Composite materials presenting the FRP-BARS

Geotextiles are an apt material for civil works

- Eng Frank Kweronda
  Optimise operational and maintenance practice on our country's infrastructure

- Trailblazing
  Why have we forgotten prefabrications?

- Dr Alice Nabatanzi
  CACTUS in building construction
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Public Private Partnership
ENGINEERS, REBOOT THE SHORT MEMORY ON PREFABS AND INFRASTRUCTURE!

Is it true that Ugandans have a short memory? If so, they might need to cultivate a long one instead.

It is the long memory, for example, of India’s resources, culture and civilization that made Mahatma Gandhi resist the Raj after Queen Victoria declared that she was Emperor of India. And it is not that the Mahatma and others of like mind merely fought away the British rule. No, they took a long memory of the inherent local resources of strengths such as the raw materials (natural and human), the means by which the culture and civilization of Indian people had grown through the ages to that stature, and applied it for their development. Today we look at India with envy (sorry about that); but the rest is history.

Leaving the long memory of the Indians aside, within recent memory – the 60s and early 70s – the Uganda government built (of course with international aid) schools, hospitals, and even housing estates using prefabs. Kibuli SSS, Nabisunsa Girls School, Ntinda Housing Estate, the Bugolobi Flats, the Doctors’ Village in Mulago, Kiryandongo Hospital, etc, were made of prefabs. The prefabricated system was a creative and value-for-money way of using the local resources to bring about development. See how the infrastructure and development still stand! So, policymakers, construction professionals and other movers and shakers, why the short memory about prefabs?

Further, as you flick through the magazine, you will find Konstantin Gorchakov, managing director of MRG Composites, continuing with his new topic ‘Composite Materials’ in Uganda, where plastics are stronger than steel! Then you will find the article ‘Geotextiles, an apt material in civil works’, sponsored by Terrain Plant Ltd and another, ‘XYPEX Concrete Waterproofing’, sponsored by ADMIR UGANDA LTD.

Furthermore, Dr Alice Nabatanzi the phytochemist and neutraceuticist, will interest you about the ‘Cactus in construction’, an article that might touch off research among students and other stakeholders in the construction industry. Eng Frank Kweronda and Architect Verna Mbabazi have put their finger on the maintenance culture on infrastructure among Ugandans. And of course, you will look for your regular articles like ‘How Samson and Delilah built their dream home’, Angella Naluwenda’s cost of materials and indices in construction – this time on tiles as a finishing material. ‘Mama Fundi’ has her finger on the pulse in the dynamics of bidding in construction: should it be in hard or soft copy or both? She seems to be for electronic bidding!

Going back to us in Uganda having a short memory (such as, say, on prefabs among the engineering fraternity) and our maintenance culture on infrastructure, can we reboot?

Till next issue, cheerio!

Samuel Hadido
Editor
We challenge our readership, particularly the government technocrats, scholars in universities, professionals and the relevant business community to read our symposia’s and publications’ topics, research and use the results to act for the social, economic and technological development of Uganda!

In the outgoing events on page 4, under the topic, “Exploitation of lake levels for hydropower in Uganda”, Hon Eng Hilary Onek labours to show how we can harness a whopping 1,500MW of power from one single source on the River Nile at a less cost than we paid to get 1,230MW from the four dams of Kiira, Bujagali, Isimba and Karuma put together! At least, let government technocrats, independent researchers and professionals prove him wrong, so he challenges us! And 8M Construction Digest agrees, not for the love of Onek’s neck but for the mission and vision we stand for!

When the idea of fibreglass reinforcement plastics in construction surfaced on the 8M Information Forum six months ago, some laughed it off, unaware about the power of information. Only reading, research and action will prove otherwise. Government through Uganda Development Corporation and its technocrats need to nose around and work with or assist on-the-ground MRG-Composites LLC, ‘producers of the stronger, lighter and cheaper MRG Composites that can replace steel as a reinforcement in selected aspects of construction’ to decrease construction costs and revolutionise it! Read page 8

The prefabricated system of construction (prefabs) has gathered dust in construction archives. Only the relevant technocrats in the Ministry of Education, Health, etc, and teachers in universities can reawaken the idea by researching and acting on, “How to make an appropriate prefab system for Uganda”.

Look, Dr Nabatanzi’s “Cactus in construction” (page 14), Eng Kweronda’s and Architect Mbabazi’s themes on “the poor maintenance culture” (pages 6 and 7 respectively) need reading, research and action for development!

What are the merits and demerits of forwarding construction bidding using the hard copies or soft copies or both? (see page 14) We challenge PPDA to read us, research and adopt an appropriate bidding system for Uganda using the new e-procurement technology which according to Eng Darlington Sakwa and Eng Dr Anania Mbabazi (see page 21), has more advantages!

Till the next issue.

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Use our symposia’s and publications’ topics to READ US, RESEARCH AND ACT!

8M Construction Digest continues to research for and publish engineering and construction information for grassroots social, economic and technological development. And we debate it!

Our Mission
To research and communicate construction and engineering information for Uganda’s grassroots development.

Our Strategic Goal
To research for information, compile and store it, package and design it into magazines and documentaries, and spread it using the print and electronic media, music, dance and drama.

Our Strategic Objective
To expand everyone’s business in the engineering and construction industry using innovative and professional technical journalism, thus causing Uganda’s grassroots development

Read us, research and act to develop Uganda’s construction industry!
Read, learn and use the 8Ms for success in construction and any business:
Mindset, Markets, Methods, Management, Money, Materials, Manpower and Machinery.
8M Information Forum Members, comprising leading engineers, scientists, academicians, other professionals and the business community attended an end-of-year 8M Symposium on 21st December 2018 at the Kembabazi Restaurant, Naguru, in Kampala. At the heart of the matter was less of the eating, drinking and merrymaking and more of the topic that the group had resolved to tackle: “Why has a 1,400MW tunnel project at Butiaba on Lake Albert eluded everyone from 1983 to date?”

Hon Eng Hillary Onek was to present the topic, mildly titled, “Exploitation of lake levels for hydropower in Uganda.” The Rt Hon Deputy Prime Minister, Alhaji Kirunda Kivejinja, represented the Prime Minister, The Rt Hon Dr Ruhakana Rugunda, as the Guest of Honour. Eng Dr Henry Ntale was the discussant on the occasion.

Notable among the attendees were: Eng Fred Tumwesigye, Director of Babcon Uganda Ltd, who arrived sharp on time; Eng Vincent Ollie Ochwo, President of the engineers; Eng Dr Moses M Odongo, ERB Chairman; Eng Francis Okinyal, Deputy Chairman, ERB; Dr John Bahana, a leading scientist/consultant; Eng Peter Balimunsi, Commissioner of Industry in the Ministry of Trade, Industry & Cooperatives and past president of UIPE; Eng Patrick M. Batumbya, a leading consultant with MBW Engineers; Mr Stuart Mwegwa, Business Manager at Roofings Group; Mr Eridad Nyanzi, a leading quantity surveyor; Eng Steven Kiseka, MD Terrain Plant Ltd; Architect Brig-Gen Timothy Sabaiti Mutebile, Engineer-in-Chief, the UPDF Engineering Brigade; Eng Dr Charles Wana-Etyem, consultant and outgoing Chairman of Makerere University Council, and former Chairman of ERB; Eng Karuma Kagina, Past President of UIPE; Eng Livingstone Kangere, a leading engineering consultant; Mr Amar Chandarana, a prominent businessman; Eng Ephraim Turinawe, a leading structural engineering consultant; and many others. All staff of 8M Construction Digest ushered and attended to the guests, in liaison with the Kembabazi catering staff.

After some time of the live and DJ music, MC Eng Peter Balimunsi, ordered for quiet. Then Eng Hon Hilary Onek let the audience have it all: that through omission or neglect, Uganda had missed to develop a value-for-money 1,500MW tunnel power-scheme at Butiaba on Lake Albert, which would have saved a colossal amount of money and time instead of the Kiira, Bujagali, Karuma and Isimba, all combined! “But how?”, all eyes seemed to ask of the Ugandan tall engineer-son of Acholi and MP for Lamwo County, Minister of Refugees and Disaster Preparedness, and formerly Minister of Energy.

The gist of his powerful power-point presentation was thus:

A hydropower scheme that can yield between 1,100MW and 1,500MW of energy at less the cost and time than what was spent on the four power dams of Kiira180MW, Bujagali 250MW, Isimba 180MW, Karuma 600MW! The science is that between Masindi Port and Butiaba on Lake Albert via a westward tunnel is about 79.5km. From this Butiaba point to the lake below is a height of over 400m, and the rest is technological history: Producing a gigantic amount of electricity needs a volume of water falling down onto turbines through a mighty height. Compare that with the fact that the Nile falls through only around 20m at the different waterfalls of the four dams!

In his detailed presentation, which may be accessed on www.8mconstruction.com, Eng Onek went through the following:

**Preliminaries**

Some aspects of the hydrological studies of Lake Kyoga, Lake Albert and River Nile

The feasibility of River Nile diversion into tunnels to Lake Albert

Schematic delivery of high pressure water to the Pelton-wheel turbines

Cross-sections of the tunnels –Lake Kyoga to Lake Albert (Masindi Port to Butiaba)
Hydraulic design of the tunnels, complete with engineering calculations
The intake at Masindi Port area
Approximate comparative analysis of the tunnel diversion system (volume of work)
Technology of the tunnel construction.
Eng Onek ended with a summary of the current observations on the proposal as follows:

If implemented, the design would generate 1,100 MW of energy out of the 300m³/s diversion of the Nile at Masindi Port to Butyaba. If 400 m³/s is diverted to the tunnel, 1,500MW of power would be generated and this is environmentally possible as the Nile needs only 281/m³ to maintain its ecology, based on the 1923 flow level.

Removing 300m³/s from the Nile at Masindi Port, letting 412m³/s flow to the Nile would reduce 190MW from Karuma hydropower and about the same amount from the projected Ayago hydropower scheme. A total of about 380MW would be lost from the two power facilities downstream.

Removing and diverting to the tunnel 400m³/s from the flow, the Nile would reduce 250MW from Karuma and Ayago and about the same amount from Ayago when constructed, but gaining 1,000MW (1500 – 500).

However, 380MW loss at the expense of adding 1,100 MW would give us additional power of 730MW to the system in the country. Or 500MW loss at the expense of adding 1,500MW would give the country a net gain of 1,000MW.

The cost of constructing the tunnels and the underground powerhouse will have to be evaluated against the gains of 730MW or 1,000MW. At its conception in 1981, the project would have cost about US$200m. If the current costs level out at about $2m per megawatt – the internationally considered normal rate for hydropower construction or at US$2.5m compared to the current Ugandan rates of over US$3m per megawatt, then it would be cheaper than Bujagali and Karuma hydropower plants, rated at much higher costs, but with generation capacity of 850MW (Bujagali at 250MW and Karuma at 600MW), which capacity is under-utilized due to error in hydrological evaluation. This proposal is based on over 100 years’ observation of the Nile, and therefore will have minimal deviation from the natural hydrology of the Nile.

Eventually, a detailed evaluation and cost-benefits analysis would be required to decide whether to build more dams in series for hydropower on the Nile or take this option. We could comfortably divert 400 m³/s to generate 1,500MW of power, losing a total of about 500MW from Karuma and Ayago and the country gains 1,000MW.

The project is environmentally feasible with minimum impact arising out of the diversion. As stated earlier, during 1923, the Nile’s lowest discharge was recorded at 281 and there was no reported significant environmental impact reported.

It is more energy efficient and effective compared to the proposed multiple costly dams.

It is economically more beneficial to the country with least interference to the existing activities and the National Parks.

It is more professionally exciting and can trigger more scientific research in hydrology and geo-sciences.

From his typed-out notes, the discussant Dr Ntale observed that though the scheme sounded great, there was need to go through some parts with meticulous and technological evaluation. Indeed many others took this angle, though equally many speakers supported the scheme. In the end, the gathering resolved that Government should invite all the stakeholders in such a scheme, i.e. the relevant ministries, departments, professionals, academicians and researchers, and cause a deliberate scientific analysis of the presentation for a logical conclusion and way forward on the issue.

8M Construction Digest would stay coordinator. The Rt Hon Prime Minister, Alhaji Kirunda Kivejinja, in not so many words, blessed this outcome!

