# BRITPAVE® NEWS

britpave
The British In-situ Concrete Paving Association

20 years
1991-2011

# 20/20 Vision:

## Past, Present, and Future Transport Infrastructure


## BRITPAVE 2011 ANNUAL DINNER AND SEMINAR

*- Celebrating 20 years.* Details inside.

# WELCOME

## Contents



***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.



## Editor's Note

**For some of its senior members it will be hard to believe that Britpave was 20 years old this March. Back in 1991 the Association was largely a road-focused and contractor lead group which enjoyed considerable in-kind support for the British Cement Association (BCA). Members in the early days included many now merged or taken over companies such as Trafalgar House, Acer Consultants, Henry Boot, Maunsell and Partners, Blagg and Johnson, ARC, Blue Circle Cement, Mowlem and many others. Fast forward to 2011 and Britpave still has a corporate membership of 55 companies, ranging in size from giant international operators to family owned businesses.**

One of the unchanging characteristics of Britpave is its membership base. Members contribute over £500,000 in time towards promoting Britpave's activity areas of roads, rail, airfields, barriers and soil stabilisation. And because Britpave's members are active in each area, Britpave has a unique marketing advantage and is able to swiftly respond to client needs and opportunities.

The current climate of deficit reduction by cutting the spending of government departments and agencies is spurring members to offer innovative, minimalistic, sustainable and long lasting options to these clients. Fuel efficient concrete truck lanes topped with a thin overlay or a low noise ground and grooved concrete surface offer sustainable solutions at a time when bitumen prices are at record levels. Stabilised soils means vastly reduced lorry movements and less virgin aggregates imported. Slipformed techniques offer high outputs in airfield paving markets, whilst minimum construction concrete barrier gives protection to motorists and low cost for the client. Slab track remains a big opportunity and the issue of a suite of new publications indicates a determination to put the advantages of this replacement for ballasted track in front of decision makers.

Britpave has changed dramatically over the last two decades, and is now an independently funded organisation with clear business models for promoting the interests of its members. It will surely change over the next decade, but with vibrant membership inputs, efficient and motivated office staff, and a clear management structure, Britpave is well set up to meet and adapt to new challenges and market opportunities.

David Jones
Director of Britpave

# TRANSPORT INFRASTRUCTURE

**A good transport infrastructure that is reliable, safe and environmentally sustainable is essential for a successful economy and society. Yet, despite the widespread appreciation of this fact, the last 20 years have seen significant under-investment in our transport infrastructure and systems. This under-investment is despite the ever-growing demands that are placed upon on our transport systems. The number of motorists and passengers continue to increase. There are higher expectations of performance and reliability. There are greater demands for cost-efficiencies and sustainability. For the next 20 years it is fair to predict that these demands will continue to grow.**

Britpave, the British In-situ Concrete Paving Association, was established in 1991 to develop and forward concrete solutions that deliver a transport infrastructure that is reliable, efficient and sustainable. Over the last 20 years the organisation has some significant successes, notably the introduction of the concrete step barrier for motorway central reservations, the use of concrete guided busways, concrete truck lanes and airport pavements and a growing understanding and appreciation of the benefits of concrete for transport infrastructure.

Fast forward to 2011 and the need for increased infrastructure investment has never been more apparent. Congestion on the UK road network, both national and local, is getting worse. This has serious implications for the economy and for the environment. The financial cost of congestion is estimated to be an annual £20 billion. By 2025, this figure is set to increase to £22 billion. The poor UK transport network is recognised as being a constraint to business to both UK and international firms. This is particularly the case with our road network. A CBI survey found that 90% of respondents said that poor reliability of the road network had a negative impact on their productivity.

Our railways are overcrowded and are reaching the limits of their capacity. Passenger numbers are at record levels. Between 2008 and 2009 1.27 billion rail journeys were made and the demand for rail travel is forecast to double within the next 30 years. It is a situation made worse by Britain's ageing rail network that is based on out-dated ballast tracks. The situation is no better with our airports many of which are running close to full capacity with plans for extra runways at Heathrow, Gatwick and Stansted cancelled.

Over the last 20 years Britpave has provided a focus for concrete solutions to address these issues. It has developed best practice and technical guidance for the use of a wide range of transport infrastructure solutions. These solutions have the vision to not only provide cost efficient and high quality performance to meet current demands but are robust and resilient enough to meet those demands for next 20 years and for 20 years after that. That is real 20/20 vision.

***The financial cost of congestion is estimated to be an annual £20 billion.***

Dordtsche Kil Tunnel Portal [photo: Hullie (GNU free documentation licence)]

# ROADS

## Concrete Roads Save Fuel

**A growing amount of research is finding that, when compared to asphalt roads, driving on concrete roads delivers dramatic fuel savings particularly for heavy goods vehicles. With petrol prices continuing to the rise, the research makes interesting reading for anyone concerned about the cost of filling up their vehicles.**

Research carried out by the Canadian National Research Council's Centre for Surface Transportation Technology (1) found that at 100km/h a heavy goods lorry used up to 1.8% less fuel when travelling on a concrete road compared to an asphalt pavement and up to 3.1% less fuel compared to a composite (asphalt topcoat over concrete). When travelling at 60km/h, the fuel saving was up to 3% compared to the asphalt road and up to 6% compared to the composite road.

For a passenger car, the concrete road fuel saving was 2.9% compared with the asphalt road pavement and a reduction of 2.3% fuel consumption compared to the composite pavement.

The Canadian research has been backed up by new research carried out in Sweden by the Road and Transport Research Institute (2). The Swedish research examined the fuel consumption of a Volvo car and a 60 tonne lorry on the E4 motorway north of Uppsala, Sweden, which has both concrete and asphalt sections. Driving on the concrete section the lorry used 6.7% less fuel than when driving on the asphalt section. The car used 1.1% less fuel on the concrete section compared to the asphalt.

Similarly, research carried out in Japan by the Nippon Expressway Research Institute, together with Narita International Airport and the Japan Cement Association (3) found that the fuel consumption of a heavy good vehicle is up to 3.4% less on a concrete road compared to asphalt.

