu O.A. and Osinubi J. K.

The paper presented soils study to evaluate standard penetration test (SPT) results obtained from South-South geo-political zone of Nigeria; and used conventional empirical/analytical models and numerical modeling to correlate the soil properties and evaluate the foundation bearing capacity and settlement characteristics. The SPT N-values were corrected to the standard average energy before the soil properties were evaluated. The numerical analysis results using Plaxis 2D, a finite element code, showed that analytical/empirical methods of estimating the allowable bearing pressure of shallow foundations provided acceptable results. Results obtained indicated that the susceptibility of soils in the South-South region of Nigeria to compression is high on the average and the average bearing capacity can be used for shallow foundations with embedment. Based on recommendation of Eurocode 7 which allowed a maximum total settlement of 25mm for serviceability limit state, it was recommended that raft or deep foundations should be considered for applied foundation pressures exceeding 300kN/m2 in the South-South zone.

RELIABILITY ANALYSIS OF FOUNDATION SETTLEMENT IN NORTH-CENTRAL NIGERIA

– Salahudeen, A. B.

The Paper presented results of investigation to develop a method that will assist in the calibration of load and resistance factors for service limit state, with focus on the soils of the North-Central geo-political zone of Nigeria, based on standard penetration test (SPT) results. The research was necessitated by the major concern posed by the safety and reliability analysis of building infrastructure of many State and Federal agencies in Nigeria. The author reiterated that in an effort to harmonize with structural codes, geotechnical design codes around the world were beginning to migrate towards reliability-based design (RBD). The methodology adopted involved calculating Reliability indices based on the Burland and Burbidge foundation settlement prediction model. The results of the reliability analysis showed that, as the variability of geotechnical properties at a site increases, larger values of settlement were obtained with a higher probability of occurrence. The use of coefficient of variation (COV) value of SPT N-value based on the Burland and Burbidge method for SLS design was recommended for RBD of footings and total settlement on soils in the North-Central geo-political zone of Nigeria.

PARALLEL SESSIONS C2:

EMERGING CONSTRUCTION TECHNIQUES

IMPLEMENTATION OF LEAN THINKING AND PRINCIPLES IN CONSTRUCTION INDUSTRY IN NIGERIA

– Dauda M., Akubo I. and Shehu M.

The paper presented the efficacy of Lean Construction techniques and principles toward addressing the perennial challenges of the construction industry in Nigeria. It asserted that Lean construction is a philosophy based on the concept of lean manufacturing. The study ascertained the effectiveness of implementing lean thinking/principles in terms of project performance in Nigerian construction projects by examining professionals in the construction industry. the research methodology included questionnaire administration and personal interviews with relevant professionals based on Lean construction principles. The data analysis indicated that 63.6% of the respondents have average knowledge/awareness about the lean construction concept. The paper thus opined that Lean construction may require more time in the design and planning phases, but this minimizes conflicts that can dramatically change budgets and schedules. Thus, Lean Construction framework could be developed in order to provide alternative technical support for lean methods application within the building industry for ultimate goal of achieving affordable housing delivery system.

DEVELOPING INFORMATION REQUIREMENT MODEL FOR BIM-BASED QUANTITY TAKE-OFF USING BUILDING AND ENGINEERING STANDARD METHOD OF MEASUREMENT 3 (BESMM3)

– Madugu A.A., Abdullahi M. and Musa U.

The paper developed an information requirement model for BIM-based Quantity Takeoff in Nigeria using the BESMM3 as a standard of measurement. It deduced its imperativeness based on challenges observed as a barrier to Building information Modeling (BIM) implementation in the industry. Similarly, the paper noted that the slow pace of BIM adoption by Quantity Surveyors has been reported globally, and had been attributed to lack of conformance of the BIM software to local standards such as standard rules of measurement. The paper opined that to address this problem, the Industry Foundation Classes (IFC) data model needed to be extended to capture various local standards. The data scheme extension can only be done if the information requirements establishing the local standards and provisions are established. The research method included sourcing information requirements for BIM-based quantity take-off directly from the BESMM3. The results showed that Work breakdown structure of the BIM-based QTO tool doesn't conform to the Nigerian Standard (BESMM) for generating quantities. The results also indicated that 100% of respondents used the Autodesk Quantity takeoff tool as a BIM-based QTO tool.

PARALLEL SESSIONS C2:

EMERGING CONSTRUCTION TECHNIQUES

CRITICAL SUCCESS FACTORS INFLUENCING INDUSTRIALISED BUILDING SYSTEM PERFORMANCE IN NIGERIAN MASS HOUSING PROJECTS

– Ojoko E.O., Osman M.H., Rahman A.B., Omar W.S., & Musa J.

The paper investigated factors that are critical to the successful performance of Industrialized Building System (IBS) in mass housing project delivery. It established the inability of the conventional construction methods to meet mass housing project objectives for decades in Nigeria, which necessitated the paradigm shift to Industrialised Building System (IBS) by the Government in 2011. The paper enumerated the four (4) IBS models adopted and attributed the low uptake of the methods till date, to poor performance. The research methods involved questionnaire administration; and from the data analysis, several factors were identified as critical. From the study, the paper revealed that although most factors are relevant, the factors relating to stakeholders, interaction and infrastructure were more critical to IBS performance in Nigerian mass housing project delivery. Based on the results, the paper provided a framework for decision making on IBS implementation for Nigerian mass housing projects and probably other developing nations interested in similar technologies.

