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Experimenting with Resin-bonded Agregate Flooring to Repair the Potholed Asphalted Paving at the Calabar Campus Gate, Unicross

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ABSTRACT
Built around 1973, the asphaltic concrete roads on the sandy loam/sandy clay soil in Calabar Campus of the University of Cross River State are old, potholed and damaging, both to the cars entering, and also to the image of the University generally. The more visible potholes are those at the vicinity of the school Gate. Several previous attempts to fill the potholes with concrete, concrete rubbles and stone-based debris failed, partly because of the type of soil, and the inability also to bond with the asphalt. The main reason why the potholes are not repaired with asphaltic concrete is that it comes at a cost too huge for the University to afford. This study sought to explore simple tools and easily doable processes of resin-bonded aggregate flooring to repair the pothole of the asphaltic concrete road by the Main Gate of the Calabar Campus, University of Cross River State.

KEYWORDS: Unicross, asphaltic pavement, pothole, repair, resin-bonded aggregate

Introduction
University of Cross River State (Unicross, formerly Cross River University of Technology) was established in August 2002 by the Cross River State Bill No. 9, later amended as Bill No. 6 of 2004. The four campuses of the university are spread across the state, with the Headquarters in Calabar, the Capital City. The Academic programmes of the University are offered at undergraduate and graduate levels.

Whereas the Calabar Campus is the Headquarters of the University, the road infrastructure and network in the compound is old. The Calabar Campus was formerly the Polytechnic Calabar, which was also formerly College of Technology Calabar, established in 1973 (Nssien and Umoh 1984). While it is believed that asphalted roads typically have a lifespan of about 25 years or more, with adequate maintenance (Neal 2022), the ones in the Calabar Campus of Unicross were made about 50 years ago. Also, the Calabar Campus is located in the coastal region of Anantigha, Calabar South. Being a coastal topography, Ofem and Esu (2015) note that the soils on which Calabar Campus is built have sandy loam to sandy clay and silt textures, while the poorly drained soil is commonly composed of iron pyrites, periwinkles and crabs. In essence, the asphalted roads in the Calabar Campus of Unicross have not only outlived their expected lifespan, but that the soil-type on which the roads were built is both sandy-loamy and sandy clay, making it inevitable for some sections to fail and develop portholes. Over time, several attempts have been made to arrest the situation by filling the potholes with concrete and concrete rubbles. Many of the efforts have also included the use of stone-based debris to fill up the portholes. The main reason why the potholes are not repaired with asphaltic concrete is that it comes at a cost too huge for the University to afford. Thus, pothole repair efforts have been limited to rubbles and concrete, which have proven to be grossly inadequate.

In the visual arts, resin-bonded aggregates such as

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epoxy flooring are used in interior and exterior designs. This flooring method relies on resin to bond the aggregates used in the flooring composite. And, since the resin used is water-insoluble when set, the floorings are water-proof. Also, since the resin-bonded aggregates cure by chemical hardening, rather than by physical drying, there is no need for the cumbersome processes and equipment necessary for asphaltic concrete laying. Since the resin-bonded aggregate floors used by visual artists for garages, driveways, walkways and other flooring needs in built environments are able to withstand heavy vehicular traffic in and out of the rainy seasons, there is a scientific basis/justification for them to be effective in potholed asphaltic concrete road repairs. All of the previous efforts have not been successful because, given the sandy and loamy nature of soil type (Ofem and Esu 2015), as soon as the rains come, the fillings are dislodged and the problem resurfaces more prominently. Some of the holes become so deep that cars have been known to spoil when their tires enter and the bottom plates hit the floor. Besides this, the entire scenario of a university gate with potholes is very unsightly and demeaning (See Figs 1 and 2). There is therefore a need to research, identify and explore alternative and durable methods for repairing the potholed school gate. This research will explore the use of resin-bonded aggregates for the repair of the pothole in the asphalted road by the Main Gate of the Calabar Campus, University of Cross River State.

