

# CASE STUDY

## Car Park Refurbishment

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### PROJECT

ASDA Worcester

### STRUCTURE

Steel Frame with  
Concrete Slab

### CLIENT

ASDA Worcester

### CONTRACT



The 10,000m<sup>2</sup> multistorey car park in Worcester was originally built in 2012 by the then giant Carillion as part of a £75million investment in the St Martin's Quarter.

The steel frame concrete slab structure shares the same façade as the Royal Artillery building, home of the Territorials. The 8-level multistorey was suffering from highly polished floors, which when wet through with rain deposited by cars, made the car park a skating rink. The top deck levels 7-8 required asphalt and joint repairs as well as drainage works to prevent water ingress to the structural steelwork.

Makers were commissioned by Gleneagles Project Services Ltd on behalf of ASDA to treat the surface making it safe for all ASDA customers and visitors to Worcester.

Six trial areas were prepared to allow for comparison of various surface preparation techniques and following examination by all concerned it was agreed that the most appropriate and economical solution would be Triflex DeckDefence ECO membrane system to combat the issues and provide a slip resistant surface.

The site needed to remain open to provide parking for shoppers and visitors, so a phased approach and traffic management was key to maintaining access.



Before



Before

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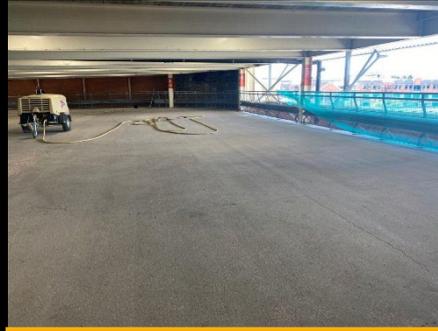
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Testing



Double Blasting



180° turn from Test Area

Six trial bays were chosen as they were furthest away from the lift operation and some of the bays were already closed off due to water penetration from above. The area selected had a natural exclusion zone and the 6 bays allocated gave a test area of 75m<sup>2</sup>.

3 different types of preparation was carried out to two parking bays each, where a filled Triflex system DeckDefence was applied to 3 bays and Triflex DeckDefence Eco to the other 3.

The difference in the systems is that in the DeckDefence the primer base coat is filled to produce a thicker system whereas the Eco system relies on the primer coat which then is fully aggregated and then sealed.

The 3 different types of preparation consisted of in trial 1 A plane and blast of the surface. This a mechanical planner which removes 4-5mm of the top surface and then is captive blasted, trial 2 using the captive blast machine to blast the top surface twice to create a key, and trial 3 a single pass of the captive blast machine.

Following the preparation, the substrates where tested and all passed the 1.5KN/mm<sup>2</sup> test required for the application of the Triflex system.

After inspection of all 3 techniques to both systems it was decided that the double blast and DeckDefence Eco was the way forward and a specification and tender process duly undertaken.

The contract programme starts with the agreed specification and tender process, however, after progressing further directly to the right of the original test area the surface was consistent with the polished crust removed and the residual intact and bonded. Cracking was evident within the top of the surface and this was also seen during the trial.

The tender intention was not to waterproof the deck but to provide an anti-slip surface and the highly polished surface was considered dangerous when wet and slips being reported.

But preparation was carried out on the same deck 180 degrees turn from the test area and the result was startlingly different.

The top crust had been blasted to form a key but had also given itself up, losing up to 5mm of material creating a very uneven and friable surface. 8 test sites were located across the area and the results were poor with over 60% of them failing and not achieving the required 1.5kn/mm<sup>2</sup>. After closer examination the "cauliflower" effect left very friable edges at the points of transition which very quickly would debunk and fail causing a failure of the system if applied.

The decks original construction is inconsistent with very distinct areas, and the resulting surface after the double blast showed a moon crater effect, with clear channel lines indented which were originally thermoplastic lines, and when blasted removed 5mm of the concrete topping.



Surface Cracks

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The Triflex DeckDefence Eco system consists of 3 elements, the primer, the cast in aggregate and the seal coat which when combined produces a system around 1.5mm thick and will only follow the profile its applied to. It was considered that the resultant surface after the specified preparation would not be acceptable and any coatings applied would not only be poor, but would fail very quickly and be unable to receive any warranty due to the poor profile and adhesion.

