

## Foster Yeoman

**A new carriageway through the Dartford River Crossing's west tunnel posed real challenges for the asphalt contractor, not least in providing a safe and durable surface during and after construction. Foster Yeoman rose to the occasion.**

# High performance surfacings go underground

**T**he oldest of Dartford River Crossing's twin tunnels, the west one, is hugely busy: it carries a fair proportion of the 65,000 vehicles which travel north daily, including all the HGVs. Keeping the bore open each day during recent renewal of its road deck was essential which meant careful phasing of concrete slab replacement during night time closures.

Maintaining a high performance surfacing on the slabs at all times was an absolute priority. The final wearing course could only be laid when the remedial work was complete and all the new deck segments were in situ. In general, the materials had to be durable, able to withstand future traffic loadings without deformation and promote safety.

"A high performing base course applied to the decking before installation and which could temporarily double up as a wearing course was vital," says Foster Yeoman Contracting business development manager Simon Eeley. "So was an equally high performance surface course for topping off the job on completion."

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**Simon Eeley**

Foster Yeoman undertook the work in close partnership with its bitumen supplier Shell Bitumen as part of a larger contract to refit the tunnel deck carried out by Skanska.

The base course had to be good enough to serve as a wearing course through 10 months of redecking and the asphalt specialist decided to build on its Stratagem range of proprietary asphalt thin surfacings to meet the stringent demands of the job.

"Skanska invited us to tender for the carriageway reconstruction aspects of the deck refit in April 1999 and the tender process involved developing a detailed proposal for the work," says Eeley. "Skanska and its client Dartford River Crossing were keen to find materials which would resist forming ruts under load. They also had to cope with predicted increases in traffic volumes while not exceeding a 100mm maximum thickness."

Foster Yeoman and Shell Bitumen jointly developed the Stratagem asphalt range to create both a high performance base and surface course specifically for the job. Stratagem uses Shell Bitumen's superior SBS modified binder – formulated specifically for Foster Yeoman – for enhanced resilience and performance producing a low noise and spray reducing surface.

The specially engineered binder and surface courses were subjected to rigorous analysis to establish their overall performance and resistance to deformation. This included laboratory testing plus wheel tracking tests to prove the high performance of the materials under heavy axle loadings. The results were good and Foster Yeoman started work on the contract early last year.

Skanska set up a casting yard near to the Essex end of the tunnel to produce the new precast slabs. The 410, 30t concrete segments, measuring 6.5m in width and 3.5m in length, were fabricated at the yard and surfaced with the base course in sequence. Skanska then removed the old deck and surfacing and installed the new sections into the 1.5km long tunnel during a series of night closures

## Growth of the Dartford crossing

The two lane west tunnel is the original Dartford crossing which opened in 1963 at the cost of £13M and carried both north and southbound traffic. Two million vehicles were expected to use the tunnel each year when it opened but actually 4M passed through its portals in the first 12 months.

Construction of a second tunnel started in 1972 and opened eight years later to carry the southbound traffic, leaving the west tunnel to carry just northbound vehicles. The tunnels became a vital link to the M25 motorway when it was fully opened in 1986.

Traffic volumes continued to grow and led to development of plans for a bridge crossing adjacent to the tunnel. The Queen Elizabeth II Bridge opened in 1991 to carry all the southbound vehicles; with north bound traffic using both tunnels.

using a specially adapted crane.

Skanska prepared the deck sections in its yard by applying a waterproof membrane over which Foster Yeoman applied a red sand asphalt layer bound by an Evatec binder. This was followed by a 60mm thick layer of Stratagem 14 asphalt formed from a 14mm aggregate and a specially adapted SBS modified binder.

"The sand layer and base course were laid onto 17 precast panels in each – almost weekly – visit to Skanska's yard. Using a specially extended and adapted Dynapac paving machine, the material was laid to the required road profile with a gentle fall from the centre line and a steeper 500mm edge camber," says Foster Yeoman contracts manager Bob Stephen.

Road markings were then painted on before Skanska cut through the base course to separate the panels and install them in the same sequence to give an even profile. Temporary ramps were used to transfer the traffic onto and off of the new sections until the wearing course could be laid.

Foster Yeoman laid the wearing course – a 20mm thickness of Stratagem 10 – during two weekend night closures in February this year. Stephen says: "The final stage of the work went very smoothly partly because working in the long established road tunnel not only protected the surfacing from the elements, it also meant the site was well lit."

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1. Skanska set up a temporary casting yard near the Essex end of the Dartford twin tunnels.

2. The precast deck segments were waterproofed then surfaced with red sand asphalt and a Stratagem binder course in the yard.

3. Road markings were painted onto the freshly laid binder course and fitted the sections in sequence.

4. A specially adapted crane was used to lift in the new deck segments.



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