

Town Centre Car Parks' Ben Ziff (right) inspects the site



Merrion remade

The 1960s Merrion Centre car park in Leeds is being transformed into a 21st century car park, reports **Mark Moran**

Car parks are not usually destinations in themselves, but last month a group of over 40 people donned hi-vis jackets and hard hats to tour the multi-storey serving the Merrion Centre in Leeds. The tour was organised by the team refurbishing the car park to show a range of systems and techniques being applied to the project, including the use of carbon fibre wrapping to strengthen parking decks and sacrificial anodes to counter the corrosive effects of chlorides on steel reinforcement concrete.

The Merrion Centre and its multi-storey car park opened in 1964 and has remained largely unchanged since the 1970s, when a roof was added to the

mall. The centre is now undergoing a major revamp, with owner Town Centre Securities (TCS) adding bars, cafés, restaurants and leisure facilities. The first phase of the regeneration project is to upgrade the car park.

Ben Ziff, managing director of Town Centre Car Parks, a TCS subsidiary said it would have been cheaper to demolish and replace the car park, but the multi-storey is vital to the centre's operation so refurbishment was the only viable option. "Keeping the car park live during the 48-week refurbishment was vital as this keeps our retail and office tenants happy," he says. "During the evening and at weekends the

multi-storey is also the main car park for people attending events at the First Direct Arena."

The main contractor for the centre and car park refurbishment is GMI Construction Group, whose senior project manager Gary Oates has the job of keeping the car park operational during the upgrade. "We have to ensure that no more than 30% of the spaces are out of use at any one time," he explains.

GMI and engineer Curtins Consulting commissioned car park refurbishment specialist Makers Construction to carry out the works using materials supplied by Sika.

The phased refurbishment of the ageing concrete structure



included a series of major concrete and structural repairs, new expansion joints and new anti-carbonation and waterproof coatings. New signage and bay markings will see the creation of wider bays, reducing capacity from just over 1,000 to 950 more user-friendly spaces.

The new interiors will be brighter as a result of re-lighting with LED units. Contemporary, lightweight safety barriers have been surface bolted to the perimeters of each deck. New Disability Discrimination Act (DDA) compliant lifts will be installed. The existing APT Skidata pay-on-foot system will be enhanced by the addition contactless payment options while customer-only pedestrian access gates will enhance security.

Electric car charging facilities are also being introduced.

The car park's exterior will be replaced with a new diagrid (diagonal grid) façade treatment with feature lighting.

A challenging site

The car park was built as a cast insitu reinforced concrete frame bearing precast concrete deck planks. After over 50 years of service car park was not in a good condition, says Nic Webb, technical director at Curtins Consulting. "The lighting was poor, with low lux levels," Webb explains. "Previous remedial works had included painting the ceiling soffits white, but only above the centre of each driving aisle. The interior decks were unprotected and had a rough finish. The concrete was spalling due to a high chloride content. They were in a generally poor condition, with previous patch repairs failing. The joint system had failed, allowing water to leak into the decks below, dripping on to the parked cars. The existing traffic barriers were bolted through the decks."

The major challenge was the loss of continuity of steel reinforcement within the concrete decks, which had changed their structural performance. Condition surveys revealed the floor slabs were in a poor state. "The topping had delaminated from the precast planks. High chloride content meant there was a high corrosion potential. The loss of continuity had changed the structural performance.

"The normal solution would



Carbon wrapping the ceiling soffits



Makers and Sika staff

be to remove and replace the floor slabs, but we sought a more sustainable and less intrusive solution to extend the building life," says Webb

"Applying a carbon fibre wrap to a neutralised slab was a more sustainable solution, involving greater re-use of the existing structure and its embodied energy. The repairs and strengthening can be completed in phases in discrete areas while the remainder of the car park beyond the safety zone remains open."

Wrapping the car park

The approach adopted at the Merrion Centre has been to strengthen the decks using carbon fibre wrap with anchors installed every 300mm. The anchors are a cluster of carbon fibre ropes, which spread the load. They are inserted into holes drilled into the beams and then fanned out over the carbon fibre sheets. A total of 37,000 anchor holes will be drilled.