The deck was planned to get to the residual surface of the polished concrete and further investigation showed black dots or holes within the concrete which in themselves not such a problem but create the opportunity for outgassing. This is the process whereby air and moisture vapour escape when heat is applied through the warming of the deck and the exothermic reaction that occurs during the polymerisation phase of "curing" of the rod cut when applied.

The decking systems apply a newton force in excess of 6Kn/mm<sup>2</sup> and so a solid sound substrate was required. When all the adhesion tests were taken all of them failed within the substrate and had a large deposit of material on them.

The polished surface was created by overworking the surface to encourage the "fines" or small particles to rise to the top. Constant working creates a thickness but has very little aggregate or concrete paste so whilst it is in it's drying and curing phase it maintains its bond, but due to the shrinkage probably caused by accelerated drying out this crust became detached and weakened.

On close inspection of the substrate the slab was suffering from "Lignite", this is a rare occurrence whereby iron ore aggregate has contaminated the mix. The issue with Lignite is if it gets wet it creates an acid that burns through the deck system, causing blisters and pockets under the surface.

The voids/holes within the surface were between 2-3mm deep and were caused by Lignite which is small fragments of coal ore which had probably been caused by not cleaning out batch plant when mixing concrete. These deposits are inert but when they come into contact with water, they produce black soluble solution. This reaction was immediate and once dried the black powder was air blasted away, leaving the issue of voids or craters in the substrate which could lead to outgassing during the installation process. Outgassing is when the resin as it cures forms a bridge or skin across the hole to which the rest of the system is applied. Unfortunately, the area directly below the bridge is hollow and unsupported which allows the moisture and oxygen vapour to expand when it's heated through thermal gain and as it expands, it bursts through the system causing "pin holing".

Pin holing is not detrimental to the performance of the system and would not be seen by the naked eye, but over time gather dirt and leave a speckled effect in the brighter coloured coatings. On the black and adorned grey not so obvious but as we were not producing a waterproofing system it wasn't a problem and the system was being installed for safety and aesthetics.



Lignite



Planning



Spoil

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After



Before



After

The solution was to plane off the residual crust to get down to the better substrate which had already been tested producing adhesive results in excess of 3Kn/mm<sup>2</sup>.

The top deck required various minor repairs such as installation of movement joints, drainage repairs, making upstands watertight, movement and reinstallation of guttering and trolley bays were refurbished with coatings. After repairs were carried out the top deck received refreshed line marking installed throughout.

Each level 1- 6 required surface preparation of the concrete deck to ensure best rests of the installation of Triflex DeckDefence ECO. All levels were prepared using Schibeci to remove lines and shot blast.

The Triflex DeckDefence ECO system was the most economical solution to provide a slip resistant surface to provide a solution to the hazard.

A self-priming coating layer was installed which is the resin the quartz sand is broadcast into, embedding into the resin to provide slip resistance properties. Once fully cured the excess sand was swept off with a sweeper before installing a wearing/seal.

All areas were taped off in preparation for the Triflex DeckCoat system; wearing/seal coat containing the required colours which is poured onto the deck and applied to the surface areas to specified consumption using a squeegee and then back rolled, providing a coloured sealed finish.

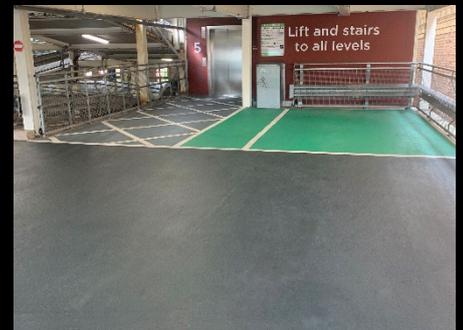
The standard 2.4 metre bays were widened to 2.6 to provide easier parking and offer better customer parking experience. Where required trolley bays were refurbished with new furnishings and new line-markings and directional arrows re-instated throughout.



After



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