What the research has found is that the smoother ride offered by concrete pavements compared to the ride resistance of asphalt roads contributes to significant fuel savings. This is a direct cost and sustainability benefit that drivers can understand. The findings provide further evidence of the benefits of having concrete inside lanes for dual carriageways and motorways. These 'truck lanes', in addition to enabling fuel savings, would also provide longer performance and need less remedial maintenance.


1. Effects of pavement structure on vehicle fuel consumption. G.Taylor and J.Patten, Centre for Surface Transport Technology, National Research Council of Canada. 2002

2. Measurements of fuel consumption on an asphalt pavement and a concrete pavement in Sweden. B-A.Hultqvist, Department of Road Engineering, Road and Transport Research Institute, Sweden. 2010.

3. Effect of pavement type on rolling resistance and fuel consumption of heavy-duty vehicles. T.Yoshimoto, Japan Cement Association; T.Kazato, Nippon Expressway Research Co. Ltd; I.Hayakawa, Narita International Airport Co. Ltd. 2010.


Ring Road around Antwerp

## Whisper Concrete – Historic first section to be replaced

**After Seventeen years in service, a short stretch of the first ever whisper concrete to be laid in the UK is due to be removed and replaced with an asphalt thin surface. The section, on the northbound carriageway of the M18, between Junction 5 – 6, was constructed by Mowlem Civil Engineering in two layers paved monolithically.**

A rail mounted SGME paving train laid the concrete 240mm thick. The base layer was 190mm thick, and the top 'whisper concrete' layer was 50mm thick and used high skid resistant gritstone 8mm chippings from Cumbria in the running surface.

After a Gomaco longitudinal 'super smoother' had passed over the concrete, a surface retarder was applied and covered with polythene sheets for protection. After some 24 hours the polythene was removed and the surface laitance brushed off to expose the aggregate surface which has lasted so long.

Concern was expressed at the time about loss of the small surface chippings but those doubts have proved groundless. This first section of whisper concrete gave noise readings less than adjacent hot rolled asphalt, and the 'trial' contract was deemed a success.

Now the reasons for the replacement of this historic section are given as de-bonding of the upper surface from the lower one, and also there has been some pot holing.

Still, not bad for 17 years! Will the new asphalt surface last as long?

# ROADS

## A421 Improvements

**The use of an Early Contractor Involvement (ECI) contract provided a number of benefits that ensured the success of the project to construct 13km of new dual carriageway on the A421 between the south side of Bedford and the M1.**


The A421 is part of the strategic east-west (Oxford-Milton Keynes-Bedford-Cambridge) strategic route corridor. The existing A421 between the Bedford Southern Bypass and the M1 was largely single carriageway. With traffic flows expected to rise from 25,000 to 65,000 vehicles per day by 2026 the road was becoming increasingly congested with a poor accident record.

The ECI contract was awarded to Balfour Beatty Civil Engineering in November 2005. Construction began in October 2008 with completion, ahead of programme, in December 2010. The cost of the scheme came in under the £201 million budget. The new road features a re-modelled junction with the M1 and Ridgmont Bypass in the west and connects to the Bedford Western Bypass in the east. 16 major structures and 2 million cubic metres of earth were removed and 400,000 sq m of surfacing was laid. The scheme also involved extensive planting and landscaping. Drainage is via new balancing ponds prior to discharge into existing watercourses.

As the ECI contractor, Balfour Beatty examined local constraints in relation to construction best practice, best value and 'buildability'. These constraints are balanced against programme and cost targets. This had the benefit of providing greater programme predictability. In addition, the process also improved the understanding of local sensitivities to the construction process. This helped to identify and resolve potential objections and so reduced the overall timescale of the statutory Public Inquiry leading to associated cost savings.

The ECI contract also allowed Balfour Beatty to fully engage with specialist contractor PJ Davidson Ltd at a very early stage and so determine the most efficient solutions. The early input of PJ Davidson resulted in improvements to the proposed surface water channel and concrete barrier and facilitated a smooth day-to-day site operation.

The new road has resulted in improved road safety and journey times as well as considerable relief for communities along the old single carriage which is now used by local and not through traffic.

# LOOKING TO THE FUTURE

## Future Predictions - The Next 20 Years

**The demands on our transport infrastructure in 2031 will be even more intense than they are now. Britpave examines how developments in concrete transport infrastructure over the next 20 years will meet the predicted future pressures.**

20 years into the future and those pressures upon our transport systems that Britpave has witnessed over the last 20 years will have intensified. By 2031, the UK population is predicted to grow to 71 million thereby increasing congestion, the failure of successive governments to implement long-term transport infrastructure vision and investment will mean reliance on transport systems based on 19th and early 20th century infrastructure and the ever growing demands for greater cost efficiencies and sustainability will call for innovative infrastructure solutions.

Against the background of increased congestion, historic lack of investment, budgetary limitations and $CO_2$ restrictions, transport will be subject to an additional number of factors not least of which will be:

- Road pricing and over-reached capacity limits demanding assured performance and minimum maintenance
- Extreme weather events due to climate change plus terrorism threats calling for increased robustness and resilience
- Increased use of embedded technology to facilitate traffic flow and passenger management
- Introduction of new transport systems such as urban and suburban mono-rails, double decker trains and double decker roads to increase capacity on existing routes, and in order to avoid the congestion on the ground, an increased use of air transport for UK local journeys.

The combination of these factors will mean that the transport infrastructure of the future will really have to earn its keep. It will have to provide long-term performance and minimum maintenance, be structural robust and sound whilst having the flexibility and plasticality to incorporate new technology.

Concrete already has the ability to provide such a transport infrastructure. A number of technological developments will increase those abilities still further as over the next 20 years a number of concrete innovations offer the potential to become mainstream solutions.

