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# Keeping the UK moving



○ Metrail are one of the selected by National Highways on a £3.4billion framework covering these areas

Metrail is one of the leading specialist contractors in the UK focussed on concrete repair, bridge deck waterproofing, bridge deck expansion joints and slab stabilisation.



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## case study

# M180 Concrete Road Refurbishment

With sections of the motorway in need of refurbishment, Metrail employed a resin-stabilisation technology from Germany to provide innovative, cost-effective and time-efficient solutions for renovating the concrete pavement on a five-kilometre stretch of the east-bound carriageway of the M180, returning that stretch of pavement to Class A without completely replacing the running surface of the motorway.

### Facts & Figures:

<b>When?</b>	October 2021 to February 2022
<b>Where?</b>	A five-kilometre stretch of the east-bound carriageway of the M180 between Junctions 1 and 3
<b>How?</b>	Injecting resin into over 20,000 holes
<b>Technology</b>	A two-component silicate resin, which cures to 90% full strength within 15 minutes. Full compressive strength of ca. 50n/mm <sup>2</sup> is achieved within the hour
<b>Result</b>	James Fisher Testing Services has now classified the overall stretch of pavement as Class A

### The challenge

Heavy traffic flows, water ingress and uneven settlement had taken its toll on the M180, creating voids under sections of the concrete pavement, thus rendering the carriageway unstable, leading to failures. The fix would require enhanced maintenance, including stabilisation, levelling as well as replacement of the existing concrete slabs.





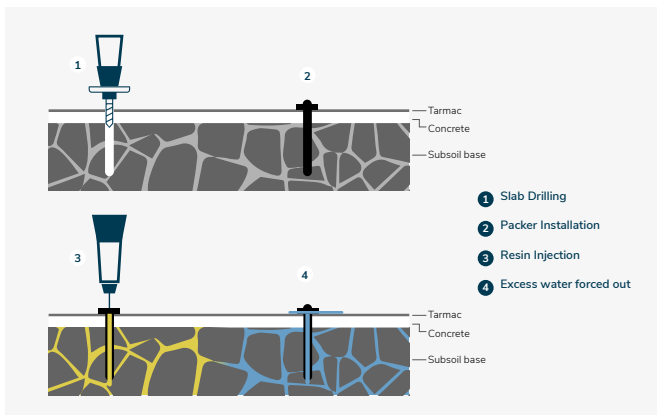
resin  
cures to  
**90%**  
strength within  
15mins

**5km stretch** | on the east-bound carriageway of the M180 between Junctions 1 and 3 refurbished back to Class A

## Solution approach

Rather than completely replace the running surface of the motorway, Metrail employed a cost-effective, long-term solution. Our technique: drilling holes into the concrete to inject a highly specialised resin product whose job was twofold. One: displace any groundwater trapped below the surface. Two: fill in all voids in the sub-formation.

Over 20,000 holes needed to be drilled, which was carried out with either hand-held drilling tools or an automated drill rig. A standard 600 x 600 mm grid pattern was adopted from the edge of each slab, which is equivalent to one hole per 0.4m<sup>2</sup>.



## Resin-stabilisation technology from Germany

Let's start with a few facts about the resin product: mixed on-site, the resin was designed for the stabilisation of concrete slabs on high-speed roads in Germany, where most of the critical roads are built using such slabs. The resin has a product life of up to 30 years, good adhesion to the upper concrete slab, excellent penetration and void-filling capability, and can survive under the road much longer than brittle cement-based systems. Plus, with this technique the road can be reopened to traffic just 15 minutes after application.



## Execution

First things first, a contra-flow system was put in place to allow unfettered access to the carriageway. Then, remember those holes we talked about? Packers were mechanically fixed into them and the resin injected at a controlled pressure. This ensures that any cumulated water gets forced out and the voids are filled completely. The process was continuously monitored using geodetic equipment, and upon taking the packers out of the road, any excess resin on the surface was removed.

Maxicrete was employed in the second phase of the project to repair and seal the joints between the slabs.



## The result: M180 section back to Class A

With Metrail's aim to deliver high-quality work with a focus on careful planning to ensure safety, quality and on-time delivery, we are pleased to report that James Fisher Testing Services has now classified the overall stretch of pavement as Class A.

The maintenance provided is also expected to reduce the frequency of roadworks along this busy stretch of the M180.



Watch the  
case study  
video



## case study

# A180 Concrete Road Refurbishment

While traditional methods of working would have likely required a two-week programme of night-time closures, Metrail teamed up with Otto Alte-Teigeler GmbH (OAT) of Germany, employing OAT's bespoke silica resin design mix to provide innovative, cost-effective and time-efficient solutions to support Highways England, successfully completing a tight programme of slab lifting, stabilisation and bay replacement on the A180 – in a single weekend.

### Facts & Figures:

**When?** March 5–7, 2021

**Technology** A two-component silicate resin, which cures to 90% full strength within 15 minutes. Full compressive strength of ca. 50n/mm<sup>2</sup> is achieved within the hour

**Result** Slab lifting, stabilisation and bay replacement on the A180

### The challenge

Highways England's Area 12 contains a number of heavily utilised sections of concrete road that are in need of enhanced maintenance, including both levelling as well as replacement of existing concrete slabs. One particular area requiring urgent attention was a section of the A180 between Grimsby and Barnetby Top.





## Solution approach

A key driver for the success of this project was regular Early Contractor Involvement (ECI) meetings with the client and supply chain. These meetings allowed us to understand the opportunities as well as the constraints.

With a complex site for each shift, all deliveries, roles and processes required careful coordination. When it came to deliveries, each contractor was allocated a specific time. Why? In addition to ensuring that the scheme ran smoothly and to schedule, doing this also – and most importantly – reduced the risk to the workforce from a large number of traffic movements.

The eastbound carriageway of the A180 was closed to traffic between Brocklesby and Barnet with a local diversion.



The scheme was carried out in a single weekend



Work on  
**A180**

## Technology

Let's start with a few facts about the resin product: MINOVA/OAT Inject GEO-plus is a two-component silicate resin that cures to 90% full strength within 15 minutes, and full compressive strength of 48n/mm<sup>2</sup> is achieved within an hour. This method of grouting allows traffic to run on the newly lifted bays within 15 minutes.

As far as the concrete goes, it was provided by Spot On Concrete. Metrail specified Spot On Rapid, which is an innovative new design mix the company developed that achieves 33n/mm<sup>2</sup> in 5 hours, 40n/mm<sup>2</sup> in 12 hours and 50n/mm<sup>2</sup> in 24 hours.

## Execution

### Phase 1 of the works: slab lifting.

Doing this required drilling through the concrete slab and injecting the highly specialised resin product under the slab, which raises the slab and then provides continuous support.

### Phase 2 of the works: replacing the adjacent bays that were too badly damaged to be lifted.

In a separate activity Metrail carried out concrete repair work on a number of cracked slabs.



## Result

Drawing on the knowledge of our skilled workforce and collaborating with A-one+, our partner OAT and our experienced supply chain, Metrail is pleased to report the successful completion of a tight programme of slab lifting, stabilisation and bay replacement on the A180. Our careful planning and use of lean tools and techniques was paramount to completing the scheme to a high standard that met Highways England's imperatives – safety, quality and on-time delivery.