Statement of the Problem

The asphaltic concrete roads built on the sandy loam/ sandy clay soil in Calabar Campus of University of Cross River State are old, and perennial potholes at the Main Gate are damaging both to the cars entering, and also to the image of the University itself. Since the said road is surfaced with asphaltic concrete, repairs will normally need asphaltic materials, equipment and specialised manpower that are too expensive for the university. In another vein, the quantity of asphaltic concrete needed to repair the pothole is small, which fact will make it too expensive to use the heavy and specialised equipment and processes of asphalting. In view of the fact that asphaltic concrete is not affordable and the use of concrete and rubbles have been inefficient to fill the potholes at the Unicross Gate, there is an urgent need to explore an alternative, durable and affordable method of filling the potholes. Also, since the materials, equipment and manpower for laying asphaltic concrete are specialized, part of the research problem is to explore alternative materials and processes that are simple, doable, affordable and require no specialised manpower, processes and big equipment.

Objective of the Study

The objective of this study is to explore simple tools and easily doable processes of resin flooring for the repair of the potholed sections of the asphaltic concrete road by the Main Gate of the Calabar Campus, University of Cross River State. The specific objectives are as follows:

1. To experiment with various mixes of aggregate and resin to determine what is suitable for pothole patching on asphaltic pavement.
2. To experiment and determine a suitable process of laying the resin-bonded aggregate in pothole patching on asphaltic pavement.
3. To repair the pothole in the asphaltic pavement at the school gate with resin-bonded aggregate.
4. To find out the suitability of resin-bonded aggregate for surface-sealing of concrete patches on asphaltic pavements.

Figs. 1 and 2: Potholes filled with rubbles and sand at the entrance of University of Cross River State, Calabar. Note how the rubbles are loose and have gradually given way. Source: Authors, 2023.

By its objective, this study is justified because it seeks to explore alternative, simple, and doable materials and processes to repair unsightly potholes in the Cross University of River State. Along with this, the fact that the pothole patching in the asphaltic pavement can be done without the cumbersome equipment and specialised manpower for asphaltic repairs is also a justification for undertaking the study.

The Nature of Asphaltic Concrete

Asphaltic Concrete continues to be one of the most common types of pavement surface materials used in the world. It is a porous, strong, durable, and adhesive material produced at a very high temperature of about 180°C and consists of a mixture of asphalt binder (bitumen), aggregate particles (fine, coarse and filler), and air voids (Afifa et al., 2012). Aggregate refers to a structure generally formed from a mass of compacted fragments and particles. It is a hard inert material such as sand, crushed stones, gravels, slag and rock dust. An aggregate can be coarse or fine depending on the particle size. In Asphaltic Concrete production, different aggregates are used, and they include coarse aggregate, fine aggregate, filler, and sometimes steel slag (Afifa et al., 2012, Alok Goel, 2015 and Wasilewska et al., 2017). All the discussed materials are shown in Figures 3 and 4.

Bitumen as binder in asphaltic concrete plays an important role in binding or holding the various constituents of the aggregate together. It also serves as a waterproofing agent and helps in increasing the strength of the mix generally (Ladyali and Lal, 2008). Bitumen is used as a binder in asphaltic concrete production and some types of bitumen include Bitumen (60/70), Polymer modified bitumen and Nano modified bitumen.

In summary, these different aggregate types are mostly batched in proportion by weight, which depends greatly on the design mix adopted. The proportion at which these aggregates are mixed also depends on the purpose of the asphalt concrete, whether as a macadam asphaltic base, as a binder or wearing course.

Equipment for Asphalt Laying and Repair

Different types of specialised equipment are needed for asphalt laying and repairs. Each of these types of equipment plays a vital role in ensuring proper and smooth finished asphalt pavement surfacing. The equipment includes the following:

Paver or Finisher: This equipment is generally used in laying the asphalt into desired width and depth, it ensures an even placement and spread of the asphalt concrete as desired of the project design (Fig. 6). The asphaltic concrete aggregates are first mixed in a asphaltic concrete mixer (Fig 5) before being transferred to the Paver. Both the asphaltic concrete mixer and the paver are extremely expensive equipment.

Fig. 3: Fig. 6: Coarse Aggregate (Source; Sermatech Yard, Odukpani, Nigeria)

Fig. 4: Fine Aggregate (Source; Sermatech Yard, Odukpani, Nigeria)

Pneumatic Jar Roller (PJR): It is used to smoothen and polish the surface of laid asphalt concrete by applying uniform pressure throughout the widths of its tyre on the laid asphalt (Fig. 7).

