



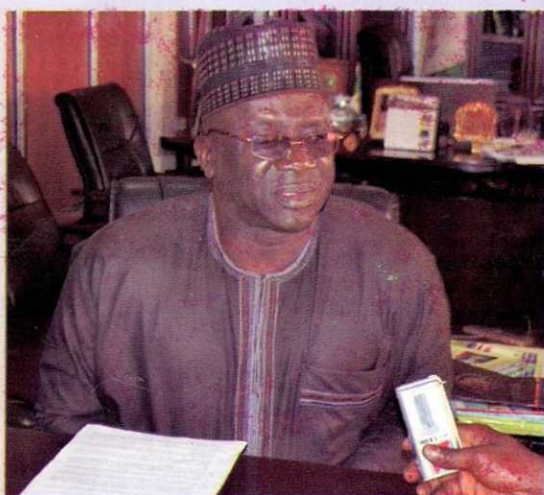
NBRRI

NEWSLETTER

Vol. 2. No. 10, September, 2015

The Quarterly Newsletter of the Nigerian Building and Road Research Institute

MUBI BURNT BRICK INDUSTRIES SIGNS MoU WITH NBRRI ...Pg. 4



SCIENCE, TECHNOLOGY
AND INNOVATION (S,T&I)
SECTOR DESERVES BETTER
COMMITMENT AND
FUNDING IN NIGERIA
...PROF. MATAWAL, DG-NBRRI

...Pg. 5

NBRRI PREPARES FOR 2015 RIGAN GAMES



...Pg. 25

NBRRI HOSTS RIGAN NEC MEETING

...Pg. 17

SOME NBRII PUBLICATIONS

- NBRII TECHNICAL REPORT NO. 22:** Collapse of Buildings in Nigeria: Technical Report on the Collapse of a 2-Storey Building at Mararaba (Near Abuja), 22pages, Oct 2011
- NBRII TECHNICAL REPORT NO. 23:** Collapse of Buildings in Nigeria: Technical Report on the Collapse at Adenubi Close, Ikeja, Lagos State, Nigeria, 19pages, Oct 2011
- NBRII TECHNICAL REPORT NO. 24:** Preliminary Survey of some Limestone Deposits in Nigeria, 12 pages, April 2012.
- NBRII TECHNICAL REPORT NO. 25:** Preliminary Survey of Some Clay Deposits in Nigeria, 8 pages, May 2012
- NBRII TECHNICAL REPORT NO. 26:** Report on a Collapsed Building in Ilorin, Kwara State, Nigeria, 16pages, July 2012
- NBRII TECHNICAL REPORT NO. 27:** Design and Fabrication of Water-Bitumen Spraying Machine, 16pages, July 2012
- NBRII TECHNICAL REPORT NO. 28:** Design and Fabrication of Cube & Beam Moulds and Slump Cone Apparatus, 14 pages, June 2013
- NBRII TECHNICAL REPORT NO. 29:** Collapse of Buildings in Nigeria- Analyses of Collapse of Two-Storey Building at Kubwa Extension III, 37pages, December 2012
- NBRII TECHNICAL REPORT NO. 30:** Engineering Characteristics of Subgrade Soils of Kogi State, Nigeria Analyzed for Economic Pavement Design, 25pages, December 2012
- NBRII TECHNICAL REPORT NO. 31:** Assessment of Speed Trends During Day-Time and Night-Time of Nigerian Drivers: A Case Study of Abuja Metropolis, 60 pages, May 2013
- NBRII REPORT No. 32:** Evaluation of a Nanotechnology-Based Polymer on some Tropical Soils. pages. 2014
- NBRII REPORT No. 33:** Investigation of Road Failure in Nigeria: A Case Study of Enugu-Port Harcourt Expressway. 48pages. December 2013
- NBRII REPORT No. 34:** Effect of Mineralogical Composition on Performance Characteristics of Compressed Stabilised Earth Blocks (CSEB). Pages. December 2014.
- NBRII REPORT No. 35:** Technical Report on the Collapse of Six-Storey Guest House of the Synagogue Church of All Nations (SCOAN) In Ikotun-Egbe, Lagos State, Nigeria. ... pages. November 2014
- NBRII RESEARCH SEMINAR:** Book of Abstract NO. 1; *Tuesday Bi-Weekly Seminar (2011-2013)*. 15 pages. April 2014
- Proceedings of NBRII Stakeholders' Forum: Bridging the Gap Between Building & Road Research and Stakeholders,pages, May 2011
- Proceedings of National Technical Workshop on Building Collapse In Nigeria: Curbing the Incidences of Building Collapse In Nigeria, ... pages, July 2012
- Proceedings of National Conference on Road Pavement Failure In Nigeria: Challenges of Road Pavement Failure in Nigeria, 161pages, June 2013
- HOUSING SUMMIT 2014:** Proceedings of International Conference on Achieving Affordable Housing in Nigeria, 221 pages. 2014
- The Challenges of Building Collapse in Nigeria, 52pages, May 2012
- Road Safety Guidelines for Nigeria (RSG 2014), 240 pages
- West African Journal Of Building and Road Research, Vol. 1 (1), March 2014, 84 pages
- NBRII CONSTRUCTION DIGEST No. 1:** Corbelling in Residential Buildings, 16pages, June 2013
- NBRII CONSTRUCTION DIGEST No. 2:** Nigerian Housing Policy- Challenges and Prospects, 15pages, December 2013
- NBRII CONSTRUCTION DIGEST No. 3:** Construction for Durability in Nigeria- The Strength of Building Materials, 15pages, January 2014
- NBRII CONSTRUCTION DIGEST No.4:** Laboratory and Field Tests for Quality Control of Road Works, 16pages, January 2014

NOTE: ALL REPORTS ARE AVAILABLE AT NOMINAL COSTS FROM NBRII

EDITORIAL

This 3rd Quarter edition of *NBRI Newsletter* is coming out with new innovations to spice the quality of information it presents to its ever increasing readership. The first innovation is the Review of a published Paper titled *Core Housing as a tool for affordable housing delivery* by some NBRI Research staff. The review, which is very revealing, presents information on what the Core housing concept is, the benefits, how it works and results of its application to Federal Civil Servants of known salary structure.

Another innovation is the quest to inform the general public about the R&D activities in the Institute and to encourage feedback from interested stakeholders on these R&D activities. To do this, *NBRI Newsletter* has packaged the Abstracts of technical papers presented by NBRI Research Officers in the 3rd Quarter of 2015 at the Internal Seminars held fortnightly at NBRI National Laboratory Complex in Ota, Ogun State and at the National Administrative Headquarters, Abuja.

Perhaps, one critical attraction in this edition on *NBRI Newsletter* is the Interview with the Director-General of NBRI, Professor Danadi Slim Matawal who in his characteristic pragmatic way, gave an insight into the R&D activities, innovations and measures being made to impact NBRI technologies into the construction industry and lives of ordinary Nigerians. This is indeed a must read as it gives insight of what to expect from NBRI.

An area of human endeavor which NBRI Management has, in the past few years, been actively engaged in is in sports development. Apart from the monthly Fitness and Jogging exercises which NBRI Management has actively supported and organized for its staff, the euphoria of the upcoming Research Institutes Games Association of Nigeria (RIGAN) Games scheduled to hold at the Nigerian Institute of Transport Technology (NITT) Zaria between the 20th and 30th November 2015 has been pulsating in recent times. This is because of the heightened preparations for the Games by the Staff. In the midst of this, the President of RIGAN came paying a courtesy visit which eventually led to the RIGAN National Executive Council (NEC) holding its meeting in NBRI. All these events are featured in this edition of *NBRI Newsletter*.

Within the period, NBRI played host to the Chief Executive of the Adamawa State-based Mubi Burnt Bricks Industries which culminated in the signing of MoU for collaboration between both parties. Also, a delegation from an affiliate of the International Road Federation (IRF) in Nigeria, the Road Accident Prevention Network Center (RAPNEC), paid a courtesy call to Prof. Matawal at NBRI Administrative Headquarters, Abuja. At the meeting, the nomination of Prof. Matawal for an IRF award based on due diligence carried out, was announced. The highlights of these activities and more are presented in this *NBRI Newsletter* edition;and we invite you as usual, to savor all the interesting read. Please read on....

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NBRI (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.

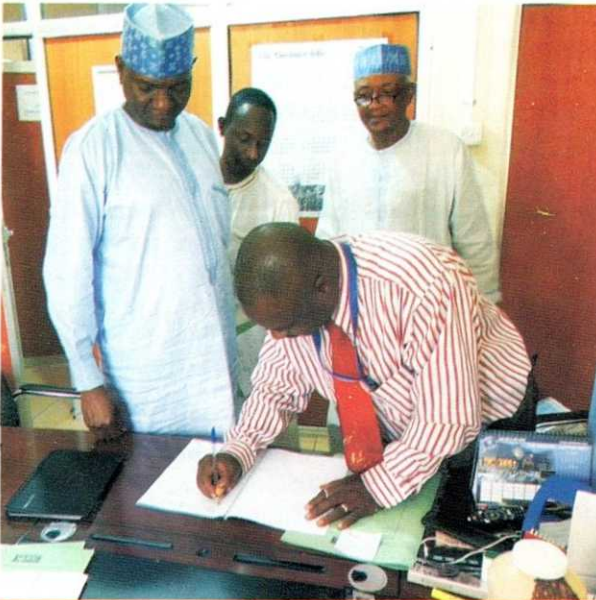
MISSION

Integrated R&D, capacity building and robust extension services in which technological 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

MUBI BURNT BRICK INDUSTRIES SIGNS MoU WITH NBRII



Mr. Makava, the Head of Consultancy & Extension Services Dept. NBRII signing the MoU while the General Manager of MBBI, Mr. Ibrahim Yasha'u looks on

Adamawa State-based firm, Mubi Burnt Bricks Industries (MBBI) has entered into agreement with the Nigerian Building and Road Research Institute, NBRII, to enhance its production capability and capacity. The agreement which was stated in the Memorandum of Understanding, MoU, was signed between the firm and the Institute at a brief ceremony held at NBRII Administrative Headquarters, Abuja.