UPCOMING EVENTS

ENGINEERS REGISTRATION BOARD

The Engineers Registration Board (ERB) recently signed an MoU with the Egyptian Syndicate of Engineers (ESE) for mutual cooperation in the engineering discipline including training. In this vein therefore the ESE and ERB have arranged for a four weeks training in Cairo during the period 11th February to 11th March 2019 for 20 electrical engineers.

FIDIC – GAMA 2019 26TH INFRASTRUCTURE CONFERENCE

Fidic Gama conference is a critical regional gathering an networking event providing a forum for engineers, contractors, government officials, private investors, funding agencies, construction equipment and material suppliers to discuss and tackle infrastructure development issues in a continental context. The conference draws thousands of attendees and is rocked by social events like dinners, galas, exhibitions among others. It will take place at Kampala Serena Hotel from Sunday May 12 to Wednesday May16, 2019.

INTERNATIONAL CONFERENCE ON TECHNOLOGY AND MANAGEMENT

05-06 August 2019, Silver Springs Hotel, Bugolobi, Kampala, Uganda

The International Conference on Technology and Management, organized by the ICTM will take place from 5-6th August 2019 at the Silver Springs Hotel in Kampala. The Conference will cover areas like the state, society, politics and governance in development, democracy, human rights, sustainable development goals (SDG), evaluation capacity development, and many more.

UGANDA INTERNATIONAL OIL AND GAS SUMMIT

19th September 2019 Kampala Serena Hotel, Kampala, Uganda

Uganda International Oil and Gas Summit is to examine the future of oil and gas exploration and production in Uganda, setting out the government’s vision and implementation for sustainable, long-term development and how to bring them together with potential private sector partners and other stakeholders. Participants will share announcements and successes and discuss any hurdles that have been encountered.

News & Events

8M Construction Digest Volume 4 Issue 1 February–March 2019
It has become increasingly clear that a paradoxical situation is emerging with respect to sustainability of our infrastructure. On the one hand, a huge demand for infrastructure has resulted from the rapid urbanization there is today; on the other, the existing infrastructure is falling into disrepair before completing its design life. Yet operation and maintenance (O&M) has been identified as the key to sustaining the existing infrastructure and assets. However, there is a general lack of understanding by stakeholders about the role of operation, maintenance and sustainability in good governance.

Definitions and importance

Operation and maintenance (O&M) refers to all of the activities needed to run any infrastructure in place, except for the construction of new facilities. The overall aim of operation and maintenance is to ensure efficiency, effectiveness and sustainability of facilities. The two activities of “operation” and “maintenance” are very different in nature. Operation refers to the direct access to the system by the user (e.g. operating a generator), and to the rules or by-laws, which may be devised to govern who may access the system, when, and under what conditions. Maintenance, on the other hand, has to do with the technical activities (preventive, reactive and corrective) to keep the system working. Maintenance requires skills, tools and spare parts. In many cases, in order to ensure the sustainability of our infrastructure, the infrastructure needs to be community-owned and community-managed, making the end-users directly involved or responsible for the operation and maintenance of the installed facilities. Successful operation and maintenance require following an “owner’s manual” prepared by the contractor and engineer at the onset of the planning process.

This should spell out a schedule and procedures for maintenance and should also include methods to carry out tasks such as bookkeeping, paying employees, collecting bills (utility management), inspection, refurbishments, replacement of parts, etc, giving an integral framework for operation and maintenance.

Infrastructure is essential for sustained economic growth, competitiveness and social progress. A country’s infrastructure endowment plays a major strategic role in its economic growth and global competitiveness. A basic government responsibility is to secure maximum optimization from the O&M of existing infrastructure assets. The Government can adopt various strategies to optimize the socio-economic returns generated from these assets. Generally, many infrastructure projects experience their most serious problems with operation, maintenance, and cost recovery.

Why lack of sustainability

Hundreds of projects around the world demonstrate how the newly built infrastructure deteriorates after the project's termination. Therefore, it is imperative to plan for operation and maintenance with a planned withdrawal of external support as local ownership builds. Operation and maintenance is a crucial element of sustainability, and a frequent cause of failure of service facilities in the past. Many failures are not technical ones. They may result from poor planning, inadequate cost recovery, or the outreach inadequacies of centralized agencies. Operation and maintenance has been neglected in the past, or been discussed and introduced only after a project was completed. This neglect or delay in applying proper operation and maintenance has adversely affected the credibility of the investments made, the functioning of the services, the well-being of rural and urban populations, and the development of further projects.

High-quality infrastructure may be costly to build and maintain, but it provides many economic benefits, because it facilitates trade and production efficiencies for other industries. For example, consider how an unreliable power supply would add to the overall cost of doing business, as factories must either pause production during blackouts or pay for expensive back-up generators. The same negative impact may apply to water shortage, poor roads, poor water (boats and ships) and railway transport as well as air transport. While building new infrastructure assets ranks high on the agenda, existing infrastructure assets are often neglected, thus bringing on unnecessary operational costs and inadequate maintenance. Against the backdrop of increasing user demand, constrained financing and an ageing asset base, it is imperative for planners and implementers to make the most of their existing infrastructure assets – specifically, to increase the assets’ productivity and longevity.

The key strategy

Most policy-makers and implementers emphasize constructing new assets, but this strategy is not the best solution; after all, public-budget constraints exist, as do multiple difficulties in getting projects from idea to implementation in a reasonable time frame. A complementary and potentially more cost-effective approach is to improve the utilization, efficiency and longevity of the existing infrastructure by optimal O&M. There is always a tendency to neglect the existing assets, and current O&M practices are often seriously deficient. In operations, they fail to maximize asset utilization and to meet adequate user quality standards, while incurring needlessly high costs as well as environmental and social...
externalities. Maintenance is all too often neglected, since political bias is towards funding new assets. Similarly, resilience to natural disasters tends to be ignored, although such hazards are becoming more common and more destructive because of climate change. As a result of the maintenance backlog and the lack of resilience measures, existing assets deteriorate much faster than necessary, shortening their useful design life.

Many projects promote community participation in the planning, implementation and management of these services. Increased participation in O&M is usually assumed. It has become increasingly apparent that a contradictory situation is emerging with respect to infrastructure services in our less developed countries. On the one hand, a huge demand for infrastructure has resulted from rapid urbanization; on the other, existing infrastructure is falling into disrepair before completing its design life. Planned O&M has been identified as the key to enhancing the sustainability of existing infrastructure and assets. However, there is a general lack of understanding by stakeholders about the role of operation, maintenance and sustainability as indices of good governance. No matter how sustainable a structure may have been in its design and construction, it can only remain so if it is operated responsibly and maintained properly.

A country’s competitive economic advantage clearly depends on a properly articulated infrastructure vision and long-term planning. Planners and leaders must inspect their project portfolios critically and decide which ones to accelerate first based on their strategic importance, independently of the restricted duration of a political cycle. However, vision and planning are not sufficient and it is fundamental that we all learn how to assess and select an appropriate infrastructure delivery model at the early stages of the project preparation process and are fully aware of the implementation consequences in terms of whole life-cycle cost. In addition, there is need to develop a holistic and long-term strategy for operating and maintaining the physical assets that may represent a considerable financial burden for future taxpayers.

In reality, the Government may struggle to achieve high O&M performance due to insufficient funding especially through annual grants, weak capabilities and inadequate O&M governance.

The chances of successfully optimizing O&M are improved by three factors: existing role models of good practice, technological innovation and relatively modest implementation costs. Operation and maintenance activities which encompass not only technical issues but also managerial, social, financial and institutional issues, must be directed towards the elimination or reduction of the major constraints which prevent the achievement of sustainability. Therefore, the importance of O&M should gain considerable visibility and policy-makers and project designers should be more conscious of the direct links between improved O&M practices and the sustainability of infrastructure. There should also be a recognition of the need to approach these projects in a comprehensive way, emphasizing not only the design and construction but also post-construction activities.

A proper solution will require a change in infrastructure management. In fact, such a transformation is feasible. Many examples of O&M best practices exist from the various infrastructure sectors (e.g. roads, water supply and sanitation, electricity) that just need to be adopted more widely. Most important of all, O&M solutions are affordable. They are highly cost-effective in an otherwise capital-intensive industry. Even small O&M improvements can make a remarkable impact, given the large size of the global asset base, where each per cent of improvement translates into billions of money saved. And in addition to generating financial savings, O&M improvements can also bring considerable social and environmental benefits, in line with the Government’s service mission.

Finally, it is crucial to remember that proper O&M is part and parcel of high-quality service alignment for users, and this user-based focus is what drives their willingness to pay for services, thus reinforcing funding sustainability. As such, effective approaches to O&M of the assets of existing infrastructure provide a blueprint for sustainable investment for the future.

Eng Frank Kweronda is a civil engineer and Ag. Assistant Commissioner at the Directorate of Water Development, Ministry of Water and Environment. He is a Member of ERB
In the previous article, we covered ground on a brief background on the use of Composite Materials in history. Furthermore, we covered the major divisions (matrices and reinforcing elements) of the components of composites, and the way composite materials are classified or grouped – the zero-dimensional group, the one-dimensional group, and the two-dimensional group. Lastly we described the main production technology of composites – the manual manufacture, manufacture by dusting, by pultrusion by winding, by compression and by RTM (resin transfer moulding).

We promised that in the next article, we would describe the applications in construction as well as the physical and mechanical properties of composites, and then discuss the pros and cons of these materials in today’s world. Thus in this article we will focus on the practical application of composites in civil and industrial construction.

The practice

Composites are new products in East Africa, although the technology of fibreglass reinforced bars (FRP-bars) has already established itself around the world.

This product – fibreglass reinforced bars (FRP-bars) – has more than 70 years’ history. During its existence, the technology has been greatly improved and has become available to a wide range of consumers. FRP-bars replace metal rebars, familiar to everyone, but they are cheaper and more durable, which reduces the cost of construction and increases the availability of housing.

At the moment there are tens of thousands of buildings around the world using FRP-bars, including more than 300 bridges in Canada, let alone skyscrapers there and in China and Japan. Even here in Uganda, there is a bridge in which renovation with this material was used and several buildings constructed.

Raw materials

Unlike metal counterparts, no recycled materials are used in the production of FRP-bars. All raw materials created specifically to produce products with high requirements for strength. The main materials are different types of resins and glass roving – the finest glassfibres, which are several kilometres long. The thinner the fibre’s diameter, the stronger the composite: at the moment, the most common fibre is one with a diameter of 0.024 mm and thinner.

If there is a task to increase the strength of the final product, glassfibre may be replaced with basalt or carbon fibres. It is important to note that in the
production of this kind of material, only certified components are used.

**Production process**

In the previous article, we have already considered this method of manufacturing composites as pultrusion. It is this process that underlies the production of fibreglass reinforcement or FRP-bars. Starting from a special stack, the roving of the coils is passed through a bath containing a mixture of chemical components, where it is thoroughly impregnated. Next, passing through the calibration die, the excess resin is removed and returned to the impregnation bath. This phase is extremely important, because the mechanical properties of the rod are dependent on the ratio of reinforcing material/binder. The formed cylindrical bar passes through the site of application of a periodic profile (rib). The necessary bonding with concrete is then achieved with further use in construction. Modern manufacturers apply from 1 to 4 ribs per rod, depending on the technology or customer requirements.

After that, a bar with ribs moves to a continuous furnace where, under high temperature, the glass transition process of the resin occurs and the reinforcement gains its strength. At the exit, a device designed to pull the rod through the entire technical process is installed and a cutting mechanism that measures the required length of the final product is in place to do its job.

The technology allows to produce a rod of any length, up to 5 km in one piece. Furthermore, the rebar is wound into coils which can be delivered in this form to the customer. If the rod is made more than 12 mm in diameter, then such products are delivered in the straight form.

After production, each batch of finished products must pass through a system of tests, according to international and local standards. Attention should be paid at this stage in order to avoid the use of substandard low-grade material.

**Ecology**

An important issue in the modern world is environmentally friendly production, operation and disposal of products. In this regard, the composites are really ahead in the industry. Around the world, a lot of research on the impact of composite materials on humans and the environment has been conducted. After the production, these materials are known to be completely safe and approved for use in medical institutions, schools and restaurants. During the production process, certain substances are emitted, but their concentration does not harm the environment. This is because, since these compounds are extremely unstable, they break down into environment-friendly substances, almost immediately, without harming the environment.