**6 bay  
replacements**

including over banding,  
to a total of 52m<sup>3</sup> concrete  
within 5 hours



8 bays lifted  
and levelled using

**1,200L**

of resin – an area  
of approximately  
250m<sup>2</sup>

## case study

# Tinsley Viaduct Concrete Repair & Waterproofing

With both lanes of the A631 in need of repair and resurfacing, Metrail carried out bridge deck waterproofing and associated concrete repairs on the A631 southbound carriageway of the Tinsley Viaduct in two five-week phases, on a total of 18,000sqm of deck and 1,850sqm of walkway.

### Facts & Figures:

**When?** Two five-week phases commencing in May 2019

**Where?** A631 southbound carriageway of the Tinsley Viaduct

**What?** Bridge deck waterproofing and associated concrete repairs

**Structure** Tinsley Viaduct – a two-tier steel box girder viaduct

### The challenge

The contract awarded to Metrail covered the following scope of work:

- removal of the existing waterproofing as well as removal of the existing walkway surfacing,
- scraping of the main deck in order to remove any remaining surfacing and waterproofing,
- the identification and carrying out of concrete repairs prior to waterproofing,
- the application of waterproofing, including a bond coat; and the application of combined waterproofing/high friction surfacing on the walkway.



## Solution approach

In order to complete the works, a traffic management scheme needed to be put in place which enabled two-way traffic on the northbound carriageway, thus allowing full closure of the southbound carriageway, enabling us extended daytime working for completion of the resurfacing. The Metrail scope commenced once the asphalt surface on the main carriageway had been removed down to approximately 10–20mm.

Waterproofing  
of approximately  
**18,000**  
sqm

## Technology

ELIMINATOR®, the GPC Advanced Technologies waterproofing system, is a rapid cure, cold liquid spray applied system, which is based on methacrylate monomers which forms a tough, flexible seamless membrane with no vulnerable joints. It's resistant to chemical attack by oil, fuels, brine and dilute mineral acids. Where asphalt is to be laid a bond coat – also known as a tack coat – is applied as well. When it comes to the walkway, we employed Safetrack, a GCP product specifically designed to provide a durable anti-skid surface.

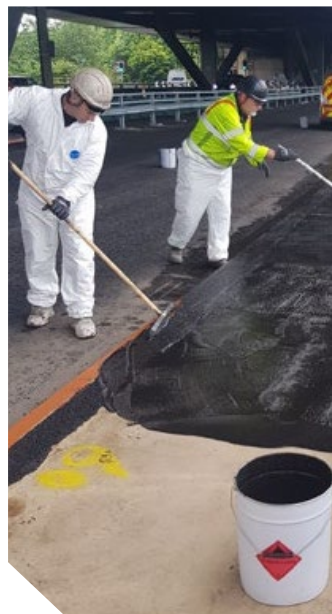
## Execution

Employing a large Caterpillar tracked scraper with a bladed head, the first thing we did was remove as much of the remaining surface as possible before fine milling to remove any remaining traces of the old surface. We then carried out an extensive number of concrete repairs using Metaset Rapid Repair Mortar which cures to full strength in 1–2 hours. Next up: sand blasting the surface and carrying out adhesion testing. We then primed the

surface and manually sprayed it with the ELIMINATOR® system. Rather than screeding the steel walkway – a method that had proved time consuming and costly – we proposed using Safetrack. After stripping and cleaning the old walkway surface down to the bare steel, we then primed and waterproofed it with ELIMINATOR® so that Safetrack could be applied.

## Result

This project offered us the opportunity to showcase our extensive experience and skills in waterproofing and concrete repair, and we're pleased to report that Metrail achieved all the timescale milestones to ensure an on-time opening of the A631 southbound carriageway of the Tinsley Viaduct. Sound project management, technical competence and close coordination with all stakeholders involved were key to the success of the project.



## case study

# Rochester Bridge Concrete Repair, Joint Replacement & Waterproofing

With the three road bridges of the Rochester Bridge – this includes the Old Bridge, the New Bridge and the Service Bridge – in need of major refurbishment, Metrail carried out concrete repairs on all three bridges as well as expansion joint replacement and bridge deck waterproofing on the Old Bridge and the New Bridge.

### Facts & Figures:

<b>When?</b>	On-Site work started in July 2019
<b>Which structures?</b>	The Old Bridge, New Bridge and Service Bridge of Rochester Bridge
<b>What?</b>	Metrail carried out concrete repairs on all three bridges as well as expansion joint replacement and bridge deck waterproofing on the Old Bridge and New Bridge
<b>Result</b>	One of the first projects to utilise an NEC4 Contract, in which 78% of our completed works were through variations

### The challenge

Due to the age and heritage of the structures associated with the bridges, a comprehensive programme of checking and inspection was required. We did this to ensure that all areas requiring attention were identified.

This was also one of the first projects to utilise an NEC4 Contract, in which 78% of our completed works were through variations.

And in addition, the complexity of the programme required the Metrail team on-site to interface with many different stakeholders in order to ensure that at each stage of the works everyone was happy to proceed, without detriment to the programme.



**2,000**  
sqm of deck

**78%**

of our completed  
works were  
through variations



## Solution approach

We began our on-site work in July 2019 with concrete repairs to the bridge soffits. Unfortunately, however, the programme was disrupted due to the Covid-19 pandemic and the first national lockdown in March 2020. This led to the programme needing to be rescheduled and a new completion date being agreed upon.



## Concrete Repair (all three bridges)

Our first step of concrete repair: the breakout of unsound concrete. This has to be cut to a depth of 10mm for repair mortar and 20mm for repair concrete. Where reinforcing is encountered, this needs to be exposed to the full circumference of

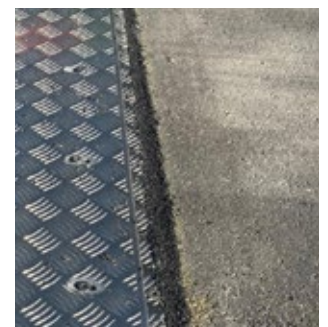
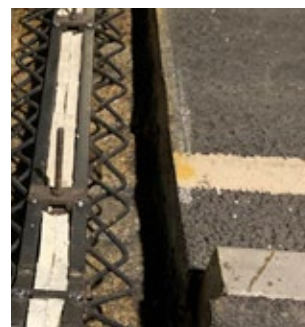
the steel. Any signs of corrosion require removal using abrasive equipment, and in some cases where the corrosion is bad, additional bars are added prior to repair. Care was also taken to ensure formwork was secure before repair concrete was placed.

Resin injection repairs turned out to be very minor.

