BRITPAVE NEWS

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Front cover image: Manchester Airport expansion, see page 13

CHAIRMAN'S WELCOME

Welcome to the Spring 2023 issue of Britpave News.

We - who are 'in-the-know' - recognise and understand that cementitious and concrete solutions can offer unbeatable whole life cost and reduced CO2 infrastructure solutions that have long-term performance requiring minimum maintenance. Unfortunately, there are those who are not so well-informed.

National Highways replacement of concrete road surfaces with asphalt as part of its concrete roads programme is questionable. Why replace a road surface that offers over 40 years long-term performance with minimum maintenance for one that needs resurfacing at least twice within the same time? Why fail to recognise the benefits of concrete eRoads that would provide a road infrastructure fully able to realise the benefits of electric vehicles without the worry of a flat battery, plus the additional benefits of reduced fuel consumption, useful albedo effect and climate change resilience.

Similarly, there are some who question the use of soil stabilisation despite it being a well-proven and effective technique to recycle and strengthen poor soils without the environmental and financial costs associated with dig-and-dump.

Ongoing significant programmes and investment in new net-zero products and more efficient designs further underline the benefits of cementitious and concrete solutions

Britpave aims to forward these benefits by promoting dialogue with infrastructure clients, dissemination of concrete benefits and best practice via publications, guides and seminars as well as funding specific research projects. By undertaking such a programme of initiatives, we hope that others will also become 'in-the-know' and so be able to make an informed choice for better infrastructure solutions.

Joe Quirke
Britpave Chairman and Engineering Manager, VolkerFitzpatrick

Britpave, the British In-situ Cementitious Paving Association, promotes the better and greater use of concrete and insitu cementitious infrastructure solutions. Its members include major contractors, specialist equipment and material suppliers, consulting engineers and interested trade associations. Together, they provide a single voice for the insitu concrete paving industry.

Britpave News is published regularly by Britpave with the aim of keeping members up to date on Association matters, industry developments and member company news and views. Please help keep us in the picture on all of this by sending us any relevant information that you feel may be of interest to the membership.

BRITPAVE OPINION: ADDRESSING A11 MISCONCEPTIONS

The misconceptions and false assertions in a recent article in New Civil Engineer 'Future of Roads: A11 sets the standard for concrete roads', (27th March 2023) needs addressing and correcting.

Concrete roads, when properly maintained, have been proven to provide better performance in carrying heavy traffic than asphalt ones. They have a track record of carrying more traffic than they were originally designed for and study after study has proven that the whole life cost benefit of concrete can offer savings of up to 30% when compared to asphalt.

The suggestion in the title that the solution is to replace the concrete roads is beyond foolish. Had the A11 been asphalt it would have failed many years ago and it is testament to concrete performance that it has lasted this long despite any effective maintenance. The "constant maintenance" referred to in the article has been nothing more than sticking elastoplastic into the cracks, without seriously investing in full proper repairs.

CRCP has been used for years across the UK, Europe, and the USA and in some regions, it is mandated when traffic loads are high. It doesn't rut and is designed for 40 year and beyond.

Why this section failed prematurely is not known but it is certainly not representative of CRCP pavements across the world and the idea that it should be discounted because "the material has since proved a real pain for anyone charged with digging it up" is beyond belief.

CRCP with low noise surfaces, "whisper concrete" developed and laid by UK contractors 25 years ago are still in service today. New generation concrete surfaces (NGCS) which is quieter than asphalt are currently being laid in Europe and the US.

The comment regarding the new "surface layer" of asphalt is mis-leading. The asphalt layer is 350mm thick and based on 8km by 4 lanes wide would require around 90,000t of primary quarried high-quality aggregate. A solution, where the concrete was recycled back into concrete and re-laid to give the long-lasting performance that concrete is renowned for was surely what was required here.

This asphalt pavement does not have a "40-year lifespan". The asphalt will require re-surfacing around year 12 as well as year 30 with major maintenance around year 20. A concrete surface would not require anything other than joint sealing and occasionally localised reconstruction – not a surface patch.

Cement production is carbon hungry. However, great strides have been made to lower the carbon demand. Alternative fuels, carbon capture and the use of alternative binders are lowering the CO2e in concrete to parity with asphalt. When this is compared with the thinner, longer lasting, and lower maintenance concrete pavement then carbon over the whole life of the pavement is lower than the asphalt one.

Additionally concrete pavements, by providing a stiffer surface, have been proven to reduce fuel consumption by up to 6% as well as providing superior albedo values than asphalt.

Concrete pavements have been used to hold charging loops and charge EVs as they travel- solving the "range anxiety" over EVs.

A recycled concrete pavement would have been a lower cost, lower carbon, and longer lasting option. A trick has been missed and a lot of money has been wasted by not understanding the history of concrete performance and the long-term benefits.

If the A11 is the future standard setting performance that we can expect, then we are in deep trouble.

To view the NCE article visit: **http://bit.ly/3lUA5Os**

NEW LEGACY CONCRETE PAVEMENT MODEL

Britpave member AECOM has developed the National Highways' legacy concrete pavements (LCP) deterioration model. It moves away from the design-based approach and concept of residual life to a novel data-driven and performance-based model. The model has been developed to assist National Highways in managing their assets more effectively.

Built between 1950 and 1985, National Highways' LCP are defined as concrete pavements with either an exposed concrete surface or with a thin asphalt overlay of up to 50 mm thick. Whilst comprising only a small percentage of the Strategic Road Network (SRN), legacy concrete roads are key connections to some of the major ports in the UK.

These roads typically are at or beyond their design life. As design-based approaches fail to determine the actual pavement needs, the LCP assets continue to deteriorate, and the amount of unplanned maintenance interventions increases.

The AECOM team – led by Jessica Tuck, Andy Nelson, and Dr Federico Perrotta – understood that what was required was an innovative, consistent, and technically robust approach to define priorities and determine associated needs that supported the preservation and retirement of these key assets.

A series of collaborative workshops was organised to bring together some of the world experts in the field, including members of National Highways' Safety Engineering and Standards (SES) team and Concrete Roads Centre of Excellence, to help the team identify the most pressing challenges and potential solutions.

Moving away from the concept of residual life and combining advanced data mining techniques, statistics and interactive dashboards, a series of data-driven and performance-based deterioration curves, to predict the behaviour of National Highways concrete pavements, was developed. The model uses asset information and condition data from National Highways Pavement Management System, annual traffic data from DfT and defect counts. These represent actual data commonly used to inform pavement management and maintenance assessment procedures.

The data-led performance-based approach defines current state and deterioration rates for concrete pavements based on condition. The model enables simulation of different asset management and intervention strategies and allows evaluation of multiple options for more informed evidence-based decisions.

In line with the Design Manual for Road and Bridges (DMRB) CS 230 "Pavement maintenance assessment procedure", four condition categories were established based on data distributions, precedence and validated against 4K video footage. This enables definition of the present and future status of the whole network and allows scheme prioritisation.

An interactive web-based application was developed to collate all the information available and visualise the model outputs in the form of user-friendly maps and graphics, to make presentation of the project outcomes and future decision making intuitive.

Fully transferrable and scalable, the newly developed model represents an innovative and powerful tool to enable National Highways better understand current conditions, simulate multiple intervention scenarios and determine an optimum asset management strategy.

Bachar Hakim, Asset Management Director, AECOM, said:

"The developed data-driven pavement deterioration model will help National Highways to better predict pavement performance, plan future maintenance, optimise whole life cost and inform asset management."