After the end of the life of the composites, the powders that have been produced in the process can be reused in the production or as a filler in concrete or other building materials.
The advantages and disadvantages

Every material has advantages and disadvantages when compared with the others. Here we shall consider only the major ones.

The advantages:

1. The weight of fibreglass composites is 9 times lighter than metal counterparts, assuming both have the same strength.

2. Their durability is 3.5 times higher than that of steel (compared with the brand of reinforcement A400).

3. Their service life is up to 80 years.

4. Fibreglass composite materials are cheaper than steel (assuming both have the same strength characteristics).

5. Fibreglass composites can be produced in special lengths. This reduces the cost of construction and installation time.

The disadvantages:

1. The modulus of elasticity for fibreglass composites is lower than that of steel.

2. Fibreglass is dielectric, i.e. it is not designed for welding.

3. Do not bend these composites. It is not possible to give the necessary shape on the construction site.

4. Does not burn. However, after heating above 300°C FRP-bars lose their properties of strength.

How to install them

Working with FRP-bars is easier than with metal. Due to low weight, transportation becomes easy and cheap. You can transport 100 rods of 12 metres each on a regular bodaboda, as rebars are delivered in rolls. It is possible to cut and install FRP-bars as well as metal. In cases when it is necessary to bend a corner, it is applied together with metal. When using, it is necessary to take into account the modulus of elasticity of this product.

FRP-bars can completely replace metal reinforcement. However, based on international experience and the level of construction in a particular region, the following recommendations can be made. Without recalculating the strength characteristics, it is easy to replace the metal with a composite in slabs, foundations and flooring, columns and load-bearing walls up to the 5th floor. Septic tanks, drainage systems, port and hydraulic structures, special concrete tanks for the storage and operation of chemicals. For example, when enriching gold-bearing ore, these are precisely the harsh conditions in which composites work perfectly.

Reinforced Polymer-FRP-Bars being put to use

FRP-bars can completely replace metal reinforcement. However, based on international experience and the level of construction in a particular region, the following recommendations can be made. Without recalculating the strength characteristics, it is easy to replace the metal with a composite in slabs, foundations and flooring, columns and load-bearing walls up to the 5th floor. Septic tanks, drainage systems, port and hydraulic structures, special concrete tanks for the storage and operation of chemicals. For example, when enriching gold-bearing ore, these are precisely the harsh conditions in which composites work perfectly.

Safety of FRP-bars

By themselves, FRP-bars cannot harm health. However, when working with them, you should observe safety precautions as in any construction process. Since the material consists of fibres, they can cause splinters. When cutting the material, glass dust is formed. All these factors do not cause significant harm, but for comfort it is recommended to work in protective gloves, respirators and protective glasses.

The cost

Since the strength of this material is several times higher than that of the common steel, this allows the use of a smaller FRP diameter compared to the metallic counterpart. For example, instead of using steel diameter Ø 12mm, FRP of diameter Ø 8 mm can be used, and for steel Ø 16mm, FRP Ø 12 mm. The current cost of steel Ø16mm is Shs68 000 while FRP-bar Ø12mm costs Shs52,000.
GEOTEXTILES ARE AN APT MATERIAL FOR CIVIL WORKS

By 8M Technical Writer

Have you ever heard of road sections, usually near or in swamps failing time and time again by sinking into the marsh? The Kabale-Katuna Road near the Uganda-Rwanda border at Katuna may be one such example. The sinking mass gives the layman the feeling that something should have been mixed with the soil and stone to provide the strength and stop the sinking. Yes, and geotextiles do this, among other things.

What they are

Geotextiles, according to Wikipedia, are permeable fabrics which, when used together with soil, have the ability to separate, filter, reinforce, protect or drain. Typically made from polypropylene or polyester, geotextiles come in three basic forms: woven, needle-punched and heat-bonded. There are composites of geotextile products like geogrids and meshes. However, the interesting important facts about geotextiles is that they are not easily biodegradable, that is, they are durable and can withstand many things, and even soften the fall on an object on impact!

The basic principles of incorporating geotextiles in civil works like on marshland are the same as those used in the design of reinforced concrete by incorporating steel bars which are strong in tension to strengthen the concrete which is weak in tension even though it is strong in compression. Geotextiles are used in providing tensile strength for the earth mass in locations like marshland where shear stress would be generated. Moreover, to allow rapid dewatering of the roadbed, the geotextiles need to preserve the roadbed’s permeability unaltered by the mechanical loading.

Geotextiles have become quite popular, especially over the past 15 years. They owe their success in more than 80 applications mainly due to their resistance to biodegradation.

Geotextiles are indeed textiles, though not in the traditional sense like other natural materials such as cotton, wool or silk. They are synthetic fibres that can be made into a flexible, porous, non-woven felt fabric. They are porous to the flow of water, in varying degrees.

Non-woven geotextiles resemble felt and provide planar water flow. They are commonly known as filter fabrics, although woven monofilament geotextiles can also be referred to as filter fabrics. Typical applications of non-woven geotextiles include aggregate drains, asphalt pavement overlays and erosion control.

A woven geotextile is a planar textile structure produced by interlacing two or more sets of strands at right angles. There are two types of strands: slit films, which are flat; and monofilaments, which are round. Woven slit-films are generally preferred for applications where both strength and filtration are a concern, such as in shoreline rip-rap applications.

Geotextile-related materials such as fabrics formed into mats, webs, nets, grids, or formed plastic sheets are not...
the same as geotextiles. These would fall under the more general category of geosynthetics.

**There are five different applications of geotextiles as hereunder**

1. **Separation:** The geotextile is laid between two distinct layers of different materials. This could be two different types of soil, old and new pavements, or soil and new construction. Separation is nearly indistinguishable from stabilization, but there are some distinct variations to achieve stabilization. So why use a geotextile separator?

   Wet soils are weaker than dry soils and fine soils are weaker than coarse soils. Therefore, a suitable geotextile can:

   - Prevent the reduction of load-bearing capacity which may have been caused by the mixing of fine-grained subgrade soil with the aggregate base.
   - Increase the load-bearing capacity by preventing the migration of aggregate or armour blocks into the soft subgrade. The use of a geotextile can increase the degree of compaction.
   - Reduce the deterioration of roads through frost heave effects.

   The segregation prevents adjacent materials from mixing, thus maintaining the integrity and stability of the respective materials and structures.

2. **Drainage:** Geotextiles efficiently collect superfluous water such as rainwater or surplus water from the soil or the structure, and discharge it. They are thus used in various drainage applications such as: (a) Typar and French drains, (b) vertical drains, (c) agricultural and pipe drains, (d) blanket drains in roads and sports fields, (e) road and civil engineering drainage, (f) side drains, and (g) wall drainage.

3. **Filtration:** Geotextiles are an ideal interface for reverse filtration in the soil adjacent to the geotextile. In all soils, water allows fine particles to be moved. Some of these particles will be halted at the filter interface. Some will be halted within the filter itself while the rest will pass into the drain. The complex needle-punched structure of the geotextile enables the retention of fine particles without reducing the permeability of the drain.

4. **Reinforcement:** Heavy geotextiles can be used to reinforce earth structures by means of fill materials. Thanks to their high-soil fabric friction coefficient and high-tensile strength, they are an ideal reinforcement solution. Along with their advantages, geotextiles may be used for various reinforcement applications in such places as: steep slopes, retaining walls, waterworks, earth dam slopes (erosion control), river and lake embankments, land reclamation areas (using hydraulic fill), and embankments on compressible soils.

5. **Protection:** Geotextiles are an ideal protection from erosion of earth embankments by wave action, currents or repeated drawdown. A layer of geotextiles can be placed so as to prevent leaching of fine material. They can be used for rock beaching or as mattress structures. They can even easily be placed underwater. Advantages include: increased road durability (less rut), better compaction and aggregate saving. This ensures longer service life and less maintenance costs.

**Use of geotextiles in civil engineering**

Geotextiles are used in civil engineering earthworks to reinforce vertical and steep banks, to construct firm bases for temporary and permanent roads and highways, to line ground drains so that the soil filters itself and stops the drainpipes from filling up. They also prevent erosion of stones on river banks. Civil engineering works where geotextiles are employed can be classified into the following categories:

1. **Roadworks:** The basic principles of incorporating geotextiles into a soil mass are the same as those used in the design of reinforced concrete by incorporating steel bars. The fabrics provide tensile strength in the earth mass in locations where shear stress would be generated. Moreover, to allow rapid dewatering of the roadbed, the geotextiles need to preserve the roadbed’s permeability without losing its separating functions. Its filtration characteristics must not be significantly altered by the mechanical loading.

2. **Railway works:** The woven fabrics or non-woven are used to separate the soil from the sub-soil without imped ing the circulation of the groundwater where the ground is unstable. Enveloping individual layers with fabric prevents the material wandering off sideways due to the shocks and vibrations from the running trains.

3. **Works in river canals and coasts:** Geotextiles protect riverbanks from erosion by currents or lapping. When used in conjunction with natural or artificial enrocksment, they act as a filter. For erosion prevention, the geotextile used can be either woven or nonwoven. The woven fabrics are recommended in soils of larger particle size as they usually have larger pore sizes. Non-woven fabrics are used where soils such as clay silt are formed. Where there is hydrostatic uplift, the fabrics must have sufficient high permeability.

4. **Drainage:** In civil engineering, the need for drainage has long been recognized and has created the need for filters to prevent in-situ soil from being washed into the drainage system. Such wash-in soil causes clogging of the drains and potential surface instability of land adjacent to the drains. The use of geotextiles to filter the soil and a more or less single-size granular material to transport water is increasingly seen as a technically and commercially viable alternative to the conventional systems. Geotextiles perform the filter mechanism for drainages in earth dams, roads and highways, reservoirs, behind retaining walls, deep-drainage trenches, and agriculture.

4. **Agriculture:** It is used in mud control. For the improvement of muddy paths and trails, those used by cattle or light traffic, non-woven fabrics are used. They are folded by overlapping to include the pipe or a mass of grit.
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Dr Alice Nabatanzi
The writer, a PhD holder in phytochemistry and nutraceuticals, is a lecturer in the Department of Plant Sciences, Microbiology and Biotechnology in the College of Natural Sciences, Makerere University

CACTUS
IN BUILDING CONSTRUCTION

Due to the highly competitive market for building materials where margins are constantly under pressure, operational excellence combined with greater efficiency is key to achieving profitability. Thus, the strong move by 8M Construction Digest to investigate and explore the locally available construction materials for affordable housing and sustainability.

Cactus (cacti/cactuses – plural) is a member of the plant family Cactaceae, a family comprising about 127 genera with some 1750 known species of the order Caryophyllales. Cacti are prickly, and pleasing. Extremely ungainly, they flourish in arid conditions where no plant can survive. Succulent inside, their thick coats and nettles ensure predators cannot get to the sap inside. Cacti are very much treasured for their wood and gum/sap.

Cactus wood
Various types of cactus plants produce wood, though unlike common wood producers like pine, maple and oak trees, cactus wood is hidden behind the plants’ layers. Cacti contain layers of spines that provide protection from animals and, in some cases, the sun. These spines attach to the thick green or grey skin of the cactus, which helps retain moisture by preventing transpiration, or evaporation. Underneath this skin, large species of the cactus possess thick wood bodies much like those of small trees.

Cacti exhibit specific tendencies through their wood. Many cactus species exhibit polymorphic wood growth. This means the plants grow different types of wood.
at different stages in their development. All large species of cacti possess wood with especially high fibre content, which makes the wood extremely strong. Cactus plants evolve such that successive generations of plants store larger amounts of water in their wood than did their parents. Storing water in the wood with the use of specialized vessels increases the overall storage capacity of a plant and allows it to withstand longer periods of drought than it could without storing water in such a way.

There is a direct correlation between the types of fibre and the size of water conduction and storage vessels found in cactus wood and the growth habit of cactus species. The larger the cacti, the longer and wider the water vessels and fibres. This means that the largest cactus plants possess the strongest wood and the capacity to store the most amount of water, an obvious evolutionary trait that helps large cacti survive in harsh conditions.