Other equipment for laying asphaltic concrete include Drum Roller (Steel Roller), Tractor Sweep, Tar Boiler dumpy Trucks, Shovels, Spraying Can, Rakes , Cutting Machine, Plumbs, Line, Steel Tape and Pegs. Asphaltic concrete preparation, mixing and laying is a highly specialised process. Even the mixing is done in a special plant. After putting asphalt modifier and aggregates for dry mixing, then asphalt, rolling additives and mineral powder are added in continuous mixing. In addition to stringent temperature control during processes, asphalt road construction and maintenance require first and second compactions that closely follow each other, in order to get compactness and smoothness (Li, Feng, Li and Zhou 2021). According to Wilson and Romine (1993), for most agencies, the three main costs for pothole patching are labour, material and equipment. Owing to the nature of materials, manpower and equipment required in the processes, these costs are necessarily heavy.

While acknowledging that it is difficult to avoid potholes on asphalt surfaced roads, the South African Transport Minister, Fikile Mbalula, notes that most roads in South Africa had crossed their design life of 25 years, and that the roads were not designed for the current heavy traffic and volume of use (*Businesstech* 2021). The situation described of the South African roads is the same as those of the roads in the Calabar Campus of University of Cross River State. The asphaltic concrete roads in Calabar Campus have lived double their lifespan, and therefore are very prone to potholing, particularly when we factor in the soil being sandy loam. While there are no credible statistics for road repair costs for Nigeria, however, the Sokoto State Government spent N36.4 million on the repair of potholes at roundabouts and major roads in 2021 (Auwal, 2021). According to Adebayo and Jimoh (2015) in Nigeria, asphalted roads typically employ hot-mix asphalt (HMA) batches, requiring the use of expensive and specialised asphaltic equipment that work at a regulated temperatures. In essence, the cost and logistics of repairing the potholes with asphaltic concrete is beyond the university, which fact motivates this research into using easier to lay resin-bonded aggregate, which does not require specialised, expensive and cumbersome processes and equipment.

Resin Flooring

The most commonly used resin for flooring is epoxy. In the mid-1930s when epoxies were synthesized, it was thought that the resin will remain vulnerable to UV light. Owing to this, epoxies were initially limited in decorative flooring of spaces with limited exposure to light, such as garages. Today, it is different, because epoxy resin compositions have evolved to be UV-resistant, making them absolutely perfect for outdoor flooring projects. Some of the advantages visual designers have in using epoxy flooring are that it is resistant to abrasion and different chemicals, and a vast variety of colours and textures can be achieved, while maintaining the strength of the mix. In essence, epoxy floors are very adaptable and extremely durable flooring options (Sajjadi 2018). Epoxy flooring is used in such outdoor spaces as porches/steps, pool decks, sidewalks, entrances, and driveways.

The Nature of Epoxy Flooring

Unlike asphaltic concrete, epoxy flooring is not at all porous, but waterproof when it cures. In fact, its waterproof nature makes it well used in and around swimming pools and other projects in which water, moisture and chemical resistance is desired. Even as it is waterproof, epoxy flooring is a very strong, durable, and adhesive material. Again, unlike asphaltic concrete that requires a very high temperature of about 180°C, epoxy flooring is at room temperature and cures chemically, making it safe, easy and not cumbersome. In this

Fig. 5: Asphalt concrete mixer (Source; https://www.pngegg.com/en/png-bmeyo)

Fig. 6: Asphalt Paver (Source; Sermatech Yard, Odukpani, Nigeria)

Fig. 7: Pneumatic Jar Roller (PJR)
Source: https://gharpedia.com/blog/pneumatic-roller-compaction-equipment/

flooring, epoxy resin is a cold binder and there is no need for the high temperature control required of asphaltic road surfacing. In practice, epoxy can be used as it is for a clear covering, or with metallic colours for visual effects and with aggregates for texture and other considerations determined by the specific project.

Epoxy is mixed in ratios by volume, such as 1:1 or 2:1 between resin and hardener (Figs. 8 and 9). Since epoxy resin reacts sensitively to temperatures, below 20 degrees Celsius slows down the resin's curing, and higher than 20 degrees Celsius quickens the reaction of the resin-hardener. Aggregates used with epoxy flooring include flake, stone dust and stone fragments ranging from fine sand to gravel. These different aggregate types are usually batched in proportion by volume, and then very thoroughly mixed for even distribution of the binder through the aggregates. Figures 10 and 11 are epoxy flooring with quartz sand and stone pebble aggregates. When aggregates are used, it is the practice to apply a finishing layer of epoxy to the surface, to ensure that all particles are well bonded to the whole flooring.