Lila Tachtsi, Director of Asset Management, National Highways, said:

"This project represents a step forward for the whole industry. A successful story made of innovative thinking and collaboration between people from different backgrounds and expertise, which puts National Highways into a leading role to promote innovation and best practice in the sector, at an international scale."

For more information about AECOM's whole life costing and pavement deterioration modelling capabilities, contact Jessica Tuck: **jessica.tuck@aecom.com** or Dr Federico Perrotta: f**ederico.perrotta@aecom.com**

More information about AECOM Pavement and Asset Management team capabilities can be found at: **http://www.aecom.com/uk/pavement-design-publications/**

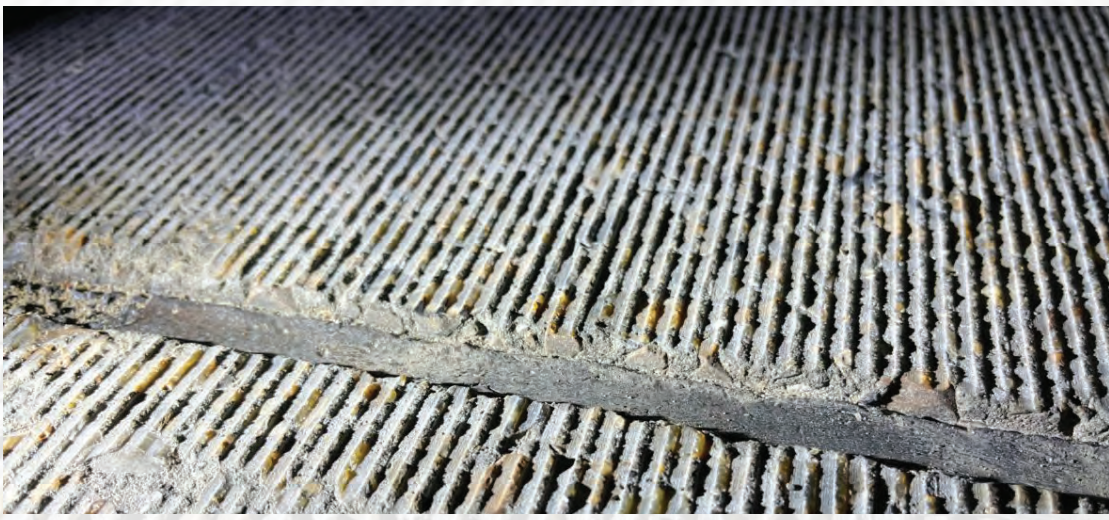
M20 GRINDING SUCCESS

Britpave member Roadgrip has recently completed a concrete pavement rejuvenation project on the M20 using longitudinal grinding. The results are impressive.

On behalf of Tarmac, on the M20 between junctions 8 – 9, Roadgrip carried out longitudinal grinding of 55,000 sqm. Initial onsite testing reported restored ride quality and texture with a 30% increase in friction that is predicted to last for many years. Tests on noise reduction are to be carried out. The expectation is for a significant reduction in traffic noise.

Longitudinal diamond grinding (LDG) involves plant equipped with closely-spaced diamond-tipped saw blades that cut water dispersal and traction grooves into the tired road surface. With grinding, 3mm to 4mm of the concrete pavement is removed to leave a level, high performance riding surface. The closely spaced grooves left after grinding provide a renewed and flatter road surface with a high level of texture and friction.

Roadgrip has been developing the use of longitudinal diamond grinding (LDG) as a cost efficient and sustainable way to extend the performance and longevity of concrete roads. Successfully used for many years in the United States, the process restores and rejuvenates the surface performance of structurally sound concrete roads. In addition to cost savings, the process is fast and is environmentally friendly as it has a lower carbon footprint than laying new asphalt overlay. It also provides a road surface that is noticeably quieter than untreated concrete as traffic driving over a textured surface emits less noise than when driving over a smooth surface.



Roadgrip reports that the cost for LDG is similar to a thin overlay but there are no additional costs for joint treatment or raising of road barriers and ironwork. This offers considerable cost savings. Environmentally, it has far less impact than asphalt resurfacing. It does not use virgin aggregates or require important of materials. The water use in the process can be recycled on the grinding plant to reduce water consumption. Furthermore, as LDG removes on 3-4 mm of the original concrete road surface the process can be repeated several times. Assuming that the road is structurally sound LDG can effectively extend the life of the surface by 50 years.

LDG is a well-proven technique that answers two major considerations: cost efficiency and sustainability. It should play a major role as part of the National Highways Concrete Roads Programme to revitalise concrete highways.

For more information on Roadgrip, visit:
www.roadgrip.co.uk

ON THE ROAD TO ZERO CARBON

Britpave member Tarmac is working with Skanska UK, National Highways and Balsalt Technologies and the National Composites Centre to develop a low carbon reinforcement solution for concrete pavements.

Results from the first trial conducted on the M62 junction 2 show a reduction of more than 50 per cent in carbon and a resilience comparable to conventional reinforced concrete using steel. The trial has proven to be such a success that Skanska is now working collaboratively with National Highways and High Speed 2 Ltd (HS2) on the next phase. The plan is to trial the low carbon combination on a permanent road and capture all the data and analysis for future publication. The ultimate aim is to roll out the low carbon solution across the UK's strategic road network.

Tarmac provided two types of concrete for the trial: a mix comprising conventional blended cementitious material and a low carbon alternative mix incorporating an Alkali Activated Cementitious Material (AACM) in place of the cement. This low carbon concrete solution was mixed at a conventional concrete plant located close to the project and installed in exactly the same way as traditional materials. This new sustainable product delivers a carbon footprint up to 80 per cent lower than a standard CEM I concrete.

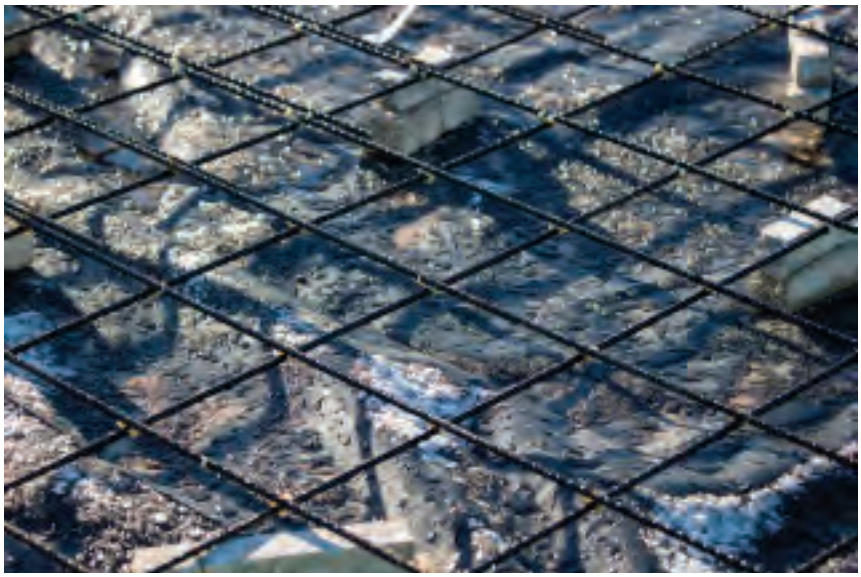
The reinforcement steel replacement was a basalt fibre reinforced polymer rebar. This is five times lighter and twice as strong as its steel counterpart, and is naturally resistant to corrosion, alkalis and acids. The main components of Bastech® rebar is basalt fibre which is manufactured directly from the most common rock on the earth's surface, basalt, in a single-melt process, and comprises only a single raw material. On average, it has 60 per cent less CO2 emission than steel and is a cost-effective substitute.