Concrete infrastructure already has a long-life with the USA recently reporting that a 100 year road is still performing well in Detroit. This long-term performance could be enhanced still further by a number of new innovations. Introducing integral crystalline elements to the cement admixture or applying to the top of existing concrete surfaces can increased the service life of roads and bridges by an additional 30 years by waterproofing the concrete from the inside out. An insoluble crystalline structure grows inside the natural pores of the concrete to prevent water ingress. Or how about self-healing concrete? Micro-biologists at Delft University are examining the potential of embedding bacteria into concrete to convert nutrients into limestone thereby healing cracks that appear on concrete surfaces and so making the structure watertight.

Other innovations include concrete pavements that are self-heating and can so prevent accumulation of snow and ice. Researchers at the University of Houston are investigating the use of sheets of carbon nanofibre to heat concrete from an electrical element. Heating a pavement from -10°C to 0°C takes just two hours and only 6 watts of power. The use of this technology could make a significant difference to the congestion and gridlock experienced on roads, rail tracks and air port runways during the winter.

Meanwhile coating concrete with titanium dioxide has been found to reduce pollution. Titanium dioxide is a photocatalytic material that removes nitrogen oxides by using sunlight to convert them into harmless nitrates that are washed away by rain. Tests carried out by the Eindhoven University have found nitrogen oxides levels reduced by up to 40% in areas paved with the new concrete. It is ironic that concrete roads, which to the uniformed are an environmental nemesis, could prove to be a green saviour.

Whilst the widespread adoption of these innovations may seem fanciful, the problems facing our transport infrastructure over the next 20 years are not. It is forecast that congestion will add £10 billion annually in costs to business by 2025. By 2020-2030 severe capacity problems are expected on motorways and trunk roads in the London, Manchester and Leeds regions plus the M1/M6 corridor from the south east to the north west. The UK already has one of the worse rail punctuality records in Europe due to high utilisation of a dated track network. This is set to get worse with substantial overcrowding by 2030. Similarly, capacity problems will become endemic with our airports with flights increasingly delayed or even cancelled due to congestion or unplanned essential runway maintenance.

Given the long planning timescales for infrastructure projects, action to address this rather bleak future is required now not later. Short-term practicality to replace or improve infrastructure already at or near maximum capacity needs to be matched by long-term vision and investment to meet the transports demands of the next 20 years and beyond. Concrete, with its inherent benefits enhanced by technological development and engineering brio, can provide the transport infrastructure solutions for now and for the future.

# BRITPAVE STEP BARRIER®

## A CE Marking First!

**Britpave Concrete Step Barrier gains CE Marking Status**

Britpave's Concrete Step Barrier has made CE history as being the only in-situ product to EU knowledge to attain full CE marking status. With the assistance of MIRA Ltd (Notified Body Number 0888) the barrier design and manufacturing process was taken through its paces against the requirements of EN1317 as laid out in Annex ZA and was successfully awarded its EC Certificate of Conformity.

Traditionally in the short life of CE marking, in-situ products were difficult to CE mark as they were regarded as being part construction and part product, perhaps explaining why there is lack of a European mandate for such products. It has been typically portrayed to only be applicable to those products made within a factory environment, such as steel safety barriers and pre-cast concrete barriers.

The common mis-understanding amongst most vehicle restraint systems which are manufactured in a factory environment is that the final installed product carries a CE mark but it doesn't! CE marking only considers product certification when manufactured in a factory but this is not extended to the installation process or how the product is used. So only the components of the proposed vehicle restraint system are CE marked. This is not the case with the Britpave installed product.

Britpave's Director, David Jones met with Vicente Leoz Arguelles (Head of Unit for Construction, Pressure Equipment and Metrology for the European Commission and Director General for Enterprise and Industry) in the early part of July. In their discussions, Mr Leoz affirmed that CE marking of in-situ products is possible provided there is a standard which covers the product for it to be compliant to.

The purpose of CE marking is to remove barriers to trade across the EU, giving companies easier access into the European market to sell their products without adaptation or rechecking. With the Britpave Designed Step Barrier package that is fully CE marked, the way is open for its Licensed Installers and all those wishing to join the Britpave Scheme to be CE marked, thus enabling Britpave to market its Step Barrier System across Europe.

From the 1st January 2012, Britpave Step Barrier Systems being installed in the UK will carry a CE mark.

***"CE marking of in-situ products is possible"***

- Mr Vicente Leoz Arguelles

## SIAC Slipform at Kielce Trade Show

**SIAC Slipform once again exhibited at Autostrada Kielce in the south of Poland.**

When exhibiting in 2010 the theme of the event was all about educating in the process and technology (convincing people that this dark art worked and was perfectly viable as an option to precast and steel). This year it was pleasing to see that is was more about the product and possible orders.

There was significant interest in the Britpave Concrete Step Barrier System and which has the blessings of the Polish Roads Authority (GGDKiA). This puts the barrier in an extremely strong position within Poland. As well as an interest in barrier systems, what became apparent was the keen interest in Pavement Quality Concrete and also drainage solutions.

Poland and the Ukraine are hosting the European Championships in July 2012, with this in mind the focus is on transport infrastructure. SIAC are set for a busy time ahead.

# RAIL

## Concrete Slab Track

**Britpave News asked Heather Ceney, Chair of the Britpave Rail Task Group, to look into her crystal ball to answer questions on the past, present and future for concrete slab track.**

**BN:** Reviewing the last 20 years, what are the major milestones for concrete slab track?

**HC:** Throughout the world, slab track has generally become the preferred track system for high speed rail lines. Thousands of kilometres have been construction in Europe and the Far East, with major construction programmes currently underway in China. Progress in the UK has remained stubbornly slow with concrete track systems mainly confined to light rail and only short 'test' section on main line routes.

**BN:** What are the current challenges facing your sector?

**HC:** Acceptance of slab track onto Network Rail infrastructure as a recognised alternative to ballast is the major challenge. Most railway engineers would acknowledge that slab track has significant advantages in terms of performance, low maintenance and low whole life cost. However, the industry standards for the UK remains traditional ballasted track. With High Speed 2 currently under development, the challenge here is to ensure that slab track forms are evaluated for the proposed high speed line in order to ensure that High Speed 2 offers value for money, takes advantage of the slab track technology and is a sustainable system built to last into the future.