**Cactus gum**

In ancient times, locally available natural polymers were used to improve the durability of lime-based mortars and concretes. Today, cactus gum can be used as a natural polymer. It increases the plasticity of the mortar and improves water absorption and freeze-salt resistance, thereby increasing strength and durability. Furthermore, when concrete is painted with cactus gum it improves water resistance.

**Possibilities**

There are a great many raw materials in Uganda. The cactus is one of them, waiting for applied research in construction among the engineering fraternity. Over to you.
How Samson and Delilah built their DREAM Home

EPISODE 12: ROOFING

By Eng Hans JWB Mwesigwa

This story from the beginning is available on www.8mconstruction.com.

In episode 1, Samson Kaloosi and his wife Delilah decide to sell their good bungalow and build a dream home: a fabulous maisonette. They seek out advice from professionals at a friendly charge. In episode 2, the architect and engineer provide plans and drawings. In episode 3, Samson gets approved plans, BoQs, the schedule of materials and labour. The dream home is estimated at Shs100 million. In episode 4, workmen are recruited and construction starts with the preliminaries. In episode 5, more preliminaries before setting out the building are done. In episode 6, the main house is set out. In episode 7, excavations and the foundation set done. In episode 8, walling of the ground floor up to ring beam level is done. In episode 9, construction of the ring beam is done. In episode 10, construction of the first floor slab using timber is done. In episode 11, partial completion of the timber floor slab, walling is done and roofing starts.

The characters in the story so far are:

- Samson Kaloosi and Delilah Matama Kaloosi, the dream-home owners
- Patrick Barugahe the lawyer
- Erifaz Nyanzi, Abdul Kizito and Cathy Ankunda, the quantity surveyor, the engineer and the architect, respectively
- George Nsimbi, the foreman and full-time supervisor.

EPISODE 12: ROOFING WITH EUCALYPTUS TIMBER AND UGANDA CLAYS ROOFING TILES

On the tenth day of the month, four months after starting the foundation, roofing had started! Being another day for rejoicing, a goat had lost its life and muchomo meat with offal soup and lots of boiled potatoes, cassava and banana had been served, to everyone’s joy.

But what was this phase to comprise?

The type of structure

The consulting team of Erifaz Nyanzi the quantity surveyor, Eng Abdul Kizito and Arch Cathy Ankunda had worked together a cost-effective roof system comprising a eucalyptus timber structure and the Uganda Clays mangalore tiles for the roof.

Cathy had suggested to create living space in the attic, but when Abdul and Eridad advised that it would escalate the cost due to the special structural design, Samson put his foot on the ground and refused. As if to hammer the point home, Delilah whispered into Samson’s ear, but loud enough for those who cared to hear, “Darling, you move in alone if you build this strange attic thing!” So the trio had opted for the traditional roof. Abdul explained that the roof trusses would be cheaper and much faster, since two people could lift and position a truss, but this precluded the use of attic space because the roof would be full of small timber members which cannot be cut or modified, at least not to any useful extent. The concept that defeated the
understanding of Samson and Delilah was simple: the big space under the floor can be utilized for home chores like washing, recreation, guests’ servants’ and children’s bedrooms! Of course it needs that extra design and timbers to yield the lifespan results.

And so, the normal timber roof structures were assembled by the carpenters, who had been carefully selected by George the foreman, who in turn knew their good record at roofing. Well-cured and dried eucalyptus timbers were cut to form king-post trusses, ridge beams, purlins and common rafters. The 230mm-thick load-bearing wall between the sitting room and the dining, which had been constructed to continue to the first floor came in handy: it provided an intermediate support for the roof thereby getting away with a lighter and cheaper truss.
Installing the battens to hold the roof tiles

Roof battens are thin strips that were made out of wood to hold the clay tiles. They were installed before the tiles were laid on the roof and theirs was to serve more than one purpose. Abdul explained to the half-absent-minded Delilah, that the ideal installation method for roof battens when installing a tile roof depended on the roof material, its slope, and the environmental conditions of rainfall, temperature and wind.

Structural and drainage duty of battens

On this roof with a 35-degree slope, the tiles were laid onto the battens. Abdul explained that if Samson’s house had been in a region where high winds are common, George’s men would have fastened the roof tiles to the battens to prevent them from lifting from the roof deck. The battens elevate the roof tile off the roof deck, and this ensures that water drains off the roof.

The roofing underlay

The clay tiles on Samson and Delilah’s roof were installed with a roofing underlay. This was a material used below the clay tiles, which Cathy explained that it would affect the tiles’ durability. Normally, the underlay is made from asphalt-saturated roofing material covering all area below the tile clay cover. Roofer ensured that the material was properly attached. An extra layer was installed near the roof edge and in valleys to protect the surface even more.

The rain gutters and a water tank:

Samson and Delilah had agreed with Cathy’s plan to harvest rainwater. And so, partly to properly drain the roof water, rainwater gutters and a 10,000-litre water tank were installed.

More finishes works were done on the entire roof and eaves. And so, in about seven days, Samson and Delilah’s house received a complete roof and a new skyline for the surroundings. This called for the obvious: More feasting on goat muchomo, boiled cassava and lots of tea. Truly, everyone went home satisfied.
By Arch Verna Mbabazi
Principal Architect, Evolution Edge
Email: evolutionedge.ug@gmail.com

Stitch in Time

There is nothing as fascinating as moving into a new home, or completing a house ready to rent out. Everything is new, bright and clean. The construction phase is over and the maintenance phase begins. Maintenance is the stitch in time that saves nine.

The truth is, home maintenance requires time and labour. This applies to home owners as well as landlords and yes, mortgage bankers. This is the most expensive household asset we are talking about. We take our cars for routine service – set up a routine service schedule for the home you live in, the houses and apartments you let out or hold a mortgage over.

Interestingly, one of an architect’s roles is to prepare a maintenance manual. If you have fully engaged an architect up to contract administration stage, insist on a maintenance manual. But in case you do not have a manual, create your own to-do list of maintenance tasks that need to be carried out periodically – either every weekend, monthly, quarterly or annually. Here are a few ideas you can consider. The frequency of carrying out these tasks can be determined case by case.

Walk around the house and property. Check trees for interference with services, for dead branches that can pose a safety problem and trim them off. Take note of cracks and peeling paint on the façade. Inspect the roof for damage, clear out rainwater gutters and ensure that the surface run-off channels are clear and water does not pool in areas. Fix whatever needs fixing. Give the house a bath and after a time a repaint job may be necessary.

Carry out deep cleaning of the interior. This includes appliances, windows and walls, dusting every nook, cleaning and clearing out closets and cabinets, and so on. This can be carried out quarterly. A thorough deep cleaning checklist can be sourced from http://cornerstoneconfessions.com

Repair grout in the kitchen and bathroom tiling. Inspect plumbing for leaks and drainage for blockage. Toilet cisterns leaks can be traced by adding food colour into the cistern and checking the bowl for colour after fifteen minutes. Flush toilets in unused spaces like the guest rooms.

Test electricity circuits and appliances. This includes sockets and extensions.

Repair damaged window and door handles and locks.

Ensure smooth running of garbage disposal.

The outdoors need care as well. Rake leaves, weed and mulch flowerbeds, trim the hedges, mow the lawns, water the plants and ensure that the sprinkler system is efficient.

Take care of bugs and pests that have made your home their home.

The list can be long and seemingly endless, but not all is grit and grime. Line up some home improvement projects as well – paint a few rooms, refit your bathroom or kitchen, add scenic outdoor spaces – and have fun doing so.

In the end, the difference between a well-maintained house and a dilapidated identical house is in the millions of shillings. Restoration of a dilapidated house will be much more expensive – nine stitches and much more.
Leisure & Jokes

Two blonde carpenters

Two blonde carpenters were working on a house. The one who was nailing down the timber would reach into his nail pouch, pull out a nail and either toss it over his shoulder or nail it in.

The other, figuring this was worth looking into, asked, “Why are you throwing those nails away?”

The first explained, “If I pull a nail out of my pouch and it’s pointed toward me, I throw it away because it’s defective. If it’s pointed toward the house, then I nail it in!”

The second blonde got completely upset and yelled, “You idiot! The nails pointed toward you aren’t defective! They’re for the other side of the house!”

Lost ear accident

Two carpenters, Henry and John, were working and Henry on a scaffold accidentally cut off his ear.

He yelled down to John... “Hey! Look out for my ear I just cut it off!”

Shortly, John called up to Henry, “Is this your ear?”

Henry looked down and said “No! Mine had a pencil behind it!”

Construction supplies

There was a Spanish guy, a Korean guy and a Russian guy, all working for the same construction company. At the beginning of the day the boss came out and said to the Spanish guy, “You’re in charge of the cement.” Then he said to the Russian guy, “You’re in charge of the dirt.” Then he said to the Korean guy, “You’re in charge of the supplies.” Then he said, “I will be back at the end of the day to check on your work. It better be good or you’re fired.”

So they all go off to get their work done. At the end of the day, the boss came back to check on their work. He looked at the big pile of cement and went, “Good work,” to the Spanish guy. Then he looked at the big pile of dirt and said, “Good work,” to the Russian. Then he couldn’t find the Korean so he asks, “Where the heck is the Korean guy?”

All of a sudden, the Korean guy jumped out from behind the big pile of dirt and yelled, “SUPPLIES!”

A physicist, a chemist and an engineer

A physicist, a chemist, and an engineer are sailing out at sea. The boat sinks and they’re marooned on a desert island. Luckily, they have a bag with a can of food in it, but no tin opener.

The engineer, arms folded, tapping his feet said, “Ok, but if they’re blind, then why can’t they play at night?”

A vicar, a doctor and an engineer

A vicar, a doctor and an engineer were playing a round of golf. They got to the third tee and were delayed by people still playing the hole.

The engineer lost his patience, “What’s going on? We’ve been here at least 20 minutes!”

The doctor nodded in agreement.

The vicar saw the greenkeeper walking by and shouted to him, “How come that group ahead of us are so slow?”

The greenkeeper replied, “Oh, they’re all blind firemen. They all lost their sight pulling school children out of a burning building, so they can play anytime for free.”

Everyone was silent for a few seconds.

The vicar finally said, “Oh dear. I’ll be sure to pray for them. Well done on such charitable work, good fellows.”

The doctor added, “Yes, well done to you. I’ll make sure they get the best treatment at the eye unit in the hospital too.”

The engineer, arms folded, tapping his feet said, “Ok, but if they’re blind, then why can’t they play at night?”

A priest hires a contractor to paint his house

A priest hires a contractor to paint his house. The contractor thins out his paints using water hoping to stretch out his supply, so the final product ends up quite lacking. When the priest confronts him about it, he apologizes and asks if the priest would like him to redo everything.

The priest tells him, “Repaint, and thin no more.”

Contractors don’t go to hell

They go to purgatory.

Once a week Satan comes down, waves, and hollers, “Guys, don’t worry. You’ll be out of here next week. I promise!”
Mama Fundi: Thank you for that concern regarding the e-procurement technology. 

My answer will be in form of a view from the Internet: Some European governments have for some time been digitalizing their procurement systems for greater transparency and efficiency. This drive has and continues with the introduction of G-Cloud 7, an online digital marketplace for cloud services. Building upon this innovation, the Crown Commercial Service launched the Crown Marketplace, a new e-platform that could be used to procure ‘off-the-shelf’ items for government. The development of these platforms shows the governments’ commitment to procurement transformation, and the scale of opportunities that could be missed, should suppliers fail to update their procurement methods to deal with this new technology.

1. Bid evaluation is much easier as each member of the evaluation committee accesses the bids directly through an automated Evaluation Committee Workflow.
2. There is no need to photocopy bids to distribute to the committee, thereby cutting costs.
3. Leakage of the documents is minimised as lower cadres are not involved in photocopying and distribution of the documents.
4. Members of the committee can carry out evaluation on their laptops at any time without carrying volumes of documents from place to place.
5. Storage needs for bids are reduced to a basic minimum of one reference hard copy.
6. Bid evaluation is faster as you can copy text from the bid to the evaluation report without having to retype everything.