The trial involved the construction of four concrete slabs at the M42 junction 6 highways improvement scheme. The slabs were laid in December 2021, consisting of:

- Slab A – conventional concrete + steel reinforcement
- Slab B – low carbon concrete + steel reinforcement
- Slab C – conventional concrete + basalt reinforcement
- Slab D – low carbon concrete + basalt reinforcement

The road was heavily used by construction vehicles throughout the trial period, with in-situ and laboratory tests carried out over a number of months. Full scale specialist lab tests involved bending and shear testing of the four types of slabs. The National Composites Centre calculated the carbon throughout the lifecycle of the structural element and carried out an environmental performance assessment.

The results have provided knowledge of the curing process, ease of construction, safety benefits, functional properties and structural behaviour of the various concrete and reinforcement combinations. This has given insight into the future use of longer lasting materials in construction.



Skanska's highways director, Glennan Blackmore, said: "The results of the trial are extremely encouraging. By working together, we have been able to speed up the process of testing and analysing a new solution for de-carbonising our road network, with the aim of getting it to market so the whole industry can benefit."

Adam Gallis, National Highways project manager, said: "At National Highways, we were delighted to use our Innovation and Modernisation Designated Fund Pot to help make this trial a reality. In utilising this funding, we can go above and beyond what we would typically deliver on our schemes. In this instance, working alongside the supply chain, we have made great strides in the development of a low carbon reinforced concrete alternative."

ZERO-CARBON CEMENT PRODUCTION TRIALLED

Three Britpave members are part of Cement 2 Zero (C2Z), a UK-based demonstrator project trialling zero-emission cement on an industrial scale. The project is backed by £6.5m of UK Research & Innovation government funding as part of the Transforming Foundation Industries Challenge. The project aims to demonstrate that concrete can be recycled to create a slag forming addition that could, when cooled rapidly, replace Portland cement.

The two-year industrial trial will test each stage of the production process, bringing together the Materials Processing Institute, the University of Cambridge and industry partners – Britpave members Atkins, Balfour Beatty and Tarmac together with Celsa and Day Aggregates. Eventually the zero carbon cement – known as Cambridge Electric Cement – will be used in a real UK construction project.

The first phase of trial melts has been carried out by the Materials Processing Institute in Middlesbrough, initially in a 250kg induction furnace, before being scaled up to six tonnes in an electric arc furnace (EAF). Once the process has been trialled and refined, industrial scale melts will follow in Celsa Steel's EAF in Cardiff.

The development of Cambridge Electric Cement came from three researchers at the University of Cambridge – Cyrille Dunant, Julian Allwood and Philippa Horton – inventing a process that converts construction and demolition waste to cement over molten steel, using an electric arc furnace (EAF), which is used to recycle scrap steel.

Trial melts in an electric arc furnace

Dr Dunant discovered that the chemical composition of used cement is virtually identical to that of the lime-flux used in the conventional EAF steel recycling process. Traditional Portland clinker, one of the main ingredients in cement, is produced by firing limestone and other minerals in a kiln at extremely high temperatures (1,450 degrees Celsius), a process that accounts for more than 50% of the cement sectors' emissions.

By contrast, Cement 2 Zero will use recycled cement as the flux in the electric steel recycling process (EAF powered by renewables), the by-product of which, when cooled and ground, produces Portland cement clinker, which is then blended to make 'zero-emissions' cement. Therefore, it is suggested, this cement product (CEC) could be made in a virtuous recycling loop that not only eliminates the significant emissions of cement and steel production but also saves raw materials.

Julian Allwood explained: "By combining steel and cement recycling in a single process powered by renewable electricity, we could supplement the global supply of the basic construction materials to support the infrastructure of a zero emissions world and to enable economic development where it is most needed."

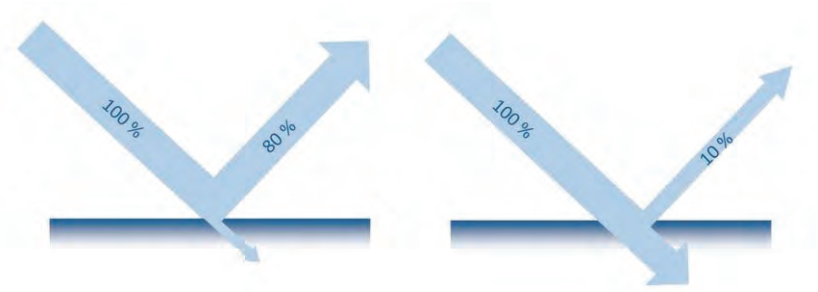
Chris McDonald, chief executive of the Materials Processing Institute, said: "Cement 2 Zero has the potential to make a significant contribution to achieving a zero-carbon society, secure and increase jobs in the UK cement and steel sectors and challenge conventional production processes, creating high-value materials from demolition waste."

Philippa Horton of the University of Cambridge, who created the project consortium, said: "If Cambridge Electric Cement lives up to the promise it has shown in early laboratory trials, when combined with other innovative technologies, it could be a pivotal point in the journey to a zero-emissions society. The Cement 2 Zero project is an invaluable opportunity to collaborate across the entire construction supply chain, to expand CEC from the laboratory to its first commercial application."

THE ALBEDO POTENTIAL OF CONCRETE ROADS

Road designers should take full account of the albedo effect if they want to improve the performance of roads and reduce their associated CO_2 impact.

The albedo effect is the ability of a surface to reflect solar rays. The effect can reduce both immediate and adjacent ambient temperatures. For road pavements this is important. Reflecting solar rays and reducing heat absorption can reduce the immediate temperature of the road thereby reducing the potential for surface material to melt and rut whilst also reducing the adjacent ambient temperature and so mitigate the impact of urban heat islands.



HIGH ALBEDO (REFLECTS) LOW ALBEDO (ABSORBS)

Albedo is measured as a fraction of solar radiation reflected from a material's surface. It is measured with a solar spectrum reflectometer on a scale of 0 (not reflective) to 1: (100 percent reflective). The higher the fraction, the higher the reflectivity. The higher the reflectivity the lower the absorption of solar heat. Concrete has an albedo of 0.4 while asphalt has an albedo of just 0.1. The Portland Cement Association reports that the incorporation of slag or white cement can give a concrete pavement an albedo reading as high as 0.70.

The potential of concrete's heightened albedo effect is attracting increased attention due the need to reduce global warming, improve long-term road performance, and lessen the need for – and therefore the CO_2 energy impacts – of street lightening.

By reflecting more of the sun's energy the amount of solar radiation absorbed by the earth's surface is reduced. Research has found that an increase in pavement albedo of 0.15 (from 0.10 to 0.25 for example) is equivalent to eliminating 38kg of CO_2 per square metre. If implemented for pavements in the 100 largest cities on earth, the equivalent CO2 offset would be over 20 gigatons[1]. Research carried out in Spain suggested that the albedo impact of all Spanish concrete motorways and major roads could provide an annual equivalent CO_2 reduction of up to 27 million tons[2].