PARALLEL SESSIONS C3:

EMERGING ALTERNATIVE CONSTRUCTION MATERIALS

STUDY ON THE BENDING STRENGTH OF SOLID AND GLUE-LAMINATED TIMBER FROM THREE SELECTED NIGERIAN TIMBER SPECIES

– Ekundayo O.O, Kimeng H.T, Ango A. J., Folorunsho T.A. and Nwaogu J.M.

The paper reported on the laboratory investigation carried out on solid/sawn and glue-laminated elements fabricated from several timber specimens obtained from the southern part of Nigeria. In particular, the paper investigated the bending strength of solid and glue-laminated timber from the specified timber species with a view to documenting their potentials as alternative structural elements within the limits of their individual resilience. The authors established the physical and mechanical properties as well as the density of the timber species and the glue-laminated elements. The paper posited that in practice, the understanding of failure modes in timber structures aided in analyzing the potential reliability in-service problems and determining their effects on the performance of structural elements; which helped to identify strategies for failure mitigation. From the laboratory results and analysis, it was established that locally glue-laminated timber elements could be further developed for structural applications. It was concluded from the results obtained that more experimental testing and further studies should be given due priority in order to establish the reliability potential.

COMMUNIQUE

b) The Construction industry provides requisite socio-economic and industrial infrastructure that provides employment opportunities;

c) Large complex contracting in Nigeria is dominated by expatriates with few indigenous companies playing a minor role due to apparent resource gap;

d) The Construction industry accounts for several millions of jobs; however, it faces severe challenges which include poor administrative and managerial skills, ownership structure, lack of effective policies and Skills Gap;

e) High rate of urbanization has resulted in severe overcrowding in available houses within the existing low quality housing stocks;

f) There is acute shortage of housing stocks attributable to the continuous upward trend in housing construction cost and housing affordability.

g) The quality and quantity of housing stock in Nigeria is inadequate because the construction industry is driven by cost minimization;

h) 70% of collapsed buildings in Nigeria do not have government approvals prior to the commencement of building development, while 80% of Contractors and 90% of Clients confirmed that there was no supervision or quality control on building sites prior to collapse;

i) Inadequate designs, substandard materials, poor supervision and workmanship are the most critical factors in building collapse occurrences and attendant deaths. Government Agencies in charge of enforcement of codes and standards are not doing their jobs effectively;

j) Labour in the construction industry is outsourced through contractors and other intermediaries, which has had negative impact on the industry through weakness in collective bargaining;

k) In Nigeria, most construction projects fail due to poor contractors performance associated with poor workmanship, low productivity, late completion, cost overruns, high accident rate and poor work practice;

l) The Nigerian Construction Industry is likely to be spurred towards more sustainable growth due to rapid urbanization, the housing deficit as well as gross deficit of infrastructure required for sustainable growth.

m) Road transport is the most popular means of transportation in the country, and it is responsible for over 90% movement of people, goods and services, but this infrastructure is inadequate in quality, quantity and maintenance.

n) The current state of highway in the country is deplorable with great stretches of potholes, gullies, reduced road width arising from eroded road shoulders; and suffers from delayed or poor maintenance

o) The state of roads is responsible for frequent cases of fatal accidents, long travel time, loss of productive man-hours, high vehicle operating costs and environmental degradation;

p) Annual loss due to bad roads is estimated at 80 billion naira with additional 53.8 billion naira on vehicle operating cost;

B. Construction Industry Finance

a) Construction in Nigeria is inadequately funded as only 2% of the GDP goes to the sector.

b) The major source of capital for the construction sector in Nigeria comes from the public sector;

c) The adoption of the Public-Private-Partnership (PPP) initiative for infrastructure development in Nigeria is still in its primary phase. However, there are currently different models of PPP financing including Joint Venture and Private Finance Initiatives in Nigeria.

d) The National Housing Fund under the previous National Housing Finance Policy cannot alone provide the huge financial outlay needed for mass housing development in Nigeria.

e) The housing finance policy has not yet balanced the problem of affordability and profitability among home owners and private developers; Corruption has been the major setback while the housing policy implementation remained poor over the years.

f) Finance is a major constraint to achieving sustainable highway infrastructure with between 6 and 9 billion US dollars being required for the repair of road infrastructure in Nigeria;

C. Construction Safety and Conflict Resolution

a) Currently, there is nonchalant attitude towards safety measures at construction sites and this is due, among others, to lack of training of workers and absence of safety management system (i.e. safety plan);

b) Some of the several Risks associated with the Nigerian construction industry were identified to include: Technical risks (inadequate site investigation, incomplete design, etc.); Logistic Risk (poor planning, ineffective transportation, inadequate construction equipment spare parts, fuel, labour etc); Managerial Risks (industrial relations), Environmental (weather, natural disasters, etc.); Financial Risks (foreign exchange fluctuation, taxes, delays in payments, etc.) and Socio-political Risks (unstable government policies, etc.).

c) Human factors, complications of works, varying construction site conditions, lack of safety culture, unsafe/improper use of machinery and equipment and non-compliance with the various safe work procedures were identified as the major causes of accidents at construction sites.

d) It is difficult or near impossible to manage a construction project without one form of conflict or another;

e) Conflicts often result in project cost overrun, project delay, reduced productivity, loss of profit and damage in business relationship;

f) Laws for protection of labourers are not strictly enforced in developing countries, Nigeria inclusive;

D. Capacity Building

a) Emphasis is placed on academic programmes and little or none on vocational training in technical colleges, thus

leading to poor performance of Artisans in the Nigerian construction industry. This has led to the relegation of Nigerian Artisans as compared to their foreign counterparts, especially in the West African sub-region.