Equipment for Epoxy Flooring

Epoxy flooring basically requires a substrate, primer coat, and final coat (Fig. 12). The two-part epoxy resin is measured and mixed with selected aggregates and desirable colours before application. Usually it is a mixer attached to a power drill that is used to mix the batch. Just as with asphaltic concrete surfacing, epoxy flooring requires different types of specialised equipment. However, the equipment needed for epoxy flooring are nowhere as cumbersome, expensive and industrial as those for asphaltic road surfacing. In the same vein, the processes are a lot simpler and easier to achieve. Not being cumbersome, epoxy flooring equipment include the following, as well as the tools in Table 1:

Concrete Mixer: This equipment is generally used in mixing concrete and its aggregates. They can also be used for mixing batches of epoxy flooring aggregates. Unlike asphaltic aggregate mixing, which is done is voluminous batches, epoxy flooring batches are done in small bits, to ensure that the resin does not start to set before use and, thereby cause waste.

Floor Grinder: Heavy duty diamond floor grinders used for grinding concrete surfaces are sometimes used in grinding epoxy floor surfaces during installation. This grinder is also used during the substrate preparation to remove old floor coatings. It is perfect for grinding large areas to a fine finish. Floor grinders are often used with dust extraction vacuums.

Electric Paint, Chemical and Cement Mixer: It is an electric handheld tool used for mixing batches of epoxy

Fig. 8: Epoxy resin components A and B

Fig. 9: Mixing the two parts of epoxy. Source: https://www.epoxycentral.com/blogs/epoxy-floor-coatings/how-to-mix-epoxy-paint

Fig. 10: Outdoor patio epoxy flooring. Source: https://www.cnycreativecoatings.com/residential/outdoor-patio

Fig. 11: Epoxy flooring with stone pebbles

mixes in small containers. There are several sizes of the mixer, and a typical project may need a number of mixers, particularly if more than one colour is used in the project.

Advantages of Using Resin for Outdoor Flooring

Epoxy flooring is used around the world by designers because it is versatile in design, including the different types of finishes such as matte or high gloss, and the variety of textures like stone details. According to *Garage Pittsburgh* (2022), epoxy is one of the most durable outdoor-space floor coatings available, because of its ease of installation, long lifespan, cost effectiveness (compared to other options) and waterproof features. Whereas many people consider epoxy as only an indoor coating for garages, showrooms, and retail stores, it's durability, and waterproof features also make it a perfect option for outdoor uses too (*Green Thumb Local* 2020). As an adaptive and creative process, one major advantage of epoxy flooring is that it can be modified to suit any décor or floor need. Owing to its durability and wear resistance, epoxy is excellent for almost any outdoor application and can withstand the heavy traffic of pool decks and patios, front steps, walkways, and driveways. Unlike concrete flooring that is relatively porous, epoxy flooring adds impenetrable and seamless layer of protection to the surface (*Green Thumb Local* 2020). According to Sajjadi (2018) and *Garage Pittsburgh* (2022), epoxy floorings have the following advantages:

1. Unlike concrete surface which de-shapes, stains and cracks because of the wear and tear of walkways and garages, for example, epoxy has durability, strength and wear-resistance.
2. Compared to other flooring types and their durability and wear-resistance, epoxy floors are an extremely affordable option for outdoor spaces
3. Concrete walkways and porches look more elegant and sophisticated when epoxy finish is used.
4. An endless variety of colours and styles can be achieved with epoxy floors, which makes it easy to enhance the beauty of the outdoor.
5. For patching and repair work, epoxy floors can be tinted to match the exact colour of the original shade.
6. Epoxy floors are also resistant to water, weather and chemical spills.
7. The surface of epoxy floors can be made of single or a mix of different aggregates.