Locally too, the albedo effect can reduce temperatures. The temperature of urban heat islands, typically metropolitan areas, can be significantly higher than the surrounding suburban and rural areas. The MIT Concrete Sustainability Hub found that if Houston increased the albedo of its pavements by 0.20, maximum summer air temperatures would decrease by 2.7 degrees Fahrenheit (1.5 degrees Celsius). While this may not sound significant, climate simulation studies suggest that the lowered air temperatures would result in 59 percent fewer heat waves affecting the city.

Furthermore, if the increase of 0.2 was replicated throughout the United States it could provide global warming impact savings equivalent to taking 3.75 million cars of the road for one year due to the lowered atmospheric temperature. This one-time benefit would remain as long as the increased albedo is maintained[3].

The superior reflectivity of concrete makes it possible to achieve savings in the costs of lighting motorways and roads. Designers of road lighting make their calculations based on 'luminance', which is the reflected light in the direction of the observer. Savings can be achieved by placing fewer lighting columns or by using lamps of a lower luminance. In both cases costs can be reduced, primarily by being able to cut back on the number of lighting columns required and secondly in annual electricity consumption.

Studies in the United States have shown that concrete pavements reduce the required lights per unit length of roadway. Cost savings in initial energy consumption and ongoing maintenance of light poles is reduced by 31% and operational energy costs to light a concrete road were 33% less compared with dark asphalt. Compared with concrete, an asphalt roadway will require 24% more light poles, an increase in project costs of $30,000 with an annual energy consumption of these extra light poles equates to an additional cost of $1100 per mile of

roadway[4]. The higher reflectivity of concrete pavements reduces the initial capital costs of lighting provision on its ongoing maintenance and energy consumption costs.

The considerable benefits in concrete pavements high albedo reflectivity should have greater appreciation and consideration. These benefits are built-in and free at the point of delivery. Realising albedo potential should have a higher priority with road clients and designers.

1. Akbari, H, et al; Global cooling: increasing world-wide urban albedos to offset CO_2; 2008
2. Sanjuan, M.A, et al; Effect of precast concrete pavement albedo on the climate change mitigation in Spain, 2021.
3. Azarijafari, H et al; Extreme heat kills inequitably: Reflective pavements can help, but city action is required; The Hill; August 2022
4. Ashley, E; Environmental and cost benefits of high albedo concrete; Concrete in Focus, October 2008.

ELECTRIC CAR BUYERS NEED CONCRETE CONFIDENCE

Industry surveys are showing that the enthusiasm for buying electric cars could be waning as potential buyers are concerned about an inadequate charging network. This could have a detrimental impact on the Government's green ambitions. Provision of concrete eRoads that wirelessly charge vehicles as they travel could provide buyers with the confidence to choose electric.

The AA has reported that the proportion of would-be car buyers considering an electric model has gone down from 25% to 18%. This echoes research from the Society of Motor Manufacturers and Traders (SMMT) shows that sales of electric models in January 2023 was just 13% compared with 17% in 2022.

Range anxiety resulted from the lack of readily available charing points is cited as being behind the waning enthusiasm for electric cars. The Department for Transport has called for 300,000 operational public chargers by 2030 when the ban on new petrol and diesel cars comes into force. Currently, there are only 37,000.

"Ongoing reports about the lack of public chargers and the resultant 'range anxiety' over the electric vehicles' battery life means that if government green targets are to be met then a different approach should be considered," said Joe Quirke, Chairman of Britpave. "That approach should be concrete eRoads that charge electric vehicles as they pass over them."

Concrete eRoads allow vehicle batteries to be charged inductively via wireless systems using magnetic coils installed in the road surface that feed an electric charge to magnetic coils fitted on a vehicle's undercarriage and so charge the battery. Other options being developed include mixing graphene or magnetic ferrite particles into concrete to make the road surface itself conductive.

The potential of concrete eRoads is being increasingly recognised. In France, a wireless electric vehicle charging system, developed by Qualcomm Technologies, has been installed in a 100m test track at Versailles, Paris. The system successfully charged two Renault Kangoos EV with 20Kw at speeds of over 62mph.

Australian-based Talga Resources is mixing graphene into concrete to make it conductive and so charge an EV whilst it is driving. Whilst in Germany, Magment – magnetizable concrete materials – are being developed by using magnetic ferrite particles as aggregates. Magment concrete consists of 87 per cent magnetisable aggregates which is waste product from the manufacture of ceramic ferrites and the recycling of electronic scrap. It allows energy to flow into a coil to inductivity charge vehicles as they pass. In the USA, the potential of Magment to provide affordable and efficient inductive charging is being examined by Indiana's Department of Transport in collaboration with Purdue University.

Road surface durability and minimum maintenance are important for the successful operation of inductive charging. This is especially so as the vehicles, particular heavy goods vehicles, will be travelling on the same path in order to charge. The road surface must, therefore, not prematurely deflect or rut. Concrete roads have a performance life of 50-60 years and are so fully able to provide the required long-term performance and durability. If buyers are to have the confidence to buy electric cars and so forward the government's green transportation ambitions then they must have confidence in the charging infrastructure. Concrete eRoads would provide concrete confidence."

UK UNPREPARED FOR CLIMATE CHANGE IMPACTS

The UK is 'strikingly unprepared' for climate change, according to a new report from the Climate Change Committee (CCC).

In its report 'Progress in Adapting to Climate Change' the CCC says the UK's first 40C day, in summer 2022, was the clearest indication that climate change has arrived in this country. Last year's record breaking temperatures and storms resulted in significant infrastructure disruption.

The CCC report describes a 'lost decade' in preparing and adapting for climate change – adding that the impacts of climate change will intensify over coming decades, leaving the UK vulnerable without better resilience planning and preparation.

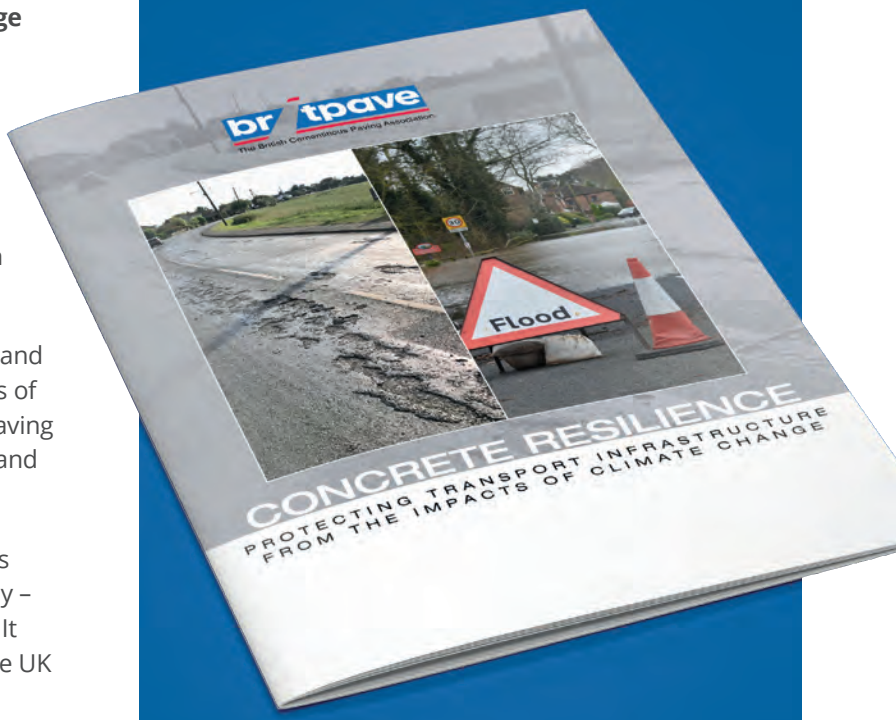
The report publishes a new appraisal of the outcomes needed to build climate resilience across the economy – and the extent of policies and delivery to meet them. It outlines a striking lack of climate preparation from the UK government. In particular:

- **Policies and plans.** Despite some evidence of improved sectoral planning by Government for key climate risks, 'fully credible' planning for climate change – where nearly all required policy milestones are in place – is only found for five of the 45 adaptation outcomes examined in this report.
- **Delivery and implementation.** In none of the 45 adaptation outcomes was there sufficient evidence that reductions in climate exposure and vulnerability are happening at the rates required to manage risks appropriately. For around one-quarter of outcomes, available indicators show insufficient evidence of progress.