**BN:** How is your Task Group addressing those challenges?

**HC:** Britpave is preparing a new brochure to highlight the advantages of slab track. We are also undertaking a cost study to investigate the whole life cost of slab track systems compared to traditional ballast track. The major challenge is to change perceptions – railways do not have to be ballast.

**BN:** What sector developments do you predict for the immediate future?

**HC:** High Speed 2 is an opportunity for the UK to apply the best slab track technologies from around the world to achieve a new state-of-the-art high speed railway line. The design speed at 400kph is significantly higher than High Speed 1 (Channel Tunnel Rail Link).

**BN:** What sector developments do you predict for the long-term future?

**HC:** In the long-term, we aim to get slab track routinely accepted onto Network Rail infrastructure for new build and relaying of upgrade works. In order to achieve this there will be a need for UK design standards and handbooks to be produced. Work is already underway in Europe developing standards and design guides. We would like to see the knowledge and technology transferred to the UK network.

# RAIL

## Rail Network is Overcrowded and Out-of-Date

**Britain's railways are at breaking point with 1.32 billion train passenger journeys made in 2010. Our overcrowded railways are reaching the limits of their capacity. The situation is not helped by the fact that train companies are trying to run services on an aging rail network based on an out-date ballast track system.**

During 2010, passenger journeys increased by 6.9 per cent compared with 2009. The last time that this many rail journeys was made was in the 1920's. Then, there was twice the 10,000 miles of track currently in the network, making the pressure on today's smaller network for high levels of performance all the greater.

Last year, the Association of Train Operating Companies warned the government that Britain's overcrowded railways are reaching the limits of their capacity and called for greater investment in the rail network. A significant part of the capacity problems facing train operators is the lack of investment in a 21st century rail network. We run our trains on a ballast track system from the 19th century. It is a network that is outdated and simply not up to job. The result is delays, weekend closures and unplanned maintenance disruptions.

Concrete slabtrack, as used by the highly successful Japanese rail network and increasingly throughout mainland Europe, is the way forward. Concrete slabtrack maximises operating efficiency by eliminating unplanned maintenance, provides high levels of safety and comfort and impressive long-term performance.

Some £12 billion has been set aside between 2009 and 2014 to address capacity constraints through measures such as lengthening platforms and signalling improvements to allow more trains to run. However, this is failing to address the real issue: an outdated rail network.

If train operators want to provide an efficient level of service that meets the growing demand for rail travel then they must have the right track that eliminates the delays and disruption caused by continual patch and mend maintenance programmes. Increasing the length of rail platforms is all very well but what happens once the train leaves the station. Concrete slabtrack offers the long-term performance and reliability essential for an efficient and punctual rail service.

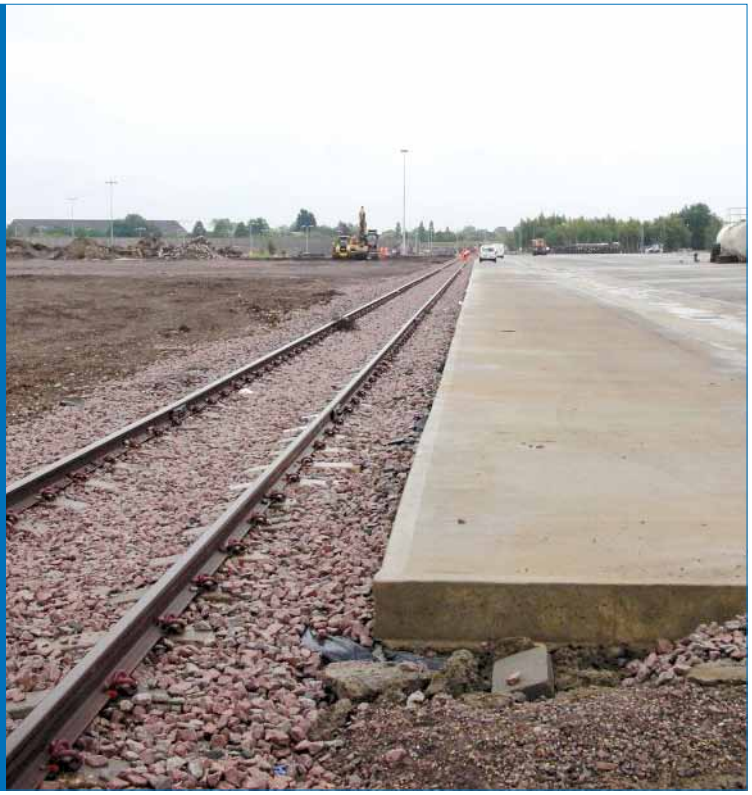
## Roads for rail

**Gill Civil Engineering have completed the paving of some 75,000 sq m of concrete hardstandings, roads, channels and building floor slabs for a new Network Rail Recycling Centre at Whitemoor in March, Cambridgeshire.**

Over 18,000 cubic metres of concrete was produced by the company's on-site batching plant. The main 40,000 sq m track dismantling slab was paved at a depth of 270mm. Other areas were provided for switch and crossover works and included a workshop building, the foundations, slab and walls for a new ballast wash facility, accommodation building and site roads.

All coarse aggregate for the pavement was recycled from Network Rail crushing facilities and the concrete incorporated a 30% PFA cement replacement.

The work was carried out on behalf of the principal contractor, C Spencer Limited, whose in-house team also carried out the design of the project.



# AIRFIELDS

## Boosting European Airport Capacity Needs Maintenance-Free Airport Infrastructure

**A study calling for an extra 28 million passengers a year to use European airports underlines the need for long-term, maintenance free runways, taxiways and aprons.**

The EU study, by an independent transport planning consultancy, believes that the millions of extra passengers could be accommodated if landing and take-off slots were allocated to airlines more efficiently. It states that the problem of airport congestion will worsen because many busy airports, including London Heathrow, have no plans for runway expansion.

The study focuses on the way that airport slots are allocated to airlines using a criteria that often includes 'historic preference' which tends to favour traditional airlines. This means that new airlines can find it difficult to get slots. Recommendations from the study include EU-wide secondary trading of airport slots which would allow airlines to sell the slots that they cannot use.