## Expansion Joint Replacement (Old Bridge & New Bridge)

### Technology

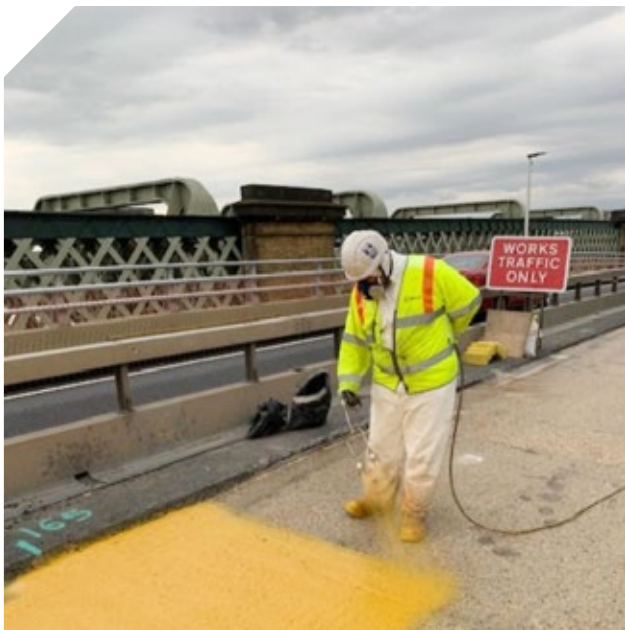
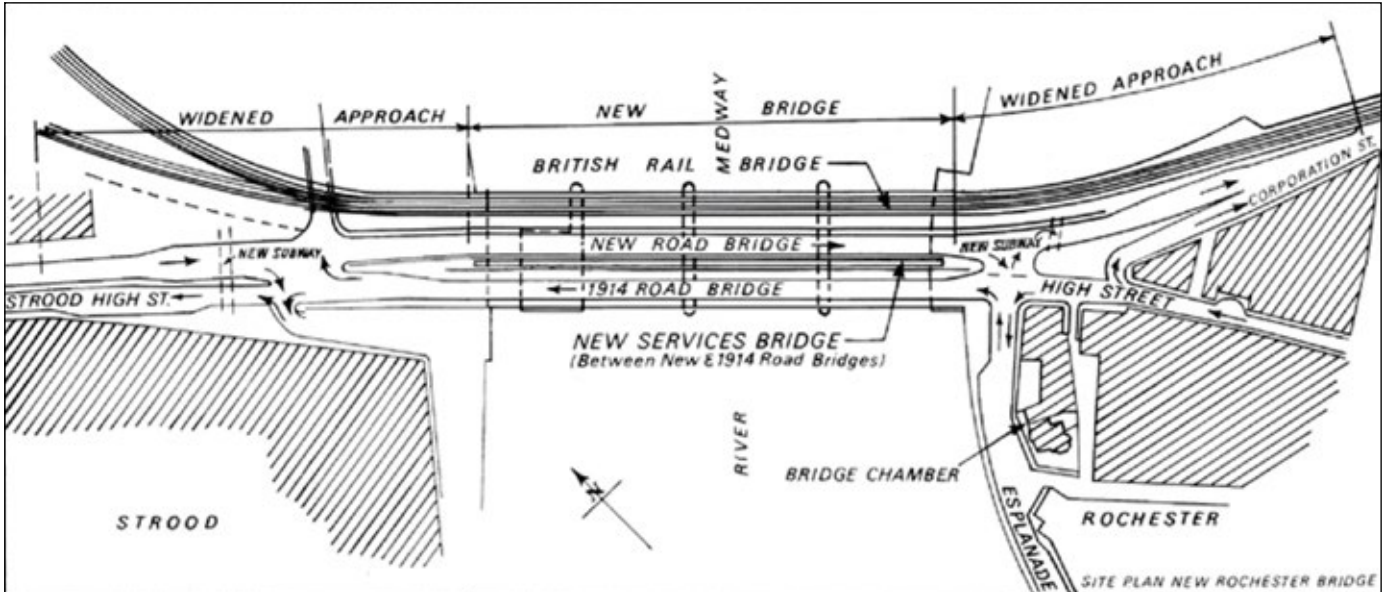
The majority of the joints replaced on the Old Bridge were Type 1, also known as a “plug joint”. Cost-effective and maintenance free, the plug joint is a simple expansion joint for highway bridges. On the New Bridge, Type 6 joints were specified. Type 6 joints incorporate a central elastomeric seal inserted into two steel carrier rails. The carrier rails have special sinusoidal-shaped reinforcement welded into the rear face which locks the carrier rails into the nosing mortar.



### Execution

When it comes to replacement of the joints, damaged areas need to be cut out and all exposed surfaces primed before the Sentinal EMR rails can be lifted into place. Polystyrene shuttering was used before pouring the nosing mortar which was levelled with the road surface. Safetrack, a proprietary anti-skid finish, was then applied.





## Bridge Deck Waterproofing (Old Bridge & New Bridge)

### Technology ELIMINATOR®

The GPC Advanced Technologies waterproofing system, is a rapid cure, cold liquid spray applied system based on methacrylate monomers which forms a tough, flexible seamless membrane. In places where asphalt is to be laid, a bond coat is also applied.

### Execution

After removal of the asphalt wearing surface,

Metrail scraped and cleaned the bridge deck as well as carried out any necessary concrete repairs to the surface using Metaset. Fine milling of the surface then ensured that the substrata was clean, dry and structurally sound so that the primer coat could be applied.

As the Rochester Bridge Trust had specified that the waterproofing should mirror the original waterproofing on the bridge, two coats of the ELIMINATOR® waterproofing membrane were applied and the bond coat used was SA1030.

## Results

Metrail was honoured to have been awarded this work on such an important and historical structure. The refurbishment of Rochester Bridge provided us with the opportunity to demonstrate our core skills and depth of experience in concrete repairs, expansion joint replacement and bridge deck waterproofing. The impact of Covid-19 on the project was significant, but careful planning and management of resources allowed us to overcome this, and we're pleased to report that it did not affect delivery of our works and we were able to meet the revised programme.

## case study

# M621 Joint Replacement

Over a three-week period, Metrail removed and replaced over thirty individual joints on the J5–J7 section of the M621, a project that required over 80 tonnes of Permatrack mastic asphalt to be poured – and the work was carried out entirely at night.

### Facts & Figures:

**When?** The work was carried out over a three-week period between February 22 and March 12, 2021

**Where?** The J5–J7 section of the M621

**How?** Removal and replacement of over thirty individual joints on the motorway totalling around 400 linear metres

### The challenge

The J5–J7 section of the M621 has a number of underbridge sections that are subject to heavy traffic loading where the expansion joints had become irreversibly damaged. The Metrail scope required the removal and replacement of over thirty individual joints on the motorway totalling around 400 linear metres.

Planning for the project was originally based on full road closure. But when the local authority insisted on keeping some traffic moving, we were able to flex our programme to ensure the project was completed on time.