Baroness Brown, chair of the Adaptation Committee, said: "The government's lack of urgency on climate resilience is in sharp contrast to the recent experience of people in this country. People, nature and infrastructure face damaging impacts as climate change takes hold. These impacts will only intensify in the coming decades.

"This has been a lost decade in preparing for and adapting to the known risks that we face from climate change. Each month that passes without action locks in more damaging impacts and threatens the delivery of other key government objectives, including net zero. We have laid out a clear path for government to improve the country's climate resilience. They must step up."

To read the CCC report, visit: **http://bit.ly/3zeSt7H**



Last year, Britpave published a report, 'Concrete resilience: protecting transport infrastructure from the impacts of climate change'. It calls for transport infrastructure to have built-in resilience and be future-proofed against the impacts of climate change. It points out that concrete infrastructure does not melt or catch fire. Concrete is resilient to summer heatwave temperatures. The stiffness of concrete surfaces remains constant and will not suffer from softening or rutting. This stiffness and ability to carry traffic loads remains for the performance life of the concrete pavement. Concrete pavements and rail systems thus provide better environmental and economic solutions as they will not need maintenance or repair after heatwaves. As well as being heat resistant, concrete is also water resistant. This inherent performance benefit enables concrete roads to withstand the impacts of increased rainfall and flooding. For a free download visit: **www.britpave.org.uk/publications**

HS2 REVEALS TUNNEL DESIGN

HS2 has revealed the final designs for the North Portal of the Chiltern Tunnel – the last of seven key structures for the high speed rail project's longest tunnels.

Once construction is complete, the seven 'Key Design Elements' will be the only parts of the tunnel visible to the local community.

Alongside the North Portal, which will be near South Heath in Buckinghamshire, they include the South Portal, near the M25, and headhouses above the ventilation and emergency access shafts, which are mostly designed to resemble agricultural buildings.

The design work has been completed by HS2's main works contractor, Align JV – a team made up of Sir Robert McAlpine, Bouygues Travaux Publics, and VolkerFitzpatrick, working with its design partners Jacobs, Rendel-Ingerop and LDA Design, and its architect Grimshaw.

Construction of the twin tunnels, which will stretch for 10 miles under the Chiltern hills, recently passed the halfway point, with two giant tunnelling machines currently between Amersham and Little Missenden.

The reveal of the last of the Key Design Elements for the tunnel represent a double milestone for Align who are also responsible for the Colne Valley Viaduct, meaning that they have completed their entire Detailed Design including designs for all of the Key Design Elements.

Hidden low into the landscape between Great Missenden and South Heath in Buckinghamshire, the North Portal will only be partially visible from a footbridge over the railway to the north.

Two perforated concrete hoods will cover the track, extending the tunnel into the open air. These 'porous portals' will avoid sudden changes in air pressure – and resulting noise – caused by trains entering and exiting the tunnels.

Kay Hughes, HS2 Ltd's Design Director said: "HS2 will provide zero-carbon journeys across the UK, improving links between London, Birmingham and the North, while freeing up space for more freight and local services on the existing main line.

"The Chiltern Tunnel North Portal will be one of the least visible parts of the project, but today's reveal of the final designs is a major symbolic milestone – and I'd like to congratulate Align on getting all their Key Design Elements to this final stage of development."

Alongside the portals, there will also be a simple single-storey ancillary building to house mechanical and electrical equipment which will be clad in earth-coloured pigmented zinc. Following feedback from the community, this building has been reduced in size and will now feature a green roof to help further blend the infrastructure into the landscape.

Alan Price, Align's Technical Director said: "This is a significant achievement for both Align and our design partners in Align D, that is led by Jacobs and Ingerop-Rendel. Having the design on the shelf releases procurement and allows complete flexibility to optimise the construction programme."

THE BENEFITS OF A DIFFERENT HARDSTANDING APPROACH

Danley's Strategic Reinforcement Design provides a cost efficient and sustainable hardstanding solution for the new Siemens Mobility train manufacturing facility.

The new facility at Goole, East Riding of Yorkshire, includes a number of manufacturing and commissioning buildings plus a 4.5km rail connection to the main railway line. It will provide the manufacturing base for a fleet of new trains for Transport for London

A key feature of the £200 million facility is a 24,000sqm external concrete hardstanding for the manoeuvring and storage of train carriages during their construction. The heavy loads of the carriages called for a robust and long-lasting hardstanding solution. The client Siemens and main contractor GMI Construction also wanted a solution that offered sustainability benefits, construction efficiencies and cost savings. This called for a new approach for the hardstanding slab rather than the more typical use of steel mesh for reinforcement which can, under very high loads, make the concrete prone to cracking.

The solution was Danley's Strategic Reinforcement Design which ensures successful early-age concrete performance by eliminating restraint during the curing process. Importantly, the resultant hardstanding can withstand the high loads placed upon it whilst having the flexibility to reduce the stresses withing the concrete.

Strategic Reinforcement Design uses the tapered plate geometry of the PD3 plate dowel cradle and Danley dowels to allow bilateral free-movement at all joints within the slab as the concrete shrinks. This removes the restraint that can result in random cracking. The dowels provide maximum stability to limit joint deflection and ensure long-term performance with reduced future maintenance.

The results of using this system speak for themselves. There was increased sustainability due to 15% less concrete by volume and 90% less steel-by-weight which reduced CO_2e by 33%. Construction efficiencies meant less placement days, no mesh to carry and install and 158 fewer concrete deliveries. Cost savings of 19% were achieved.

The Siemens' project proves the moving away from traditional construction techniques and the mindset of "that's how we have done it before" can result in significant construction and long-term operational benefits.

Project team:	
Client:	Siemens Mobility
Main contractor:	GMI Construction
Slab design engineer:	Adept Consulting Engineers Ltd
Concrete Contractor:	Snowden Seamless Floors

For information on Danley, visit: **www.danley.co.uk**

Danley are offering bespoke a CPD presentation 'An alternative design solution for hardstandings'.
To register, visit: **https://danley.co.uk/book-a-cpd-presentation/**

FREEPORT MOMENTUM

The new freeports – announced by the government two years ago - are starting to attract some significant new projects and construction contracts.

Freeports offer various tax breaks aimed at encouraging firms to invest and build. Manufacturing businesses locating in freeports can import goods and raw materials free from tariffs and re-export them without paying UK duties. Firms on the freeport sites can also benefit from lower property taxes and rates – including new buildings they commission – and lower national insurance payments.