Increasing slot efficiency may help increase capacity by improving the number of slot availability. However, increasing airport capacity this way will underline the need for airports to ensure that their runways and taxiways are able to at operate at full capacity without disruption caused by unplanned maintenance.



Increasing capacity without building new runways means that airports will rely more heavily on the long-term, maintenance-free performance of concrete pavements. These pavements have particular resistance to fuel spillage damage and heat damage from engine blast, and provide high load bearing capacity to cope with new and heavier aircraft. The long-life performance of concrete pavements means reduced unplanned maintenance. Increasing slot efficiency must be met with increased efficiency and performance of airport infrastructure.

# SUSTAINABILITY

## Climate Change Calls for Robust Infrastructure

**A government-backed report calling for effective and reliable transport infrastructure that can withstand the predicted impacts of climate change has been welcomed by Britpave.**

The report, 'Infrastructure, Engineering and Climate Change Adaptation – Ensuring Services in an Uncertain Future' was been published this Spring by Engineering the Future, an alliance representing nearly half a million engineers. It was commissioned by the Department for Environment, Food and Rural Affairs and warns that the potential impacts of climate change could bring considerable disruption to energy, transport, water and IT. In particular, the report foresees damage to roads and railways due to increased summer temperatures plus increased damage due to storms and flooding. Ministers are now considering the report's findings as they work on a cross-government strategy on adaptation and infrastructure.

The report's conclusion that "effective, reliable infrastructure underpins economic activity", is one that Britpave has long championed. There is a direct correlation between investment in transport infrastructure and economic growth and well being. Unfortunately in the UK there can often be a lack of long-term vision and real, meaningful investment that means parts of our transport grind to halt even without the predicted impacts of climate change.

The long-term robustness and minimum maintenance benefits of concrete solutions such as concrete road surfaces and barriers, rail slabtrack and airport aprons and runways offer solutions that will not fail in high summer temperatures and provide inherent flood resilience. These are the solutions of choice for many countries which have the extreme weather conditions that Britain may have to face in the future.

# SUSTAINABILITY

## Concrete versus the elements

### The Pennines are helping to test the impact of freeze-thaw cycles on concrete

#### FREEZETHAW

Where concrete is exposed to freezing and thawing exposure conditions there is a risk of surface or more serious degradation.

In simple terms this is caused by any water in saturated concrete freezing and expanding. Where this ice has no voids to expand into, it damages the concrete. The depth or severity of the damage will depend on the depth of saturation and freezing, as well as the number of freezing and thawing cycles.

To minimise damage it is important that a reasonably strong and impermeable concrete is specified, as this will ensure the rate of water permeation is small and that the concrete matrix is capable of resisting expansive forces. However, probably more effective than using very strong concrete is the use of an air entraining admixture, which with effective mixing of the fresh concrete entrains air bubbles within the concrete.

These bubbles need to be of a particular size and distribution to be effective, and the required air void spacing is achieved using admixtures conforming to the BS EN 934-2 requirements of an air void spacing s 0.200 mm.

#### Field Exposure Trials

During the 1980s a number of problems were reported in relation to the production and supply of high strength air-entrained concrete, and this led to the establishment of a cross-industry working party, (ready-mixed concrete industry trade associations, materials suppliers, Highways Agency and TRL).

The working party established that a number of potential problems existed and proposed that a series of reinforced concrete units be cast and placed on an exposure site for a number of years. The units were produced with a range of concretes of various compositions and strengths and placed on the A9 near Perth in 1994, but transferred to the A66 in 2005. The objective of the exposure trials is to establish the necessity for air entrainment and the concrete requirements to ensure adequate durability.

***"Entrained air appears to have less influence than strength in terms of physical damage: the units produced with higher strength concretes suffered less damage regardless of whether they were air entrained"***

# SUSTAINABILITY

The units were cast as an inverted T shape as shown in the picture above; the backfall of the 'T' was inclined inwards at approximately 3 degrees to trap rain and spray. Casting of the units using plywood forms took place in late 1992/early 1993 in Wembley using concrete containing Thames Valley aggregates; a number of cementitious types and for the majority of concretes an air entraining admixture.

Test specimens were taken and the fresh and hardened properties of the concrete determined, and the resistance of the various concretes to accelerated freezing and thawing was measured using the ASTM C6663 method.

These test results indicated questionable performance but it should be noted that the field exposure trials do not replicate the aggregate breakdown shown in the accelerated laboratory testing.

In January 1994, the 28 concrete test units (duplicate units were cast) were moved to an exposure site on the A9 (near Perth). The test units were inspected in 1998, and then again in June 2000, but after six years of exposure it was observed that the level of damage on all but the lower strength units was small in that there were minor losses of surface mortar from above coarse aggregate particles, thus exposing the aggregate.

The samples were relocated to an exposure area close to the highest point on the A66 (Trans Pennine route) in 2005 (pictured). A further condition survey was carried out in early October 2010, after 16years of exposure, and a summary of the concretes and their condition compiled.

## Surprising results

It is estimated from weather records that the units have been subjected to approximately 1,100 freeze-thaw cycles.Although it was anticipated that the most severe freeze-thaw attack would occur on the 3 degrees to horizontal rain and spray trap, this was not the case. The majority of the most severe attacks was observed on the top surface, often around the lifting eye locations, and those vertical faces that faced East-North-east (70 degrees).

A differentiation was made between surface scaling exposing aggregate (EA) probably caused by frost crystals, and spalling caused by freeze-thaw (FT) action rather than just surface mortar being lost.

Overall, entrained air appears to have less influence than strength in relation to the extent of physical damage in that the units produced with the higher strength concretes have suffered less damage regardless of whether they were air entrained.

The units made with fly ash or ggbs did not suffer significantly more deterioration than the equivalent strength CEM I concrete units.

Although the surface matrix has been lost on most of the units exposing the aggregate, the level of damage is of minor importance as the units demonstrate that the concrete remains in a serviceable condition after 16 year exposure. However, it will be interesting to re-assess the performance of the units after a further five to 10 years of exposure.