b) The Nigerian Artisans in the construction industry have suffered neglect over the years because government had not placed priority on vocational and technical training;

c) The country has lost over 960 billion naira annually through importation of skilled labour in masons, plumbers, Iron Benders, etc. from neighboring West African countries

E. Sustainable and Alternative Materials for Construction

a) The use of Tin Ore Tailing (TOT) in partial or total replacement of river sand in concrete production is beneficial due to increase in strength of the concrete, while the density of concrete product with TOT increased with days and TOT content;

b) Ordinary Portland Cement (OPC) is one of the critical construction materials. However, its production process is not eco-friendly as it releases greenhouse gases into the atmosphere.

c) Nigeria is blessed with various pozzolanic materials which can be blended with OPC for various construction purposes;

d) Compressed Earth Blocks (CEB) technology is an appropriate technology with the potential of providing affordable housing for the populace;

e) Alternative construction materials using Palm Oil Fibre Ash, Soya Bean Husk Ash, Lime, etc. as partial replacement of cement in concretes and pavement have been researched into and can be deployed for construction

f) Other Environmentally friendly construction materials researched into which include Laminated Bamboo Panels, Recycled Concrete Aggregate Geopolymer, Solid/Glue Laminated Timber Beams using secondary timber, etc. are available for deployment and uptake in the Construction industry.

F. Promotion of Local Content

a) Most construction equipment are heavy duty and typically more complex compared to other equipment. Most of these equipment are imported from Europe or Asia;

b) The Nigerian Steel Rolling Mills has the potential to fast track industrialization and employment generation in the construction sector;

c) There is a general lack of appropriate standards and specifications for locally available construction materials resulting in their poor acceptability;

7) RESOLUTIONS

Following the deliberations, the following resolutions were made:

A) Construction Industry Performance

a) There is an urgent need to update Draft Reports relevant to the Built environment such as National Housing Policy, National Construction Policy and National Maintenance Policy, National Local Content Act, etc. and process into laws in Nigeria's statue books in order to give effect to legal backing that will promote compliance, enforcement and other relevant issues.

b) Strict adherence to professional codes by architects, engineers, constructors and regulators in Nigeria is required since this will lead to standard maintenance, while employment of Quality Assurance Engineers and Managers including establishment of Quality Assurance/Quality Control Department be taken as a priority.

c) Prompt selection of contractors should be based on competence and potential for quality performance, rather favouritism, etc. Also, Clients should be encouraged to demand for proof of Consultants/Contractors' credentials for Quality Assurance capability before compiling their tender lists, with constant assessment and evaluation of Consultants and Contractors, before and after engagement, to determine their level of compliance to quality standards.

d) Enforcement of quality standards must be given urgent attention. Severe penalties for non-compliance to quality standards (with regard to materials used and professionals engaged) should be put in place by government and professional bodies. The materials to be used in construction works like sand, cement, aggregates, reinforcement rods and in particular, foundation soil should be tested before commencement of the works.

e) The National Assembly should as a matter of urgency give speedy attention to and pass the enabling law on the National Building Code, in order to facilitate proper operation of the construction industry in Nigeria.

f) Construction companies should operate the contents of the Quality control manual and ensure adherence to the standard of the manual

g) Mobile laboratories for testing basic materials like concrete, aggregates, soil and reinforcement rods should be provided to make it easy to carry out quality control tests on projects in remote areas.

B) Construction Industry Finance

a) Private sector participation in the planning, procurement, financing, construction and management of Infrastructure should be further explored in the country in order to take advantage of the inherent benefits.

b) The Federal Government of Nigeria is encouraged to recapitalize the Federal Mortgage Bank of Nigeria (FMBN) for it to provide affordable mortgages for Nigerians

C) Construction Safety and Conflict Resolution

a) In order to ensure adequate health and safety awareness, and target zero tolerance at construction sites, all construction companies should ensure that

COMMUNIQUE

their employees undergo mandatory health and safety induction training which should cover first aid administration, fire safety, site safety measures among others.

b) To ensure that Health and Safety is adequately catered for, it should be made mandatory that competitive Bids for Construction Works during Tendering should include provision for Safety and Health.

c) In order to promote zero tolerance to Accident at construction sites, Development Control Authorities should ensure compliance with Health and Safety measures at construction sites at different stages of construction

d) Government through the regulatory bodies should make it mandatory for project signboards to be displayed with vital information on projects at construction sites.

e) The Factory Inspectorate of the Federal Ministry of Labour and Employment is enjoined to strengthened their inspectorate arm regularly for health and safety with adequate advice provided

f) Comprehensive Geotechnical investigation for every site should be made mandatory and Site Investigation Report submitted with all other relevant documents for approval before commencement of construction.

g) All buildings must secure requisite approvals before construction. Also only appropriate, certified professionals in the built environment should be made to handle building construction.

h) Strategies for proper and efficient supervision to ensure effective monitoring at every stage of construction should be developed and deployed to every site, in order to ensure compliance with specifications on reinforcements; setting-out, concrete quality, general construction procedures, etc.

i) Identified erring professionals should be sanctioned by their professional bodies, while owners of collapsed buildings should be compelled to pay compensation to victims of the collapse.

j) Compulsory Insurance cover for buildings under construction and Statutory Legal framework for compensation of victims of building collapse should be incorporated into the Nigerian Building Code and Nigerian Statue Books.

k) It should be made mandatory for Building contractors and developers to obtain compulsory public liability Insurance to cover all operators associated with on-going building construction projects.

l) All collapsed Building sites, by law, should be annexed and confiscated by Government to serve as deterrent.

m) In order to effectively and ultimately reduce accidents, injuries, sick pay, fatalities, etc., Safety culture on construction sites should be policy-based and clearly stated.

n) The existing Health and Safety Manual developed and approved by the National Council of Housing and Urban Development in 2013 should be adopted and put into practice by all Professionals and Regulatory bodies; and also included in the training of professionals in the built environment.

o) All parties to a construction contract should establish good working relationships with well defined communication, problem-solving and conflict resolution procedures, in order to avoid costly conflicts that could jeopardize timely and cost-effective project delivery.

p) The Nigerian construction industry needs to be more committed to eliminating accidents and achieving a zero-accident environment by embracing safety culture especially at construction sites.