Eight locations have been designated as freeports in England. These include: Teesside; Thames freeport in Essex and sites near Liverpool; Plymouth; Hull; together with shared freeports being created at Felixstowe/ Harwich and Southampton/ Portsmouth and one has been created at East Midlands Airport in Leicestershire. In Scotland, two areas have been selected as freeport sites: Cromarty Firth near Inverness, and the Firth of Forth, near Edinburgh. In Wales freeports have been announced for Anglesey and Millford Haven-Port Talbot.

Glenigan, the construction sales leads and market analysist, points to evidence of a growing momentum behind the freeport concept.

The business case for a £50 million development of Plymouth & South Devon Freeport has been approved by the local council. Plans include a new Sherford Business Park next to the A38 aimed at attracting marine technology sector companies. Meanwhile, the freeport includes sites at Devonport's South Yard including an energy zone. Work on the port infrastructure is set to start this autumn and run for 18 months.

At the Port of Tilbury in Essex - part of the new Thames Freeport - detailed plans have been granted for a £21.9 million cement manufacturing plant for Aggregate Industries. Work on the scheme, which is at the pre-tender stage, and involves over 17,000 sq m of industrial space, is due to start this spring and run for 11 months.

In the long term some potentially huge developments are set to get underway at freeports. At the Humber Freeport, which is expected to be given the go-ahead this spring, detailed plans have been granted for the £1.74 billion ABLE logistics park. This will involve a redevelopment to create a 235-hectare business park with over 21,000 sq m of light industrial space and nearly 230,000 sq m of storage/distribution units along with offices and banks. Work is expected to stretch over 10 years.

There is no shortage of ambition at some of the freeport sites. Freeport East has plans to create a green hydrogen hub across its sites in Felixstowe and Harwich which it believes could meet a demand for 500MW of energy by 2030 - equal to 10% of the UK's target for green hydrogen production. The freeport's backers see hydrogen as part of a wider innovation cluster centred on the site which would build on the region's existing strengths in areas such as renewables, robotics, automation, artificial intelligence, and data science.

For more info see: **http://bit.ly/3JEOXYV**

AIRPORT EXPANSION BOOST

Airports across the UK are implementing expansion and renovation programmes according to construction analyst Glenigan.

Regional airports expansion plans include extensions at Southampton and London City airports, major expansion at Bristol Airport and a plan to reopen Manston Airport in Kent.

The need to update passenger terminals at UK airports is also creating new contract opportunities. At Manchester Airport, work on a £440million terminal modernisation programme is due to start later this year which will double the size of the departure lounge and create more retail space.

Meanwhile, airport maintenance and renovation work is providing a useful source of new work for civils contractors. Britpave member Lagan has started work on a contract to resurface London Stansted's 3km runway in a project set to run over five months.

Longer term, London Stansted could provide a major source of infrastructure work for the industry as and when work starts on a £480million expansion involving a terminal extension, a new arrivals building and two new taxiway links. The Planning Inspectorate has approved the plans, which involve increasing the airport's capacity to 43million passengers.

At London City Airport detailed plans have been submitted for a £31.3million extension. Tenders are being invited and work is calculated to start in autumn 2023 and run for eight months.

Meanwhile, construction work on a £500million project to reopen Manston Airport on a former RAF base near Ramsgate in Kent could start towards the end of this year. The scheme to create a dedicated air freight facility - with around 10,000 air cargo movements annually - alongside business travel and aircraft engineering facilities is being promoted by Riveroak Strategic Partners and has been deemed a Nationally Significant Infrastructure Project (NSIP). Construction work could continue well into the next decade.

At Southampton Airport, plans for a significant runway extension have been approved to accommodate larger aircraft and attract more passengers as a key step in ensuring the facility's long term viability. Tenders have recently been returned on a £50million project which involves a 164m extension to the runway and the creation of 600 extra car parking spaces.

Plans for the £22million expansion of Bristol Airport, increasing passenger numbers from 10million to 12million, were given the go-ahead by the High Court at the end of January. The scheme includes two extensions to the terminal building and a new walkway and pier. Work could start at the end of this year and run for 24 months.

There are also some potentially significant airport extensions moving slowly down the pipeline. Work on the third runway at Heathrow is unlikely to start anytime soon although a client announcement on the £14billion project is expected later this year.

Another National Significant Infrastructure Project which may start in the medium term is a £1.4billion plan for an expansion at London Luton Airport. Work could possibly start in 2025.

NEW SOIL STABILISATION RESEARCH

Britpave in collaboration with the Nottingham Trent University is to undertake important new research into the testing of leachate potential of a variety of UK soil types.

Soil stabilisation offers a sustainable and proven method to re-use otherwise unsuitable fill material or to provide enhanced soil for civil engineering applications. It does so without importation of quarried stone, deals with soil issues on-site and avoids the removal and landfill of poor materials thereby offering a sustainable and cost-efficient solution.

Despite the considerable advantages of the approach, there continues to be concerns about possible leaching of certain chemistries from lime or cement stabilisation resulting in potential pollution of water courses/ aquifiers. The potential risk is minimal, particularly if good industry practice is followed. However, the Environment Agency continues to question the potential for pollution from binder leachate has concerns with regards to high pH water levels. Current literature fails to fully address these concerns. The new Britpave and Nottingham Trent University research aims to provide the data to do so.

The investigation of three soil types is proposed. They offer different mineralogical composition and range from low to high plasticity. The soils include:

- MMG – BBV HS2 Phase 1 Area North
- London Clay – ALIGN HS2 Phase 1 C1
- Glacial Soils – EKFB HS2 Phase 1 C2-C3

Five binder types/combinations are proposed:

- Lime (QL) only – range from low (1.5%), medium (3%) and high (4.5%)
- Lime and cement – 1% QL + 2% CEMI and 1QL +4% CEMI.

Each binder combination will be prepared with one batch at the Optimum Moisture Content (OMC) and a second batch of OMC. Three specimens of each mixture type will be prepared and tested to validate results amounting to a total of 90 tank tests. Untreated soil samples will also be subjected to tank testing to establish a baseline and any changes to leachability risk as a result of soil stabilisation.

Image supplied by Cemblend Ltd

The research will assess the risks of leachate and aims to demonstrate that soil stabilisation does not pose a significant risk to groundwater.

The anticipated results should provide reference technical data and validation of the low risk to groundwater following soil stabilisation. It is anticipated that the research and testing will provide a robust body of evidence that will counter concerns about potential leachate risks and so forward the use of soil stabilisation.

BRITPAVE MEMBER SPOTLIGHT ON CEMBLEND

The Britpave membership is wide-ranging and diverse. Below is a profile spotlight on Britpave member Cemblend, a provider of cementitious powder solutions.

Cemblend began in earnest in January 2020 when Matt Cunningham and Simon Boulter spotted the opportunity to provide bespoke cementitious powder solutions across the construction industry with a particular focus on stabilisation and remediation. Initially, the focus was on bulk bags and 25kg bags to support smaller, awkward sites where traffic management and lay-down space made logistics difficult. Responding to customer demand, the business soon evolved to more bulk solutions and invested in a bulk blending facility.