■ Dr Jim Troy is director of concrete and mortar technology. Tarmac Ltd

# SUSTAINABILITY

## Ballast Phoenix use IBAA at new Tilbury Plant

**Ballast Phoenix's new ash-processing facility at the Port of Tilbury, Essex will not only process Incinerator Bottom Ash (IBA) from Cory Environmental's Riverside Energy from Waste (EfW) facility at Belvedere in South-East London, it is also a practical example of the wide applications that the finished product, Incinerator Bottom Ash Aggregate (IBAA), can be put to.**

IBAA was used in the construction as Type 1 sub base under the whole of the site hardstanding and also as a capping material in areas where levels had to be built up. The hardstanding was constructed by Britpave member Bardon Composite Pavements in Roller Compacted Concrete (RCC). This was selected because of it's toughness and durability in hard conditions, but also because of it's ability to accommodate considerable differential settlement, some of which is anticipated at the Tilbury site.

The new plant is Ballast Phoenix's seventh plant in the UK and the Company aims to expand to meet the needs of the numerous new EfW plants which will be needed in the future. The Government's recent review of Waste Strategy suggested that waste-to-energy treatment will rise to about 25% of municipal solid waste by 2020, requiring the capacity of EfWs in the UK to rise threefold.

The £5m Tilbury plant is a major investment by Ballast Phoenix and demonstrates its confidence in the growing market. The infrastructure of the project was funded by Cory Environmental as the plant will be the main outlet for IBA produced from its Riverside EfW facility.

The new IBA handling facility will produce approximately 150,000 tonnes of aggregate every year, increasing Ballast Phoenix's annual UK production of IBAA to nearly 600,000.

*"Incinerator Bottom Ash Aggregate already has many positive environmental qualities and these will be significantly enhanced by using water transport to bring the raw material in from the Cory plant. Some finished aggregate will then be distributed by water. Taking away potential lorry movements will help ease pressure on the road system in the South East,"* said Ballast Phoenix Managing Director David York.

*"The Tilbury facility significantly increases our capacity and represents a major investment by Ballast Phoenix and notably comes when interest in, and the market for, aggregate produced from Incinerator Bottom Ash is increasing."*

### Incinerator Bottom Ash Aggregate

Incinerator Bottom Ash (IBA) is the residue that falls through the grate after the energy has been recovered from the waste: *"The term 'ash' is misleading because it is not powdery as most people expect it to be, but contains glass, brick, rubble, sand, grit, metal, stone, concrete, ceramics and fused clinker as well as combusted products such as ash and slag,"* explained David York.

When the IBA arrives at the new facility it will be stored for a few weeks before being processed through the Ballast Phoenix plant which separates the material into various size fractions with any remaining metals in the ash extracted and sent for further processing. This finished product is now Incinerator Bottom Ash Aggregate (IBAA) ready to be used in building and civil engineering projects.

# SUSTAINABILITY


Incinerator Bottom Ash Aggregate (IBAA) is an environmentally friendly material with a consistency which makes it easy to handle and use. This consistency and structure makes it an ideal material for a number of construction applications. It has useful properties such as 'self setting' and therefore has a superior load bearing capacity to other aggregates. It is also easy to manipulate by hand and it relatively lightweight. IBAA has a number of applications, either to be used as a component of another product, such as asphalt, or as a foundation material where its stability and strength make it ideal for such uses in roads or industrial hardstanding foundations.

*"IBAA's suitability as an aggregate is illustrated by the way it has been used in a number of significant projects. The alterations to Junction 28 of the M25 used 20,000 tonnes and 30,000 tonnes went into the construction of the M6 Toll Road. Other transport related uses which illustrate its versatility include the Docklands Light Rail which took 30,000 tonnes of our products, Felixstowe Docks which used approximately 50,000 tonnes for CBM and Heathrow Terminal 5,"* said David York.

*"We have also placed 30,000 tonnes in the Olympic Village site and provided 10,000 tonnes for the M11 Olympic Logistics Centre."*

A further advantage of IBAA and one which further enhances its environmental credentials is that it has a low carbon footprint; its low density relative to other aggregates, a lower energy requirement in production than primary aggregates and the proximity of the facilities to conurbations and markets help achieve significant carbon savings.

There are other significant environmental savings: *"When IBAA is used as an aggregate it also means that somewhere else natural aggregates are not being quarried and metal ore is not being mined, smelted, shipped and then transported by road to its final destination, because of the metals we recover from IBA. The waste used in a modern EfW plant uses the residual waste left over after communities have carried out their recycling. We recover or recycle the equivalent of about 22% by weight of the original waste sent to the EfW just the same as in a number of other European countries,"* said David York.

For further information please contact:
Keith Butterick PR Consultant: 07986 651129
David York, Managing Director, Ballast Phoenix, 01778 423345

# SOIL STABILISATION

## Website upgrade

The Soil Stabilisation Task Group has updated and developed its section on the Britpave web site. The Group aims to provide a comprehensive online resource for soil stabilisation that includes an explanation of the processes and benefits of soil stabilisation, technical guidance and project case studies as well as an informative FAQ section. The provision of a multi-media library offers videos of soil stabilisation projects a comprehensive photograph gallery. There is also a publications library and a list of soil stabilisation contractors, engineers and suppliers.

Commenting on the new site Al McDermid, Chair of the Soil Stabilisation Task Group, said:

***"We are aiming to provide a 'one-stop-shop' for those wanting information and technical guidance on soil stabilisation. We will continue to develop the website as a prime online resource."***

- For further information please visit: www.britpave.org.uk/SoilStabProcess.ink


## New delivery guidance

New guidance for the safe delivery and receipt of powered binders by pneumatic discharge bulk powder tanker has been developed by the Britpave Soil Stabilisation Task Group. The guidance provides information and assistance for both the contractor and delivery driver.

For the contractor, responsibilities include ensuring that a certificate of inspection (pressure test) is in force if silos or spreaders are to be used, providing clean and suitable hoses and hose couplings, well maintained filters and pressure relief devices and having a well marked, accessible, safe and level parking area.