D) Capacity Building in Construction Industry

a) In order to increase competence in equipment operations, there is the need to increase awareness of ergonomics through education and training; and inclusion of Ergonomics as part of the syllabus for training in construction-related disciplines in vocational and tertiary institutions.

b) Training and Capacity Building to certify Artisans (Masons/Craftsmen, Laboratory Technologists and Technicians, Detailers and Draughtsmen, etc.) should be given due priority, in order to improve the quality and competences of Artisans in the Nigerian construction industry.

c) As a result of the huge annual capital flight of between N450 – N500 billion for importation of foreign Artisans from neighbouring countries, and the dearth of competent Training Centres to provide the needed quality training of local Artisans, priority should be given for the take-off and funding of the proposed NBRRI Academy.

d) The re-training of professionals through the Continuous Professional Development programs by professional and regulatory bodies should be improved upon and sustained.

e) In order to ensure that the construction industry is vibrant, responsive, productive and pragmatic, an effective networking platform driven by NBRRI for critical Stakeholders such as the National Universities Commission (NUC), the Industrial Training Fund (ITF), the Federation of Construction Industries (FOCI), Regulatory/Professional Bodies, NBRRI, etc. should be established to synergize and share information on common activities, achievements, programmes, etc. for effective complementation of each others' efforts. This could be in the areas of training and capacity building; construction, site and manpower management; construction safety and operations; alternative building materials optimization; standards specification and compliance; urban and regional regeneration, etc.

f) As part of efforts to promote networking of key stakeholders in Nigerian Construction industry, there is the need to establish and maintain a sustainable Data Bank on the Construction Industry will promote synergy and effective service delivery in the Industry. The sustainability of the Data Bank should rest on the key Stakeholders and driven by NBRRI

E) Sustainable and Alternative Materials for Construction

a) Stakeholders in the built environment involved in the development of Building Material Standards should

ensure that appropriate standards for the production and use of compressed earth bricks are established and included in the National Building code.

b) Successful Research innovations on Alternative Building Materials such as Palm Oil Fibre Ash (POFA), Soya Bean Husk Ash (SHA), Calcined Clay, etc. as well as Bamboo Laminated Panels (BLP), Solid and Glue laminated Panels, Recycled Concrete Aggregate (RCA), Geo-polymer binders and other nanotechnologies, etc. should be profiled for effective pilot testing and uptake into the Nigerian Construction Industry.

c) Researches on CEB technology and agro-industrial-based alternative building materials technology especially for mass housing, should be promoted and sponsored by both governmental and non-governmental bodies.

d) The Nigerian Building and Road Research Institute (NBRRI) should be encouraged to intensify research efforts more on demand-driven Research and Development (R&D) activities geared towards evolving alternative, cost-effective, eco-friendly state-of-the-Art technologies for uptake into the Nigerian Construction industry

e) NBRRI should be empowered to set up a Subsidiary or Unit, with the active participation of key stakeholders in the construction industry including the Regulatory/Professional Bodies, with the mandate to conduct pilot testing and demonstration programmes on all successful research innovations, prior to their effective uptake and massive application in the construction industry.

f) Some successful R&D-based alternative technologies that could be considered for deployment in the construction industry include 50% Tin Ore Tailing (TOT) partial replacement of river sand in concrete production for pavement works; Glue Laminated Timbers for structural purposes; Bamboo Laminated Panels for building facade and partitioning. Likewise successful R&D-based Alternative Binders and Pozzolana considered fit for use in construction include Lime Cement for structural concrete in civil and building works; Recycled Concrete Aggregates for road works and maintenance; NBRRI's pulverized calcined clay (PCC) and cabide waste (CW) to fully replacing cement; Palm Oil Fuel Ash (POFA) for partial cement replacement in concrete;

g) Stakeholders in the construction industry should collaborate with and constructively engage NBRRI in providing demand-driven R&D activities, programmes and outputs on different areas of the industry including affordable housing, new construction methods, materials, innovations on prototype designs, prefabrication, and appropriate construction materials specification, for the benefit of the Industry. Stakeholders exercise the will to utilize R&D innovations arising thereof for the construction industry.