Having built its first blending plant in 2021, Cemblend have recently completed a full overhaul of the plant, adding a further 500t of material storage across two new silos. Matt Cunningham, said: "When we first built the plant, we worked closely with Danfords to ensure it had the flexibility to grow as the business did. After 18 months we had a much better idea of the solutions required in the market and decided that it was the right time to further invest". Not only has the storage capacity increased but the outloading system has been significantly overhauled as well. A new weighbridge has been installed along with upgraded outloading bellows. Combined with a new automatic control system this makes the full blending, loading and weighing process a seamless operation.

"One of the biggest advantages of the upgraded plant is the efficiency it brings in terms of loading tankers as it allows us to do more loads per day" explained Simon Boulter. "We are now better positioned to meet the needs of larger projects requiring hundreds of tonnes per day of deliveries". Situated in Rugeley, the plant is well placed to provide full national coverage and deliveries are generally made using Cemblend's own dedicated tanker fleet. Cunningham added: "We've supplied material from Scotland to Cornwall. Even with 6 or 7 loads a day to the same site".

There is also less lead time for switching between blend mixes as Cemblend can now stock four raw materials instead of two. This also simplifies the process of mixing multiple products giving full flexibility to the stabilisation industry. The most popular blends so far are based on Cement, GGBS, PFA and Limestone Filler and the combinations of these differ based on the bespoke customer requirements. To help contractors create value for their clients and maximise the amount of material recycling Cemblend also provides geotechnical support services so feel free to send them a site investigation or testing requirements and see if a bespoke blend could benefit you.

CALBLEND LIME PRODUCTS

Working closely with soil treatment specialists, Cemblend offers a variety of lime-based products and advanced service solutions to address the many challenges faced on civil and construction projects.

Fine soils with a poor bearing ratio are often a major challenge for geo-engineers and designers. When CalBlend is mixed into fine soils, an unworkable site can be converted into a solid working platform. This provides a base for further construction of all types of subgrade, capping layers and subbases for highways, railways, roads, industrial areas, airports or other earthworks related to civil engineering projects.

Wet, weak, and fine-grained soil can pose a major challenge at many construction sites. A muddy site makes for difficult working conditions, such as access for site traffic vehicles. A site like this can also make it harder to achieve compaction requirements established by the project's civil or geotechnical engineer. Wet and poorly compacted soil results in poor pavement support and embankment/fill.

CalBlend immediately dries up fine clay containing soils. It also improves the working conditions during construction, thanks to the flocculation effect of lime and clay. Cemblend can also provide Geotechnical pre-studies that can optimise the reuse of soil, resulting in long-term improvements.

Adding CalBlend can result in three major soil improvements:

Soil drying	reducing the soil moisture content.
Soil modification	reducing soil plasticity, aiding compaction and increasing early strength.
Soil stabilisation	increasing long-term strength, reducing swell potential, and resistance to freeze-thaw.

From a project perspective CalBlend costs less than other soil improvement options, particularly when compared to 'remove-and-replace' when using aggregate base course and geo-synthetic materials.

CEMBLEND PARTNERSHIP WITH HOFFMANN GREEN

Hoffmann Green Cement Technologies, an industrial player committed to decarbonizing the construction sector that designs and distributes innovative clinker-free cement has signed a partnership agreement in the United Kingdom with Cemblend. Hoffmann Green will supply Cemblend with its H-IONA, H-UKR and H-EVA clinker-free decarbonated cements for distribution to its customers in the UK and Ireland. This exclusive distribution agreement is a first step towards the signature of a licensing agreement which would see Cemblend build and operate a production unit similar to Hoffmann Green's second production site (H2), and then produce and market Hoffmann cements in the UK.

Further to Cemblend signing the exclusive distribution agreement in 2022, they are working collaboratively to progress the low carbon alternatives into the stabilisation sector. Following live site trials with Eurovia in France, HGCT have further developed the H-EVA Calcined Clay solution for specific application into stabilisation through the new H-EVA SOL product. This is the most bespoke, application driven product developed by HGCT to date and is available for supply across the UK in bulk bags or bulk tankers. All HGCT products are available through Cemblend and are low carbon alternatives to cement and other traditional stabilisation powders, as demonstrated in the table below.

Innovative technologies with high performances Applying to every market of the construction sector		
	Impact CO2 9kg CO2eq / T of ciment	
Impact CO2 9kg CO2eq / T of ciment		gap vs H-UKR
H-IONA	142	-
H-UKR N or R	188	-
H-EVA	272	-
CEM III/C	233	19%
CEM III/B	310	39%
CEM III/A PM-ES	363	48%
CEM III/A	456	59%
CEM V/A	536	65%
CEM II/B-L	666	72%
CEM II/B-M	672	72%
CEM II/A-S	772	76%
CEM II/A-L	779	76%
CEM i	881	79%

Through active engagement at all stages of projects Cemblend aims to forward are providing low carbon solutions that meet the technical and strength requirements of schemes. Customers are invited to send Cemblend Site Investigation reports, materials specifications or engineering designs for their in-house technical team to review and recommend powder combinations and addition rates on a bespoke basis.

To find out more visit: **www.cemblend.co.uk**

Steel framework going up on the first building at the new Sleaford Moor Enterprise Park. Photo credit: Kurnia Aerial Photography

CONSIDERATE CONSTRUCTORS SCHEME

ENTERPRISING SMITH CONSTRUCTION

Works are well underway on the first phase of a business park which will unlock new jobs for North Kesteven. Phase one of the 37-acre Sleaford Moor Enterprise Park is expected to be completed by August.

Britpave member Smith Construction is carrying out the initial enabling groundworks for plots one and three to be built, which make up the first phase as well with the accompanying civils and spine road construction.

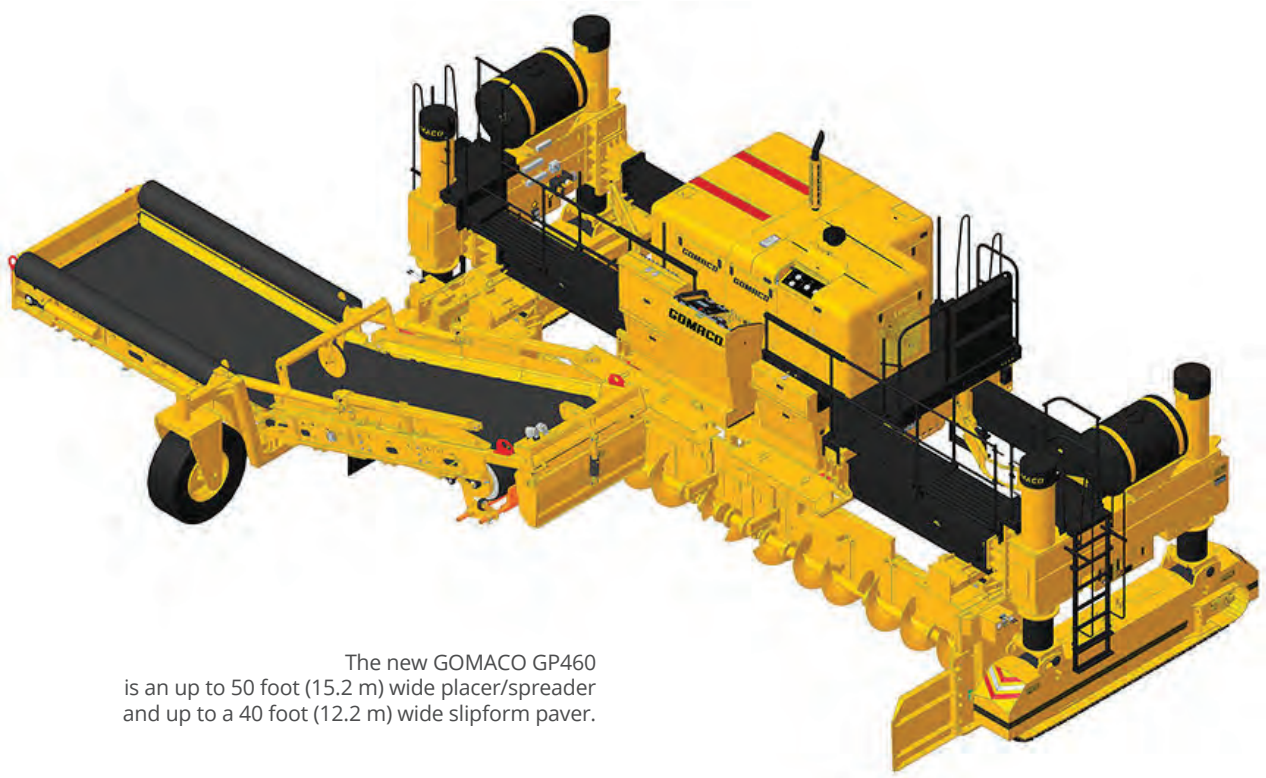
Ken Smith, Managing Director of Smith Construction, said: "Works are progressing well. We are also delighted to announce that Sleaford Moor Enterprise Park has been registered with The Considerate Constructors Scheme, demonstrating our willingness to provide standards beyond statutory requirement. It's great to be on site and doing what we do best."