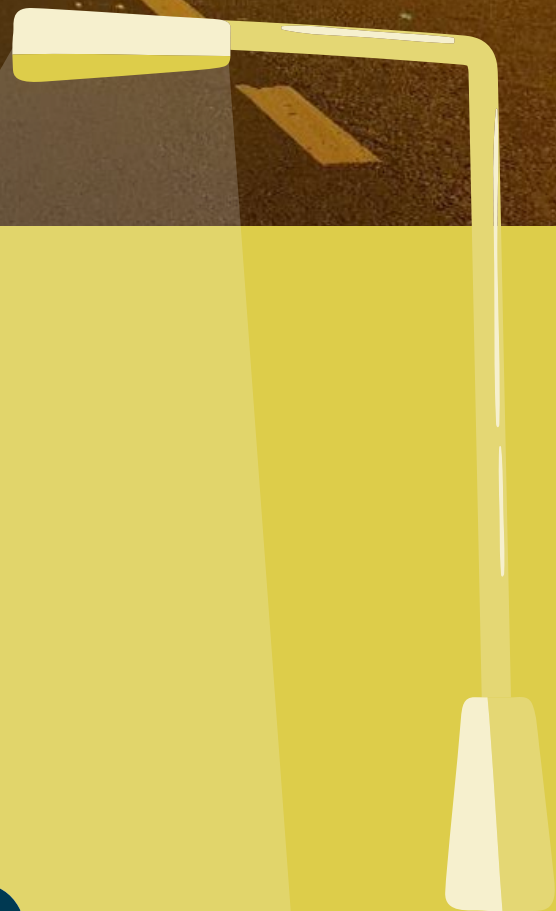
### Solution approach

The Metrail jointing wagon is a specialist vehicle developed by Metrail technicians to provide on-site support in all Metrail jointing operations. It was on-site throughout the contract programme and includes a cauldron for providing the molten PSB. The only additional plant required was a planer, which we used to cut out and prepare the old joints.



over  
**80t**  
of Permatrack  
mastic asphalt  
poured

Work was carried  
out entirely at night



When it comes to delivery, all jointing materials were delivered to the site in a mechanically agitated cauldron at a controlled temperature.

## Technology

### Joints:

For this project we employed the IKO Permatrack H heavy duty joint.

### Asphalt:

The mastic asphalt used was a high-modulus material that uses a binder of SBS modified bitumen and Trinidad Lake Asphalt, which provides the low-temperature flexibility as well as the high-temperature stabilities required for heavily trafficked roads.

## Execution

We began by marking out the new joint and planing the old joint out to a width of 500mm, with a 25mm rebate on the edge of the trench.

Old plates were then removed, and both the trench and the air gap were cleaned.



Using the IKO PermaFLASH D300, we plugged the air gap and then applied a primer to all trench surfaces. After the primer came a first layer of molten PSB, which is a highly flexible material used for tanking the trench. It was applied to the base of the trench, and a galvanised steel plate was placed in the trench. The trench could then be fully tanked out and we installed a drainage channel and rodding box.

### Next:

Installing the actual expansion material, known as PSB Strips. The strips were applied to the vertical faces of the trench, and then another coat of PSB was applied.

We then placed a fibre glass sheet in the trench and filled the joint with Permatrack H.

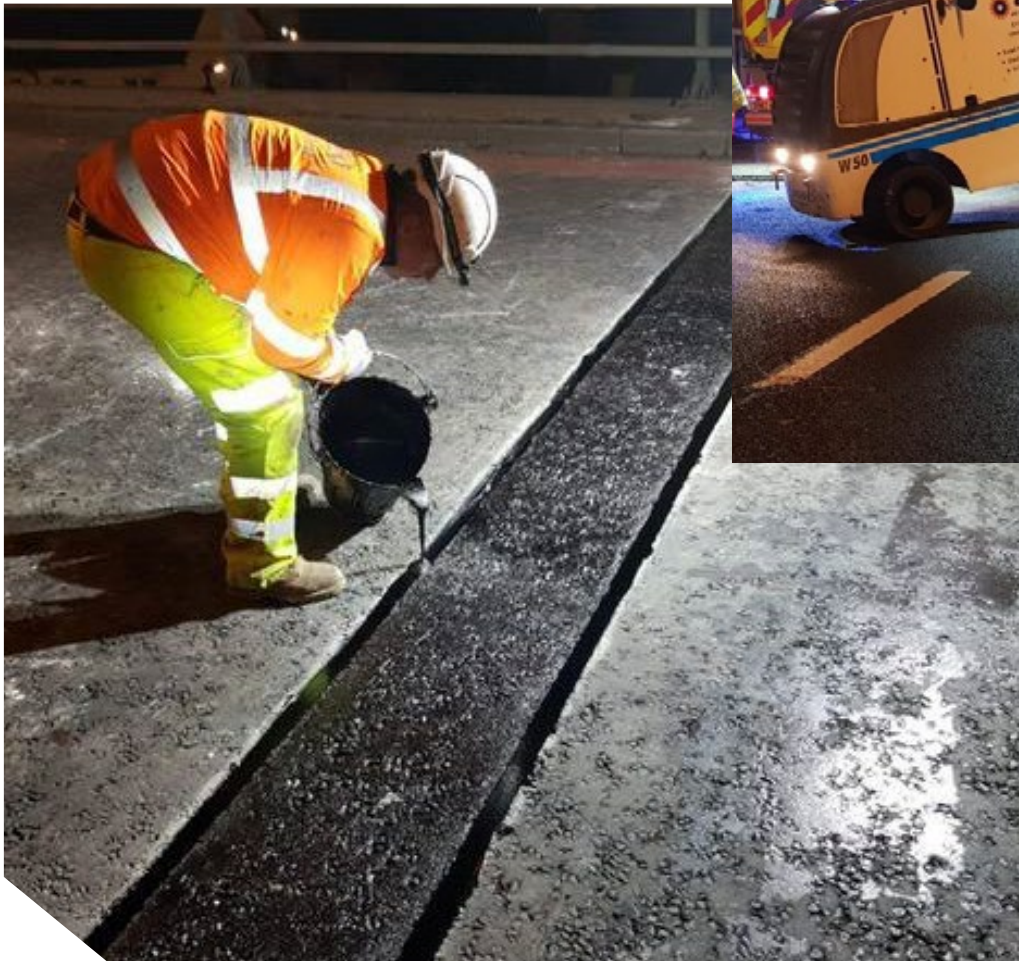
We brought the trench up to the same level as the rebate so that steel side bars could be installed in the rebate. The joint could then be trowelled level and scattered stones were rolled into the surface until satisfactory embedment was achieved.

### Last but not least:

We removed the steel bars and filled the resulting grooves with PSB.

## Results

With Metrail's aim to consistently deliver high-quality work safely and on time, we are pleased to report that this was achieved on the M621 joint replacement project, which was delivered to the full satisfaction of the main contractor as well as the client.



## case study

# M62 Lofthouse Joint Replacement & Waterproofing

Utilising an eight-week closure that allowed Metrail access to the M62 JCT29 Lofthouse Interchange's four bridges, we employed a joint planer rather than hand breakers, ELIMINATOR® waterproofing, fast-setting R2 and R4 materials, and two different types of joints – Permatrack Type 2 and EMR Type 6 – to replace waterproofing and the interchange's 20 bridge joints.

### Facts & Figures:

**When?** Summer 2020

**Where?** M62 JCT29 Lofthouse Interchange

**What?** Joint replacement and waterproofing

### The challenge

At each stage of the project we faced significant additional challenges to overcome:

- Levelling concrete and shot blasting steel to prepare the deck ends
- Removal of gullies
- Testing for lead content of paintwork
- Additional hydrodemolition requiring additional concreting and curing windows

These additional works not only compressed the programme significantly but also removed any contingencies that we had built into the programme.