The benefits to the industry are also enormous – as follows:
1. Imagine how many times one has to photocopy the certificate of incorporation, the tax clearance, the degree certificate, etc. These could be verified online by the issuing authority or verified once by PPDA.
2. Forging soft copies is more difficult.
3. You have a password to your financial which you only give after passing technical proposal. This saves the bidder in many ways.
4. You can submit at any time even after working hours. Even when you are in the field so long as you can access the Internet.
5. You do not need to waste time making more copies to submit.
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Wondering what happened to flat surfaces and Xypex, the writers explain what Xypex actually is, how it works, its benefits and applications.

An 8M Construction survey reveals that of all the originally flat roofs in Kampala, about 95% were replaced with iron sheets in lean-to or other roofing styles, thus losing out on the useful purpose of such roofs to act as meeting places for business and leisure. Take an example of Embassy House on King George VI Way, Kampala. It was built in 1968 by the defunct Uganda Consolidated Properties Limited (UCPL). UCPL was owned by the Uganda Development Corporation (UDC) by about 85%.

The last and ninth floor was flat, finished with a waterproofing adhesive, probably similar in action to Xypex. It was glued with concrete tiles of 300mm by 300mm together creating a waterproof surface. The concrete tiles were pasted on top of the load-bearing slab. There was a strong safety-banisters around the 10m by 36m rectangular flat surface, which gently sloped towards the down-pipes to fast-drain the rainwater.

With an external fire-fighting escape staircase, the place was complete as an exquisite and fully furnished bar. It was known as the UDC Executive Club, trodden by the directors and management executives of the UDC fraternity who mixed with the elite of Kampala. A lot of dancing, drinking and other merriments went on there.

With the Ugandan poor maintenance culture, 34 years down the road around 2002, a Ministry of Education department as the beneficiary of the premises decided to do away with the leaking place and created an archive for decaying files, putting an end to the better use! Why? It would appear that the wonder-waterproofing material, Xypex, was either no longer known or anywhere nearby. Yet, for more than 45 years in more than 80 countries including Uganda, Xypex crystalline technology has set an international standard of excellence in concrete waterproofing, durability and protection. Continued worldwide research shows that no other ‘comparative’ product has its equivalent.

WHAT IS XYPEX?

Xypex is a non-toxic chemical treatment for the waterproofing and protection of concrete. Its primary and most distinguishing performance feature is its unique ability to generate a non-soluble crystalline formation deep within the pores and capillary tracts of the concrete; a crystalline structure that permanently seals the concrete against the penetration of water and other liquids from any direction. Xypex crystalline products are dry powder compounds composed of Portland cement, silica sand and many active, proprietary chemicals.
HOW DOES XYPEX WORK?

Crystalline waterproofing is a capillary waterproofing formulation of proprietary blends of chemicals, quartz sand and cement. The chemicals contained in the crystalline waterproofing materials require the presence of moisture to set off a chemical reaction from within the matrix of the concrete.

Concrete is porous. Its tunnel-like capillaries are a natural part of its mass, and permit the passage of water and other liquids. By means of diffusion, the reactive chemicals in Xypex products use water as a migrating medium to enter and travel down the capillaries of the concrete. This process precipitates a chemical reaction between Xypex, moisture and the by-products of cement hydration, forming a new non-soluble crystalline structure. This integral structure fills the capillary tracts rendering the concrete waterproof. It can also self-heal cracks up to 0.4mm.

BENEFITS OF USING XYPEX

The crystalline nature of the Xypex waterproofing system provides many application advantages over traditional barrier products.

- It does not require a dry surface or dry weather to be applied; in fact, a wet surface is necessary.
- There is no need for priming or levelling prior to application.
- It cannot puncture, tear, or come apart at the seams
- It does not require protection during backfilling or during placement of steel, wire mesh or other materials.
- It can be applied on either side of a concrete surface – the negative or the positive (water pressure) side.
- Xypex does not require sealing, lapping and finishing of seams at corners, edges or between membranes.
- It is less costly to apply than most other methods.

XYPEX APPLICATIONS

- Protecting wastewater treatment infrastructure
- Protecting water treatment structures
- Water-holding structures
- Protecting foundations and flat roofs
- Protecting tunnels
- Protecting power & utility structures
- Protecting power & utility structures
- Protecting marine structures

This article is sponsored by DYNACO LTD, a fast growing indigenous civil engineering company specializing in the provision of civil engineering solutions and construction services for roads, bridges, dams and related infrastructure works.

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WHY HAVE WE FORGOTTEN PREFABS?

(Editor: The prefabricated system of construction was successfully used in the sixties in Uganda and its structures stand safe and sound today. Members of the 8M Construction Forum trailblazed about it)

[8:52 PM, 12/28/2018] Eng Canon Perez Wamburu: Panel-built (prefabricated) houses have been around for a long time. All the Bugolobi flats, for example, were built using panels.

[9:09 PM, 12/28/2018] Eng Patrick Batumbya: Eng Dr Badru Kiggundu and I can attest to that fact as this was when we were at National Housing and Construction Company in the early 1970s. It was Israeli technology with Ugandan architects (Architect Amagu and Architect Waiswa) [at work].

[11:39 PM, 12/28/2018] Eng Livingstone Kangere: I think even the Makerere estate in Katalemwa is also prefabs, not very sure.

[9:14 PM, 12/28/2018] Eng Darlington Sakwa: Bugolobi, Wandegeya, Bukoto Brown and White Flats were all built using prefabricated panels. The Doctors’ Village in Mulago was built with prefabs. This mode of construction is quick and offers consistent quality. [However], as late as 1988 there were still many panels swallowed by papyrus grass at Bugolobi just beside Silver Springs Hotel.

[9:15 PM, 12/28/2018] Eng Patrick Batumbya: That was the precasting centre.

[9:25 PM, 12/28/2018] Eng Julius Musimenta Bakeine: Bugolobi Flats and most of the government schools had prefab components that minimise supervision, provide consistent quality and must be cheaper. NHCC sold all the remaining equipment near Silver Springs Hotel to some scrap dealers. Where are the lessons learnt?


[9:28 PM, 12/28/2018] Eng Julius Musimenta Bakeine: If these prefab structures are introduced to the Ministry of Education, Defence, etc, several mafia contractors will be out of business. Kickbacks will be minimised, quality of products improved; and this is not what the mafia want to happen. BUBU has failed due to the same reasons.

[9:29 PM, 12/28/2018] Eng Livingstone Kangere: The late Okao was in charge of the panel production when the Israelis left and yours truly was in charge of the machinery.

[10:01 PM, 12/28/2018] Eng Julius Musimenta Bakeine: If these prefab structures are introduced to the Ministry of Education, Defence, etc, several mafia contractors will be out of business. Kickbacks will be minimised, quality of products improved; and this is not what the mafia want to happen. BUBU has failed due to the same reasons.

[10:09 PM, 12/28/2018] Dr John Bahana (scientist): I personally tried
to introduce this to the Uganda Police. I failed. You can guess why.

[9:33 PM, 12/28/2018] Eng Darlington Sakwa: Have we moved forward or backward in this industry, especially when you look at the quality of ‘new buildings’ and the rate at which structures collapse, killing people all over Kampala?

[10:13 PM, 12/28/2018] Eng Livingstone Kangere: I think production stopped with the fall of Amin or slightly earlier. Amin’s army was occupying the flats and with the advent of the war it became insecure. Mr Okao could have run into exile.

[10:34 PM, 12/28/2018] Eng Patrick Batumbya: The prefab production indeed followed the trend and got into the systemic destruction line. Eng Okao stayed at NHCC during the Amin era and became MD after the ouster of the Okello regime. He was gunned down in 1987 at Kisementi at around 9.00 pm. The killers were never caught.

[11:43 PM, 12/28/2018] Eng Livingstone Kangere: Yes. Now I remember, Mr. Okao was gunned down. But he had a very good team of builders – the Kahuzos and the like.

[10:24 PM, 12/28/2018] Eng Patrick Batumbya: Colleagues, those were times when Government was “doing business” through the parastatals: NHCC, UDC, Uganda Hotels Ltd, CMB, etc. Procurement by the Central Tender Board for consultancy and constructors was quick, transparent and effective. I can do nothing to go back to those good old days; and so I look with pity at dear Uganda.

[10:32 PM, 12/28/2018] Eng Darlington Sakwa: There are many things in this country that can make one shed tears. There used to be a roadworks training school in Kyambogo; it was closed and the premises allocated to UNRA! All the training facilities were dismantled and probably sold.

At the back of the office block, you find components for bridge construction training with a dry river over which bridges used to be assembled by trainees under supervision. The bridge prefabs are now covered in thick grass while the rest of the area is a scrapyard for accident government cars!

[10:29 PM, 12/28/2018] Eng Hans JWB Mwesigwa: Please, old-timers, give us more! Great enlightening info. Julius, made a great point: If the Ministry of Education, or Defence, or others need schools’ and teachers’ buildings, a generic design with production centres could spring up in districts to support the project and create capacity. Give us the advantages and disadvantages of the system. I volunteer to reproduce the info, publish it in 8M Construction Digest, distribute
it to the policymakers, the professionals, relevant government departments, the business community, the academia, hopefully to cause tears that could result in action! What is the new and revamped UDC doing? Maybe we could re-awaken sleeping giants!

[10:32 PM, 12/28/2018] Eng Dr Henry Ntale: Perhaps after COSASE is through with the Bank of Uganda, they should engage NHCC to establish the full story. What happened after the Bugolobi and Bukoto flats projects? Why did progress grind to a [halt]?

[11:04 PM, 12/28/2018] Eng Dr Francis Baziraake: We have to note, however, that the environment has changed! Otherwise changing back the production system might again not work!

[11:28 PM, 12/28/2018] Eng Livingstone Kangere: I believe prefabs are still viable because even to the private developer it makes construction cheaper and qualitative. Somebody with big money could venture into the business to produce prefabs but must be supported by policy. Schools, hospitals, [housing] estates could turn out cheaper to build.

[11:30 PM, 12/28/2018] Eng Dr Francis Baziraake: What would happen if the prices were inflated?

[11:35 PM, 12/28/2018] Eng Livingstone Kangere: These can be regulated. Members, the Ntinda and the Naguru estates were built with prefabs, prison staff houses in Luzira were built with prefabs. They would solve Government’s housing problem and help it go back to housing its workers and [harvest] motivated service delivery.

[11:38 PM, 12/28/2018] Eng Dr Francis Baziraake: It appears moral decay is ignored or underestimated! However, my observation is otherwise!

[11:52 PM, 12/28/2018] Eng Hans JWB Mwesigwa: If anything, it should be spearheaded by the project managers, consulting architects, engineers and quantity surveyors! They are the ones to advise big clients like ministries. Maybe we should sensitize ourselves through a “Symposium on An Appropriate Prefabricated Construction System for Uganda”! Coordinating it through all stakeholders is easy for me! Then the business communities through BUBU will easily come on board.

Uganda Consolidated Properties also had a standardised system of materials and designs, including basic furniture and compound tables and chairs, done to precision and consistent good quality!

[7:22 AM, 12/29/2018] Eng Patrick Batumbya: I say this from authority, that it is only on the approval of the originator (the World Bank) of decentralisation and what effectively amounts to Government abandonment of service delivery that the waste of resources and corruption-driven prices will be brought back in check. Moral decay will only then become a risk to the perpetrators. That is the deathbed of standards, quality and sensible moral pricing in the entire construction sector.


[7:36 AM, 12/29/2018] Eng Patrick Batumbya: Perfect example, Hans, of what a threat such a situation would be perceived and brutally resisted by the beneficiaries of the current porous procurement system.

[8:01 AM, 12/29/2018] Edison Mwebaze (construction supervisor): There’s a sample of a prefabricated CAF panels house I supervised in UPDF UMEC Lugazi...maybe admin can seek audience with Arch Brig-Gen Sabiiti Mutebire for a symposium on it.

[8:04 AM, 12/29/2018] Eng Hans JWB Mwesigwa: You are arming a publisher! Bravo! These are symposium topics for discussion, where UIPE/ERB and all other stakeholders contribute, giving the constraints industry as example since we understand it only too well!

[2:29 PM, 12/29/2018] Eng Dr Francis Baziraake: Probably someone should write a critical analysis of this approach in Uganda so that really both sides are seen clearly! For example, there are issues of transport, accuracy (the pieces must fit exactly) and, of course, moral decay! We need an honest presentation!