Speaking during the signing ceremony, the Head of Consultancy & Extension Services (CES) Department of NBRII, Mr. Daniel Makava said that the collaboration with MBBI is apt as NBRII is equipped with the capacity and expertise to offer such services based on its wealth of experience and R&D activities on Burnt bricks over several years. He further mentioned that this has emanated from the fact that the mandate of the Institute is essentially to conduct integrated and applied Research in all the varied aspects of the building and construction industry, including local alternative building and construction materials development so as to determine the most effective and economic methods of utilization. Speaking further, Mr. Makava noted that the vision of setting the pace in indigenous construction industry has amply positioned the Institute to develop and apply innovations within the related fields of its mandate, as well as collaborate with Industries like MBBI towards ensuring quality and affordability in the Building and Road construction sectors of Nigerian economy.

Also speaking, the Director, Planning and Information Technology, NBRII, Mr. Tunde Adeyanju, who presided over the ceremony, noted that the collaboration between MBBI and NBRII will not only enhance the local content index within the sector but also provide facility window for the proliferation of Small and Medium Enterprises (SMEs) in the sector. He gave the assurance that NBRII will fulfill its part of the agreement for the benefit of both institutions and Nigeria in general.

The General Manager of Mubi Burnt Bricks Industries, Ibrahim Yasha'u, disclosed that MBBI is a Limited Liability Company as well as a Public-Private Partnership with Adamawa State Government owning the majority share. He added that the Industry was established in 1986 for the production of Burnt bricks products with an installed capacity of 30,000 bricks per day.

Yasha'u said that the scope of the envisaged collaboration includes: undertaking of joint analysis; Capacity building and R&D with respect to specialized building technologies; Joint design and construction of IDP Camps, Mass Housing Projects, Modern Township Markets, Modern Cattle Market, Modernized Motor Park; technology for Labor-based access Roads and Intellectual Property Rights protection.

The General Manager thanked NBRII for accepting to collaborate with MBBI and is optimistic that the partnership will succeed.

Mr. Makava signed the MoU on behalf of DG/CEO NBRII while the General Manager of MBBI signed on behalf of the company.



The General Manager MBBI, Mr. Ibrahim Yasha'u (L) and Mr. Makava, the Head of Consultancy & Extension Services Dept. (R) after the signing of the MoU; while the Director of Planning and Information Technology of NBRII looks on

SCIENCE, TECHNOLOGY AND INNOVATION (S,T&I) SECTOR DESERVE BETTER COMMITMENT AND FUNDING IN NIGERIA

.....PROF. MATAWAL, DG-NBRII

The Director-General/CEO of Nigerian Building and Road Research Institute (NBRII), Professor Danladi Slim Matawal recently granted an exclusive interview during which he gave insight on his aspirations for the Institute and NBRII's future role in the construction industry and the nation at large. Here are excerpts culled from the Interview:



Prof. Danladi Slim Matawal
DG/CEO NBRII

PROF MATAWAL: NBRII has achieved quite a number of things. The most important one is the the capability and capacity enhancement of our research base and creating the conducive environment for Research and Development (R&D). When I assumed office in 2011, the number of technical staff was quite low. The proportion of researchers to support staff was unfavorable to the environment. A lot of machineries for research have aged. The buildings at the institute's laboratory complex at Ota were more like an abandoned site. We have been able to turn the situation around for the better and have created a conducive environment for research; and we have also restored a level of confidence in the staff. The need to raise the quantum of quality research staff is essential and this process is still on-going.

It is a known fact that you commenced your second term in office this year as Director-general of NBRII after a very productive first term. How has it been?

PROF MATAWAL: I thank God for everything because he has been faithful and things have moved on fairly well. We have been able to establish a level of confidence in our operation. We have increased our capacity, especially human capacity. We have updated our research infrastructure and we are looking forward to better days ahead in Nigeria building and road research projects. More importantly, NBRII gradually becoming a household name in Nigerian construction industry because of the confidence level of stakeholders on the ability of NBRII to deliver on its mandate

Nigerians would like to know the highlights of some of the landmark achievements of the Institute and how the Institute intends to meet their expectations.

“.....as a matter of deliberate policy, we try every year to interact with the professional community and stakeholders where we tell them what we have done, what we are doing and what we intend to do; as well as invite them to present their own opinions on critical national topics.”

Concerning NBRII innovations, we took a look at some of the existing titles and innovations and tried to make them more robust, user-friendly and less problematic. We tried to commercialize some of them and this process is going on too. Also, as a matter of deliberate policy, we try every year to interact with the professional community and stakeholders where we tell them what we have done, what we are doing and what

we intend to do; as well as invite them to present their own opinions on critical national topics.

Can you give us an insight to some of the major research initiatives the Institute is presently pursuing?

PROF MATAWAL: I must tell that there are



Prof. Danladi Slim Matawal responding to question from the crew

numerous ideas, initiatives and directions. One of them is an existing NBRRI technology which was had operational challenges; and we have set out to address the challenges and perfect the technology. I am particularly referring to one of the machines that was designed and fabricated by the institution. We are currently looking for fabricators that will give us machines that are less problematic.

We are looking for a way to refine our capacity building mandate which, before now has never been beyond a simple two to three days contact session in a particular location in the country. We are thinking that we should begin actual National Vocation Qualification for Artisans and other Tradesmen in the construction industry in order to impact both our special innovative technologies to the public as well as offer training and capacity building programmes on conventional techniques to vocational personnel particularly the routine bricklayers, masons, iron-benders, carpenters among others who have created a gap that is responsible for many encountered technical problems in the Nigerian construction industry.

We are also looking for alternative techniques continuously in order to actually take the bull by the horn in the issue of providing durable and inexpensive

buildings as well as user-friendly techniques that will help our rural folks to own comfortable and affordable homes. Also, we are out there making impact in the rural areas with our community-based technology for the provision of quality rural and feeder roads sector to make sure we reach out to the people using them.

It has been said in different fora that NBRRI is a very critical and target-oriented agency in the Ministry of Science and Technology. What can you catalogue as the major challenges facing the Institute and how have you been coping with them?

PROF MATAWAL: Yes thank you for that question. I think we need very strong government intervention in the area of commercialization of research innovations. I can tell you that there are many tested research innovations that are ready for commercialization, which can add to the volume of the economy in the areas of value addition, job and wealth creation as well as cutting foreign reserve by curbing excessive importation.

“.....we are out there making impact in the rural areas with our community-based technology for the provision of quality rural and feeder roads sector to make sure we reach out to the people using them.”

We also need funding to train and re-train our staff. Apart from this, there is the need to focus on our main mandate which is the conduct of R&D. We don't have funds to do this very aggressively. It may interest you to know that in the 2015 budget, there was zero capital budget appropriation for R&D. This is really suicidal to the

development of the country's economy. So I want to say that the science, technology and innovation (STI) sector in Nigeria deserve better respect and commitment by giving it more support and funding. It is quite easy to see that all the countries that Nigeria appears to surpass are succeeding due to their strong S,T&I base, their strong injection of innovations from science and technology and their commitment by way of funding of articulated R&D that are of national importance. This is what I recommend. I don't think we have reached there yet. But we must in order to be independent and self-sustainable. We need to project our R&D base and our innovations to the benefit of our people.

The issues of building collapse and failed roads are challenges facing the Nigerian construction industry. What has your agency been doing about them? Is there any synergy with the Standards Organization of Nigeria (SON) and professional bodies like the Nigerian Society of Engineers (NSE) and Nigerian Institute of Building (NIOB) to address the challenge? Also, what is the present situation on the critical local and international partnership entered into by the institute?

PROF MATAWAL: In the recent past between 2011 and 2012, NBRI made significant efforts to address the challenge of incessant building collapse in the nation. In doing this we interfaced with all professional associations and regulatory bodies in the built environment; and our efforts yielded significant dividends. I want to say that building collapse is literally becoming a thing of the past. It is no longer recurring like it was in the past five or six years ago. But in a number of scale, we have had very drastic reduction from the over 30 collapses in 2012 in Lagos to nearly over 20 in 2013. In 2014 there were just over seven cases; though for the collapse that took

place at the Synagogue Church of All Nations, the lives lost nearly surpassed almost all the other cases of the collapses combined in the country. In Abuja, we have major reduction too from over 20 in 2012 to literally zero in 2013 and 2014. In the road sector, we have also intervened by making our researches available. Where I am aiming at is to emphasize that through our activities and collaborations between professional

bodies, we have been able to tackle these problems in order to nip them at the bud. We must develop the attitude of zero tolerance to building collapse. There are still few happenings here and there in places like Awka, Port Harcourt and Onitsha, but not anywhere near the scale of Lagos and Abuja. The success can be ascribed to the collaboration between us and the professional bodies as well as voluntary groups that are incubated in the professional regulatory bodies such as the Building Collapse Preventive Guild in Lagos.

All these happen because we met with each other and hosted conferences where building issues on road pavement collapses were discussed and preventive measures recommended. We gave our technical findings in the field and stakeholders were all present to decide on the line of action that were categorized into short, medium and long terms. Some of these have been implemented. On the international scale, we have also been collaborating. We have become recognized particularly on the African scene. We have been meeting with groups from South Africa, initiated programmes with Building and Road Research Institute of Ghana where we compare notes on R&D, and developments & application of research findings. I believe that on the national and international scale, we have been very active and collaborating in order to address areas of problems that affects building and road construction.

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“We initiated the Skills Acquisition Centres and Rural/Feeder Roads construction projects in order to sell our walling technology primary for building as well as to promote the community-based construction solutions using our roller compactor and techniques in the road sector.”

We are aware that the Institute embarked on the construction of Skills Acquisition Centres. What is the idea behind this? What is the status of each of the Centres set up today? Also, how are you trying to transfer knowledge in the area of capacity building to the private and public sector?