The programme was also complex and restrictions brought about by the Covid-19 pandemic made coordination of the works even more challenging.



## Two types of joints

Permatrack Type 2 and EMR Type 6



## M62 Lofthouse Interchange



1700m<sup>2</sup> of waterproofing completed per shift



### Solution approach

With the works originally programmed for 12 weeks, our Early Contractor Involvement (ECI) focused on how the programme could be shortened in order to reduce the impact on road users.

Revised programme duration agreed upon by all parties: 8 weeks.

### Technology & Execution

Metrail's specialist works included:

- Removal of EMR rails and joint plates
- Deck scrape
- Fine milling and enclosed blasting
- Metaset concrete repairs (R2)
- Concrete repairs (R4)
- Permatrack Type 2 joint installation
- EMR Type 6 joint installation
- Application of ELIMINATOR® waterproofing
- Adhesion and holiday testing

When it comes to the joint repair works: rather than employing hand breakers, using

- ▶ a joint planer significantly reduced the time taken and lowered the HAVS risk for the operatives. We also used Permatrack High Modulus Type 2 joints which were supplied direct from the factory with the additional benefit of greater quality control from a factory produced mix.

### Results

The M62 JCT29 Lofthouse Interchange joint replacement and waterproofing project was a complex one and Metrail's element of the works were highly specialist. We overcame significant challenges at each stage of the project, and we're pleased to report that we increased our productivity significantly through the use of innovative techniques in order to avoid delays to the overall programme as well as avoid additional disruption to the public.



## case study

# Croydon Flyover Joint Replacement

With Croydon Flyover in need of joint replacement, Metrail employed a bespoke planing drum and Permatrack H, replacing a total of 33 joints whilst keeping road closure times for the works strictly to schedule – 9pm until 5am.

### Facts & Figures:

**When?** March 2019

**Where?** Croydon Flyover,  
part of the A232

**Technology** IKO Permatrack Heavy Duty  
Expansion Joints

### The challenge

A little background info about Croydon Flyover: as the name suggests, it's an overpass in Croydon, England that was opened in 1969. And with Croydon Flyover prone to heavy traffic congestion, queuing traffic ends up sitting on top of the bridge, which places huge amounts of pressure on the expansion joints in the structure.

### Solution approach

Early Contractor Involvement (ECI) with the PC Kier and the client allowed us to come up with a more heavy-duty solution for the joints as well as minimise the risk to delivery whilst maximising the working window and ensuring minimum delays to the road user.

During the project, the depths of the joints were not as stated in the as-builts. But from experience we always ensure we carry a percentage uplift of material to allow for the unknowns – like this one!

a total of  
**33**  
joints  
were  
replaced







The joint material caters for +/- 20mm movement range (40mm total)

Each joint was 7.69 metres long, 550mm wide x 160mm deep

## Technology & Execution

For this project, Metrail replaced a total of 33 joints using Permatrack H, which was delivered hot charged in tankers carrying up to 18 tonnes of material direct to site – this increases safety for Metrail’s teams handling the material as they do not have to prepare it on-site, and it also allows for greater speed of application, thus saving on traffic management costs.

### How much Permatrack H was used on this project?

In total: 54 tonnes. The high-modulus joints incorporate Permatrack PSB, which is a highly polymerised elastic bituminous membrane in preformed strips. These strips provide the movement properties of the joint and are bonded to Permatrack H using a high-modulus matrix consisting of SBS modified bitumen and Trinidad Lake Asphalt. As far as the movement range goes, the joint material caters for  $\pm 20\text{mm}$  (40mm total), and this movement range is in line with the recommendations of CD357 issued by Highways England.

Our use of a bespoke planing drum gave us full control of the works and allowed us to amend the works as needed on-site. Using it also saved time compared to conventional removal of the joints with handheld vibrating breaker tools.

The material that was planed out was taken off-site and disposed of correctly and waste certificates issued.

## Result

Early contract involvement on this project added value through achieving programme certainty and specialist input into appropriate intervention solutions as well as mitigating delivery and safety risks. We’re pleased to report that the combination of exceptional products and our effective project management made the project a great success delivered on time and on budget.

This project demonstrates Metrail’s ability to work in restricted nighttime only windows with critical carriageway reopening times always achieved.

## case study

# London Bridge Refurbishment

In six month time and two phases, Metrail carried out extensive refurbishment works on one of London's most important bridges. The works included waterproofing 10,000m<sup>2</sup> with GCP ELIMINATOR® as well as concrete repairs.

### Facts & Figures:

<b>When?</b>	March - August 2020
<b>Where?</b>	London Bridge
<b>How?</b>	Waterproofing and refurbishing the bridge deck
<b>Technology</b>	GCP ELIMINATOR® a high performance waterproofing membrane
<b>Result</b>	Work completed on time and budget, with the bridge remaining operational for many years to come

### The challenge

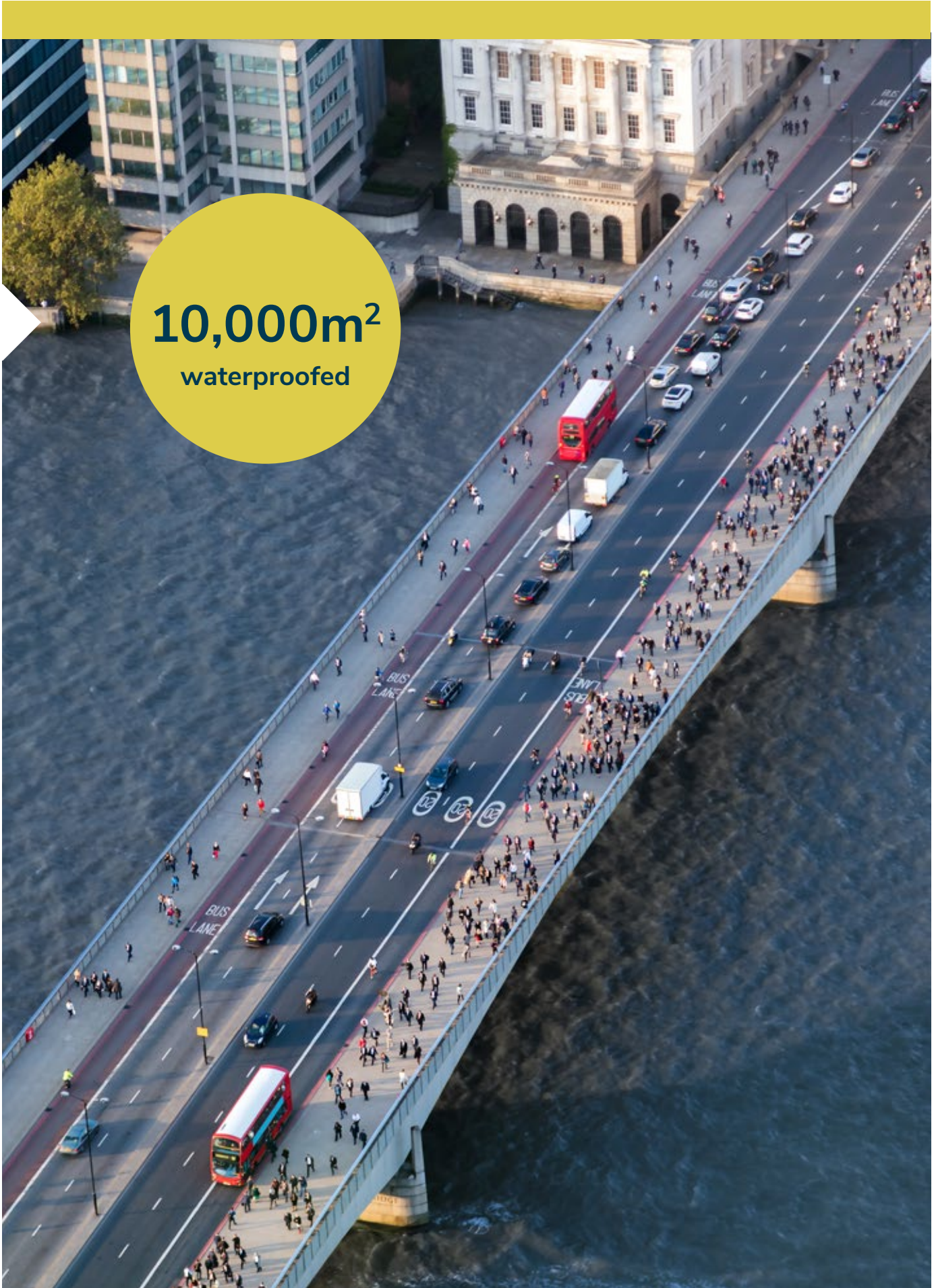
In 2020 the City of London Corporation started essential refurbishment work on London Bridge, which had become vital to ensure the bridge remains operational for many years to come.