F) Promotion of Local Content

a) NBRRI, as part of its mandates, should identify successful research innovations to be manufactured by cottage Industries; and it should be encouraged to promote Cooperative and Self-Build Housing Schemes in order to increase capacity and reduce high deficit in infrastructure.

b) The Nigerian Building and Road Research Institute (NBRRI) should be adequately funded and encouraged to institutionalize its research innovations for uptake into the Nigerian construction industry.

c) The Nigerian Building and Road Research Institute (NBRRI) should be adequately funded, equipped and encouraged to focus more on demand-driven R&D activities into requisite themes in the country, such as alternate construction materials, new construction techniques, nanotechnologies, pozzolanas, etc.

d) NBRRI's Pozzolana prototype plants using calcined clay should be replicated in different parts of the country as a primary and sustainable source of Pozzolana for partial replacement of cement in mass housing delivery.

e) Research support and funds should be provided by the private sector and other interest groups to encourage the local production of the Crushers, Nodulizers, Ball Mills and Bagging system of NBRRI Pozzolana Plant and its eventual adoption and popularization of in the construction industry.

f) Local content, produced at appropriate standards and specifications should be introduced to the building and construction industry in Nigeria. To this ends, government should encourage the manufacturing of Machines for producing local building materials, particularly compressed earth bricks (CEB), pozzolana cement and other binders, etc. in Nigeria through incentives such as tax waivers, provision of serviced land, etc.

g) Government should patronize and promote the use of CEB technology in public projects while professional and regulatory bodies should encourage its use.

h) The Nigerian Steel Rolling Mills should be revamped as a matter of urgency so that local content especially in the production of iron rods, sheets, etc. can be achieved for industrialization, employment generation and promotion of national economic development.

i) In order to reduce green house effect and reduce global warming arising from the production process and use of cement, the Government and Stakeholders should promote research, production and use of alternative binders in construction

COMMUNIQUE

their employees undergo mandatory health and safety induction training which should cover first aid administration, fire safety, site safety measures among others.

b) To ensure that Health and Safety is adequately catered for, it should be made mandatory that competitive Bids for Construction Works during Tendering should include provision for Safety and Health.

c) In order to promote zero tolerance to Accident at construction sites, Development Control Authorities should ensure compliance with Health and Safety measures at construction sites at different stages of construction

d) Government through the regulatory bodies should make it mandatory for project signboards to be displayed with vital information on projects at construction sites.

e) The Factory Inspectorate of the Federal Ministry of Labour and Employment is enjoined to strengthened their inspectorate arm regularly for health and safety with adequate advice provided

f) Comprehensive Geotechnical investigation for every site should be made mandatory and Site Investigation Report submitted with all other relevant documents for approval before commencement of construction.

g) All buildings must secure requisite approvals before construction. Also only appropriate, certified professionals in the built environment should be made to handle building construction.

h) Strategies for proper and efficient supervision to ensure effective monitoring at every stage of construction should be developed and deployed to every site, in order to ensure compliance with specifications on reinforcements; setting-out, concrete quality, general construction procedures, etc.

i) Identified erring professionals should be sanctioned by their professional bodies, while owners of collapsed buildings should be compelled to pay compensation to victims of the collapse.

j) Compulsory Insurance cover for buildings under construction and Statutory Legal framework for compensation of victims of building collapse should be incorporated into the Nigerian Building Code and Nigerian Statue Books.

k) It should be made mandatory for Building contractors and developers to obtain compulsory public liability Insurance to cover all operators associated with on-going building construction projects.

l) All collapsed Building sites, by law, should be annexed and confiscated by Government to serve as deterrent.

m) In order to effectively and ultimately reduce accidents, injuries, sick pay, fatalities, etc., Safety culture on construction sites should be policy-based and clearly stated.

n) The existing Health and Safety Manual developed and approved by the National Council of Housing and Urban Development in 2013 should be adopted and put into practice by all Professionals and Regulatory bodies; and also included in the training of professionals in the built environment.

o) All parties to a construction contract should establish good working relationships with well defined communication, problem-solving and conflict resolution procedures, in order to avoid costly conflicts that could jeopardize timely and cost-effective project delivery.

p) The Nigerian construction industry needs to be more committed to eliminating accidents and achieving a zero-accident environment by embracing safety culture especially at construction sites.

D) Capacity Building in Construction Industry

a) In order to increase competence in equipment operations, there is the need to increase awareness of ergonomics through education and training; and inclusion of Ergonomics as part of the syllabus for training in construction-related disciplines in vocational and tertiary institutions.

b) Training and Capacity Building to certify Artisans (Masons/Craftsmen, Laboratory Technologists and Technicians, Detailers and Draughtsmen, etc.) should be given due priority, in order to improve the quality and competences of Artisans in the Nigerian construction industry.

c) As a result of the huge annual capital flight of between N450 – N500 billion for importation of foreign Artisans from neighbouring countries, and the dearth of competent Training Centres to provide the needed quality training of local Artisans, priority should be given for the take-off and funding of the proposed NBRRI Academy.

d) The re-training of professionals through the Continuous Professional Development programs by professional and regulatory bodies should be improved upon and sustained.

e) In order to ensure that the construction industry is vibrant, responsive, productive and pragmatic, an effective networking platform driven by NBRRI for critical Stakeholders such as the National Universities Commission (NUC), the Industrial Training Fund (ITF), the Federation of Construction Industries (FOCI), Regulatory/Professional Bodies, NBRRI, etc. should be established to synergize and share information on common activities, achievements, programmes, etc. for effective complementation of each others' efforts. This could be in the areas of training and capacity building; construction, site and manpower management; construction safety and operations; alternative building materials optimization; standards specification and compliance; urban and regional regeneration, etc.

f) As part of efforts to promote networking of key stakeholders in Nigerian Construction industry, there is the need to establish and maintain a sustainable Data Bank on the Construction Industry will promote synergy and effective service delivery in the Industry. The sustainability of the Data Bank should rest on the key Stakeholders and driven by NBRRI

E) Sustainable and Alternative Materials for Construction

a) Stakeholders in the built environment involved in the development of Building Material Standards should

ensure that appropriate standards for the production and use of compressed earth bricks are established and included in the National Building code.