PROF MATAWAL: The Skills Acquisition Centres (SAC) have been a very sensitive issue. We initiated the Skills Acquisition Centres and Rural/Feeder Roads construction projects in order to sell our walling technology primary for building as well as to promote the community-based construction solution using our roller compactor and techniques in the road sector. We have become very more confidence in our ability in the SAC projects. Initially it was very shaky in the sense of perfecting the procedure. Every project that started recently has a very clear mission and template for construction. When the funds run out we were able to stop on a very definite level and continue thereafter. So we have been able to dictate the pace. Most of projects are successful in these regard.

You should also be aware that when we started this, many National Assembly members saw it as a very attractive, people-oriented venture and they jumped at it to be used as their constituency projects. Some of them were interested in implementing it through contract. So far as an institute, we don't have a problem, but sometimes the contractors themselves do give us some headaches. The other angle to it is from the viewpoint of the flow of funds. Some of the National Assembly members themselves put in the projects and the executive frowns at it. Even though it is appropriated, when it comes to the release of the funds, it is somehow not tied to implementation. But we want to say absolutely clear that we know where every project is and those that have been completed. We are using the SAC in our Ota office as laboratories and offices.

The next stage of it is equipping SACs in the

sense of the needs and peculiarity of the environment in which it is located. For example the one located by NBRRI is being used as laboratory facilities and offices because that was our need. We have converted it and we are only looking forward to funds to equip it. We have already allocated all the laboratories and what they can be used for. There are SACs in various communities where they need to house maybe a block making machine, welding machine, ICT, computers, etc. For the one in Akwa-Ibom State, I think they are already moving computers in even though it has not been perfectly finished yet. But it has reached a stage where they felt it can be used. So the plan is to empower the communities in skills that are peculiar to their environment. But some of the SACs would support our vocational skill ambition for the country.

What about the transfer of technology to the private and public sector? How is awareness created and enhanced in all you are doing?

PROF MATAWAL: We have planned a lot of investment activities through the skills acquisition centres and rural road projects. We are doing road projects in states like Kaduna, Ogun, Ebonyi and Benue. The next thing is to show people what we can do. We are also in partnership with the private sector definitely. Some of them are involved in our schemes, to show them what we do. Primarily for each year, if we have the number of schemes for road projects, what we do is we organize an initial course of training which a contractor who is to construct the road is expected to provide its personnel for training. In this way we can transfer our innovative technologies.

NBRRI's technological innovations are no doubt laudable. What are the improvements on the Institute's interlocking block making machines you met and the pilot Pozzolana Cement Plant project which you initiated?

PROF MATAWAL: The interlocking block making machines I met on ground had a lot of challenges which

“We have planned a lot of investment activities through the skills acquisition centres and rural road projects. We are doing road projects in states like Kaduna, Ogun, Ebonyi and Benue. The next thing is to show people what we can do”

we have been addressing. But they are performing very well now. The only thing now is commercialization. When you have commercial ventures, you will have in mind a production line where you do your perfection according to specifications, as well as some tests carried out and feedback mechanisms to improve on them. In this regard, I must say that these machines have been literally deployed to and are being used in all Skills Acquisition Centre project sites. In applying them, we have been able to identify some major faults. We looking out for and have been able to identify some local fabricators that we can work with in order to effect the re-design and enable us meet the demands of people acquiring the machines. We have a couple of requests for the Machine. Though in 2015 we have zero capital budget, there are some constituency projects owners that come for the interlocking block making machines.

The Pozzolana Cement Plant project has come very far. We have two such pilot plants. The first is in NBRI Laboratory Complex in Ota and the second is in Plateau State. The pilot plant in Ota has been completed. What is remaining is the commissioning. What is remaining in the Ota Plant is the test running and fine-tuning of the Plant, which is in top gear. We have gone very far too in the second pilot plant in the second plant. What is actually delaying the commissioning of the Ota Plant is for the production process to be perfected and fine-tuned. To be very specific, the whole thing needs to be run continuously for initial 24 hours, then 46 hours, and before it can finally start running with enough materials through the kilning process to be able to start production.

As we speak we don't have enough power now to sustain these periods, so there is a need to have a second generator. So, the pozzolana plant in Ota has been completed and will be commissioned later once

"The Pozzolana Cement Plant project has come very far. We have two such pilot plants. The first is in NBRI Laboratory Complex in Ota and the second is in Plateau State."

these issues are sorted out. Since the Pozzolana Cement is a special innovation, we wanted to combine it with the commissioning of our Office Complex building built through the skill acquisition centre concept in our National Laboratory Complex, Ota. So you have to be on the lookout for the commissioning which will take place very soon.

I guess the measures you mentioned are designed to keep stakeholders abreast with R&D researches and policies in the Institute. Are there other specific issues you would want to share in this regard?

PROF MATAWAL: First of all, NBRI host an international conference every year where critical stakeholders such as the Federal Ministry of Works, Federal Ministry of Lands, Housing and Urban Development, Federal Capital Territory, professional regulatory bodies and associations in the construction sector, Standards Organization of Nigeria (SON) and Federal Roads and Maintenance Agency (FERMA) are invited to partner with us. These MDAs and others are among the many stakeholders involved in our activities every year.

Through this forum and international conference, we are able to interact directly in order to get their opinions in what we have done, what we should do and what we are doing. In addition, awareness is created on every of our R&D outputs, some of which have been packaged into technical reports. We have been churning out a large number of technical reports from 2011 till now. These technical reports are printed in nothing less than 2000 copies and they are meant to be distributed to stakeholders and displayed in trade fairs. NBRI also takes advantage by effectively participating and displaying our technologies and technical reports in different professional forums and conferences organized by Nigerian Society of Engineers, Nigerian Institute of Architecture, Nigerian Institute of Building and Nigerian Institute of Town Planners, etc. some professional and regulatory bodies like the Council of Registered Builders of Nigeria

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(CORBON), COREN, etc. have visited us to see what we are doing. So we are not unmindful of the fact that knowledge kept on the shelf is not useful until it is put into practice. We propagate our researches as freely as possible. We give some of publications to University libraries. We promote publications of books by indigenous authors in the construction industry. We have acknowledgement of this, as far as our reports and proceedings of conferences organized by NBRII are concerned, from academic institutions such as the University of Jos, University of Ibadan, Ahmadu Tafawa Balewa University, Bauchi, University of Nigeria, Nsukka, University of Port Harcourt, Bayero University, Kano, Federal University of Technology, Minna, University of Agriculture, Abeokuta, Covenant University, Birmingham University, etc. We give these private and public higher institutions of learning free donations of books as well as our technical literatures. We put it on their shelves so that whoever is interested can read them. We also have a library in Ota with a lot of stuffs on construction materials and methodologies. We have started one in Abuja where people can come and get to know some of our technologies and activities.

What are your strategies to ensure that the structural integrity of buildings and roads is not compromised, especially with the issues of poor maintenance culture that is prevalent with the country's infrastructures?

PROF MATAWAL: I have emphasized that each year we should organize a forum where everybody meets. If we are meeting on road sector, we involve all stakeholders in the road construction and usage. That is what the Annual International Conference organized by NBRII is all about. This year, the International Conference was on *Roadmap to Safe, Efficient and Sustainable Road Transportation in Nigeria*. In 2014 we had an international Conference on *Affordable Housing in Nigeria* and stakeholders in the housing sectors were there to rub minds. These are done annually. So these are forums where we also sensitize as well as have feedback from stakeholders. Apart from our culture of physical intervention on site, we raised a team that is institute-based that has professionals from all over the construction industry

usually chaired by a university professor with members that are cognate with the problem at hand. We go and look at every problem in the field to enable us to build a case history to avert failures in the future or reoccurring issues of such magnitude. We are also involved in the developing documents that are protecting the industry in conjunction with professional regulatory bodies. For example, NBRII is actively involved in the development of *Concrete Design Manual for Nigeria* in collaboration with the Council for the registration of Engineers in Nigeria (COREN). We have mechanism to improve our research personnel base. We are able to allocate researches to various projects in the country where our interest lies.

What have been your experience and constraints in trying to make most of your researches sustainable and eco-friendly and what is your level of collaboration with other MDAs and the private sector in achieving this objective?

PROF MATAWAL: Eco-friendly solutions cannot be said to have evolved into a situation of absolute confidence in any country. There is no country that is providing electricity to its people primarily through solar energy. I think eco-friendly concept is still quite a

nascent and young area. Nonetheless, we believe our researches are eco-friendly solutions and we will continue to promote them. Before then, we don't have to deploy huge machineries to our rural roads system. Pozzolana is an eco-green solution. When we are able to breakthrough, we will not only be providing something that is already being used in African and world technology, but we will also be introducing a green solutions into the country.

But I think it is important to emphasize that green solutions sometimes need strong intervention of government and institutions. As much as possible we need to control research in that direction. We had a few collaborations with a group that came from Germany that is involved in road construction that held an occasion earlier this year somewhere in Abuja. As a research institution we are looking left, right and center to broaden our region wherever we can.

"This year, the International Conference was on Roadmap to Safe, Efficient and Sustainable Road Transportation in Nigeria. In 2014 we had an international Conference on Affordable Housing in Nigeria and stakeholders in the housing sectors were there to rub minds."

Can you point the way forward for Nigeria to achieve her technological goals?

PROF MATAWAL: As a country aspiring to attain technological height, we need to connect to the community of knowledge. Rome was not built in a day. Nobody should really expect a technology that is just being deployed to perform perfectly. But if it is deployed, from feedback mechanism of challenges encountered, it would be perfected after some time. I don't think our people should continue to live in adobe buildings in the rural areas. I think if the government can make available brick molding machines, such rural buildings can be built or upgraded with NBRI Interlocking bricks as they can be easily constructed. They are easily erected, rugged and the living standards of our people can be improved. Then you have affordable houses that are comfortable. This I think can produce low-cost and quality houses.

Development of quality and affordable construction materials and technology are part of NBRI mandate. What is NBRI's intervention in curbing the existence poor quality building materials produced and sold in the country?

