Bridge Deck Waterproofing

Eliminator® Product in Action

Avonmouth Bridge Southbound, UK

Client: HIGHWAYS AGENCY
Main Contractor: INTER ROUTE
Authorised Contractor: STIRLING LLOYD CONSTRUCTION

Since its completion in 1973 the Avonmouth Bridge, which carries the M5 over the River Avon has become a vital part of the road infrastructure in the South West of the UK. A crucial structure that links Somerset, Devon and Cornwall to the rest of the country, the bridge is not only important for commuters to Bristol and South Wales but is an essential element in the route carrying holiday makers, who are vital to the local economy, to this part of the country.

Designed by B. Wex the 1.4km structure is highly dynamic and is subject to significant vibration, which has meant that retention of surfacing has been a challenge. Consequently, repetitive surfacing works and other maintenance projects has put the busy section of the motorway at the forefront of local debate.

Resurfacing Required

Despite having been resurfaced in 2000, in September 2006 the announcement was made that the whole bridge was to be resurfaced. InterRoute, the joint venture between Mott MacDonald and Balfour Beatty Infrastructure Services, the Highways Agency Managing agent for the region, awarded the contract for the bridge deck waterproofing and resurfacing of the bridge to Stirling Lloyd. This was the culmination of five years of collaborative development work between Stirling Lloyd, their preferred surfacing partner, Aeschlimann International who supply the advanced "Gussasphalt" surfacing system and InterRoute.

It's All in the Planning

Disruption limitation was a major aim and therefore decisive steps were taken to reduce the impact on road users. Stirling Lloyd Construction worked with InterRoute to keep traffic flowing as freely as possible throughout the contract by ensuring three lanes of traffic, in both directions, as well as an emergency vehicle access lane remained open at all times.

With peak usage of the bridge being in the summer months, the works had to be carried out during winter. It was therefore imperative that the products specified for use on the bridge could not only be applied in cold temperatures but would suffer no detriment to their performance in this challenging environment if applied at low temperatures.

Stirling Lloyd's standard Eliminator waterproofing membrane can be applied down to -5˚C (with grades available for even lower temperatures), while still maintaining rapid cure times and with no compromise in the in-situ performance of the system.

The Work

The removal of the surfacing and deck preparation was no easy task; despite using a variety of methods the previously applied Eliminator waterproofing proved to be still water tight, had not deteriorated since it was applied and was still maintaining its strong bond to the substrate. Once the material had been removed, approximately 24,000m^2 of Eliminator was applied to the Southbound carriageway, comprising of 8,000m^2 to the steel main span and 16,000m^2 to the concrete approaches.

Ref. PIA_Elim023(3E).pdf
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The first element of the waterproofing system was the application of the appropriate primer, ZED S94 anti-corrosive primer on the steel sections and PAR 1 reactive primer on the concrete deck. These primers gave the enhanced bond strengths required in the Highways Agency's Interim Advice Note 96/07 Revision 1, which was developed to enhance the performance of surfacing on such high stress sites.

Tensile Adhesion tests were carried out at regular intervals along the deck, which confirmed the strong bonds between the membrane and the concrete and steel decks.

Once the primer had cured, typically in well under an hour, the membrane was applied in two colour-contrasting coats. The first to coat was applied to provide a minimum dry film thickness (dft) of 2mm. Wet film gauge thickness tests were taken throughout application to confirm this thickness was being achieved. As Eliminator doesn't have a critical overcoating time and is tough enough, once cured, to allow heavy site traffic to drive over the membrane without causing any damage, its use allowed the project manager greater flexibility in the works programme as day joints, working in non-continuous sections and access over completed areas provided no issues or disruptions to the works programme.

Once the first coat had cured and been electronically integrity tested a second 1mm dft layer of Eliminator was applied. This was overscattered with an aggregate before curing in order to provide additional resistance to shear in the surfacing. Finally a heat activated tack coat, that enhanced the bond between the membrane and the subsequent Gussasphalt surfacing, was applied.

Gussasphalt Surfacing

Stirling Lloyd Construction sub-contracted the surfacing to Aeschlimann International who are specialists in the application of Gussasphalt surfacing, which is a very dense mastic asphalt that is itself almost impervious and is self-compacting when laid. The material was spread using a special paving machine that runs on pre-positioned rails to achieve the required thicknesses of asphalt, as well as providing a highly accurate finish, having a tolerance of +/- 2mm giving an excellent ride quality and ensuring that the dead weight is controlled. Applied to the entire 17 metre wide Southbound carriageway in only two runs in order to minimise the number of joints, the total thickness of surfacing was only 50mm on the steel sections and 60mm on the concrete.

A Long Term Solution

By choosing to utilise two technically advanced systems, namely Eliminator waterproofing and Gussasphalt surfacing, working in unison, InterRoute and the Highways Agency have given the Avonmouth Bridge a refurbishment that was not only delivered on time and within budget but is set to reduce maintenance costs dramatically in the coming years. The durability of the Gussasphalt surfacing is expected to provide a service life of between 20 – 30 years, a maintenance period to date unheard of for what is one of the most heavily trafficked structures in Britain with such a thin layer of asphalt surfacing.

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