[2:30 PM, 12/29/2018] Eng Canon Perez Wamburu: This kind of construction can be adopted by contractors. It can be to their advantage. Imagine if DOTT Services had used prefabs for culverts on Tirinyi Road, they would have finished long time ago.

[2:34 PM, 12/29/2018] Eng Darlington Sakwa: Transporting prefabs or human beings?

[2:34 PM, 12/29/2018] Eng Dr Francis Baziraake: Prefabs! Imagine you are transporting walls, beams, et cetera!

[2:37 PM, 12/29/2018] Eng Darlington Sakwa: Even if you did the comparative transport costs, you can even consider regionally-placed manufacturing units. The advantages of prefabs in terms of consistency, speed of construction and standardisation are so high.

[2:39 PM, 12/29/2018] Eng Justus Akankwasa: The advantages of prefabrication are: (1) Programme savings due to the ability to progress work as a parallel operation in a factory and on a construction site (2) Factory tolerance and workmanship are of a higher quality and consistency compared to that achieved on site (3) There tends to be less waste (4) Independence from adverse weather and winter working (5) An alternative means of production where there may be shortages of local skilled labour (6) Access to cheaper labour markets. For instance, two hundred prefabricated timber lodges for short-holiday lets in Pembrokeshire were sourced from Eastern Europe (7) Greater programme certainty (8) The factory environment can allow better safety than the construction site.

The disadvantages of prefabrication include: (1) Road transport maximum widths (2) the need for police escorts (3) height restrictions under bridges (4) daytime traffic restrictions in city centres (5) maximum load capacities of site cranes and temporary gantries (6) additional cost of temporary bracing for transportation and/ or lifting or permanent framing to support prefabricated assemblies, and (7) additional cost of pre-assembly in the factory prior to dismantling for transport and delivery (8) The in situ work abutting prefabricated assemblies requires a higher degree of accuracy than is normally associated with on-site building work to avoid interface problems. A mistake in the mass production of prefabricated elements ahead of the measurable site work is...
a serious risk. Reputedly, there is a field in which 60 prefabricated concrete staircases were buried as they had been incorrectly manufactured for a tower block in the City of London (9) Sustainability is an issue regarding the transportation of the materials to the construction site (10) Factory production requires predictable and consistent demand, whereas construction tends to require large numbers at the same time, then none.

[2:40 PM, 12/29/2018] Eng Dr Francis Baziraake: At last you are cooperating! Thanks.


[2:42 PM, 12/29/2018] Eng Dr Francis Baziraake: Seriously! Thanks!

[2:44 PM, 12/29/2018] Eng Justus Akankwasa: We need to evaluate advantages and disadvantages before we promote the method of construction.

[2:47 PM, 12/29/2018] Eng Hans JWBMwesigwa: Honestly guys, just look around for the article on prefabs made in Uganda for the attention of the relevant stakeholders.

[2:49 PM, 12/29/2018] Eng Darlington Sakwa: Where is it?


[2:54 PM, 12/29/2018] Eng Hans JWBMwesigwa: No, we are going to compile it from your great contribution. Possibly in our Feb/March issue.

[2:59 PM, 12/29/2018] Justus Akankwasa: I get u. Prefab technology is economical when there is a programme with many projects of similar design; for example, building 100 schools across the country.

[3:07 PM, 12/29/2018] Eng Ephraim Turinawe: Gentlemen, if you recall the prefabs were used in the 1960s and 1970s for the USAID-aided schools. Definitely we have the numbers of all the projects that we may decide to embark on.

[3:09 PM, 12/29/2018] Eng Canon Perez Wamburu: This where the discussion began. Remember also that even some Uganda Railways old buildings were prefabs. It is not a new technology.

[3:24 PM, 12/29/2018] Eng Dr Francis Baziraake: Did anyone stop us from prefabs?

[3:50 PM, 12/29/2018] Eng Hans JWBMwesigwa: The truth is, prefabs started and thrived in those developed countries that have

...
THE 8M CAMERA CAPTURES CONSTRUCTION AND INFRASTRUCTURE FACILITIES

Somewhere in Kampala, a retaining wall!  
Photo by an 8M Information Forum Member, February 2019

Steel talking: A UIRI structure undergoing completion at Namanve.  
Photo by 8M January 2019

The poorly designed drainages in Kampala. What would happen if one fell over? Drainages should be designed to fulfil not only the drainage purpose, but to stay safe.  
Photo by 8M February 2019

Panoramic view seen when riding in the lift of the URA Tower.  
Photo by 8M January 2019
The College of Engineering, Design, Art and Technology (CEDAT) in partnership with the Public Private Partnership Committee in the Ministry of Finance, Planning & Economic Development is spearheading training in PPPs.

**Target Persons:**
Middle-level managers in Government MDAs; professionals like engineers, architects, surveyors, planners, lawyers, accountants, medics, and others in the business community and NGOs.

**Admission requirements:**

i. An undergraduate degree in any field from a recognized university.

ii. At least **TWO years** working in either Government or the Private sector.

iii. Candidates shall prepare a Motivational Statement explaining why they want to do that particular course.

iii. A certificate in PPP Principles & Regulatory Frameworks for all advanced courses.

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<tr>
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<td>Certificate in Feasibility Studies of PPPs</td>
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<td>Certificate in PPP Procurement</td>
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<td>Certificate in PPP Project Finance</td>
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<td>Certificate in PPP Agreements Management</td>
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1. Download application form from [www.cedat.mak.ac.ug](http://www.cedat.mak.ac.ug)
2. Submit completed application form to: pr@cedat.mak.ac.ug, ssemogerere@yahoo.com
3. Wait to receive application evaluation report from one or both of the emails above
4. Make payment (a sum of Shs2,500,000/= for every two week course). Payment details will be shared on email.
5. Receive your admission letter.
Carpenters construct and repair building frameworks and structures such as stairways, doorframes, partitions, and rafters made from wood and other materials. They also may install kitchen cabinets, siding, and drywall.

Carpenters typically do the following:

- Follow blueprints and building plans to meet the needs of clients
- Install structures and fixtures, such as windows and molding
- Measure, cut, or shape wood, plastic, and other materials
- Construct building frameworks, including walls, floors, and doorframes
- Help erect, level, and install building framework with the aid of rigging hardware and cranes
- Inspect and replace damaged framework or other structures and fixtures
- Instruct and direct laborers and other construction helpers

Carpentry is one of the most versatile construction occupations, with workers usually doing many different tasks. For example, some carpenters insulate office buildings; others install drywall or kitchen cabinets in homes. Those who help construct tall buildings or bridges often install the wooden concrete forms for cement footings or pillars. Some carpenters erect shoring and scaffolding for buildings.

Carpenters use many different hand and power tools to cut and shape wood, plastic, fibreglass, or drywall. They commonly use hand tools, including squares, levels, and chisels, as well as many power tools, such as sanders, circular saws, nail guns, and welding machines. Carpenters fasten materials together with nails, screws, staples, and adhesives, and do a final check of their work to ensure accuracy. They use a tape measure on nearly every project because proper measuring increases productivity, reduces waste, and ensures that the pieces being cut are the proper size.

The following are examples of types of carpenters:

Residential carpenters typically specialize in new-home, townhome, and condominium building and remodeling. As part of a single job, they might build and set forms for footings, walls, and slabs, and frame and finish exterior walls, roofs, and decks. They also frame interior walls, build stairs, and install drywall, crown molding, doors, and cabinets. In addition, residential carpenters may tile floors and lay wood floors and carpet. Fully trained construction carpenters can easily switch from new-home building to remodeling.
Commercial carpenters typically remodel and help build commercial office buildings, hospitals, hotels, schools, and shopping malls. Some specialize in working with light-gauge and load-bearing steel framing for interior partitions, exterior framing, and curtain wall construction. Others specialize in working with concrete forming systems and finishing interior and exterior walls, partitions, and ceilings. Most commercial carpenters perform many of the same tasks as residential carpenters.

Industrial carpenters typically work in civil and industrial settings, where they build scaffolding and create and set forms for pouring concrete. Some industrial carpenters build tunnel bracing or partitions in underground passageways and mines to control the circulation of air to worksites. Others build concrete forms for tunnels, bridges, dams, power plants, or sewer construction projects.
Beavers are some of the most skilful tree fellers and dam builders on earth.

**Description**

Known as “nature’s engineers”, the beavers, large nocturnal semi-aquatic rodents, are famous for their ability to build impressive dams known as beaver dams. These dams are built for serving a variety of purposes like keeping the beavers safe from predators like coyotes, bears and wolves and also for accessing food sources quickly and safely during winter time. Beavers also build lodges where they reside and water canals which they use to float their food and building materials. This ability of the beavers to adapt the environment based on their own needs is not seen anywhere else in the Animal Kingdom except, of course, in the case of man.

**Dam building processes the beaver way**

Beavers building dams have often been photographed by researchers studying this interesting behaviour in these creatures. The beavers do not build dams in areas with fast, deep flowing rivers and streams but build dams in areas with shallow, slow flowing water to prevent the blockage of the underwater entrance to their lodges by ice in winter and also to create a water body with sufficient depth to hide themselves from their predators. The beavers first gnaw away at the barks of trees and branches near the river or stream to allow them to fall on the flowing water-body, blocking its flow and creating a diversion. This basic structure is then further strengthened by placing twigs, stones, leaves, branches, grasses, uprooted plants and anything else the beaver manages to find, on top of the base to build a superstructure. The beaver dams are usually 5 ft high, a few feet to over 330 ft long, and the water reservoir resulting from the dam is usually 1.2 to 1.8 metres deep.

**Ecological significance**

Beaver dams have high ecological significance as they trigger the creation and development of stable, wetland ecosystems, one of the most productive ecosystems of the world, which serve as the home of rare and endangered flora and fauna. The dams also divert water to the newly created ponds or reservoirs,
thus, preventing flooding in areas downstream of the rivers where these dams are built. Beaver dams also protect land from soil erosion and act as natural filters for toxins like pesticides and silt, trapping these contaminants, blocking their flow downstream into major water bodies.

**Negative effects of beaver dams**

Though beaver dams are ecologically significant, they might act as a nuisance in some cases when crop fields and pastures are destroyed by the flooding of water from these dams. The moisture retained in the soil near beaver dams might also weaken the underground foundations of roads, bridges, and railway tracks. Thus, often a need has been felt to control the construction of the beaver dams, especially in human inhabited areas, near agricultural fields and pasture lands. The beavers might be relocated from these areas to new areas where dam building would not pose a threat to humans. Special low voltage electric fences or other barriers might also be installed in human inhabited lands and waterways to restrict beavers from entering such territories.

**What can we learn from beaver architects?**

The small-scale dams of beavers can help us learn a lot about dam building, its advantages, and disadvantages. Beaver dams also allow us to study the gradual development of a rich wetland ecosystem in an area that was previously sparsely populated with wildlife. Unlike dams built by humans, most of which lead to widespread displacement of human populations and large-scale ecological damage, dams built by beavers have the exact opposite result of attracting species to inhabit the newly created wetlands. This fact definitely proves that nature’s own ways are always better than those of human beings.
A cost-effective product or service gives you value for the money. Clays bricks add value for your money, when you know when, how, why and where to use them! They save construction costs.

When walling or constructing columns, design time and costing should be invested to ensure the material used is of high quality and that it produces the desired strength, safety but with least construction and maintenance costs. Burnt clay bricks do just this. They are obtainable from different in Uganda. The workmanship also plays a large role in the final outcome of the walls and columns. To ensure the most effective utilization of bricks, therefore, one should invest in adequately trained and qualified masons.

The burnt clay bricks can be used for constructing load-bearing walls, partition walls, columns, drainage systems, decorations and other purposes depending on their specifications.

Walls that support the loads, weights and roofs of buildings, all buildings, whether for residential, commercial, industrial and other purposes need external and some internal walls to support the loads or weights of the building. These are called load-bearing walls. The Uganda Clays’ solid brick is excellent at providing this strength because of its high strength in compression.

Walling as an integral part of the construction building process has become an outlet in which people are increasingly able to add a personal touch to the environment in which they will spend a large proportion of their time. This can be achieved in a variety of ways through the use of the different types of the clay bricks, the various ways in which they are assembled as well as the outlined paths they follow.