PROF MATAWAL: Sand is a natural material. It is the processing of sand that matters. Some people wash the sand and use it, while other doesn't pay attention to it. Others allow deleterious materials like clay and organic content. These are some of the reasons we have collapsed roads and buildings in the country. The major reason is based on the quality of the materials used in the construction. These are issues of monitoring. This is where the SON comes in and we have been having a number of forums where they are involved in dealing with these issues. We have written technical papers on concrete blocks and we have tested a large number of them. We have also assisted some professional regulatory bodies in these problems. We can make our

“...if the government can make available brick molding machines, such rural buildings can be built or upgraded with NBRI Interlocking bricks as they can be easily constructed. They are easily erected, rugged and the living standards of our people can be improved. Then you have affordable houses that are comfortable”

R&D available. But the goodwill of supervising the use of quality construction materials will help a lot in producing a standard building or road infrastructure. The Development Control Departments have their critical roles to play in ensuring compliance with building regulations and codes at every stage building construction. It requires all hands to be on deck to ensure that quality buildings are erected in the country.

One of your visions is to nurture the emergence of vibrant, knowledge-based and highly competitive indigenous construction firms capable of meeting global standards. What are your efforts so far and how is the agency going about the establishment of cottage industries in the country?

PROF MATAWAL: We are doing our best. We are involved with young construction firms in our own peculiar technological promotion area. Each time we are involved with them, we show them the processes of our technology. So we are pushing as hard as we can. We have had new ideas for example in addressing the issues of accommodating internal displaced persons (IDPs) by helping put up structures that can be

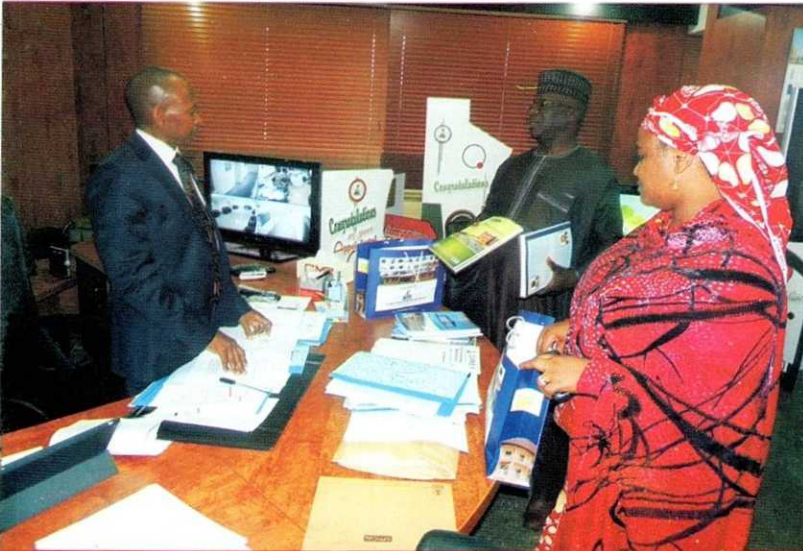
“We have had new ideas for example in addressing the issues of accommodating internally displaced persons (IDPs) by helping put up structures that can be dismantled. This will assist in rehabilitating them and provision of shelter. These are buildings that can be set out within a short period of time. We look forward to the goodwill of the government and current technology to do this.”

dismantled. This will assist in rehabilitating them and provision of shelter. These are buildings that can be set out within a short period of time. We look forward to the goodwill of the government and current technology to do this. We don't really need tedious process. They are dismountable walls. As I said earlier, what we need to do is from time-to-time, we get their personnel and train them. So I think

collaboration and teamwork between the research institutes and stakeholders including the academia, professional and regulatory bodies will make it work.

DG NBRII VISITS THE AGF

.....PLEDGES COLLABORATION AND SUPPORT



Prof. Matawal showing some NBRII Publications to the AGF, Mr. Ahmed Idris

A team from the Nigerian Building and Road Research Institute (NBRII), Professor Danladi S. Matawal paid a courtesy visit to the Accountant-General of the Federation (AGF), Mr. Ahmed Idris in his Office. The NBRII team, which was warmly received by the Accountant-General, was headed by its Director-General, Professor Danladi Slim Matawal; and he was accompanied by the Head of Accounts Division, Mr. Ignatius Onwusiri and the Head of Public Relations Section, Mr. Peter Mashem.

Speaking at the brief visit, Prof. Matawal congratulated Mr. Idris on his new appointment as the Accountant-General of the Federation by the President Muhammadu Buhari GCFR, saying that it was well deserved. Matawal added that the appointment of Mallam Idris did not come to anyone as a surprise because of his sound academic background and excellent track record in his public service career. Prof. Matawal noted that NBRII and the Office of the Accountant-General of the Federation have over the years, always had good and cordial working relationship, which has been beneficial to both Agencies of Government.

Prof. Matawal pledged that NBRII will cooperate and support the new Accountant General of the Federation to succeed in his new assignment and

wished him well as he settles down in Office.

The DG NBRII also used the occasion to brief the AGF on the mandate of NBRII and to present several publications of the Institute such as NBRII Conference proceedings, NBRII Technical Reports and NBRII Newsletters, among others.

Responding, the Accountant General of the Federation, Mr. Ahmed Idris thanked the DG and his delegation for the visit which he said has encouraged him. The AGF further expressed his excitement on the NBRII publications presented to him, saying that as an ardent reader, he

will find them very useful. Furthermore, Mr. Idris noted that the demands of the new office are high and therefore solicited for support and prayers. He assured the DG that he will working harmoniously with the all Agencies of Government including NBRII to enable them achieve their corporate objectives which will no doubt be to the benefit of the Federal Republic of Nigeria.

The high point of the visit was the presentation of a congratulatory card to the AGF by Prof. Matawal on behalf of the Institute.



Group photograph during the visit shows the DG/CEO of NBRII, Prof. D. S. Matawal (3rd from left) and the AGF, Mr. Ahmed Idris (4th from Left) with the Congratulatory card presented.

A REVIEW ON NBRRI'S CORE HOUSING INITIATIVE AS A TOOL FOR AFFORDABLE HOUSING DELIVERY

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Consultant (Research), NBRRI and Editor, NBRRI Newsletter

PREAMBLE

In line with its mandate, the Nigerian Building and Road Research Institute (NBRRI) has over the years been at the forefront of advocacy on the use of alternative technologies in mass housing delivery. Apart from the technological innovation products developed, NBRRI has also initiated and promoted construction processes, procedures and operations designed to facilitate affordable housing delivery in Nigeria. One of such efforts is the advocacy for the adoption of CORE Housing concept for affordable housing delivery.

This article reviews NBRRI's Core Housing concept, its benefits, its applicability and the research results obtained from actual analysis on Federal Government Public servants to demonstrate its viability. This review is based on a paper titled *Core Housing as a tool for Affordable Housing Delivery by NBRRI Researchers Danjuma, G. A and Abdullahi, A., published in Volume 1, No. 2 of the West African Journal of Building and Road Research (WAJBRR)*. The conclusions reached in the study are as interesting, beneficial and intriguing as the core housing concept itself. This informed the need to propagate the concept and bring the benefits of the Core Housing Concept to the consciousness of all stakeholders involved in the Built environment; and encourage its adoption in Nigeria's mass housing delivery.

NIGERIAN HOUSING SITUATION

Housing represents one of the basic human necessities; it is as fundamental as the need for food and clothing. However, the housing situation in Nigeria is one faced by enormous and complex challenges. The National Bureau of Statistics and United Nations study estimate a housing deficit of between 12-16 million (Yinusa, 2011). The National Housing Policy (2012) however published a figure of 17 million as housing deficit in Nigeria and indicated N60 trillion as funds required to bridge this deficit. This estimate was based on N3.5 million as the unit cost of producing a building. However, housing provision hinges very much on affordability which

refers to the ability of an individual to pay for the house. Furthermore, the economic capacity of households to own houses at the estimated N3.5 million is inhibited by the wide gap between household income and housing cost (Okupe and Windapo, 2000).

CORE HOUSE CONCEPT AND DESIGN

Core housing implies the development of a building with a minimum livable space, with the ability to be extended in the future by the occupants as their resources allow. The issue of note however is that the house is inhabited as soon as the first phase of construction activities are completed and remains inhabited even as the construction of the other phases are being carried out. The funds required for the development of the first phase represent only a fraction of what is required to develop the whole building up to the last phase. The concept of the Core Housing can readily be applied to address housing availability and affordability challenge, especially for low to medium income salary earners. The cost-effectiveness becomes even more glaring when NBRRI alternative building materials are used in construction.

The demonstration of the Core Housing concept is presented in Figures 1 to 8 which present the designs developed for the core house, on a phase by phase basis. These figures show the floor plan and the 3D impression of the core house for each of the 4-stage construction, which can span over several years. The progressive expansions of each phase from a one-bedroom house to a three-bedroom house are indicated in magenta in the Figures.

A fundamental attribute is that construction activities can span over several years depending on two critical issues, namely the increment of the earning capacity of the family and the increase in the core family unit (i.e. as the family grows with children). Another benefit from the Core Housing concept is that the house is inhabited as soon as the Phase 1 construction activities are completed; and the house remains inhabited as construction of other Phases are carried out.