Main contractor, FM Conway, had overall responsibility for the refurbishments works and selected Metrail to carry out the waterproofing and concrete repairs.

### Solution approach

Our work scope covered structural concrete repairs, removal of existing waterproofing including deck scrape, fine milling, blasting and re-waterproofing. The total area of waterproofing was approximately 10,000m<sup>2</sup>.

Renewing the waterproofing involved removing the existing surface of the carriageway and footway, carrying out any necessary concrete repairs and then applying and testing the waterproofing system before resurfacing the bridge.



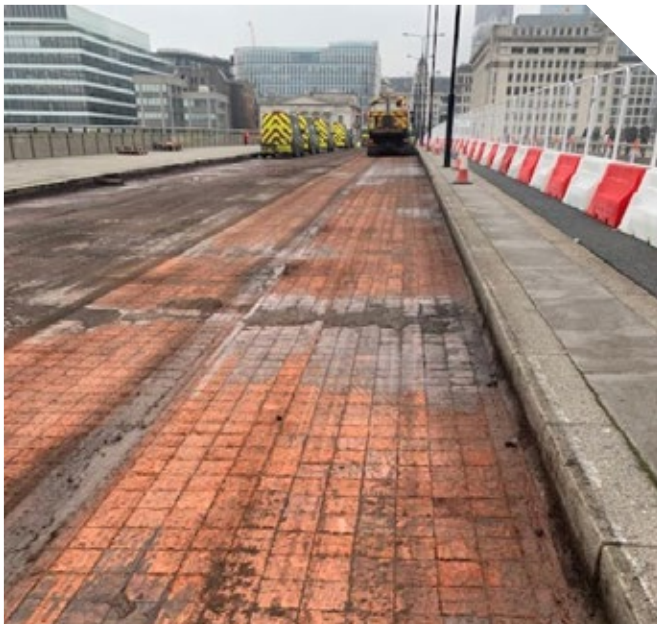
**10,000m<sup>2</sup>**  
waterproofed

## Technology

As a GCP approved contractor, we installed the internationally proven waterproofing system supplied by GCP (formerly Stirling Lloyd) known as ELIMINATOR®. The ELIMINATOR® is a high-performance waterproofing membrane based on Methyl Methacrylate resins which cures rapidly to provide a tough and flexible seamless membrane.

The success of any waterproofing system is dependent on the surface preparation.

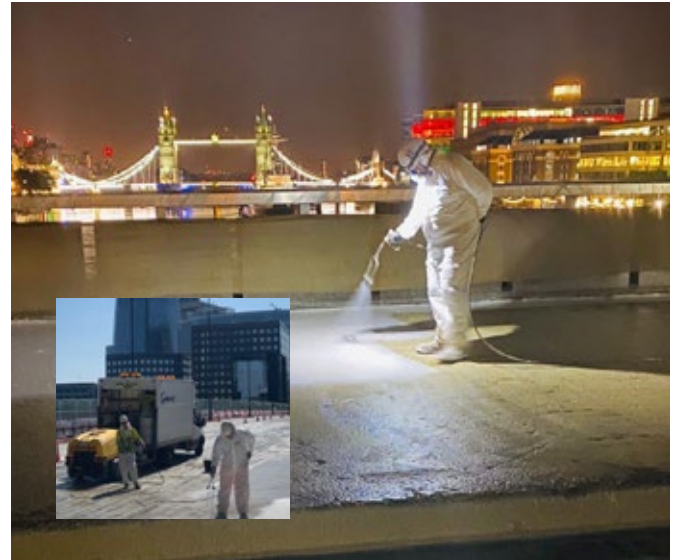
Following scraping of the old deck and fine milling, extensive concrete repairs are required on the exposed bridge deck to ensure the surface is clean, dry and structurally sound to allow application of a primer



On completion of the concrete repair work the GCP ELIMINATOR® waterproofing membrane is applied to provide a minimum dry film thickness of 2mm which equates to 2.8 kg/m<sup>2</sup>

Metrail uses airless spray equipment specifically developed to meter, mix, and apply the product.

As the waterproofing membrane is to protect



a road bridge, a tack coat (coloured orange) is applied to ensure a strong bond with the asphalt road surfacing.

## Execution

The work was carried out between March and August 2020 in two phases. Phase 1 covered the eastern carriageway and Phase 2 the western carriageway which allowed the bridge to remain open at all times under traffic management conditions.

