

Aggregate Industries

Aggregate Industries UK Ltd and Shell Bitumen have jointly developed an innovative new base course material which is well on the road to Highways Agency approval.

Durable road base set for widespread use

Bardon Superstructure is a highly durable road base, developed by Aggregate Industries and Shell Bitumen, which could soon be widely used on the UK's highway network. One small obstacle still stands in the way of full Highways Agency (HA) approval for the material – proving its resistance to water sensitivity.

But Aggregate Industries is confident of this obstacle's early removal through independent research currently under way at the newly opened Nottingham Centre for Pavement Engineering (NCPE, see box).

The new material builds on existing road base technology to meet the performance demands of modern road loadings. "The level of traffic on the UK's road network is rising but increasing pavement thicknesses to cope is not an option in many locations because of the presence of existing services.

"So stronger road bases are needed to prevent deformation and fatigue failure," says Aggregate Industries product development director Paul Phillips.

"Our aim was to develop a proprietary high stiffness road base with improved durability, flexibility and adhesion."

John Read

One of the UK's most heavily trafficked sections of road in the UK – the entrance to Shell's fuel depot at Stanlow in Cheshire – is currently the test site for Bardon Superstructure. The product was used to reconstruct the road in March this year and has been almost constantly trafficked by Shell's fleet of tankers ever since.

"Stanlow is the perfect site to trial the material," says Phillips. "Not only is it very heavily trafficked, putting the material through a rigorous test, but we also have accurate records of the number of vehicles and loadings which have tracked the road since it was laid.

"Cores were taken after several months and the results were good. But gaining HA approval of the material is essential for us to bid for highway construction, of course. We presented the findings of the Stanlow trial to the HA earlier this year but although it was impressed with the material's overall performance it still queried the product's sensitivity to water."

Aggregate Industries commissioned the NCPE to independently investigate the water sensitivity aspects of Bardon Superstructure to satisfy the HA of the material's performance.

The need for high performing road base material has grown in recent times. Not only have traffic loads increased but an HA accepted way of forming road bases has been called into question. Since Aggregate Industries and Shell Bitumen began developing Bardon Superstructure in 1998, the HA has suspended the use of High Modulus Bases (HMB) over concerns regarding stiffness reduction at a number of trial sites. The moratorium was imposed on HMB – which use stiff bitumen to create an unyielding base – last year while investigation into the unexpected results is carried out.

"In developing Bardon Superstructure our aim was to create a proprietary high stiffness road base asphalt with improved durability, flexibility and adhesion plus high resistance to the effects of ageing

and water ingress,” says Shell Bitumen technical manager John Read. “When we started the development the HA was firmly backing HMB but we felt that there was more than enough room in the market for an alternative road base product.”

Shell Bitumen undertook the rheological analysis of various engineering and polymer bitumen modifications to produce a short list of potential binders. Aggregate Industries meanwhile investigated volumetric influence using a whole host of different aggregate combinations to find the most advantageous grading.

Both binder and volumetric design were eventually narrowed down by a process of extensive testing including long term ageing, stiffness, fatigue, immersion wheel tracking and water resistance to produce the optimum product.

Analytical comparison of the finalised Bardon Superstructure and a 15 pen HMB was carried out prior to trial of the material at Stanlow. “The results showed the stiffness of the new material to be 22% less sensitive to the effects of water ingress and 6% less affected by ageing,” says Phillips. “We are confident that the NCPE work on Bardon Superstructure will confirm our findings on water sensitivity.

“Our analysis also proved Bardon Superstructure to have a greater resistance to fatigue and maintain greater stiffness over a wider temperature span than 15 pen HMB.”

Investigation into the long term performance of HMB is still on going and could eventually produce an even better product, Phillips claims. “Nonetheless, there will always be room for competition and with the prospect of gaining HA approval in the near future, Bardon Superstructure is the perfect candidate.”

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1. The HA was impressed with the results from the Bardon Superstructure test site.

2. Bardon Superstructure builds on existing technology to produce an ultra strong, highly durable road base.

3. Shell's fuel depot entrance in Stanlow is the first trial site for the material.

New Nottingham research centre now open

Research into asphalt and bitumen technology received a considerable boost in September this year when a new facility – the Nottingham Centre for Pavement Engineering – opened at the University of Nottingham. The new centre is the result of close working partnership between the University's School of Civil Engineering, Shell Bitumen UK and Shell Global Solutions.

The £2.3M centre was officially opened by Highways Agency chief executive Tim Matthews on 12 September and will cover research into bitumen and asphalt technology as well as other pavement engineering applications. Each of the project partners has its own

research facilities at the centre and independent testing support and research will also be carried out on behalf of external clients in the pavement engineering industry – a service which Aggregate Industries is already making full use of.

Shell Bitumen managing director Ruth Leach says: “Developing new ways of coping with the increasing demands of growing traffic volumes, while meeting increasing environmental and sustainability considerations, is an ongoing challenge for everyone connected with road construction and maintenance. The Nottingham Centre for Pavement Engineering is geared up to help meet these challenges.”