The delivery driver must ensure well maintained vehicles with all-round vision and CCTV rear view camera, full adherence to site safety rules, obtain client confirmation for product to be delivered and remain at the vehicle controls through the discharge process.


- The full listing of guidance and responsibilities can be found on 'Guidance for the Safe Delivery and Receipt of Powered Binders by Pneumatic Discharge Bulk Powder Tanker' available as a download from: www.britpave.org.uk/SoilStabProcessPublications.ink

# SOIL STABILISATION

## Stabilisation of Sulfate Bearing Soils

**Stabilisation with lime, cement or other binders is a well-established, cost-effective method of converting weak soil into a useable and environmentally sound construction material, which can be used as a foundation for roads, pavements, embankments, reinforced earth structures, railways, housing and industrial units.**

Very occasionally, the presence of sulfate in the original soil has caused swell and heave of the stabilised layer. Updated guidelines from the Soil Stabilisation Group explain the mechanisms responsible for sulfate heave and how to avoid it.

It has been well-known for over fifty years, that soils containing sulfates can cause expansion problems when stabilised with lime or Portland cement. In the presence of water, the reaction of calcium (from lime or cement), alumina (a primary constituent of clay) and sulfate produces calcium-aluminate-sulfate-hydrate minerals, which can produce high swell pressures and disruptive increases in volume, sufficient to cause disruption of overlying layers.

As well as sulfates, sulfides can also be a risk factor for soil stabilisation because disturbance of a soil can induce sulfides to oxidise and increase the sulfate level. This oxidation is accelerated during soil stabilisation operations by both the pulverisation process and by the use of lime and/or cement, which increases the pH level and thereby decreases the chemical stability of the sulfides.

The updated guidelines highlight the need for a thorough assessment of the site, including comprehensive sampling and testing for sulfates and sulfides. They describe the test methods, explain the significance of what they measure and advise on how to evaluate the potential of the soil for expansion. The guidance goes on to explain how alternative binders such as ground granulated blastfurnace slag (GGBS) should be considered when there are high levels of sulfate or sulfide in the soil and concludes with sections on laboratory tests for potential swelling and good construction practice for the stabilisation of clays.

- Guidelines for Stabilisation of Sulfate-Bearing Soils may be downloaded from: www.britpave.org.uk/SoilStabProcessPublications.ink


The A6 north of Bedford was built on a capping layer, consisting of stabilised clay. The clay soil contained high concentrations of sulfur and sulfates and comprehensive laboratory testing was carried out before deciding to carry out the stabilisation with a combination of 2% lime and 2% GGBS, to avoid expansion due to sulfates.

Hump in experimental road, caused by expansion of underlying stabilised soil

# 20TH ANNIVERSARY DINNER AND SEMINAR

**2011 is the 20th Anniversary of Britpave. Britpave was established as a trade association within the transport infrastructure sector, to promote the use of concrete and cement. It has a broad membership base, from large corporate organisations to smaller independent businesses. Many of these members have been involved with Britpave since the start.**

Here are some details on the upcoming event, this year to be held at the stunning Savill Court Hotel near Windsor.

## Overview of Events

**Golf**
Monday 26th September 2011
10am Start – 11am First Team Tee Off
Mill Ride Golf Club, Ascot

**Dinner**
Monday 26th September 2011
Drinks Reception 7pm, Dinner 8pm
After Dinner Speaker
Savill Court Hotel, Nr Windsor

**Seminar**
Tuesday 27th September 2011
8.30am – 9.15am – Registration
9.15am – Seminar Starts
Savill Court Hotel, Nr Windsor

For this special seminar we have put together a varied program of thought-provoking presentations, which cover a broad spectrum of subjects from within the industry.

Britpave has always maintained close relations with its international counterparts and this year we are proud to feature 3 top class speakers from the USA.

Leif Wathne will make all of us think hard about how we market our businesses. This paper was chosen as one of the keynote publications at The 11th International Symposium on Concrete Roads held in Seville in October 2010. John Roberts will greatly encourage those of us with an interest in growing the market for concrete roads, and Mark Smallridge, a world expert in his field, will share with us his vision for the use of roller compacted concrete in ports.

Not to be outdone though, the UK team is high calibre. Dyfrig James will share with us his vision as chief executive of one of the world's largest cement and aggregate companies. This is a unique opportunity to hear first-hand from an industry leader about how his company is dealing with the current economic crisis.

The CPNI presenter will give an explosive look at how real the terrorist threat is to our infrastructure, and how industry is combating this. Jill Nelson offers a view from outside our industry that forward thinking companies should take note of, as Britpave did some 3 years ago.

Laurence Pritchard, from Britpave's lawyers DWF, will be able to deal with awkward questions as he has spent time as a stand-up comedian in Liverpool!

Eupave's official lobbyists, Alonso & Asociados, represented by Emiliano Alonso himself, will remind the British members of the audience of the vital role of the EU in policy making and how Eupave, of which Britpave's David Jones is Vice-President, is fighting to get our industry voice heard.

Finally, but no means least, Council Member and Task Group Chairman Al McDermid, of Beach Soil Stabilisation along with Hedley Greaves of Tarmac, will remind attendees of the opportunities for our companies offered by stabilised soil solutions.

## Hotel Details:

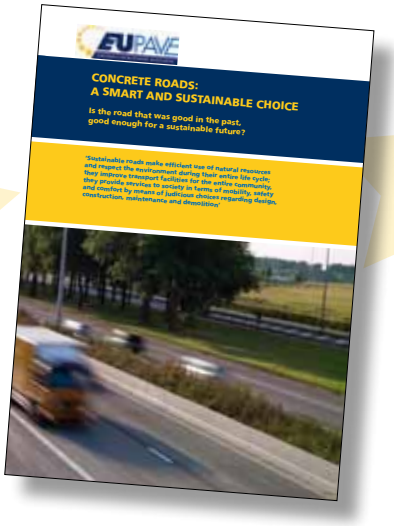
Savill Court Hotel is holding a block of rooms for those wishing to stay overnight on Monday 26th September. A special rate of £100.00 including breakfast has been agreed for those booking for the Britpave Conference. The standard rate is £195, so a saving of £95, if you book early!!