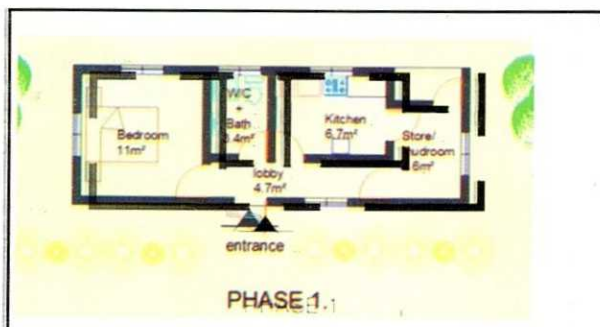


Figure 1: Floor plan of First phase of core house



Figure 2: 3D of First phase of core house

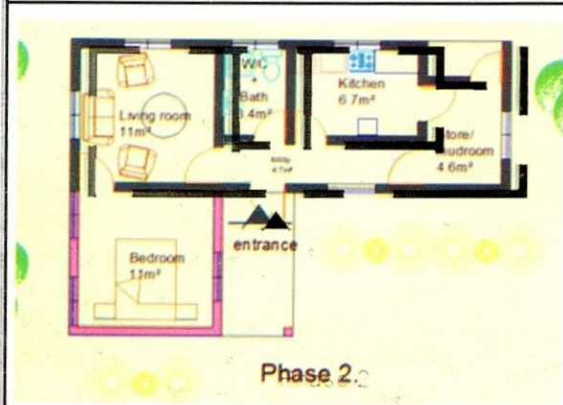


Figure 3: Floor plan of Second phase of core house



Figure 4: 3D of Second phase of core house



Figure 5: Floor plan of Third phase of core house

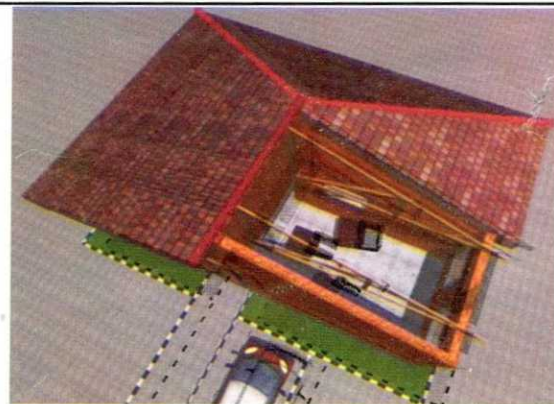


Figure 6: 3D of Third phase of core house

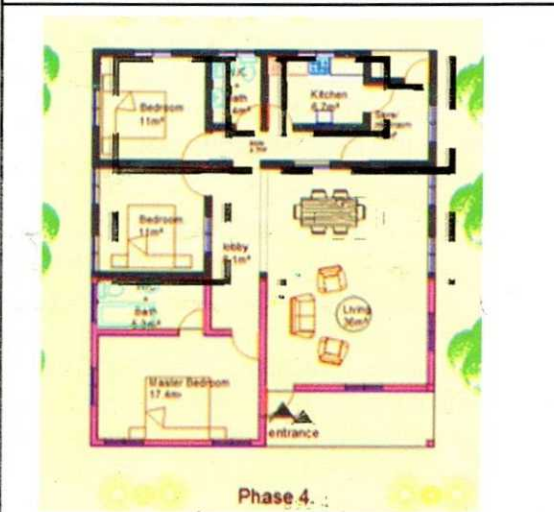


Figure 7: Floor plan of Fourth phase of core house

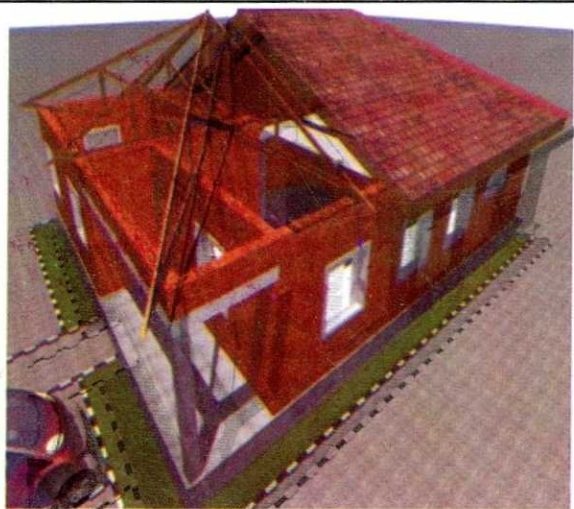


Figure 8: 3D of Fourth phase of core house

BUILDING MATERIAL SELECTION CRITERIA

The choice of building materials to be used for core housing, as pointed out by Ikaputra (2008), is guided by some principles to ensure cost-effective. They should:

- i. have the potential for dis-assembly and reuse; or
- ii. be used as part of permanent component of the housing structure

Consequent on the above, the choice of alternative building materials to be used for core housing should have the following attributes:

- a. Ease of removal and re-use with minimal waste
- b. Responsiveness to local climatic conditions
- c. Cost-effectiveness
- d. Durability and quality in terms of adequate strength.

From this submission, the use of Alternative building materials such as "dry stackable" block masonry units laid without mortar, is more appropriate for core housing. The colossal waste associated with conventional masonry works, such as concrete works, etc. when there is a need for building alteration, discredits its application in projects that are intended for extend-ability. Generally, with the use of NBRRI alternative building materials such as the Interlocking blocks, there is a cost savings of up to 24% in cost of walling.

COST ESTIMATES FOR BUILDING THE CORE HOUSE

From a study carried out by these authors on the incremental cost of the Core house, it was reported that 39.8% of the cost of the Core house was expended in the first phase, 11.2% in the second phase, 10.9% in the third Phase and 38.1% in the fourth Phase.

This cost increment profile of the phase-by-phase development of the core house provides a basis upon which self-build initiatives can be made especially when limited financial resources are available to such a developer. Indeed, these figures can also serve as a basis to evaluate and ascertain incremental release of loans to beneficiaries and the expected monthly re-payment on mortgages collected from the FMBN for core housing construction.

In another analysis made by the same authors on the applicability of the Core housing concept to different levels of Federal Public servants based on their disposable incomes and housing affordability, it was noted that 76% of all Grade levels (1 to 17) could afford the first phase of the core house, 69.2% could

afford the second phase, 61.5 % could afford the third phase while only 48.7 % could afford the fourth phase. The implication is that with the core housing concept, more public servants could afford a form of decent housing when the stages of construction typical of core housing concept of housing delivery is adopted. Furthermore, more staff in the lower and middle income group can afford one form of housing or the other.

CONCLUSION

It can be concluded from the work of the authors from the foregoing that

- a) The use of NBRRI technologies in the construction of the core house provides an easy and cost effective means to affordable housing provision and as such should be patronized by stakeholders in the Nigerian housing sector.
- b) The core housing concept is appropriate for the provision of one form of affordable housing or the other to at least 76 % of Public servants while 48 % of Public servants can afford all the four phases of the core house.
- c) The core housing concept can be used as a template by the Federal Mortgage Bank of Nigeria and other mortgage institution in spacing granting of loans to an individual based on construction phase

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INTERNATIONAL ROAD FEDERATION NOMINATES DG NBRRI FOR TOP AWARD



Group photograph of RAPNEC delegation and NBRRI officials during the Courtesy visit. Standing 6th from the Left is the DG/CEO of NBRRI, Prof. Matawal flanked by Prince Julius Ogu of RAPNEC (7th from Left)

The Director-General of the Nigerian Building and Road Research Institute, NBRRI, Professor Danladi Matawal, has been nominated to receive the 2015 International Road Federation (IRF) Award. This cheering news was made known when a delegation from IRF affiliate in Nigeria, the Road Accident Prevention Network Center (RAPNEC) paid a courtesy call to Prof. Matawal at NBRRI Administrative Headquarters, Abuja.

Speaking during the visit, the Chief Executive Officer of RAPNEC, Prince Julius Ache Ogu said the International Road Federation (IRF), an organ of the United Nations, had in 2013 initiated an Award to honour Individuals, Groups and Organisations that are committed to road safety development. Prince Ogu disclosed that after conducting due diligence, the Awards Committee found Professor Matawal worthy of the nomination based on his several interventions and commitment to road safety research and national development in Nigeria.

The RAPNEC delegation headed by its Chief Executive, Prince Julius Ache Ogu, was accompanied by Chairman of the Awards committee, Ande Philips Ikaa and another member, Barrister Jane Tarka.

Prince Ogu noted that RAPNEC is a Non-Governmental Organization which collaborates with other relevant stakeholders including NBRRI towards ensuring road safety on Nigerian roads. He stated that as a key stakeholder, NBRRI has been making significant impact in reducing road crashes though its varied activities including research and road safety education.

Also speaking during the courtesy visit, the Chairman of the Awards committee, Ande Philips Ikaa, said the nomination of Prof. Matawal for the prestigious award was to recognize his positive approach of using research to address road safety issues. Ikaa cited the 2015 NBRRI-organized International Conference on Safe, Efficient and Sustainable Road Transportation in Nigeria as an example of one of such interventions initiated by Professor Matawal. Ikaa further disclosed that this year's award presentation ceremony will take place in Abuja and that a delegation from the International Road Federation will be in Nigeria to witness the event.

An overview of the mandates, functions and activities of the International Road Federation was presented by a member of the team, Barrister Jane Tarka.

Continued on page 17

Continued from page 16



RAPNEC CEO, Julius Ogu presenting a corporate gift to the DG NBRRI, Prof. D S Matawal

Responding, the Director-General/CEO of NBRRI, Prof. Danladi Matawal welcomed the team from RAPNEC to the Institute and said he was delighted that the Awards committee considered him worthy to be nominated for the honor.

Prof. Matawal however emphasized that undertaking comprehensive research on issues relating to road safety is part of the mandate of the institute; and as such, NBRRI is committed to such activities. He disclosed that one of the critical resolutions of the 2015 NBRRI International Conference on Road Transportation in Nigeria was the setting up of a body that will ensure that the resolutions are fully implemented by those responsible in order to achieve zero tolerance towards road traffic crash fatalities in Nigeria.

Speaking further, Prof. Matawal commended RAPNEC for doing a good job in ensuring safety on Nigerian roads and promised that NBRRI will continue to partner with the NGO to develop Nigeria as a whole.

The high point of the courtesy visit was the presentation of corporate gifts and NBRRI publications between RAPNEC and NBRRI.

NBRRI HOSTS RIGAN NEC MEETING

Further to an earlier courtesy visit made by the President of Research Institutes Games Association of Nigeria (RIGAN), Prof. Adamu Rabi, to the Director-General of NBRRI, the National Executive Committee (NEC) of RIGAN held its meeting at the National Administrative Headquarters of NBRRI in Abuja to fine tune its preparations towards the hosting of the RIGAN Games at the Nigerian Institute of Transport Technology (NITT) Research between 20th and 30th November 2015.

Before the RIGAN NEC meeting commenced, the Director-General of NBRRI, Prof. Danladi Matawal, gave a welcome address. He noted that over the years, the RIGAN Games has provided a veritable platform for promoting unity amongst the over 30 Research Institutes through the atmosphere of sportsmanship and healthy competition created in a manner devoid of bitterness and rancor.