Table 1: Table 1: Standard Tools/ Equipment Needed for Epoxy Flooring

Floor Prep Tools	Mixing Tools	Installation Tools and Supplies
7"and 4" Grinders and Cup Wheels	Variable Speed Drill with 1/2" or 3/8" Chuck	18" Roller Cages
Vacuums and Hoses	Mixing Blades	9" Roller Cages
Crack Chaser and Wheels	Timer for Measuring Mix Times	9", 18", or 24" Squeegees
	5 Gallon Pails	Handles for squeegees and Rollers
	Screwdriver/ Utility Knives for Opening Plastic Buckets and Sand Bags	Various Trowels
	Plastic Measuring Containers (1 quart, 2 1/2 quart, 5 quart)	Extension Cords
	Heavy Duty Plastic Tarp or Cardboard for Mixing Station	Blower
	Concrete mixers	Gauge Rake
		Infrared Thermometer
		Spiked Roller
		Spiked Shoes
		18" Roller Covers (1/4" or 3/8" Nap)
		9" Roller Covers (1/4" or 3/8" Nap)
		2 1/2" Chip Brushes
		Wood Paint Sticks
		Duct Tape
		Blue Tape
		Caution Tape
		Rubber Gloves
		Rags
		Garbage Bags
		Xylene, IPA, or Denatured Alcohol
		Thickening Agent (Cab-O-Sil, Thick-Sil, etc.)
		Putty Knives
		Dust Masks
		Ear Protection
		Safety Glasses
		Knee Pads

8. Epoxy floor systems create awesome, finishes that look great.
9. Epoxy floor systems can last nearly half a lifetime if installed correctly

From the literature reviewed, the properties and advantages of epoxy flooring discussed above definitely make resin a compelling and desirable experimental material for repairing the potholes at the Gate of Unicross. Whereas epoxy is the resin usually used in flooring, in this study, general purpose resin will be used, in the place of epoxy. General purpose resin is selected because it is more readily available in Nigeria. What makes it compelling to use resin flooring is that, while the concrete previously used in patching the potholes are porous, absorbing water and flaking-off of the loamy clay soil, the resinous material is both waterproof and durable, and may better withstand the rains. For the same reason, resinous flooring materials are definitely also better than loose concrete rubbles previously used in filling the potholes. Also the equipment needed and processes of installing resin flooring are cheaper and less cumbersome. Ultimately, for these reasons, the exploration of resin flooring to repair the potholes in the asphalted road in this study is justified.

Method

The Main Gate of the Campus has entry and exit sides. While the potholes on the asphaltic road on the entry

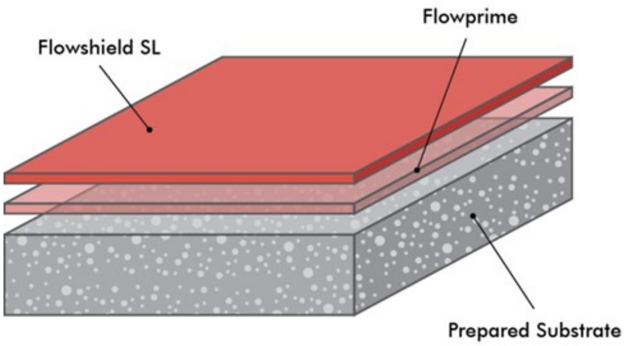

Fig. 12: Indoor epoxy flooring basically requires a substrate, primer coat, and final coat. Source: https://www.sydneyepoxyfloors.com.au/garage_epoxy_flooring

Fig. 13: Details showing the road being cut in straight lines.

Fig. 14: The cut pothole being excavated..

Fig. 15: The finished excavation.

Fig. 16: The groove made under the asphalt.

Fig. 17: Stone base was put, wetted and compacted.

side has been repaired with asphalt, the potholed section of the exit side was still there. Therefore, using the methods of Right of Way (ROW) roadwork, the exit gate was closed during all phases of the study. Users had to enter and exit through the entrance gate only. The areas around the pothole in the road were carefully cut (Figs. 13 and 14), and the rubbles were excavated to 4 inches depth (Fig. 15). Also, a groove of about 3cm depth was made under the cut edge of the asphalt (Fig. 16). This groove was to ensure that resinous aggregate is pushed under, to increase strength and ensure bonding between the asphalt and the patch.