There are a number of walling brick products available on the Ugandan market in the form of clay, earth, stone, concrete, glass, among others. Uganda Clays Ltd is one of the leading manufacturers of quality clay bricks in Uganda. Due to their attractive appearance, durability and permanent colour these bricks are one of the oldest and most widely used today. They are available in different types based on one’s preference.

The Uganda Clays’ types of bricks and when, how, why and where to use them.
Firebricks

These are made from well-blended clay mixtures, moulded and pressed to give a purely solid brick, then fired at very high temperatures. They are 230 by 115 by 75mm in size, weighing 3.5kg/unit. A surface of 1 sqm. needs 120 pieces for a 230mm-thick wall and 60 pieces for a 115mm-thick wall. Firebricks are ideal for use in areas under intensive heat up to 1500°C such as kilns, incinerators, fireplaces, among others. They are handy in energy-saving stoves using firewood for residential and commercial cooking purposes.

When using these bricks in the above areas, it is recommended to use either Heat Resistant Cement/High Alumina Refractory Cement (HAC) or Grog paste which is a mixture of both low and high temperature clay in ratios 1:4.

Solid bricks for walling and columns

The Uganda Clays’ solid bricks are suitable for both external and internal walls that bear the loads or main weights of the building. They are 230 by 115 by 75mm in size, weighing 3.5kg/unit. A surface of 1 sqm. needs 120 pieces for a 230mm-thick wall and 60 pieces for a 115mm-thick wall. They have so high a compressive strength, that they can support walls of buildings up to four storeys, with the right structural design. Where structurally recommended as columns to support beams, they save the high costs of shuttering, steel bars, cement, sands and labour.

Since they are not perforated, they also provide a high degree of sound and thermal insulation when used for both external and partition walling. They provide excellent protection from external weather elements. The bricks, though strong are standard and uniform, light and small, thus giving a wall thickness that is fit for purpose for architectural and aesthetic designs. The saved internal space can be put to better use. Uganda Clay bricks can be used in several places without plastering, thus saving construction and maintenance costs and time!

Comparative costing of reinforced and solid brick columns

The comparison assumes that all required materials are delivered on site. According to a seasoned quantity surveyor who prefers to remain anonymous, a 3.5 m–tall column of 230x230mm cross-section, which is made out of the Uganda Clays’ solid brick may cost about Shs350,000. This assumes cost of the bricks, cement, sand and labour. An equivalent 3.5 m –tall column of 230x230mm cross-section, which is made using reinforced concrete may cost about Shs800,000. This assumes cost of the steel bars, stirrups, cement, machine crushed aggregates, sand, hire of a compactor, shuttering materials and labour. The reinforced concrete column would also take three times as much time to complete.

Half-bricks (or face bricks)

The Uganda Clays’ half bricks, also referred to as facing bricks are commonly used on external walls that may have been plastered or built with poor-quality bricks. The face bricks then enhance surface beauty and decrease maintenance costs. They are 220 by 38 by 75mm in size, weighing 0.9kg/unit. A surface of 1 sqm. needs 60 pieces. Half-bricks also offer stability to weak walls and columns, thus adding some structural strength. Facing bricks may also be used to bring out architectural and aesthetic ambience. Mortar joints in half brick work should vary between 6-8 mm.

Selected grooved and smoothed bricks

They are masonry perforated bricks produced for structural or load-bearing purposes in face or no face work. They are 230 by 115 by 75mm in size, weighing 1.9kg/unit. A surface of 1 sqm. needs 120 pieces for a 230mm-thick wall and 60 pieces for a 115mm-thick wall. They are also suitable for partitioning, due to their light and small sizes, good thermal and sound properties. These bricks can also be used in beautifying of compounds and places, for drainage channels and in several other aspects.

Benefits of using Uganda Clay’s bricks over other types of bricks

They have standard dimensions, thus giving uniform wall thickness;

They are manufactured under a quality management system which is certified to ISO 9001-2000 the and Uganda National Bureau of Standards.

They are highly durable, fire resistant and with a life expectancy of 100 plus years.

They can be recycled: broken or undesirable clay bricks can be reused by crushing them to produce new bricks and fillers;

They exhibit excellent thermal and sound insulation properties (45-50 decibels).

They are environmentally friendly: they do not give off toxins when exposed to fire.

They rarely require maintenance.
Nowadays we can’t imagine a building without a finishing of tiles. For a building’s sustainability, aesthetic look and a variety of other factors, tiles have become popular in the construction industry.

Tiles can be defined as extremely thin slabs or bricks burnt in kilns. They are usually square or rectangular in shape. They are made of hard-wearing material such as ceramic, stone, metal, baked clay, or even glass, generally used to cover roofs, floors, walls, or other surfaces such as tabletops and kitchen worktops. Alternatively, tiles can sometimes refer to similar units made from lightweight materials such as perlite, wood, and mineral wool, typically used for wall and ceiling applications.

Tiles are most often typically glazed if they are for internal use or unglazed if they are for roofing or outdoor use, but other materials are also commonly used, such as glass, cork, concrete and other composite materials, and stone. Tiling stone is typically marble, onyx, granite or slate. Thin tiles can be used on walls rather than floors which require more durable surfaces that will resist impacts.

Types of tiles used in building construction

There are various types of tiles used in building construction nowadays. They can be classified in several ways based on various criteria. So, the types of tiles depend on which criteria you use to classify them.

Normally tiles are classified based on the criteria of their usage and the materials of which they are made and the manufacturing process.

Types based on usage

Based on where tiles will be used in a building, tiles can be classified into the following types:

Wall tiles: Wall tiles can be used both inside and outside of a building. For the inside, wall tiles are normally laid in bathroom and kitchen walls. Other than the bathroom and the kitchen, wall tiles are also laid on dining walls and other walls inside a house. Ceramic tiles are most commonly used as wall tiles.
of locally available materials such as clay, terracotta, slate, etc.

Pavers: Paver tiles are mostly used for covering the parking area, the driveway, the walkway, and the surrounding area of a building. Pavement tiles are mostly made of concrete, brick, travertine, flagstone, bluestone, rubber, etc.

Types based on materials and the manufacturing process

Tiles can also be classified based on the very material of which they are made and the manufacturing process through which they go.

These types of tiles can be classified as –

Ceramic tiles: The ingredients of the ceramic tiles are clay, sand, and other natural substances. Ceramic tiles are commonly used in residential building projects, mainly interior walls and floors. Ceramic tiles can be two types – glazed and unglazed. After firing the ceramic tiles, a thin layer of liquefied glass is coated over the top of ceramic tiles which makes it glazed. It can be used anywhere on floors and walls inside the building.

Glazed ceramic tiles are slippery. So they should not be used outdoors and where water can easily make the surface wet, hence hazardous. Unglazed ceramic tiles: These don’t have a thin glass layer on its surface like the glazed ceramic tiles. Not having the glass layer on it makes them non-slippery and unglazed. Unglazed ceramic tiles, also called quarry tiles, can be used anywhere where other tiles are used.

Porcelain tiles: Porcelain tiles are actually the ceramic tiles. The material used to make ceramic tiles is also used for making porcelain tiles. But the clay grain used to make porcelain tiles is finer than the ceramic tiles and during manufacture, they are subjected to high temperatures for a longer time than the ceramic tiles. The baking is carried out until all the water present in the element is evaporated, making them denser, less porous, harder and more resistant to moisture and stains than ceramic tiles.

These characteristics make these tiles suitable for both indoor and outdoor tiling. The manufacture, absorptive capacity and the breaking strength of porcelain tiles differ from those of the ceramic tiles. But compared with the ceramic tiles, they make use of heavy or denser clay. They are regarded as a superior product when factors of durability, design, colour and value factors are considered. The cost is higher when compared to the ceramic tiles. They gain more application in surface areas that have high traffic. These tiles demand special cement for their installation. So, when these tiles are used for wall surfaces, the cement that has high adhesive property is the one used. The porcelain tiles that are polished are also available in the market. After firing of the tiles, they can be polished. This would bring a shine in the tile, without any glazing.

Mosaic tiles: Mosaic tiles are made of porcelain and clay. This type of tiles are decorative pieces and commonly used in bathrooms, kitchen backsplash, and small counter-space areas.

Natural stone tiles: There are many types of natural stone used in building construction for tiling purposes. This type of tiles can be used in floor and wall finishing. Some of the common types of natural stone used in building construction are: marble, granite, slate, travertine, onyx, sandstone.
Tiles vary in type, size, colour, quality and price depending on the country in which they are manufactured. Most tiles are sold in boxes but not square metres yet the space where they are fitted is measured in square metres.

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<td>Plastic Edge Trim Strip - Ivory 10mmx2.4m</td>
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<td>1</td>
<td>13,000</td>
</tr>
<tr>
<td>H</td>
<td>Plastic Edge Trim Strip - Brown 8mmx2.4m</td>
<td>no</td>
<td>1</td>
<td>20,000</td>
</tr>
<tr>
<td>I</td>
<td>Round Edge Trim 12mmx2.5m</td>
<td>no</td>
<td>1</td>
<td>30,000</td>
</tr>
</tbody>
</table>

**Ceramic Tiles**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Qty</th>
<th>Average Price (UGX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Matt Finish Floor Tile 600x600x10mm</td>
<td>sm</td>
<td>1</td>
<td>60,000</td>
</tr>
<tr>
<td>B</td>
<td>Glossy Finish Wall Tile 300x600x6mm</td>
<td>sm</td>
<td>1</td>
<td>83,000</td>
</tr>
<tr>
<td>C</td>
<td>Stone Wall Tile 257x515x8mm</td>
<td>sm</td>
<td>1</td>
<td>66,000</td>
</tr>
<tr>
<td>D</td>
<td>Unglazed, Rustic Finish Terracotta Tiles 330x330x8mm</td>
<td>sm</td>
<td>1</td>
<td>40,000</td>
</tr>
<tr>
<td>E</td>
<td>Outdoor Floor Tiles 510x510x8mm</td>
<td>sm</td>
<td>1</td>
<td>64,000</td>
</tr>
</tbody>
</table>

**Porcelain Tiles**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Qty</th>
<th>Average Price (UGX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Polished Floor Tile 300x600x8mm</td>
<td>sm</td>
<td>1</td>
<td>75,000</td>
</tr>
<tr>
<td>B</td>
<td>Glazed Floor Tile 600x600x10mm</td>
<td>sm</td>
<td>1</td>
<td>74,000</td>
</tr>
<tr>
<td>C</td>
<td>Glazed Rectified Floor Tile 600x600x10mm</td>
<td>sm</td>
<td>1</td>
<td>74,000</td>
</tr>
<tr>
<td>D</td>
<td>Centrepiece Tile 1200x1200x10mm</td>
<td>no</td>
<td>1</td>
<td>905,000</td>
</tr>
</tbody>
</table>

**Roofing Tiles**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Qty</th>
<th>Average Price (UGX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Roman Tiles</td>
<td>sm</td>
<td>1</td>
<td>87,500</td>
</tr>
<tr>
<td>B</td>
<td>Mangalore Tiles</td>
<td>sm</td>
<td>1</td>
<td>48,000</td>
</tr>
<tr>
<td>C</td>
<td>Portuguese Tiles</td>
<td>sm</td>
<td>1</td>
<td>59,200</td>
</tr>
<tr>
<td>D</td>
<td>Flat Tops</td>
<td>sm</td>
<td>1</td>
<td>11,400</td>
</tr>
</tbody>
</table>
## AVERAGE COST OF SELECTED PERSONAL PROTECTIVE EQUIPMENT (PPE) AND TOOLS

Compiled by Angella Naluwenda, a quantity surveyor,  
Email: aluwenda@gmail.com

Personal Protective Equipment (PPE) is clothing or equipment designed to protect workers from physical hazards when on a worksite. PPE should only be considered as a last line of defense between a hazard and the worker. Attempts to control workplace risks and hazards should always be addressed first.

It can include items such as safety helmets, gloves, eye protection (glasses), high-visibility clothing (reflector jackets), safety shoes and safety harnesses, gumboots, dust masks, overalls.