The NBRRI DG noted that while other fora of interactions amongst Research Institutes are usually academic or administrative in nature, RIGAN Games is unique as it affords Research Institutes a point of convergence for both leisure and recreation. He further noted that through the RIGAN Games, athletic potentials and inherent capacities are built amongst Research Institutes' Staff while friendships and collaborations are established and mutual respect is fostered.

Prof. Matawal congratulated members of the National Executive Council of RIGAN for emerging victorious in their respective capacities during the elections;

saying that a major test of the virility of their stewardship will be the quality of the forthcoming tournament, scheduled to take place at NITT, Zaria. He however appealed to the RIGAN NEC to ensure a fair and equitable ground for merit by eschewing the use of mercenaries by participating Institutions at the event. He further suggested that they run a thorough check on contingents at the tournament before and during the event.

The NBRRI DG commended the well deserved choice of NITT as host of the all-important assembly of Nigerian Research Institutes Sportsmen and women; saying NITT is a worthy and timely host by virtue of its location and sports infrastructure. Prof. Matawal disclosed that NBRRI has taken the competition seriously in spite of scarce resources as the Institute's contingent has long been undergoing training on field and track events with a view to achieving better performance at this year's event. He revealed that as a matter of policy, the management of NBRRI under his purview has in the last four years encouraged monthly aerobic and jogging exercises, all in a bid to ensure fitness and physical wellbeing of Staff.

Prof. Matawal advised that as the Games is fast approaching, the RIGAN Exco should intensify efforts on publicity of the event and reach out to as many Research Institutes as possible to ensure a robust participation.

The NEC meeting later went into a closed door session.

3RD QUARTER NBRII SEMINAR PAPERS

One of the hallmarks of the successes of R&D activities at the Nigerian Building and Road Research Institute (NBRII) over the years is the emphasis and premium placed on seminars and peer review platforms provided for Research and Technical Staff, to review their R&D activities. One of such platform is the Internal Seminars which are held periodically, at fortnight intervals for Research Staff at the National Laboratory Complex in Ota and for the Research Unit at the National Administrative Headquarters in Abuja. The benefits from the series of Seminars held have been very rewarding in terms of building the capacity and competence of

research staff, providing avenues for peer review of project proposals as well as assessing progress of on-going research works and completed researches.

NBRII Newsletter has considered it expedient to bring the abstracts of the seminar presentations in the 3rd Quarter of 2015 to the purview of readers. This is not only to inform the public about on-going R&D activities in the Institute but also to engender possible technical responses from stakeholders on the seminar topics that cover the varied aspects of the construction industry.

ESTIMATION OF RADIATION DOSE OF STABILIZED LATERITE BRICKS PRODUCED BY THE NIGERIAN BUILDING AND ROAD RESEARCH INSTITUTE OTA, OGUN STATE

Nwafor Christiana O.

Research Officer 1, Building Research Department

Abstract

Studies on hazardous effects of radiation due to building materials have been done worldwide, since most people spend 80% of their time indoors. Laterite bricks produced in NBRII provide Nigerians with a building material of high durability and low maintenance and other good qualities. But among these qualities, radiological hazards play a significant role in assessing the exposure of the general public to natural radioactivity due to the presence of uranium – thorium series and potassium present in them. In this study, samples of stabilized laterite bricks produced in NBRII were collected and analyzed for the radiation hazard indices due to presence of natural radionuclides, using gamma – ray spectroscopy. The mean activity concentrations of uranium-238, Thorium-232 and potassium- 40 in the studied brick samples were found to be 22.8 ± 1.6 , 46.7 ± 2.2 and $179.7 \pm 8.1 \text{ Bqkg}^{-1}$ respectively. The radium equivalent activity, the external and internal hazard indices, the outdoor absorbed dose rates and corresponding annual effective dose rates were estimated for potential exposure risk of the brick samples. The average estimated outdoor gamma dose rate values for brick samples was found to be 46.7 nGh^{-1} which is lower than the world average value of 60 nGh^{-1} . The calculated external and internal hazard indices for the brick samples are less than unity as required. It can therefore be concluded that NBRII bricks are safe for usage with no significant radiological hazards.

Keywords: Natural radioactivity, Gamma ray spectrometry, Radiological hazards

THE ROLE OF BAGGASH AS PARTIAL REPLACEMENT OF CEMENT IN IMPROVING DURABILITY OF SISAL FIBRE REINFORCED CONCRETE

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Research Officer 1, Building Research Department

Abstract

The effect of baggash as partial replacement for cement in improving durability of sisal fibre reinforced concrete was investigated. The flexural strength of the fibre was tested and its extensibility measured. It was observed that the flexural strength increases as percentage replacement increased. Beams of size 100x100x450mm were cast using 1:2:4 mix ratio, w/c of 0.6 and reinforced with 5% sisal fibre by weight of cement at 0, 4, 8, 12, 16, 20 and 24% replacement of cement with baggash. The beams were demoulded after 24 hours and cured for immersion for 7, 14, 21 and 28 days hydration period. The mean modulus of rupture for the respective beams for percentage increase of baggash at 28 days was 6.30, 6.39, 6.57, 6.66, 6.71, 6.72 and 6.72N/mm². It was concluded that the baggash can be used to partially replace cement in improving durability of sisal fibre since there is an improvement in the flexural strength across the percentage increase. So also from 20% replacement, the improvement becomes steady which is not unconnected with the fact that the maximum durability can be achieved.

Key words: Baggash, durability, sisal fibre, flexural strength, hydration period.

FACTORS AFFECTING CONTRACTORS' MARK-UP SIZE DECISION IN CONSTRUCTION: A CASE STUDY OF ILORIN

Yakub Ahmed

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Abstract

The mark-up in construction is a percentage of the estimated direct cost which a contractor adds to the estimated direct and indirect costs to account for overhead cost, profit and contingencies. Deciding the right mark-up to add to an estimate is not an easy task for a contractor. The mark-up must be small enough to ensure a good chance of winning the contract, yet big enough to realize a reasonable profit. The study investigated the factors affecting the amount of mark-up of construction companies. The study was carried out through administering of questionnaires and oral interviews with the top management of the construction companies. This study presents 40 factors, with their relative importance and effect to contractors operating in Ilorin, underlying the mark-up size decision. From the analysis, the values of the important indices were found to be 4.47 for availability of materials, 4.32 for type and nature of project, 4.32 for general (office) overhead, 4.26 for complexity of project, 4.26 for types of contract and 4.21 for size of contract. The aforementioned parameters are the most important factors that affect mark-up size decision. It is recommended that contractors should focus their attention on the most important factors and hence, enhance their decision of assigning the right mark-up size to the right job.

Key words: Mark-up, Contractor, Construction firms, Materials, Overhead cost

DEWATERING OF SLUDGE FROM WASTE WATER TREATMENT PLANT

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Abstract

Sludge is the largest by-product from wastewater and water treatment plants and its disposal is one of the most challenging environmental problems in wastewater treatment process. Dewatering process is the removal of water from sludge samples, but some sludge dewater poorly. Addition of conditioning agents can solve the problem of poor dewatering of sludge. The aim of this research work is to improve the dewaterability of sludge from water treatment plant. Wood ash, Alum (Aluminum sulphate) and hydrated lime were mixed with sludge sample in different containers. Each mixture was left for aeration for some days and was weighed to determine the amount of weight loss. From the results, it shows that there was a great loss of weight in each mixture, wood ash decreased from 54.16 g to 43.85 g, hydrated lime 50.51g to 37.84g and aluminum sulphate (alum) 55.64 g to 38.03 g, compared to the initial weight of the mixture. The sludge sample mixed with hydrated lime experiences high rate of weight loss which is higher than that of the sample mixed with wood ash while the sample that was mixed with aluminum sulphate released water to its upper layer and it was made to pass through the process of decantation. This shows that hydrated lime is a preferable conditioning agent over wood ash in solving the problem of poor dewaterability of sludge.

Key words: Sludge, Dewatering, Conditioning agent

EFFECT OF pH ON ENGINEERING PROPERTIES OF LATERITIC SOILS USED IN ROAD CONSTRUCTION

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Research Officer II, Road Research Department

Abstract

Soil pollution arises from variety of sources which includes acid rain, salinity, waste disposal, etc. In recent years much attention has been paid to acidification of rain, which is one of the environmental factors which affect the properties of lateritic soil. This research study was aimed to examine the effect of pH on engineering properties of lateritic soils used in road construction. Lateritic soil obtained from the Apata area of Ibadan Oyo State was studied to investigate the effect of soaking on the engineering properties of the soil which was immersed in different pH solutions (pH= 3.0, pH= 5.0, pH= 7.0 and pH= 9.0). Hydrochloric acid and ammonia solution were used to monitor the pH of the solution for about 35 days. The original and contaminated samples were subjected to the following laboratory tests: Atterberg limit test, specific gravity, compaction and California bearing ratio. The consistency limit increased with increase in number of days in acidic condition but decreases with the increase in the number of days in alkaline condition. The MDD decreases with increase in number of days for each of the pH condition, The OMC however increase with increase in number of days for each of the pH. The specific gravity and CBR (unsoaked and soaked) decreased in both the acidic and alkaline condition. The results showed that the pH of the solution had strong influence on the engineering characteristics of the lateritic soil when compared with Nigerian General Specification. This influences rendering the soil sample unsuitable for road construction.