The cut and excavated section of the asphalted road was a total of $10m^2$ in an irregular shape. The excavated shape was then marked into 5 sections for use in achieving the experimental objectives of the study (see Fig. 18). Thereafter, raw resin mixed with black oxide was then applied to the whole of the cut edges of the asphalt to prime it. This priming of the asphaltic edges was to enable the seam between the asphalted road and the resinous patch to be sealed and watertight.

Stone base was spread inside the excavation and compacted to 3 inches deep (Fig. 17). The cement mixer was used to mix the stone base, black oxide and resin into a base aggregate of thick consistency. In the course of the study, it was discovered that the mixing of resin and stone base resulted in a near black substance that did not require black oxide to make it dark. According to the research objectives, the researchers applied 5 different aggregate mixes to each of the five sections of the excavated road, as follows:

Section 1: a mixture of 1:4 by volume of resin and stone base was thoroughly mixed in the concrete mixer, and laid. There was no need to colour the mixture by adding black oxide, because the natural colour that resulted from the mix was as dark as asphaltic concrete.

Section 2: a mixture of 1:6 by volume of resin and stone base was thoroughly mixed in the concrete mixer, and laid. There also was no need to colour the mixture by adding black oxide, because the natural colour that resulted from the mix was as dark as asphaltic concrete.

Section 3: a mixture of 1:3:3 by volume of resin, sharp sand and stone base was thoroughly mixed in the concrete mixer, and laid. The lighter colour of the sharp sand interfered and gave the mixture a lighter grey. Therefore, the authors added half a kilogram of black oxide in the mix, to compensate for the colour of the sharp sand.

Section 4: a mixture of 1:2:4 by volume of resin, sharp sand and stone base was thoroughly mixed in the concrete mixer, and laid. The lighter colour of the sharp sand interfered and gave the mixture a lighter grey. Therefore, the authors added half a kilogram of black oxide in the mix, to compensate for the colour of the sharp sand.

Since the hardening of general purpose resin requires both the catalyst and accelerator chemicals to activate, the researchers premixed the accelerator in the mixed batches in the concrete mixer. This was done to ensure that the whole batch does not set while work was going on. According to *Nivitex Fiberglass and Resins* (2024), a minimum of 1% and a maximum of 3% cata-

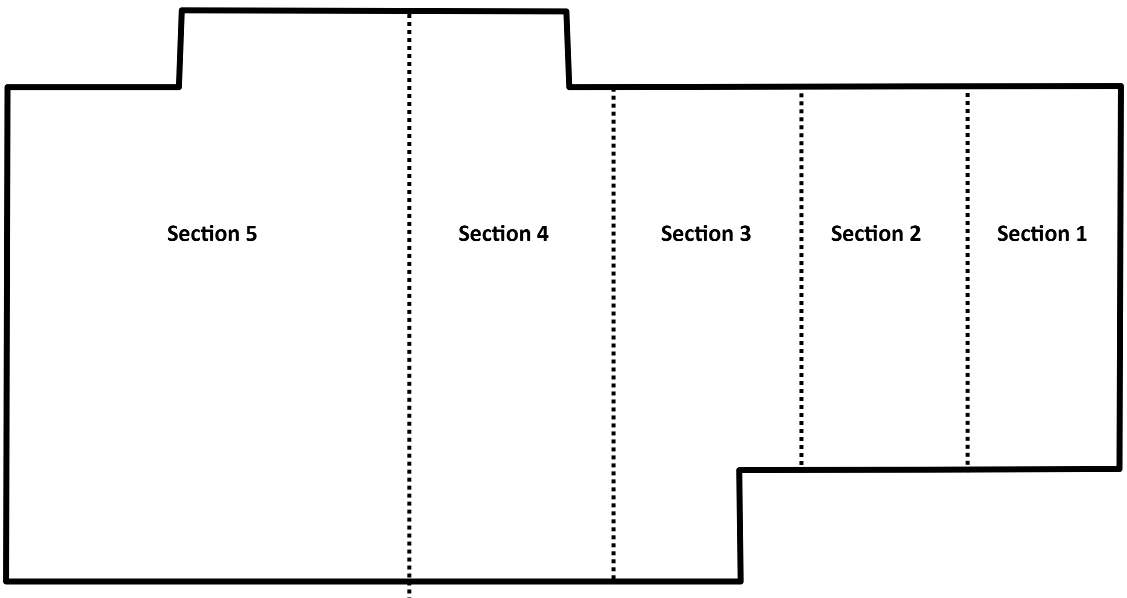

Fig. 18: Showing the location of each of the the 5 sections of the excavation, where patches were laid.