You must call and reserve your room on +44 (0)1784 472000 by 28th August or you will only be able to receive the best available rate at that time. Please note that you cannot get this rate by booking online with the hotel.

■ Book your place now!
Call the office on +44 1344 393300

EUPAVE
EUROPEAN CONCRETE PAVING ASSOCIATION

# Concrete Roads: a Smart and Sustainable Choice - now in Turkish and Spanish




**The first EUPAVE publication "Concrete Roads: a Smart and Sustainable Choice", published in September 2009 is about to become a success story.**

Only a few months after its publication in English, the publication was translated into Turkish and Spanish by EUPAVE members TCMA and Oficemen-IECA, respectively.

This shows once again the value of this publication, which explains that the modern concrete road can be a sustainable solution for our society and that it satisfies the basic criteria for sustainable construction in respect of the environment, economy and society.

## EUPAVE Welcomes New Technical Manager

**I am happy to announce you that I started working at EUPAVE as Technical Manager on 01 July 2011.**

I graduated as a civil engineer from the Middle East Technical University-Ankara, and obtained a MBA degree at the same university. I have worked as Head of the Concrete Laboratory for the last 5.5 years at the Turkish Cement Manufacturers' Association (TCMA).

From now on, I will be at your service at EUPAVE.

Best Regards,
**Özlem ASLAN**
Technical Manager - EUPAVE

**Tel:** +32 (0) 2 790 42 06
**Fax:** +32 (0) 2 640 06 70
**e-mail:** o.aslan@eupave.eu

**www.eupave.eu**

## Current list of EUPAVE members

| Member | Country | Membership Status |
|---|---|---|
| AITEC - Italian Cement Association | IT | FULL |
| ANTER - Spanish Technical Association of Soil Stabilisation and Recycling | ES | ASSOCIATE |
| ATIC - Associação Tecnica da Industria de Cimento | PT | FULL |
| BASF | ES | ASSOCIATE |
| BetonMarketing Deutschland GmbH | DE | FULL |
| Betonsuisse Marketing AG | CH | FULL |
| Britpave - British In-Situ Concrete Paving Association | UK | FULL |
| CEMBUREAU - European Cement Association | BE | ASSOCIATE* |
| Cement&Betoncentrum - Dutch Cement & Conrete Centre | NL | FULL |
| CEMEX Poland | PL | FULL |
| CIMBéton - Information Centre on Cement and its Applications | FR | FULL |
| ERMCO- European Ready Mixed Concrete Association | IT | ASSOCIATE |
| FEBELCEM - Belgian Cement Association | BE | FULL |
| GOMACO | UK | FULL |
| GRACE | BE | ASSOCIATE |
| HOLCIM Group Support Ltd. | UK | FULL |
| IECA - Spanish Institute for Cement and its Applications | ES | ASSOCIATE |
| IPAC - Spanish Steel Reinforcement Association | ES | ASSOCIATE |
| Oficemen - Spanish Cement Association | ES | FULL |
| Power Curbers Inc. | US | ASSOCIATE |
| Sika, S.A.U. | ES | ASSOCIATE |
| Turkish Cement Manufacturers' Association | TR | ASSOCIATE |
| TYROLIT Schleifmittelwerke / Hydrostress AG | AT/CH | ASSOCIATE |
| VOEZ-Association of the Austrian Cement Industry | AT | FULL |
| WIRTGEN GmbH | DE | FULL |

# THE LAST WORD…

## Getting to Know You: Adrian Erwee

### Name
Adrian Erwee.

### Location
Live in Lincolnshire, office in Derbyshire, work anywhere.

### Occupation/job title
Director, Consulting Civil & Structural Engineering.

### Organisation
Norder Design Associates.

### Top of your in tray?
My family although they do not always feel this way. I go to work every day with a smile on my face because I love the challenge that engineering poses in all its forms.

### Biggest work achievement?
Mohale Dam – The structural design of a 145m high concrete faced rockfill dam in Lesotho.

### Best part of your job?
Working with people and clients to find solutions to problems that conventional methods cannot solve easily.

### Top business tip
Always talk before committing to writing when in a conflicting situation.

### Do you have a personal business philosophy?
Work with people in a team approach to develop and consider all ideas. Form strong trusting relationships with all because successful business is where we look after each other.

### Do you speak any other languages?
Afrikaans (not very usable outside of South Africa but does help to understand Germanic languages).

### Favourite holiday destination
Anywhere with my family.

### Favourite book
Depending on my mood:
Day of the Jackal, Frederick Forsyth
Tuesdays with Morrie, Mitch Albom
The Kite Runner, Khaled Hosseini.

### Describe yourself in 3 words:
Opinionated, Optimistic, Loyal.

### Interest/hobby or favourite sport:
Theatre, Golf, Films, Reading and not necessarily in this order.

### Favourite food
South African dish: Bobotie which is a mild mince curry dish served on a bed of rice with banana, coconut and a traditional South African fruit chutney.

General: An aged marinated steak cooked on a Barbeque on a hot summers evening with a glass of good red wine to wash it down.

## Trade Marks Registered

The trade marks Britpave® and Britpave Step Barrier® have been registered with the Trade Marks Registry. This protects the use of these words and makes it easier to defend what has become an important brand. People cannot use our trademarks without our express permission. If someone deliberately uses our registered trade marks, without our knowledge or comment, they may be guilty of the crime of counterfeiting.

## Corrections and Clarifications

It is the policy of Britpave to correct significant errors as soon as possible. Readers may contact the office on: info@britpave.org.uk. Please quote the issue number and page.



**Britpave**
Atrium Court, The Ring, Bracknell, Berkshire RG12 1BW, United Kingdom
Tel: **+44 (0)1344 393300** Email: **info@britpave.org.uk** Web: **www.britpave.org.uk**

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The British In-situ Concrete Paving Association