Key words: Lateritic soil, Consistency limit, pH, California bearing ratio

GEOPHYSICAL INVESTIGATION OF GROUNDWATER POTENTIAL IN OGBESE, ONDO STATE, SOUTHWESTERN NIGERIA

Ologun Sehinde

Research Officer II, Road Research Department

Abstract

Electrical resistivity sounding of Ogbese town was conducted with a view to delineating the subsurface units and evaluating the groundwater potential of the area. Forty (40) schlumberger vertical electrical resistivity sounding were acquired with ABEM SAS 1000 Resistivity Meter. The electrode spacing (AB/2) was varied from 1-65m with maximum spread length of 100m. The interpretation of the data was quantitative, and involved partial curve matching and computer iteration technique using WinResist software. Three to four subsurface geoelectric layers were identified from the geoelectric section. These include; a top soil, clay/sand/sandy, weathered layer/fractured basement and fresh basement with resistivity and thickness value of 18- 812 Ω m and 0.4 - 1.0m; 61 - 260 Ω m and 0.3 - 2.7m; 3 - 165 Ω m and 0.9 - 17.8m respectively. The depth to bedrock varied from 0 – 21.3m with resistivity to infinity ohm-m. The weathered layer map and overburden thickness map were used to characterize the groundwater potential of the study area into low and high/medium groundwater potential zone. The high/medium groundwater potential zone underlies parts of south central and southeastern portion of the study area whereas the northern, western and northeastern parts fall within the low groundwater potential zone. The study provides a reliable guide on groundwater potential in the area.

Key words: *Groundwater, Schlumberger, Resistivity, Thickness, Sounding*

INVESTIGATING ROAD TRAFFIC CONGESTION USING SATELLITE IMAGES IN A GIS ENVIRONMENT: CASE STUDY OF NYANYA-MARARABA HIGHWAY

Geographic Information System Research Group, NBRI, Abuja.

Abstract

Urbanization in developing world has resulted in a situation where more people live in cities than previously. This migration pattern induces pressure on road infrastructure due to increased vehicular traffic. Traffic congestion occurs when city road network is unable to accommodate the volume of traffic generates. This situation is caused by rapid urbanization and lack of improvement in the road network capacity, poor traffic management techniques and road user behavior. The situation, described above manifests itself in some major roads in Abuja and its suburbs. Geographic Information System (GIS) is an effective and efficient tool for observing relationship between the spatial and physical attributes of roadway facilities. This study was carried out on the Nyanya-Mararaba high way, applying GIS to investigate congestion patterns along the highway, using satellite imagery, to determine problem areas, their causes and the management techniques suitable for their production. Primary sources influencing traffic congestion were identified and some recommendations were given. The work shows that GIS is a veritable tool that can be used to manage vehicular traffic flow in urban environment.

KEYWORDS: *traffic congestion; Geographical Information System; satellite imagery; environment*

EFFECTS OF LIQUID STABILIZERS ON SOME TROPICAL SOILS

Geotechnics Research Group, NBRRI, Abuja.

Abstract

There is a large body of research on the effect of cement, lime, fly ash and other traditional materials as stabilizers for road construction works in the country. However, there is a scarcity of information on the effects of non-traditional stabilizers for stabilization of subgrades for road construction works. These non-traditional stabilizers are presently being actively marketed for stabilization of soils for highway construction. Independent testing is therefore justified to support the appropriate selection of stabilizer and its optimum field application rate. In this study, two non-traditional stabilizers were selected to ascertain their effect on the properties of five soil types. In the micro-characterization phase of the study, Scanning Electron Microscopy (SEM) was used to evaluate the mechanism of soil modification at the particulate level of the treated and the untreated soil samples. In the macro-characterization phase of the study, standard geotechnical laboratory tests were conducted on the untreated and treated soil samples. Significant changes were observed at the soil particle level from the SEM micrographs; comparison of the treated and untreated soils showed that some treated samples appeared aggregated while one soil appeared flocculated. The test results show a significant soil improvement with the addition of the stabilizers, specifically with the strength parameter (CBR value). This percent increase however, varied for each soil type from about 12 – 150%. The effect of the stabilizers on the plasticity of the soils appeared to be inconsistent. The results of this investigation further reveal varied modifications from the application of these stabilizers on different soil types. This further emphasizes the need to conduct standard laboratory tests to ascertain the effectiveness of the stabilizer on a particular soil type prior to specifying its use on the field as compared to adopting the manufacture recommended application rate.

Keywords: *stabilization, pavement subgrade, soil improvement, CBR, soil plasticity*

ASSESSMENT OF COMPLIANCE RATE OF DRIVERS AT SIGNALIZED INTERSECTIONS: A CASE STUDY OF SELECTED INTERSECTIONS IN ABUJA METROPOLIS, NIGERIA

Transport and Road Research Group, NBRRI, Abuja.

Abstract

Traffic forecasting, analysis and deployment of signalised intersections would be meaningless if drivers do not comply with traffic regulations and obey traffic-controlled devices. This study investigated drivers' compliance at signalized intersections. Field observations were conducted at 5 signalized intersections located in Abuja metropolis, Nigeria. Data on No. of Vehicles, No. of Stops, No. of Arms and No. of Non-Stop vehicles, etc. were subjected to regression analysis to establish the relationships between these parameters. The models fitness or coefficient of determination, denoted by R^2 was found to be 0.97 which showed a very significant relationship between the variables (independent and dependent). The results of the study further showed that out of the 2,100 drivers/vehicles observed, 1,374 (65%) of vehicles came to a complete stop, 589 (28%) vehicles did not stop while 131 (6%) showed reluctance in stopping. It was found out that taxi drivers have high tendency for running red lights. It was noted from the study that 95% of all vehicles using Abuja intersections come to a complete stop during the morning off peak periods. Consequently, the need for further studies to incorporate night and day times as well as wet times scenarios were highlighted, not only to increase the sample size but to also utilize other data collection methods and new technologies such as the use of driving simulators for comparison between alternative traffic control systems. This would provide comprehensive driver behaviour at signalized intersections under all possible conditions. The study further reveals that most of the signalized intersections are not well coordinated and the installation of light on right turn that has separate flare lane is not necessary. It was recommended that policies to control, enforce and regulate the activities of drivers at signalized intersections by relevant government security agencies such as the federal Road Safety Corps, Police and VIO should be made more robust and enforced.

Keywords: *Drivers; Red lights Violation; Traffic Signal; Traffic Volume*

WASTE MANAGEMENT AND THE ENVIRONMENT IN NIGERIAN SUBURB: A CASE STUDY OF JIKWOYI PHASE I & II

Environment/Climate Change Research Group, NBRRI, Abuja.

Abstract

One of the challenges posed by rapid urbanization is with respect to effective solid waste management. To this end, this research work was conceived to assess Solid Waste Management (SWM) approaches and operations in Jikwoyi, a suburb settlement of the FCT. To investigate the problems associated with the perceived ineffective and inconsistent SWM pattern, a Survey approach was adopted where systematic and stratified random sampling techniques were applied. The survey investigated the dump-site location patterns, modes of disposal and collection of solid waste in the study area through three (3) sets of tailored questionnaires, designed for data collection from agencies responsible for SWM and other stakeholders. Of these, 15 questionnaires were administered to Staff of Abuja Municipal Council (AMAC) and 5 questionnaires to a group of randomly selected stakeholders in Jikwoyi Phases I & II, during a Focus Group Discussion (FGD). A total of 32 persons participated in the FGD, 59.4% were male and 40.6% female. The age distribution of respondents was as follows: 8 persons were between the ages of 20-30yrs, 16 persons were between the ages of 31- 40yrs, whilst 4 persons made up the representation of people between the ages of 41- 50yrs and 51- 60yrs respectively. The results further showed that the public refuse dumpsites were made of Organic (biodegradable) and Inorganic (non-biodegradable) Wastes. The study indicated that due recourse to the proximity of residences to the dumpsites was not considered in siting the dumpsites. Findings also indicated that solid waste was disposed of into storm water drainages, on walkways and on road median strips of the major roads of the study area. The study also revealed that inadequate provision of solid waste management infrastructure, ineffective collection strategies, paucity of funds and institutional frame work posed challenges in managing solid waste in the study area.

Keywords: *Solid Waste, Disposal, Waste Management, Random Sampling*

INVESTIGATING SLUM CONDITIONS IN NIGERIA: A CASE STUDY OF ASO WARD, MARARABA, KARU, LGA, NASARAWA STATE

Slump Development Research Group, NBRRI, Abuja.

Abstract

This study was conducted to provide local, up-to-date and reliable information concerning conditions of selected slums in the suburbs of Abuja. This is with a view to minimizing over-reliance on non-indigenous information on slums which is inadequate for formulating or modifying local policies for designing intervention programs. Usually, the difference in socio-economic status of citizens and the geographical variance influence patterns of slum settlements such that general and/or global information may not suffice in policy formulation. The study investigated housing conditions, water supply and sanitation, and security of tenure of dwellers in the study area. Study methods included literature review, reconnaissance and household surveys. Empirical data was obtained through administered questionnaires and interviews with 40 heads of randomly selected households in the study areas and focus group discussions. Results showed that more than half of the respondents did not have proper land titles, houses were overcrowded and in dilapidated conditions. Other findings also indicated that 92% of the occupants were reluctant to develop occupied building due to lack of security of tenure of occupied plots, only 8% developed their buildings to standard, as prescribed by local building codes, within the slum which is attributable to the fact that they possess secure tenure on the plots they occupied. Narrow streets with no storm water drains were also observed with inadequate sanitation and water supply.

Keyword: *slums, suburbs, socio-economic status, housing conditions, sanitation*

RIGAN PRESIDENT PAYS ADVOCACY VISIT TO DG NBRII



DG/CEO of NBRII, Prof. D.S. Matawal (1st from Right) discussing with RIGAN President, Prof. Adamu Rabiu (middle) during the meeting

As part of advocacy to drum up support for the forthcoming Research Institutes Games Association of Nigeria (RIGAN), the incumbent President of RIGAN, Prof. Adamu Rabiu paid a courtesy visit to the Director-General of the Nigerian Building and Road Research Institute, Prof. Danladi Matawal.

In his speech, the RIGAN President thanked the DG-NBRII and his Management team for hosting him and congratulated him for his stewardship in NBRII which has impacted positively on the construction industry. He also noted that since Prof. Matawal assumed Office, he has piloted NBRII back into the RIGAN fold after about fifteen (15) years of moribund sporting activities in the Institute. This he noted was not surprising since Prof. Matawal has been actively engaged in sporting activities in his personal capacity.