lyst is needed for a proper mix in resin. Thereafter, each batch of resinous aggregate mixed in the cement mixer was also mixed in smaller sub-batches of 20 litres, with the requisite amount of catalyst (MEKP; Methyl Ethyl Ketone Peroxide) added. For this study, 3% catalyst by volume was used in all the batches and sub-batches. The researchers attempted to use a paddle mixer to mix the sub-batches of the aggregates, but the consistency was too thick for the drilling machine. Thereafter, shovels were used to thoroughly mix the accelerator into the sub-batches (as would concrete), before application (Fig. 19). Since the mixture was to harden in a chemical rather than a physical process, pressure from the slaps of hand trowels was the only compaction given to the resin-bonded aggregate patches in all the sections of the excavated road. Care was taken to push resinous aggregate inside the grooves, under the edges of the cut asphalt. The batching, sub-batching, mixing, pouring and levelling process was repeated, until sections 1-4 of the excavated pothole were filled. After one hour of completion, a slurry of ratio 1:20 of black oxide and resin was mixed and applied to seal to surface of the 4 sections of the resin-bonded aggregate patch.

***Cleaning the Cement Mixer**:* After batching and laying the resin-bonded aggregate mixes in their respective sections of the excavated pothole, it was important to clean the cement mixer, before mixing the concrete component. There was some resinous aggregates stuck on the inside of the mixer, which needed to be removed. The authors washed the inside of the mixer sparkling-clean by putting 20litres of water, 1kg of detergent and half a wheelbarrow of chippings into the mixer and running it for about 20 minutes, emptied and rinsed with clean water. After rinsing with clean water, the authors found that the inside of the mixer was completely rid of both the remnant resinous aggregates, and older stains of concrete.

Section 5: After cleaning, concrete was mixed in the ratio of 1:2:4 in the concrete mixer, and poured in the remaining space in the excavation to level with the sections 1-4, and then left to set for 5 days. The aim of pouring this concrete section was to test the research objective number four, which was "To find out the suitability of resin-bonded aggregate for surface-sealing of concrete patches on asphaltic pavements". On the 6th day, a slurry of ratio 1:20 of black oxide and resin was mixed and applied to seal to surface of the concrete, and then left to set.

Results

After the resin-aggregate sealing of the concrete section was hardened, the school gate was opened and the road was able to be used by commuters and pedestrians. Results indicate that the resin aggregate patch was successfully laid and well levelled with the asphalted road. The patch was strong and enabled vehicular and human traffic to move easily. Also, the seam between the asphalt and the resinous patch was neat, clean and water tight. However, the researchers observed a 1mm clearance at the line of seam, occasioned by shrinkage, as the resin aggregates in sections 3 and 4 hardened. The seam in sections 1 and 2 did not show this shrinkage clearance, because they had more resin in the mix. To compensate for this 1mm shrinkage, the authors suggest that the laying of the resin-bonded aggregate can be compressed with a plate compactor machine. However, a slurry of 1:20 of black oxide and resin was applied to seal the shrinkage gaps.

Fig. 19: The laid part and the mixture being done with shovels.

In terms of the visuality of the resin-bonded aggregate mixture and patch, the texture and colour of both the mixture and the patch looked very much like asphalt (Fig. 20). In fact, passers-by thought it was asphalt that the researchers were using, because it looked exactly asphaltic.

Conclusion

From the results of the study, there are no doubts that the experimentation with resin flooring to repair the potholed asphalted paving has been successful. The unsightly pothole in the asphalted paving at the Calabar Campus Gate, University of Cross River State is now fixed and provides functionality and aesthetic appeal to the exit side of the gate. Owing to this success, it is clear that resin flooring is a viable method of fixing potholes in asphalted pavements. However, it is particularly suited to road work needing small batching, which will be too expensive to use asphaltic equipment and processes. While the qualitative results of the research is reported in this study, the researchers will continue to the quantitative stage of the research, to core and test the strength of the aggregates, and evaluate the installation over time. Also, the researchers intend to do a follow-up study to compress the resin-bonded aggregates to find out if compression will improve its functionality for potholes repair in asphaltic pavements.

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