"The Merrion Centre is Europe's largest carbon fibre structural strengthening project," says Graeme Middleton, Makers Construction's regional business development manager. "The carbon fibre plates are non-corroding and have a higher tensile strength than steel."

Sika proposed the use of a carbon fibre structural strengthening system using SikaWrap Anchors and the high performance SikaWrap 300, a reinforced carbon fibre fabric which was used for the flexural and shear strengthening of slabs within the building structure.



Recoating the top deck

The reinforced concrete beams were strengthened with CarboDur Plates, a carbon fibre reinforced polymer (CFRP) system designed by Sika to provide structural stability.

A complete makeover

Repairs are required to decks, soffits, columns and beams, says Makers's Graeme Middleton. "All surfaces were grit-blasted to remove dirt, coatings and laitance," says Middleton. "All areas were hammer tested and marked up prior to repair. A mixture of hand-placed and flowable repair mortars were used. Pre-bagged cementitious mortars were used to deliver quality control."

Middleton says the selection of Sika as a single source manufacturer guarantees material compatibility and all the repair processes and materials are fully compliant to BS EN 1504.

Mark Bushell, Sika's national sales manager (property), said because Sika was approached early in the design process, the company could carry out on-site testing in order to appraise the

extent of corrosion and devise the most cost-effective and technically viable corrosion mitigation solution.

"Sika Rapid Repair Mortar was used for the smaller concrete deck repairs due to its fast application process and adhesion properties. For deeper and large volume surface repairs, Sika Armorem Armorcrete was used," explains Bushell. "Sika Rapid was used for fast-curing repairs to the decks. For the intermediate decks, a system featuring Sikafloor 161, Sikafloor 375N Elastic and Sikafloor 358 was chosen. Sikafloor 161, a two-part epoxy resin, was used as a moisture resistant primer. The 161 was covered with a layer of Sikafloor 375N Elastic, a solvent-free elastic polyurethane membrane with crack-bridging properties and a seal coat of Sikafloor 358. The surface was broadcast with quartz aggregate to give anti-slip qualities and resistance to abrasion."

The exposed top decks, were failing and delaminated in large areas exposing the concrete deck to water ingress, says Makers' Graeme Middleton. "The top

deck was in very poor condition, suffering from multiple cracking and failed joints," he says. "The ageing deck treatments were at varying stages of degradation and patch repairs were failing. There were high levels of chloride content due to the deposition of icing salts.

"All existing asphalt surfaces were removed and the surface prepared. The surface was hammer tested and areas for repair marked and broken out. The result was a large amount of deck repairs at varying depths, including along transverse joints. The failed movement joints are reinstated to correct dimensions using the Emseal DSM system."

Sika's Mark Bushell says the top deck was treated with SikaFloor Pronto decking system, which has a fast application that minimises the time a deck is out of action. "Featuring PMMA (polymethyl methacrylic), the resin flooring system is ready for foot traffic after one hour and fully cured after two," he says.

"Due to high chloride levels and low concrete cover to the reinforcement, an effective corrosion management system was required. Sika Galvashield sacrificial anodes were applied to the concrete patch repairs to protect against incipient anode corrosion. Sika Ferrogard 903+ was spray-applied to the remaining areas of the concrete slab to protect against further corrosion occurring to the steel reinforcement due to the presence of chlorides and carbonation."

Some 32,000m² of white Sikagard anti-carbonation coatings are being applied to soffits, columns and beams.

A brighter future

The use of LED lighting will increase lux levels in the car parks while also reducing the energy bill. Before the refurbishment, Town Centre Car Parks carried out extensive trials of the LED technology, says Ben Ziff. "It was important to determine the positive impact that new technologies can have within the parking environment, on the green agenda and on the customer experience, before rolling out the refurbishment project. We wanted to be sure that it would create a car park for the 21st century and be in keeping with the needs of everyone connected with the Merrion Centre."



The open day