b) Successful Research innovations on Alternative Building Materials such as Palm Oil Fibre Ash (POFA), Soya Bean Husk Ash (SHA), Calcined Clay, etc. as well as Bamboo Laminated Panels (BLP), Solid and Glue laminated Panels, Recycled Concrete Aggregate (RCA), Geo-polymer binders and other nanotechnologies, etc. should be profiled for effective pilot testing and uptake into the Nigerian Construction Industry.

c) Researches on CEB technology and agro-industrial-based alternative building materials technology especially for mass housing, should be promoted and sponsored by both governmental and non-governmental bodies.

d) The Nigerian Building and Road Research Institute (NBRRI) should be encouraged to intensify research efforts more on demand-driven Research and Development (R&D) activities geared towards evolving alternative, cost-effective, eco-friendly state-of-the-Art technologies for uptake into the Nigerian Construction industry

e) NBRRI should be empowered to set up a Subsidiary or Unit, with the active participation of key stakeholders in the construction industry including the Regulatory/Professional Bodies, with the mandate to conduct pilot testing and demonstration programmes on all successful research innovations, prior to their effective uptake and massive application in the construction industry.

f) Some successful R&D-based alternative technologies that could be considered for deployment in the construction industry include 50% Tin Ore Tailing (TOT) partial replacement of river sand in concrete production for pavement works; Glue Laminated Timbers for structural purposes; Bamboo Laminated Panels for building facade and partitioning. Likewise successful R&D-based Alternative Binders and Pozzolana considered fit for use in construction include Lime Cement for structural concrete in civil and building works; Recycled Concrete Aggregates for road works and maintenance; NBRRI's pulverized calcined clay (PCC) and cabide waste (CW) to fully replacing cement; Palm Oil Fuel Ash (POFA) for partial cement replacement in concrete;

g) Stakeholders in the construction industry should collaborate with and constructively engage NBRRI in providing demand-driven R&D activities, programmes and outputs on different areas of the industry including affordable housing, new construction methods, materials, innovations on prototype designs, prefabrication, and appropriate construction materials specification, for the benefit of the Industry. Stakeholders exercise the will to utilize R&D innovations arising thereof for the construction industry.

F) Promotion of Local Content

a) NBRRI, as part of its mandates, should identify successful research innovations to be manufactured by cottage Industries; and it should be encouraged to promote Cooperative and Self-Build Housing Schemes in order to increase capacity and reduce high deficit in infrastructure.

b) The Nigerian Building and Road Research Institute (NBRRI) should be adequately funded and encouraged to institutionalize its research innovations for uptake into the Nigerian construction industry.

c) The Nigerian Building and Road Research Institute (NBRRI) should be adequately funded, equipped and encouraged to focus more on demand-driven R&D activities into requisite themes in the country, such as alternate construction materials, new construction techniques, nanotechnologies, pozzolanas, etc.

d) NBRRI's Pozzolana prototype plants using calcined clay should be replicated in different parts of the country as a primary and sustainable source of Pozzolana for partial replacement of cement in mass housing delivery.

e) Research support and funds should be provided by the private sector and other interest groups to encourage the local production of the Crushers, Nodulizers, Ball Mills and Bagging system of NBRRI Pozzolana Plant and its eventual adoption and popularization of in the construction industry.

f) Local content, produced at appropriate standards and specifications should be introduced to the building and construction industry in Nigeria. To this ends, government should encourage the manufacturing of Machines for producing local building materials, particularly compressed earth bricks (CEB), pozzolana cement and other binders, etc. in Nigeria through incentives such as tax waivers, provision of serviced land, etc.

g) Government should patronize and promote the use of CEB technology in public projects while professional and regulatory bodies should encourage its use.

h) The Nigerian Steel Rolling Mills should be revamped as a matter of urgency so that local content especially in the production of iron rods, sheets, etc. can be achieved for industrialization, employment generation and promotion of national economic development.

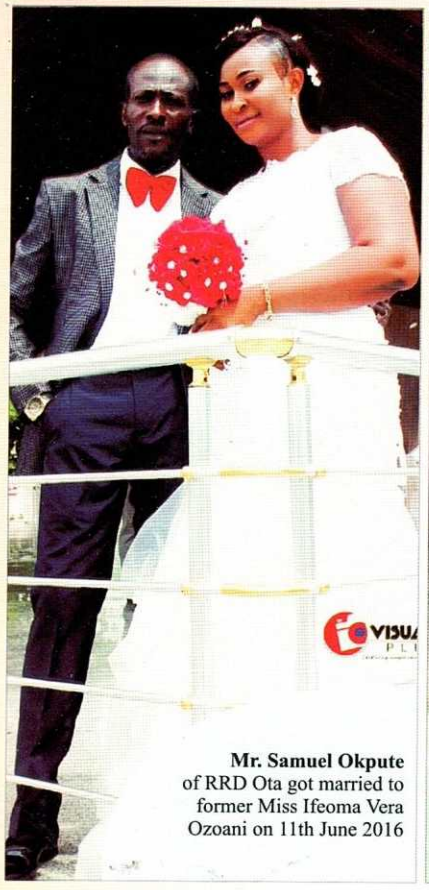
i) In order to reduce green house effect and reduce global warming arising from the production process and use of cement, the Government and Stakeholders should promote research, production and use of alternative binders in construction