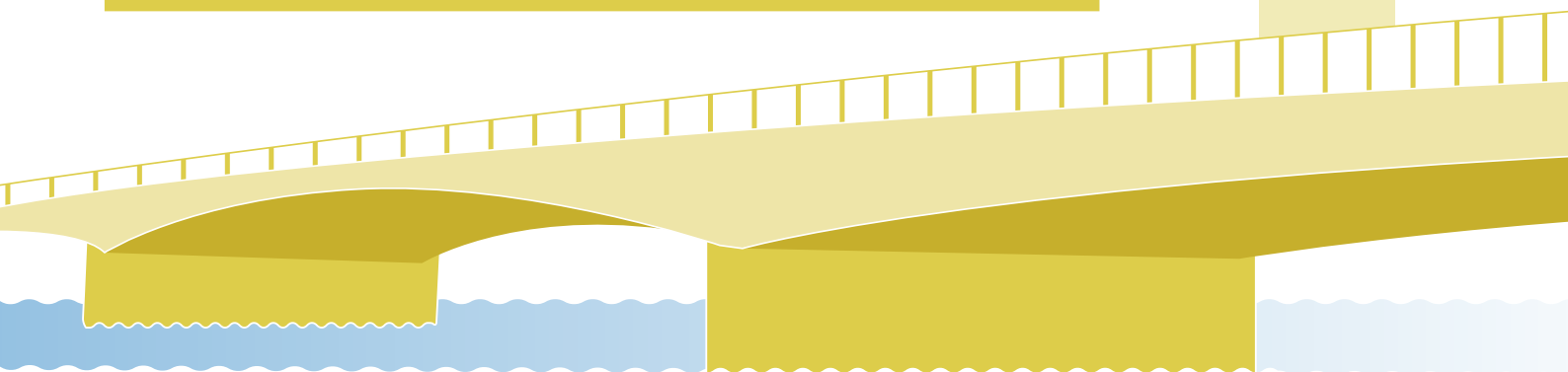
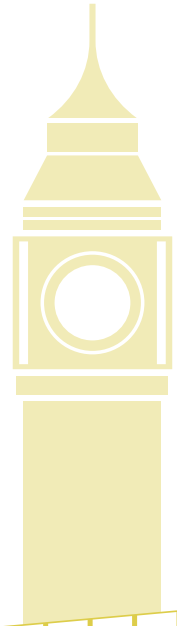
Phase 1 work commenced in March 2020 and Phase 2 commenced in the first week of June. The work was completed on time by the end of August 2020. A particular challenge to the programme was the Covid-19 pandemic but by following Government guidelines and protocols we were able to work throughout this difficult time.



**“We had a fantastic run of dry weather which is excellent for installing the waterproofing system. This meant that Phase 1 on the East side of the bridge was completed ahead of schedule.**

**We were able to work throughout lockdown, making sure that operations were fully compliant with UK Government guidance for safe working practices in relation to social distancing.”**

Martyn Sherwood, Managing Director Metrail



A minor complication resulting from the pandemic meant that to ensure social distancing a walkway had to remain open on the west side of the bridge. This became a relatively minor third phase once the bulk of the work on the west carriageway was completed.

## The result

The work was completed on time and on budget to the satisfaction of the main contractor and the client. The project was delivered during a difficult period in the UK when day to day life was significantly disrupted. Metrail are now recognised as one of the leading specialist contractors in the sector with an excellent track record working with tier one contractors.



**completed in  
5 months**

## case study

# Thurrock Road Stabilisation

In March 2023 Metrail Construction completed a trial to stabilise a heavily trafficked section of asphalt pavement carriageway on the A1014 in Thurrock in East London.

### Facts & Figures:

<b>When?</b>	March 2023
<b>Where?</b>	400m section on the A1014 in Thurrock in East London
<b>How?</b>	Injecting a silica based resin
<b>Technology</b>	MINOVA/OAT Inject GEO-Plus Two-component silicate resin
<b>Result</b>	Deflectometer testing confirmed the pavement to be fully stabilised with any excess water driven out

### The challenge

The substrata on this particular section had become defective due to water ingress washing out the Type 1 base material under the tarmac, causing deflection and reducing the strength of the road. Attempts by the local authority to solve the problem by simply resurfacing the road did not provide a lasting solution to the problem.

Excess water causes the subsoil to lose load bearing capacity resulting in significant deformation of the pavement. The winter cycle of freeze and thaw conditions also creates pot holes. A permanent solution can only be achieved if the substrata is stabilised.

### Solution approach

As a solution to the problem Metrail Construction proposed to use its innovative slab stabilisation process which is based on injecting a silica based resin into the sub-base to drive out water and fill any voids.

The resin permeates the sub-base and cures to a strength of 50 N/mm<sup>2</sup> in 15 minutes.



Watch the  
case study video



**Innovative slab  
stabilisation injecting  
a silica based resin**

The two-component silicate resin, which is mixed on site, is a cost-efficient solution for the repair and maintenance of damaged pavement compared to the alternative of completely relaying the road.

A key characteristic of the silica material, which is non-permeable and semi flexible, is that it has a density of 1.4 times that of water which means it displaces water and fills any voids under the pavement.

The silica resin allows for dynamic loads from traffic above without cracking, which often occurs with traditional methods of repairs. Renewing the waterproofing involved removing the existing surface of the carriageway and footway, carrying out any necessary concrete

repairs and then applying and testing the waterproofing system before resurfacing the bridge.

## Execution

The work was carried out over five nightshifts. The high traffic volumes meant that the carriageway could not be closed during the day and night working could only be carried out in one lane with other carriageway remaining open to traffic.

The 400m section to be stabilised was marked out to ensure accurate drill spacing for the resin injection.





The two component resin is mixed on site from a purpose built vehicle in a one to one ratio and pumped through the packers inserted in the hole to drive out the water and fill any voids.

During each shift, the full cycle of drilling and resin injection was completed and the road surface cleaned so that the carriageway could be opened to traffic as soon as the work was completed.

## The Outcome

“Before and after” deflectometer testing has confirmed the trial was a complete success with any excess water driven out, voids filled and the pavement fully stabilised to allow resurfacing with the elimination of deflection and potholes.



Work carried out  
in 5 nightshifts

## case study

# Eurotunnel Joint Replacement

In June 2021, Eurotunnel awarded Metrail a framework contract to undertake the replacement of mechanical expansion joints at the UK terminal. This ongoing project entails the removal of old and damaged joints, conducting essential concrete repairs, and installing Permatrack H joints. The scope of the contract requires the replacement of over 800 linear metres of joints within the span of five years. This significant undertaking is crucial to maintain the structural integrity and smooth operation of the shuttle service at the terminal.

### Facts & Figures:

<b>When?</b>	Five-year contract period; work started in 2021
<b>Where?</b>	800 linear metres of joints
<b>How?</b>	Replacing old and damaged joints
<b>Technology</b>	IKO Permatrack H: A heavy duty joint that is a structurally enhanced movement joint

### The challenge

The Channel Tunnel, connecting the United Kingdom and France since May 1994, facilitates high-speed trains linking London to Paris and other European destinations. Additionally, roll-on roll-off shuttle services transport freight and passenger vehicles through the tunnel. Eurotunnel operates this shuttle service and is responsible for all associated infrastructure.

At the UK terminal, the elevated decks, ramps, and platforms that support the shuttle service are complex structures, enduring heavy traffic for nearly 30 years, particularly from freight traffic. Ongoing maintenance is vital to ensure the integrity of the shuttle service, with Metrail Construction playing a key role in this maintenance programme.



## Programme

The terminal has to remain operational at all times and planning is key to minimise disruption and ensure the work is carried out in a timely manner whilst ensuring safety and quality standards are maintained at the highest level. The replacement of some joints requires the platforms, where vehicles access the shuttle, to be closed. Careful planning and extended shifts are required in these locations.

## Technology: Jointing System

As a specialist in the sector Metrail Construction has extensive experience in the installation and replacement of bridge deck expansion joints and is one of a limited number of companies approved by IKO Permatrack to instal their bridge expansion joint system.