### Selected Site Preliminary Requirements

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Qty</th>
<th>Average Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong> PPE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Helmets</td>
<td>no</td>
<td>1</td>
<td>8,000</td>
</tr>
<tr>
<td>2</td>
<td>Gloves</td>
<td>pair</td>
<td>1</td>
<td>15,000</td>
</tr>
<tr>
<td>3</td>
<td>Eye safety glasses</td>
<td>no</td>
<td>1</td>
<td>20,000</td>
</tr>
<tr>
<td>4</td>
<td>Reflector Jackets</td>
<td>no</td>
<td>1</td>
<td>7,000</td>
</tr>
<tr>
<td>5</td>
<td>Safety shoes</td>
<td>no</td>
<td>1</td>
<td>70,000</td>
</tr>
<tr>
<td>6</td>
<td>Safety harness</td>
<td>no</td>
<td>1</td>
<td>80,000</td>
</tr>
<tr>
<td>7</td>
<td>Gum Boots</td>
<td>no</td>
<td>1</td>
<td>18,000</td>
</tr>
<tr>
<td>8</td>
<td>Dust Masks</td>
<td>no</td>
<td>1</td>
<td>7,000</td>
</tr>
<tr>
<td>9</td>
<td>Overalls</td>
<td>no</td>
<td>1</td>
<td>40,000</td>
</tr>
</tbody>
</table>

| **B** Tools | | | | |
| 1 | Wheelbarrow | no | 1 | 125,000 |
| 2 | Spade | no | 1 | 10,000 |
| 3 | Pickaxe with stick | no | 1 | 14,000 |
| 4 | Hoe with stick | no | 1 | 10,000 |
| 5 | Panga | no | 1 | 5,500 |
| 6 | Mortar pan | no | 1 | 3,500 |
| 7 | Sledgehammer | no | 1 | 35,000 |
| 8 | Sisal String | roll | 1 | 5,000 |
| 9 | Bow saw flame & Blade | no | 1 | 15,000 |
| 10 | Hacksaw flame & Blade | no | 1 | 10,000 |
| 11 | Assorted Nails | kg | 1 | 4,000 |
| 12 | Axe | no | 1 | 12,000 |
| 13 | Measuring Tape -30m | no | 1 | 10,000 |
| 14 | Horse Pipe 1” | roll | 1 | 120,000 |
| 15 | Water Level - 50m | roll | 1 | 25,000 |
| 16 | Hammer | no | 1 | 12,000 |

Compiled by Angella Naluwenda, a quantity surveyor,  
Email: aluwenda@gmail.com
Daywork is a means by which a contractor is paid for specifically instructed work on the basis of the cost of labour, materials and plant plus a mark-up for overheads and profit. It is generally used when work cannot be priced in the normal way. Examples of when daywork may be applied are when unforeseen obstructions are encountered during groundworks or when work is instructed for which there are no comparative rates in a bill of quantities.

**Dayworks in Construction, January 2019**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>QTY</th>
<th>AVERAGE COST (USHS)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Labour</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Working Ganger</td>
<td>day</td>
<td>1</td>
<td>40,000</td>
</tr>
<tr>
<td>B</td>
<td>Semi-Skilled</td>
<td>day</td>
<td>1</td>
<td>40,000</td>
</tr>
<tr>
<td>C</td>
<td>Unskilled</td>
<td>day</td>
<td>1</td>
<td>20,000</td>
</tr>
<tr>
<td>D</td>
<td>Artisan</td>
<td>day</td>
<td>1</td>
<td>40,000</td>
</tr>
<tr>
<td>E</td>
<td>Driver for light vehicle</td>
<td>day</td>
<td>1</td>
<td>30,000</td>
</tr>
<tr>
<td>F</td>
<td>Driver for heavy vehicle</td>
<td>day</td>
<td>1</td>
<td>50,000</td>
</tr>
<tr>
<td>G</td>
<td>Operator for heavy equipment</td>
<td>day</td>
<td>1</td>
<td>50,000</td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Ordinary Portland Cement in 50 kg bags</td>
<td>ton</td>
<td>1.0</td>
<td>700,000</td>
</tr>
<tr>
<td>B</td>
<td>Coarse aggregate for concrete.</td>
<td>m³</td>
<td>1.0</td>
<td>165,000</td>
</tr>
<tr>
<td>C</td>
<td>Fine aggregate for concrete.</td>
<td>m³</td>
<td>1.0</td>
<td>70,000</td>
</tr>
<tr>
<td>D</td>
<td>Water for concrete</td>
<td>lit</td>
<td>1.0</td>
<td>100</td>
</tr>
<tr>
<td>E</td>
<td>Sand for building</td>
<td>m³</td>
<td>1.0</td>
<td>70,000</td>
</tr>
<tr>
<td>F</td>
<td>Sand for plaster</td>
<td>m³</td>
<td>1.0</td>
<td>70,000</td>
</tr>
<tr>
<td>G</td>
<td>Bricks for building.</td>
<td>no.</td>
<td>1.0</td>
<td>350</td>
</tr>
<tr>
<td>H</td>
<td>Concrete blocks for building, 225mm for building,150mm thick</td>
<td>m³</td>
<td>1.0</td>
<td>80,000</td>
</tr>
<tr>
<td>I</td>
<td>Concrete blocks for building, 150 mm thick.</td>
<td>m³</td>
<td>1.0</td>
<td>65,000</td>
</tr>
<tr>
<td>J</td>
<td>Hydrated lime for building 150 mm thick.</td>
<td>kg</td>
<td>1.0</td>
<td>2,000</td>
</tr>
<tr>
<td>K</td>
<td>Timber formwork</td>
<td>m³</td>
<td>1.0</td>
<td>18,000</td>
</tr>
<tr>
<td>L</td>
<td>High yield steel reinforcement:- 8-10 mm dia.</td>
<td>kg</td>
<td>1.0</td>
<td>4,500</td>
</tr>
</tbody>
</table>

| M | High yield steel reinforcement:- 12-16 mm dia. | kg | 1.0 | 4,500 |
| N | High yield steel reinforcement:- 20-25 mm dia. | kg | 1.0 | 4,500 |
| O | Steel reinforcement fabric S reference:A252 | m² | 1.0 | 18,000 |
| P | Hard core filling | m³ | 1.0 | 80,000 |
| Q | Topsoil delivered to site | m³ | 1.0 | 40,000 |
AVERAGE MARKET CONSTRUCTION PRICES AND COST INDICES FOR SELECTED TILES: JANUARY, 2019

Construction prices and cost indices are published quarterly, or on agreed intervals, which are used for estimating, cost checking and fee negotiations on public sector construction projects. The collection of data and calculation of indices is let to the Uganda Bureau of Statistics (UBOS) and there is also a requirement to develop and improve the indices methodology. These are vital in the construction industry and are used by the relevant parties in the industry.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Average Rate (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Walls</td>
<td>SM</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>B</td>
<td>Extra over tiles for rounded edge top</td>
<td>LM</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>C</td>
<td>Ditto for corner strip</td>
<td>LM</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>E</td>
<td>Surfaces and edge of splash apron</td>
<td>SM</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>F</td>
<td>Walls</td>
<td>SM</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td>G</td>
<td>Extra over rounded edge top</td>
<td>LM</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>H</td>
<td>Ditto for corner strip</td>
<td>LM</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Floor Tiles**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Average Rate (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Floors</td>
<td>SM</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>J</td>
<td>100 x 8mm Skirting</td>
<td>LM</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>K</td>
<td>600 x 600 x 10mm thick fixed onto prepared screed (m/s)</td>
<td>SM</td>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td>L</td>
<td>Ditto at staircase landing</td>
<td>SM</td>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td>M</td>
<td>Ditto in 300mm (average) wide treads with 3No. anti-slip grooves to approval</td>
<td>LM</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>N</td>
<td>Ditto in 150mm high-risers</td>
<td>LM</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>O</td>
<td>125mm high x 8.4mm thick tile skirting to match</td>
<td>LM</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

REQUEST TO REVISE CLAUSE 43 THE PPDA CONTRACT AGREEMENT FOR CONSTRUCTION

Following an article on, “Delayed payments killing local contractor” ([www.8mconstruction.com](http://www.8mconstruction.com), Vol 3 Issue 2 March-April 2018, page 32) and letters and discussions with the PPDA staff on the subject, the Chairman of 8M Construction Digest, Eng Hans JWB Mwesigwa, in a letter dated 4th February 2019 wrote to the Executive Director, Public Procurement and Disposal Authority (PPDA), requesting for a revision of Clause 43.1 of the PPDA Conditions of Contract for Construction Works. Noting that the Clause does not specify how long the Project Manager (PM) should take before issuing an Interim Payment Certificate (IPC), thus leaving the contractor vulnerable to delay risks, should the PM take unreasonably too long to act.

The Chairman further noted that such an ambiguous clause can be abused to the point of abetting corruption, the Clause should be revised to peg a clear timeline when both the PM and the Client should have produced a certificate and payment. Eng Mwesigwa noted that the FIDIC red book, Clause 14.6 of the "Conditions of Contract for Construction Works", as designed by the Employer, gives the Engineer (PM) ONLY 28 days to have issued an Interim Payment Certificate (IPC) and 56 days for the Employer to have made payment, all this calculated from the submission date of the contractor's payment claim!

Eng Mwesigwa further requested that through the relevant procurement bodies, PPDA causes an appropriate law to be put in place to use e-procurement, following the wide outcry and the advice of 8M Construction Digest (8M CD) readers, that as it stands this system has far more disadvantages than advantages, and that e-procurement would be the right way, and pacify the clientele in the construction industry. [See page 41 of this issue.]

It is the intention of 8M Construction Digest to coordinate an 8M Symposium on the topic with relevant stakeholders in the construction industry.
### 8M ADVERTISING & SPONSORSHIP RATES
(With effect from 1st November, 2018)

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DIMENSIONS (mm)</th>
<th>COST (Ugx)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full page</td>
<td>255 X 170</td>
<td>3,000,000</td>
</tr>
<tr>
<td>1/2 page advert</td>
<td>170 X 125</td>
<td>1,600,000</td>
</tr>
<tr>
<td>1/4 page advert</td>
<td>125 X 84</td>
<td>900,000</td>
</tr>
<tr>
<td>1/8 page advert</td>
<td>84 X 61</td>
<td>480,000</td>
</tr>
<tr>
<td>Full strip column</td>
<td>170 X 42</td>
<td>550,000</td>
</tr>
<tr>
<td>Logo size (on front page)</td>
<td>40 X 30</td>
<td>550,000</td>
</tr>
<tr>
<td>Company logo on 8M website</td>
<td>Per issue</td>
<td>770,000</td>
</tr>
<tr>
<td>Classified listing</td>
<td>Max. 30 words</td>
<td>50,000</td>
</tr>
<tr>
<td>Full page advertorial or sponsored articles</td>
<td>255 X 170</td>
<td>2,500,000</td>
</tr>
<tr>
<td>Inside front cover or inside back cover advert (full page)</td>
<td>255 X 170</td>
<td>3,700,000</td>
</tr>
<tr>
<td>Back page cover advert</td>
<td>255 X 170</td>
<td>4,200,000</td>
</tr>
<tr>
<td>Centre spread advert/article</td>
<td>380 X 170</td>
<td>5,600,000</td>
</tr>
<tr>
<td>Advert designing</td>
<td></td>
<td>200,000</td>
</tr>
</tbody>
</table>

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- Delivering complex and challenging projects for multinational clients
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- Microsoft offices in Nairobi & Lagos
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- The best people, every step of the way
- World-class systems and processes
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- Fully manage the delivery on site
- Safe standard of working

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- Montave Mixed Use Development, Nairobi, Kenya
- AVIC Headquarters, Nairobi, Kenya
- Mtwara Port Refurbishment, Mtwara, Tanzania
- Mtwara Port, Site Accommodation Works, Tanzania
- New 150 Room City Lodge Hotel, Dar-es-Salaam, Tanzania
- Makerere University Institute of Computer Science, Uganda
- Sheraton Hotel Refurbishment, Uganda
- Course View Towers, Uganda
- Uganda Communications Commission, Headquarters, Uganda
- Acacia Mall, Kampala, Uganda
- ESAMI Education Centre, Kampala, Uganda

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e-mail: ymrug@ymr.co.ug; eridad@ymr.co.ug; eridad.nyanzi@gmail.com
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