Social Diary

Birthdays

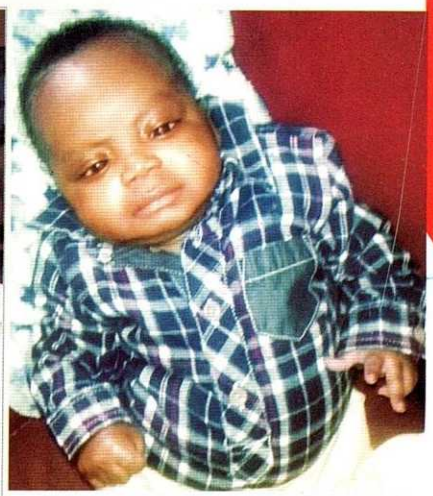
NAME	DEPT.	DATE OF BIRTH
A.M Fakeye	RRD	1st April
Igwilo Sophina Chinyelo	PITD	1st April
Obidozie Ndidi Virginia	CES	4th April
OkoloIdah Grace	PITD	4th April
Okoliko Arome S.	A/F	5th April
Adebola Abiodun	A/F	9th April
Effiong Okon Edet	A/F	10th April
Osuagwu P.N	RRD	10th April
Birnin Kudu M Rakiya	CES	12th April
Makwin Paul Luka	A/F	12th April
Falayi C.	A/F	12th April
Avre Kazzi Gaius	BRD	14th April
Taiwo Ayandapo	A/F	14th April
Ojo Emeso Beckley	RRD Abuja	15th April
Mudi Bello	A/F	15th April
Ibrahim Mohammed	A/F	15th April
Diji Nduka J.	A/F	16th April
Bulus Oliver	A/F	18th April
Etuk E.A	RRD	18th April
Bobzum B.G	RRD	19th April
Gai Friday	DG's Office	20th April
Sunday Egbe	A/F	21st April
Majidadi Tibidawe S.	RRD	21st April
Edom Atomen	BRD	24th April
OkpebhoEnobakhale	A/F	24th April
Olorunfemi A.C	PITD	26th April
Sosanolu Omoniyi	RRD	26th April
Abu Paul Agwu	PITD	1st May
Chimezie Onyema	A/F	2nd May
Asala Ebenezer	A/F	2nd May
Umar Saidu Mohammed	A/F	2nd April
Ogwu Ekele	EMRD	3rd May
Aka Endurance	RRD	5th May
Sanni Jeremiah	BRD	6th May
Akanbi Dayo Oluwatoyin	RRD	7th May
Durojayi A.M	PITD	8th May
Longtau Primak	BRD	8th May
Muhammad Alhaji Aminu		8th May
Ojachiere Rukiewe	BRD	9th May
Ojo F.A	RRD	10th May
Ibe Kingsley	BRD	11th May
Elisha Gelkur	P/M	11th May
Taofiq Bello	BRD	12th May
Effiong Effiong Okon	A/F	12th May
Friday.I Apeh	EMRD	13th May
Lamidi Rashidat Bukola	RRD	14th May
Dada Kazeem	RRD	14th May
Iliya Yusuf	A/F	15th May
Onwusiri Ignatius Sunday	A/F	18th May
Ali O.J	A/F	19th May
Cecilia Agida Omari	CES	19th May
Abubakar Khadija	RRD Abuja	20th May
Babatunde A.O	A/F	22nd May
Yatasu Abdulsalam	PITD	22nd May
Ademosu B.	PITD	25th May
Makwin Mandyong D.	M/P	25th May
Paul Isebor	DG's Office	26th May
BasseyEdet Jack	DG's Office	27th May
Igbiele Sylvester N.E	A/F	27th May
Achema Felix	EMRD	28th May
Chukwura Chris N.	PITD	30th May
EmohNya	BRD	1st June
Okoro Leonard .O.	BRD	4th June
Tenimu Ahmed Isah	DG's Office	7th June
Ladipo T. Oluwatosin	RRD	8th June
Bala Uba Jidere	RRD	9th June
Atiku Sabitu Dabai	BRD	10th June
Umar Enejo Yusuf	EMRD	13th June
Usen Magdalene	A/F	15th June
EnencheA gbo U	A/F	16th June
Yashi Jennifer	RRD	16th June
Fiyebo Samson A.B	EMRD	17th June
Anyim-Okoro E.J	BRD	18th June
Fabiyi Mustapha O.	EMRD	18th June
IbhadodeOsagie	BRD	19th June
Salami Samshudeen	BRD	20th June
Akande Cecelia N.	A/F	20th June
YunusaSaliu	A/F	27th June
Chukwuma Gerald Obiora	RRD	27th June
Menegbe Atsumbe Ralph	A/F	27th June
Thomson A.E	A/F	28th June
Idowu Rasheedat	A/F	29TH June

Social Diary

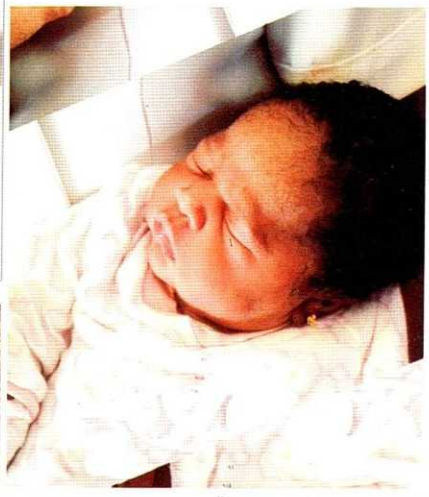


Mr. Samuel Okpute of RRD Ota got married to former Miss Ifeoma Vera Ozoani on 11th June 2016