IKO provide Metrail with product and technical support as required. The IKO Permatrack H heavy duty joint is a structurally enhanced movement joint ideal for repairing and replacing damaged joints and able to accommodate the movement inherent in bridges and decks.

It can be installed to any depth or width and any localised surface deterioration can be taken into account. The mastic asphalt used is a high modulus material that uses a binder of SBS modified bitumen and Trinidad Lake Asphalt giving low temperature flexibility and high temperature stabilities required for heavily trafficked roads.



## Execution

The methodology for the removal and replacement of the old joints with IKO Permatrack joints is described in detail in the contract documentation and the experienced Metrail team ensure that this procedure is carefully followed to ensure high standards of workmanship and quality.

In summary, the old joint is planed out to the specified width. Old plates are removed and both the trench and air gap are cleaned so as



to be free of all dirt and debris. Any concrete repairs are then carried out using specialist repair material.

IKO PermaFLASH D300 is used to plug the airgap. Primer is then applied to all the trench surfaces. A first layer of molten PSB, a highly flexible material used for tanking the trench, is then applied to the base of the trench and a galvanised steel plate placed in the trench. The trench can then be fully tanked out and a drainage channel and rodding box installed.

The next step is to install the actual expansion material, known as PSB Strips, which provide the majority of the movement for the expansion joint. These strips are applied to the vertical faces of the trench and a further coat of PSB applied.

The trench is brought up to the same level as the rebate so that steel side bars can be installed in the rebate. The joint can then be trowelled level and scattered stones rolled into the surface until satisfactory embedment is achieved. The steel bars are removed and the resulting grooves filled with PSB. The joint has to be allowed to cool before opening to traffic.

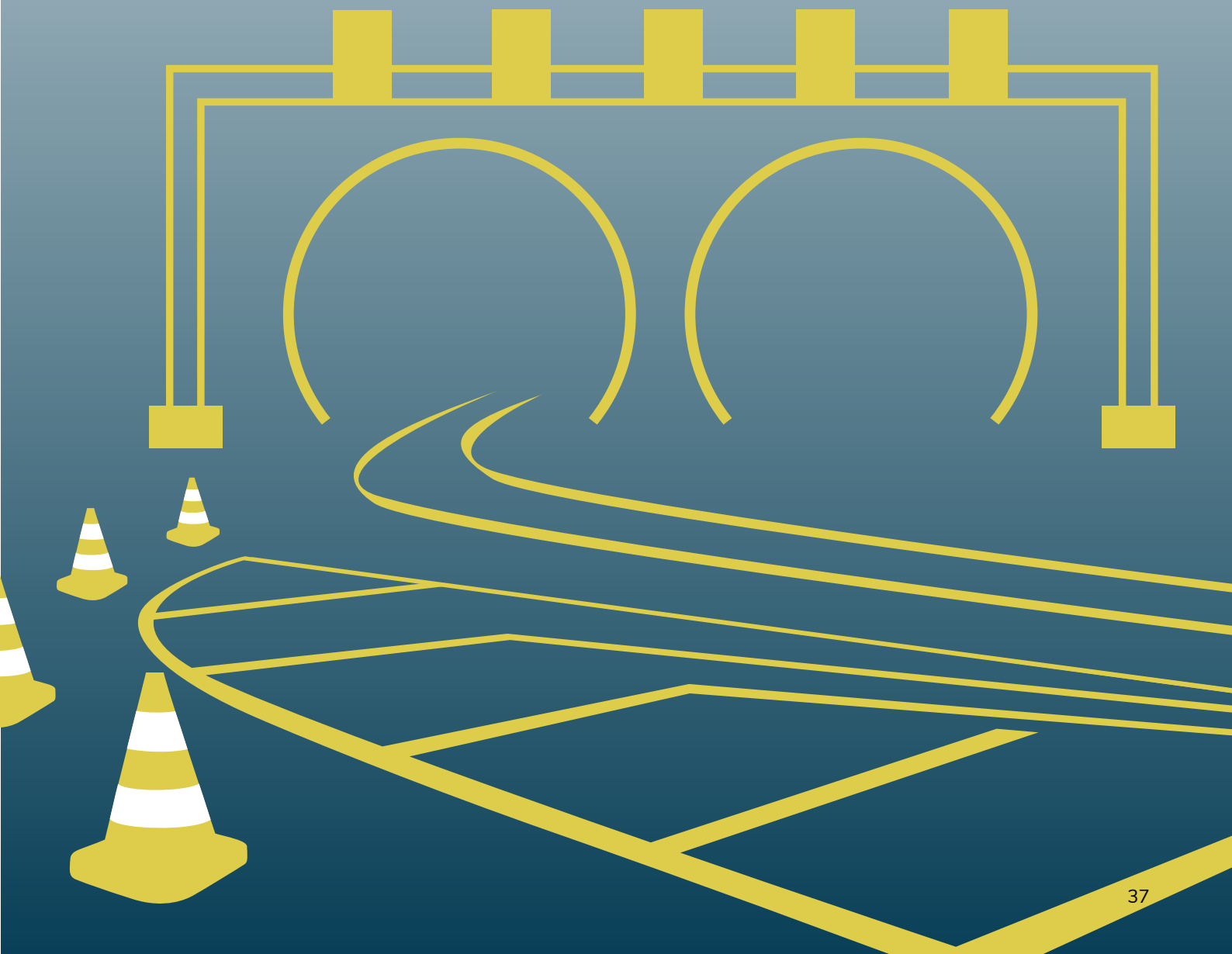
## Conclusion

Metrail's aim is always to deliver high quality work safely and on time and this is certainly the case at the Eurotunnel UK terminal.

The Civil Engineering Department at the at the UK terminal has commented that they are pleased with the progress being made by Metrail.

The IKO Permatrack joint is one of a range of joints that the Metrail team is trained and licenced to instal.

The award of a number contracts to Metrail in 2021 under National Highways Scheme Delivery Framework means that the company will be installing a range of joints including the IKO Permatrack joint over many years.



## Slab Stabilisation for Airports

# With innovative, cost-effective resin injection technology

Concrete slab stabilisation  
for airports

Quick &  
easy



Maintenance



### Resin injection: an innovative technology

- Stabilisation and leveling of heavily used concrete slabs
- Quick and efficient solution for repair and maintenance projects
- Extends the lifespan of the structure by approx. 30 years
- Lower maintenance than standard brittle cement-based solutions

### Features of the silicate resin

- 1.4 times the density of water – forces excess water out from under the slab
- Cures to 90% full strength within 15 minutes
- Full compressive strength of ca. 50n/mm<sup>2</sup> achieved within the hour
- High strength and yet sufficient elasticity to absorb vibration and be crack-resistant under load



### Hamburg Airport



Repair work with 10m  
executed silicate resin



Executed within one shift



Executed around 2021



### Bremen Airport



20 slabs with approx.  
500m<sup>2</sup> silicate resin



Executed within one shift



Executed around 2018





Your partner of choice  
for asset management  
services across the UK:

- Waterproofing

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- Joint replacement

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- Concrete Repairs

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- Slab Stabilisation

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