



Bridge Deck Waterproofing

Eliminator® Product in Action

Stonecutters Bridge, Hong Kong



Client: THE GOVERNMENT OF HONG KONG SPECIAL ADMINISTRATIVE REGION, HIGHWAYS DEPARTMENT



Main Contractor: MAEDA-HITACHI-YOKOGAWA-HSIN CHONG JOINT VENTURE
Authorised Contractor: ADVANCE SPECIALIST TREATMENT ENGINEERING LTD.

Stonecutters Bridge in Hong Kong, the second longest spanning cable-stayed bridge in the world, epitomises the latest in bridge engineering, with every element of the structure being on a grand scale. The dual three-lane crossing utilises 33,500 tonnes of structural steel in the bridge deck, 32,000m³ of concrete in the towers and the 65 steel deck units rely on 224 cables. Effectively protecting this mega structures deck from

but it also offers on-site and long term performance benefits. **Eliminator's** track record of success in high temperatures together with its proven compliance with the strict criteria for the Stonecutters project led to its use on this immense structure.

A Trusted Application

As is common in Hong Kong the surfacing material used was a Stone Mastic Asphalt (SMA), which helps to reduce noise and dissipate water from the road surface. The surfacing specification also called for a mastic asphalt intermediary layer between the waterproofing system and the SMA. To confirm that **Eliminator** would achieve the specified tensile and shear adhesion strengths to the mastic asphalt, an extensive programme of pre-construction testing was carried out. So strong was the bond that **Eliminator** achieved in these tests that in most cases the eventual mode of failure was cohesive failure within the mastic asphalt itself.



the weather extremes experienced, including monsoon rains and extreme heat in the summer, as well as the high levels of traffic travelling to and from Chek Lap Kok airport and the region's container port was essential to ensure that this elegant asset will fulfil its important strategic function for many years to come. The main contractor Maeda Hitachi Yokogawa Hsin Chong JV (MHYH JV) and designers Ove Arup and Partners HK therefore required reliable and robust waterproofing solutions and consequently turned to Stirling Lloyd Polychem Ltd., and their market leading **Eliminator** two coat, colour coded methylmethacrylate (MMA) based system and the quality assurance benefits that come with its specification.



Once on site, prior to the application of the waterproofing system, the deck was captive blasted and tensile adhesion tests, to assess the actual bond that would be achieved between the deck and the waterproofing, were carried out.

Track Record of Success In Hong Kong

Since 1995 **Eliminator** has been used to protect all new steel highway bridges in Hong Kong as, not only can it more than withstand the harsh climatic conditions experienced in the area,

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The design specification required a minimum bond of 2MPa, in fact the adhesion tests gave results of between 5 - 6MPa! The deck was then primed with Stirling Lloyd's anti-corrosive ZED S94 primer, which both protected the steel deck and enhanced the bond between the deck and subsequent membrane. The first coat of the **Eliminator** membrane, pigmented yellow, was then spray applied to the deck. Once this had cured, in well under an hour, the second coat which was pigmented grey, was spray applied to the deck, creating a seamless finish with no vulnerable laps or joints. As **Eliminator** has no critical overcoating time the spraying of the membrane could be phased in accordance with the needs of the main contractor, therefore aiding project progression. In total **Eliminator** was applied to approximately 47,500m² of the deck in the main carriageway.

Once the second coat had cured, again in well under an hour, the system was then electrically tested to confirm the integrity and 100% water tightness of the system. Stirling Lloyd's Tack Coat No.2 was then roller applied onto the **Eliminator** membrane, which acted to enhance the bond between the waterproofing and the subsequent mastic asphalt. Once this had dried the system was ready to be surfaced.



Throughout the laying of the surfacing adhesion tests, designed by Arup, were undertaken which confirmed that the high adhesion values achieved between the waterproofing and surfacing in the pre-construction testing were being realised on site.

The Decks' "Outer" and "Inner" Edges

The "outer edges" of the decks, which have a thinner surfacing thickness from the main carriageway and so are at a lower level, are used by maintenance personnel and so the specification here not only required an effective waterproofing system but one that incorporated an anti-skid surface. Consequently Stirling Lloyd's lightweight waterproofing and wearing course

system, **Bridgemaster** was selected. Despite a wide range of complex geometry, details and upstands including drainage channels, anchorage tubes of varying angles, cover plates and base plates, **Bridgemaster's** simple application and thixotropy meant that these complex details could be easily accommodated, without compromising the protection provided.



The resin element of the system, which contains aggregate fillers was first spread across the area to be treated, including up to the stainless steel parapet which separates the main carriageway from the "outer edge". To ensure that the specified thickness of 4mm was achieved a hand held pin rake was used to spread the material over the surface and smoothed using a flat float. Any trapped air was released using a spiked roller and then, while still in a liquid state, a final aggregate overscatter was broadcast to provide the skid resistance. In total some 5,000m² of the "outer edge" was treated with the **Bridgemaster** system. As the bridge comprises two decks, one carrying airport bound traffic and one carrying Hong Kong Island bound vehicles, with a 14m wide gap between the two, a waterproof solution to allow rainwater to runoff the decks and into the Rambler Channel below was required on the "inner edges" of the decks. Stirling Lloyd's **Metaset** Concrete, a rapid hardening material based on the same advanced MMA technology used in **Eliminator** and **Bridgemaster**, was used to build up the 1,000m² of this "inner edge". Its viscosity enabled a triangular shape to be created with the thick end of the wedge meeting the deck, ensuring that water travels away from the deck.

Protected For The Future

The **Eliminator** system has an impressive track record throughout the world and within this region; this combined with the products capability to meet the strict design criteria led to its use on this important, high profile structure. In addition, Stirling Lloyd's range of advanced solutions enabled the company to provide a complete waterproofing package. The quick curing nature of the products and their rapid application ensured that this element of the project was completed ahead of the scheduled programme and within budget.