Speaking further at the meeting with the DG/CEO of NBRII and his Management Team, Prof. Rabiu stressed on the need for sports activities, noting that it promotes fitness and good health as well as good state of mind and intelligence for research work. He pointed out that without exercise through Sports activities, the body cannot be healthy; adding that the motto of RIGAN is "EXERCISE FOR HEALTHY MIND" for greater research work.

The RIGAN head recalled that about forty (40) NBRII Staff participated in the last RIGAN Games festival held at the Federal Institute for Industrial Research Research (FIIRO). He consequently appealed to the DG/CEO to sponsor more Staff to the up-coming RIGAN Games scheduled to take place at

the Nigerian Institute of Transport Technology (NITT) Zaria between 20th and 30th November 2015; and take advantage of the proximity of this sports venue to NBRII Headquarters in Abuja.

Commenting on the accusations that some Research Institutes resort to using mercenaries for the Games, the RIGAN President revealed the resolution of the National Executive Council (NEC) to use e-Registration and the IPPIS platform to confirm bona-fide staff of any Research Institute, prevent such unwholesome practice from rearing its head and create a level playing ground for all participants. Prof. Adamu Rabiu further intimated the DG/CEO and his Management Team of the inclusion of *Veteran Sports* into this year's Games. This, he confirmed was designed for DG/CEOs, Directors and Heads of Departments to compete and win medals for their Institute, noting that one must be above forty (40) years of age to be eligible to participate in this event.

Prior to this, a RIGAN Council member who is also a staff of NBRII, Mr. Amos Tabe, expressed appreciation for the unalloyed and continuous support that the DG/CEO and Management of NBRII has been giving to Sports development in the Institute as well as to the activities of RIGAN.

In his response, the DG of NBRII, Prof. D.S Matawal welcomed the RIGAN President and the PRO to the Institute. He congratulated Prof. Rabiu Adamu over his election as the RIGAN President and commended his commitment and sacrifice to the cause of RIGAN. The DG/CEO said that sport promotes healthy research, healthy mind and also encourages interactions and fitness amongst workers of Research Institutes for enhanced productivity. Prof. Matawal assured the RIGAN President of the Institute's continuous support to RIGAN. He further said that the issue of mercenaries has already come up in the Institute; and that he received counsel that as much as possible, there should be transparency as people are concerned with equity and justice in winning laurels. He concluded with the hope that NBRII would do better in the next Games in November 2015 since the last one was the first the Institute participated in, after a long period of absence.

NBRRI PREPARES FOR 2015 RIGAN GAMES

The 2015 edition of the Research Institute Games of Nigeria (RIGAN) tagged *2015 RIGAN Games* will be hosted in November 2015 by the Nigerian Institute for Transport Technology (NITT), Zaria. To ensure that NBRRI does not just participate but participate to win laudable laurels in different events, the Management of NBRRI has encouraged its staff to undertake intensive training sessions to keep its athletes in top shape. This is in addition to its regular jogging exercise conducted monthly. The preparation of NBRRI staff for the 2015 RIGAN GAMES is captured in pictures and presented herein. The support shown by the sports loving Director-General, Professor Danadi Slim Matawal is also demonstrated in pictures



Cross-section of NBRRI Football Team



Director-General/CEO, NBRRI, Prof. D. S. Matawal with Amos Tabe at a Training session



NBRRI Football Team receiving pep talk during a Training session



NBRRI Football Team in a Training session

Birthdays

NAME	DEPT.	DATE OF BIRTH
Egege Chimeziri C.	RRD	1 st July
Ibrahim Solomon	EMRD	1 st July
Musa Sarah Abari	A/P	1 st July
Ibrahim Garba	CES	2 nd July
Okoi Yemi Joseph	CES	3 rd July
Ayegba M. Ojogbane	RRD	5 th July
Ogwu Ajanigo Angela	CES	5 th July
Francis Zakariah Mu'ar	A/P	7 th July
Metu Francisca U.	EMRD	8 th July
Danjuma Golesh Abel	BRD, Abuja	9 th July
Umana Ikouwem I.	BRD	10 th July
Kpanaki Martins	BRD	14 th July
Gbemisola Famuyide	A/F	14 th July
Amos David	BRD	14 th July
Otoide E.D	EMRD	16 th July
Mbaso Ebele	A/F	17 th July
Chioma Eririogu	A/P	17 th July
Alfred Buba	BRD	17 th July
Emole Charles U.	A/P	18 th July
Ochei E.S	EMRD	20 th July
Egbe Sunday Enyi	CES	21 st July
Adekunle Aminat O.	PIT	23 th July
Bala Ibrahim	A/P	24 th July
Ibrahim Samuel	A/P	27 th July
Siyabola I. Inyang	BRD	28 th July
Abu Y. Paul	PIT	4 th August
Ogboji F. A	A/P	8 th August
Akinmade O. Daniel	RRD, Abuja	8 th August
Bello D. Yakubu	BRD	10 th August
Mustapha Abraham	DG Office	10 th August
Birnin-Kudu .M. Rakiya	CES	12 th August
Eze E. Chukwuemezie	A/P	15 th August
Agala Joshua Ndubisi	Proc	15 th August
Adekunle Adebayo	BRD	19 th August
Inoh Augustine Gordian	CES	20 th August
Adamu Isah Katagum	RRD Abuja	20 th August
Ajodo Godspower O.	A/P	20 th August
Okii Gbenga	BRD	22 nd August
Onoja Patrick Omachoko	A/F	24 th August
Anaso Georgina .N	BRD	26 th August
Abdul Amina Ile	PIT	28 th August
Okpanachi John Adaji	CES	29 th August
Aruna Francis	A/P	2 nd September
Francis Aitsebaomo	RRD	2 nd September
Quadri Habeeb Adedeji	RRD	4 th September
Nwande Ocean	BRD Abuja	5 th September
Makava Daniel O.	CES	6 th September
Ikong Aboyi Pius	BRD	7 th September
Udo Itoro Gabriel	RRD	9 th September
Juliana Tyoden	RRD Abuja	12 th September
Okougha Ayemere F.	BRD	13 th September
Oghele Emmanuel	Maintenance	13 th September
Daniels Andrea .O	A/P	15 th September
Mohammed Abdulgafar	PIT	16 th September
Rose Ali	A/P	19 th September
Mapis Abigail Daniel	A/F	20 th September
Salifu Blessed Ugbede	PITD	20 th September
Adeiwale Adefolarin K.	BRD	20 th September
Izabi H. A	A/F	22 nd September
Okoi E. John	BRD	23 rd September
Ikpi Cosmas Omini	Maintenance	24 th September
Yisa Godwin Lazhi	RRD	24 th September
Cinfwat Kishak Zakka	Procurement	26 th September
Nwannenna Olachi C.	EMRD	26 th September
Yahaya Babatunde	EMRD	26 th September
Abubakar Baba Yerima	CES	27 th September
Egwu Micheal	A/P	29 th September
Nwadinobi Nneka E.	A/P	30 th September

Weddings



Yatasu Abdulsalam of PITD Abuja got married to Hon. Abdullahi M Sani on 22nd May 2015 in Kaduna



Former Miss Opeyemi Bello got married to Mr. Ademosu Babatunde of PIT Dept. Ota on 5th September, 2015 in Ibadan

Births



Mrs. Ojo Emeso Beckley of the RRD Abuja Unit had a baby on David Osezuwa Ikpeminoghena 15th April 2015

Births continued



Mrs. Juliana Tyoden of Road Research Unit, Abuja had a baby boy named Jiret Ethan Tyoden on 8th May 2015



Mr. Danjuma Golesh of Building Research Dept., Abuja is blessed with a baby girl named Tehilla Maltibweh Ayami Danjuma Golesh on 10th June 2015



Mr. Solomon Majidadi of Research Dept. had a baby girl on 7th May 2015 named Tahila Jummai Lodiah Solomon Majidadi



Mr. Musa Yola of Research Department Abuja had a baby on 15th June 2015 named Maryam Abubakar Musa Yola



. Okap Stephen Ajide pf A/F Dept Abuja was blessed with a baby girl, Martha Stephen on 7th December 2014



. Ogboji Francis Ameh of A/F Ota was blessed with a baby girl, Christabel Ehi-kowoicho Ene Ogboji on 8th May 2015



Mr. Tom Umoche of CES Dept, Abuja and Mrs Oneshi Umoche of PIT Dept, Abuja were blessed with a baby girl, Uredo Joan Umoche on 11th September, 2015



Daniel Nwaigwe of BRD Ota was blessed with a baby boy, David Munachimson Nwaigwe on 7th September, 2015

NBRRI**NIGERIAN BUILDING AND ROAD RESEARCH INSTITUTE (NBRRI)**

(Federal Ministry of Science and Technology)

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SLUMP CONE



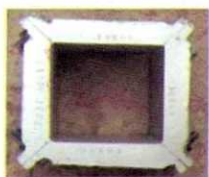
LATERITE GRINDING MACHINE



COMMUNITY-BASED TECHNOLOGY FOR THE CONSTRUCTION & MAINTENANCE OF COST-EFFECTIVE ACCESS ROADS



ELECTROHYDRAULIC BRICKMAKING MACHINE



CUBE MOULD



DIGITISED SUBGRADE SOIL MAPS



PEDESTRIAN ROLLER COMPACTOR



FCR TILE MAKING MACHINE (MULTI-CHAMBER)

Our Services include:

- ➔ Engaging in regular and contract R&D in the construction industry.
- ➔ Conducts training programmes on the use of alternative technologies in affordable housing delivery and road construction to professionals and tradesmen.
- ➔ Consultancy and Advisory Services on all aspects of the construction industry including site investigation, soil testing land use planning, building road design, construction and maintenance, housing delivery and estate development, etc.
- ➔ Community-Based Construction and Maintenance of Feeder/Access Roads.
- ➔ Organises annual conference/workshop on topical issues as it relates to the construction industry
- ➔ Recently published the reports on the building collapse across the country and other research publications (The reports can be purchased at any of the NBRRI offices across the country).

MEETING YOUR LOCAL CONTENT NEEDS IN CONSTRUCTION