GOMACO INTRODUCES THE REVOLUTIONARY GP460

Britpave member GOMACO is building on the success of the GP360, the industry's first combination concrete slipform paver and placer/ spreader on two tracks.

This year at CONEXPO-CON/AGG 2023, GOMACO introduced the GP460 for wider width operations. As a placer/spreader with a 1524 mm belt, the GP460 will accommodate widths up to 15.2 m wide. As a concrete slipform paver, the GP460 will pave widths up to 12.2 m wide.

The GOMACO GP460 is powered by a Caterpillar C7.1 turbocharged diesel engine to efficiently drive the conveyor belt and distribute concrete across the grade. The high-volume, 1524 mm conveyor belt can be mounted on either the left or right side, depending on job-site conditions and the location of the haul road. It has a discharge speed of up to 150 mpm for fast and efficient concrete placement. A controllable material deflector directs the flow of concrete at the discharge end of the conveyor for placement accuracy. A dual-drive auger system moves the material to the centre or outer areas and across the strike-off.



The new GOMACO GP460 is an up to 50 foot (15.2 m) wide placer/spreader and up to a 40 foot (12.2 m) wide slipform paver.

It's built on the framework of the GOMACO two-track GP4 slipform paver with the ability to convert the prime mover into a concrete placer/spreader. The prime mover is equipped with vibrator circuits for paving and auger drive circuits for placing. Controlling the new technology is made possible with the GOMACO-exclusive G+ digital control system. G+ seamlessly handles the controls conversion needed for each application while also bringing onboard Machine to Machine (M2M) communication, sonic sensors, 3D machine guidance, and more.

The GP460 is available with an optional sonic sensor system to monitor the concrete depth as it is placed. Information from the sonic sensors is utilized by the G+ control system on the paver using M2M communication to provide an optimum and consistent head of concrete in front of the paver.

MEMBERS' NEWS

HANSON UK ACQUIRES MICK GEORGE GROUP

Hanson UK has agreed the acquisition of the Mick George Group, subject to relevant competition authority approval.

The Mick George Group turns over £220m a year from bulk excavation and earthmoving services, demolition and waste management, as well as the supply of aggregates and concrete. The company operates four recycling facilities, eight waste transfer stations, 11 aggregates quarries and 10 ready-mixed concrete plants.

Hanson UK, part of the German cement group Heidelberg Materials, said that the acquisition would strengthen its 'circular materials offering' as well as its existing aggregates and ready-mixed concrete businesses. It said that Mick George added 'a considerable recycling platform to Hanson's portfolio'.

Hanson UK chief executive Simon Willis said: "The acquisition of the Mick George Group is a strong fit for us and another significant step towards our target to offer circular alternatives for half of our concrete products by 2030. Promoting circularity and consequently recycling, reusing, and thereby reducing the use of primary raw materials, is crucial to achieving net zero."

Founder and owner Mick George said: "I warmly welcome the 1,000 Mick George employees to Hanson and look forward to further developing the business together."

The acquisition is expected to be completed in the second quarter of 2023.

NEW ROLE FOR JASON JONES AT COSTAIN

Costain has appointed Jason Jones to the divisional leadership team, where he will work closely with the sector directors and key account directors to develop customer and industry relationships and grow new and existing business across energy, water and defence and nuclear.

With extensive experience across complex programme delivery, digital and consultancy, supplemented by insights from working globally with customers in a wide range of infrastructure sectors, Jason will be leading a function of multi-disciplinary teams across business development, bidding and marketing. Jason said he joined Costain because it has the right combination of capability and expertise to support sustainable infrastructure across the UK. He added: "I'm excited to take up a role where I get to engage with three strategic markets in which we have in-depth expertise, as well as encourage collaboration and cross-sector learning that will deliver better solutions for our customers."

BRITPAVE MEMBERS

As the focal point for in situ concrete and cementitious infrastructure solutions, Britpave offers its members a recognised industry voice, market sector development and beneficial industry networking opportunities. Britpave members include clients, consultants and engineers, contractors, material and plant suppliers and academia.

AECOM Ltd - www.aecom.com

Aggregate Industries - www.aggregate.com

Atkins Ltd - www.atkinsglobal.com

Balfour Beatty Ltd - www.balfourbeatty.com

Blue Phoenix Ltd - www.bluephoenixgroup.com

British Lime Association - www.britishlime.org

Cemblend Ltd – www.cemblend.co.uk

CEMEX UK - www.cemex.co.uk

Combined Soil Stabilisation Ltd - www.combinedssl.co.uk

Complete Design Partnership Ltd - www.cdpbroms.co.uk

Costain Ltd - www.costain.com

Danley Ltd – www.danley.co.uk

Gill Civil Engineering Ltd - www.gillgrouphouse.com

Gomaco International Ltd - www.gomaco.com

Hanson UK Ltd - www.hanson.biz

Jacobs - www.jacobs.com

Lagan Aviation and Infrastructure - www.laganaviation.com

Mick George Ltd - www.mickgeorge.co.uk

Morgan Sindall Construction and Infrastructure Ltd - www.morgansindall.com

Mott MacDonald – www.mottmac.com

Norder Design Associates Ltd - www.norder.co.uk

PJ Davidson (UK) Ltd - www.pjd.uk.net

Power Better Soil Solutions – www.powerbetter.biz

RJT Excavations Ltd - www.rjtexcavations.co.uk

Roadgrip Ltd - www.roadgrip.co.uk

SGE - www.sgeworks.co.uk

Smith Construction (Heckington) Ltd - www.smithsportscivils.co.uk

Tarmac Ltd - www.tarmac.com

Tata Steel Shapfell - www.tatasteeleurope.com

Techjoint Ltd www.techjoint.co.uk

TKL Earthworks - www.thetklgroup.co.uk

TR Stabilisation - www.trstabilisation.co.uk

VolkerFitzpatrick Ltd - www.volkerfitzpatrick.co.uk