Mr. Ocean Nwanade of BRD Abuja got married to former Miss Jamila on 17th May, 2016 in Asaba, Delta State



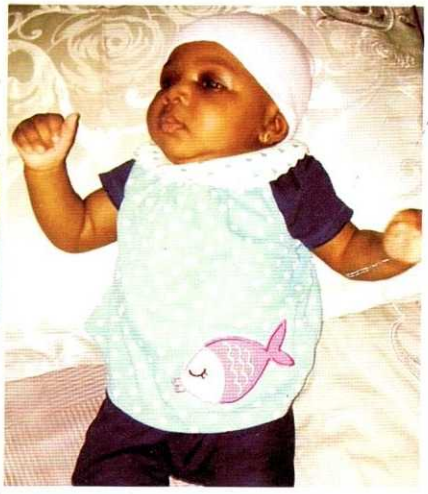
Mr Mike Ogalla of the Research Unit Abuja was blessed with a bouncing Baby Boy, Enoch E. Ogalla on the 7th April, 2016



Mrs Florence Ayogu of PIT dept. Abuja gave birth to a baby girl, Adanna Udim Ayogu on 10th August, 2016

Mr. Chimeziri C. Egege f BRD Ota, married former Miss Joy O. Iheacho on 25h June, 2016 in Port Harcourt, River State

Miss Igbekele Pheobe of PIT Dept, Ota got wedded to Mr. Otedola Adetoye on 19th December, 2015



Mrs. Zulai Baba - Gerei. had a Baby Girl, Nasreem On 11th May, 2016

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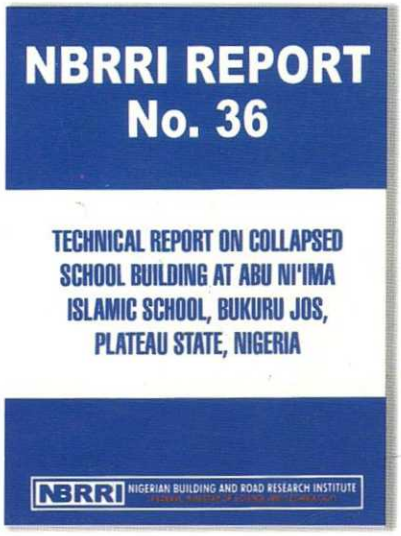
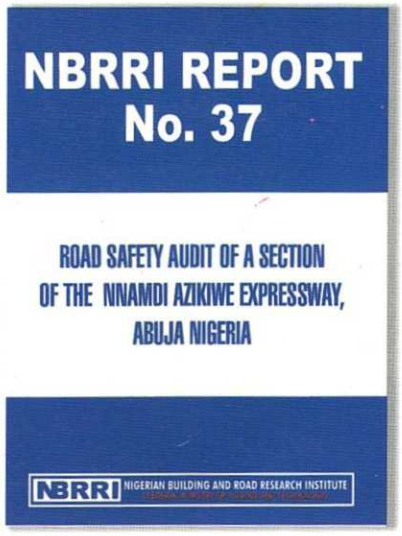
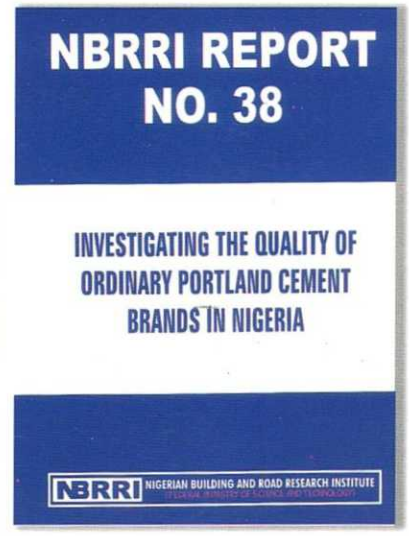
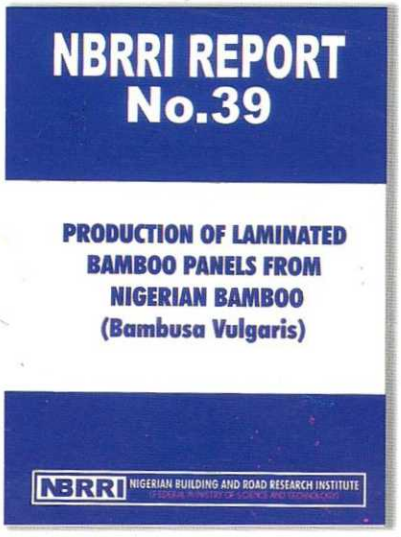
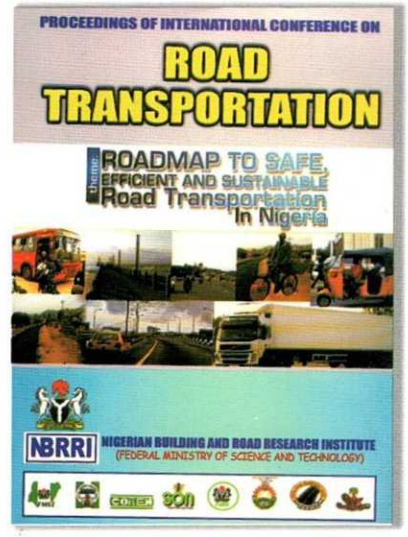
NEW PUBLICATIONS











These NBRRI Publications, which are available at NBRRI Office at nominal fees, will be found useful by all stakeholders' in the Construction Industry including Professionals, Professional Bodies, Construction Companies, Contractors, Governments, The Academia, Individuals, etc.

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